atmos CONSULTING

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Environmental Impact Assessment Report

Cummeennabuddoge Wind Farm

Technical Appendix 10-1 Geotechnical Interpretive Report

Cummeennabuddoge Wind (DAC)

September 2024

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Executive summary

Atmos Consulting commissioned Gavin and Doherty Geosolutions (GDG) to provide geotechnical consulting services for the proposed Cummeennabuddoge wind farm site.

Recent site investigations and site walkovers have identified that peat thicknesses across the site vary from 0.m up to a maximum of 5.4m in localised areas.

The intrusive ground investigation carried out across the site included a walkover at all turbine locations and key infrastructure locations to identify visible geohazards, environmental constraints, mapping of the geomorphological conditions, peat probing, shear vane testing, machine excavated trial pits, Russian core sampling and a suite of geotechnical and geoenvironmental laboratory testing.

The ground model for the site is generally described as dark brown spongy, fibrous, and firm PEAT strata, overlying gravely CLAY/SILT and clayey GRAVEL, overlying weathered bedrock. The ground conditions encountered at each turbine locations are summarised in Section 4.1.

The peat strata are comprised of three layers: spongy peat, overlying firm peat and plastic peat. The peat depths described in the trial pit and Russian core locations range from 0.40m to 2.50m, with an average value of 1.3m. The degree of humification, moisture content and fraction of fine fibrous material increases with depth suggestive of an increase in peat decomposition with depth. This is indicative of a decrease in peat strength with depth.

This report summarises the observations made during the site walkover, the records of the trial pit and Russian core logs and the results of the in-situ shear vane testing. A set of characteristic engineering parameters are derived for the peat material at the site using these results and comparing with past experience working in Irish upland peat environments and existing literature.

1 Introduction

Gavin and Doherty Geosolutions (GDG) was commissioned by Atmos Consulting to provide geotechnical consulting services for the proposed Cummeennabuddoge wind farm site. In accordance with planning guidelines compiled by the Department of the Environment, Heritage and Local Government (DoEHLG), where peat is present on a proposed wind farm development, a peat stability assessment is required.

Previous site investigations and site walkovers have identified that peat depths across the site vary from 0m up to 5.40m in localised areas.

Background desk studies and fieldworks including peat depth probing and shear vane testing are required to complete stability analyses and a risk assessment to assess the risks posed by peat failures, following the principles in Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Scottish Executive, 2017).

A preliminary intrusive ground investigation has been carried out to assess the thicknesses, material composition and physical parameters of the peat and soft ground materials throughout the site.

Site investigation works are composed of:

- Area walkover at all turbine and key infrastructure locations to identify any visible geohazards and environmental constraints, carry out geomorphological mapping and highlight any changes in the site condition from the satellite imagery,
- Peat probe locations throughout the site,
- Shear vane testing at turbine locations,
- Machine excavated trial pits for material identification and sampling,
- Russian core sampling in areas not accessible by excavator,
- A suite of geotechnical lab tests including moisture contents, Atterberg limits and particle size distribution,
- Geo-environmental lab testing of samples collected at trial pit locations for the assessment of the phosphate levels in soils,

1.1 Site description

The proposed site is located in the townlands of Cummeennabudoge and Clydaghroe, Co. Kerry and is approximately 6km north of Ballyvourney, Co. Cork. The proposed access route passes through the townlands of Cummeenavrick and Glashacormick, Co. Kerry. A site location plan is shown in Figure 1-1.

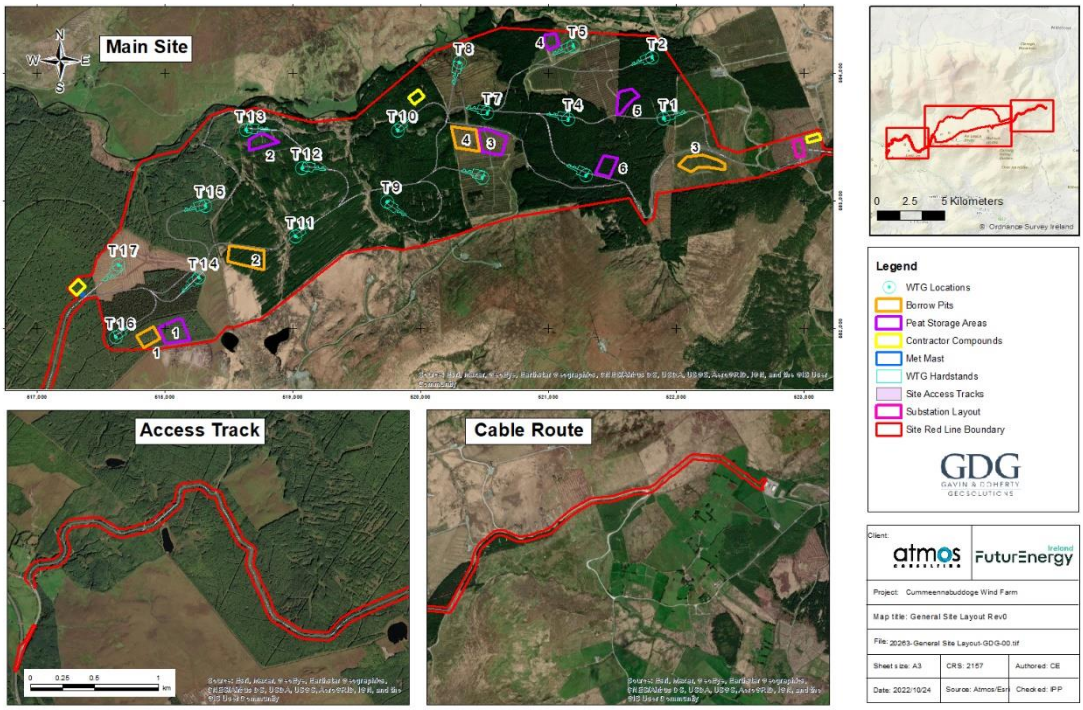

Figure 1-1: Site locations plan showing site layout

The topography of the site is typically sloped, falling from south to north with the Lackabaun and Mullaghanish mountain peaks located along the southern boundary of the site. Steep gradients are anticipated at various locations around the site. The access route is to extend from the N22 to the west and travels along existing forestry tracks. The tracks within 1.5km of the N22 are steep, climbing from an elevation of 250m OD to approximately 380m OD.

The site currently consists of coniferous plantation with existing forestry tracks traversing the site. Existing wind farms are present to the north, south and east of the site. The River Clydagh, a tributary of the River Flesk, is located along the northern boundary of the site. Additionally, there are several minor watercourses throughout the site.

Access throughout the site is possible on the existing forestry roads. Several of the turbine locations are at isolated areas of the site inaccessible by forestry roads, they are accessible on foot through existing cut lines within the forestry.

1.2 Applicable design codes and guides

- Specification and Related Documents for Ground Investigation in Ireland 2nd Edition 2016
- Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Scottish Executive, 2017),
- British Standards Institute BS 5930:2015, Code of practice for ground investigations.
- British Standard Institute BS 1377, Methods for test for soils for civil engineering purposes

2 Site Investigations

2.1 Existing site investigations

Previous to the March 2022 GI campaign there were existing investigations at the site;

- Preliminary peat probe data collected by GDG in March 2021,
- Gouge sampling locations carried out as part of a previous planning application, the information was received from the Kerry County Council archives dated in 2011 carried out by an unknown consultant.

The previous site investigation identified peat materials across the site, varying in thickness from 0.3m to 3.15m, sometimes showing a variation across short distances. Limited characterisation of the PEAT material was carried out as part of these investigations

2.2 Scheduled site investigations

2.2.1 Walkover and peat probing

An extensive peat probe campaign was carried out by GDG across the extent of the site, including at the locations of all turbines and infrastructure locations. This work composed of 145nr. peat probe locations across the extent of the site. Shear vane testing was also carried out at 17nr. locations across the site to aid in the assessment of peat strength. Shear vane testing was carried out at different depths at each location to identify any changes in strength with depth within the peat body.

During these works, the engineers were also carrying out walkover examinations of the turbine locations to identify any visible geohazards and environmental constraints, carry out geomorphological mapping and highlight any changes in the site condition from the satellite imagery.

Peat probe and shear vane layouts are shown in Appendix A

2.2.2 Trial pits

Seventeen trial pit locations were scheduled at key locations across the site, at turbine locations and, the locations of potential borrow pits and peat storage areas. A trial pits layout plan is Appendix B. Trial pits were excavated by a 13T machine excavator with low ground pressure bearing tracks for access across areas of peat. Trial pits were logged by a geotechnical engineer from the GI Contractor, Ground Investigations Ireland (GII). Material descriptions within the peat are to include the Von Post after Hobbs (1986) classification system to help identify differences within the peat and quantify the volumes of the upper Acrotelm layer and the lower Catotelm layer of the peat body.

Trial pit logs are outlined in the Cummeennabuddoge Wind Farm factual report (GII, 2022) in Appendix D.

2.2.3 Russian core sampling

Twenty-eight Russian core samples were scheduled across the site. The Russian core sampler is a handheld device which is manually pushed into the peat material to collect a sample. These locations were scheduled in areas where access with the excavator was not possible. The recovered samples were photographed and logged to aid in the classification of the peat.

Material descriptions of the recovered peat material in Russian core samples are to include the Von Post after Hobbs(1986) classification system to help identify differences within the peat, aid in deriving characteristic parameters for the material and quantify the volumes of the upper Acrotelm layer and the lower Catotelm layer of the peat body.

Russian core logs are outlined in the Cummeennabuddoge Wind Farm factual report (GII, 2022) in Appendix D.

2.2.4 Lab testing

Geotechnical and geoenvironmental testing was scheduled on the recovered samples from the trial pit locations.

Geotechnical testing was carried out on several samples to assess the material properties of the peat material and the underlying materials. Moisture content and Atturberg limit testing was carried out on peat material. Partical size distribution (PSD) testing was carried out on samples recovered in the materials underlying the peat assess its suitability for re-use.

A geoenvironmental testing suite was scheduled on samples to assess the phosphate levels of the shallow material which may have been affected by the historical forestry and fertiliser use at the site. The used suite is outlined in Table 2-1.

Table 2-1: Geoenvironmental Phosphate testing suite

Matrix	Determinant	Accreditation Status		Methodology	Detection Limit	Unit
Soil	Phosphorus (aqua regia extractable)	ISO17 025	None	ICP-OES	20	mg/kg
Soil	Orthophosphate (as P) - Water Soluble (2:1)	None	None	Colorimetric	0.1	mg/kg
Soil	Orthophosphate (as PO4) - Water Soluble (2:1)	None	None	Colorimetric	0.3	mg/kg
Soil	Phosphate as P - Extractable - BS 3882:2015 Method	None	None	Colorimetric	1	mg/l

2.2.5 Issues and limitations of survey

Several locations proved to be difficult to access with the machine excavator and on foot for the collection of data. During the planning stages of the project due to the difficulty of access to some areas of the site, Russian core samples were scheduled at locations where access with a machine excavator would not be possible. A site walkover had been carried out by the Contractor prior to the arrival on site for works and locations had been moved around as best they could be to enable the assessment of all areas of the site. However, some locations were not able to be accessed. Access was limited at the following locations:

- Trial location TP115 was not accessible due to fallen harvested trees and was not completed.
- Russian core samples GC113 and GC114, at turbines T11 and T12 respectively, were not accessible as the location is remote and the Contractor was unable to navigate to the locations.

TP116 was completed early (2.0mbgl) within the peat material as groundwater was encountered and the peat material in the pit walls collapsed before proving the full depth of peat material.

Peat probing and Russian core sampling are an effective way to estimate the peat depth and the assessment of the depth of soft materials. However, they do not guarantee to prove the thickness of peat with 100% accuracy. Other obstructions within the peat such as roots or peat timber can impede the penetration of the rods. No samples are recovered from the underlying materials so the refusal material cannot be identified.

3 Results

3.1 Peat probe results

The thickness of the peat varies across the site from 0m to a maximum of 5.4m between T09 and T10. A summary of peat thickness results at the turbines is presented in Table 3-1.

Table 3-1: Peat thickness results

Location	Maximum thickness (m)	Minimum thickness (m)	Average (m)
T01	1.17	0.99	1.08
T02	2.07	1.17	1.62
T03	1.35	1.26	1.30
T04	1.44	0.90	1.17
T05	2.97	0.18	1.58
T06	2.25	1.17	1.71
T07	2.48	1.49	1.98
T08	1.89	0.00	0.70
T09	2.70	1.26	1.98
T10	1.26	0.90	1.08
T11	2.52	1.80	2.04
T12	2.25	0.72	1.60
T13	1.44	0.72	1.05
T14	1.80	1.71	1.75
T15	1.96	1.35	1.65
T16	1.89	1.26	1.57
T17	2.70	1.80	2.16

Figure 3-1 presents the frequency of peat thickness values across the site. Peat thickness values between 1m and 2m are the most frequent, followed by values less than 1m.

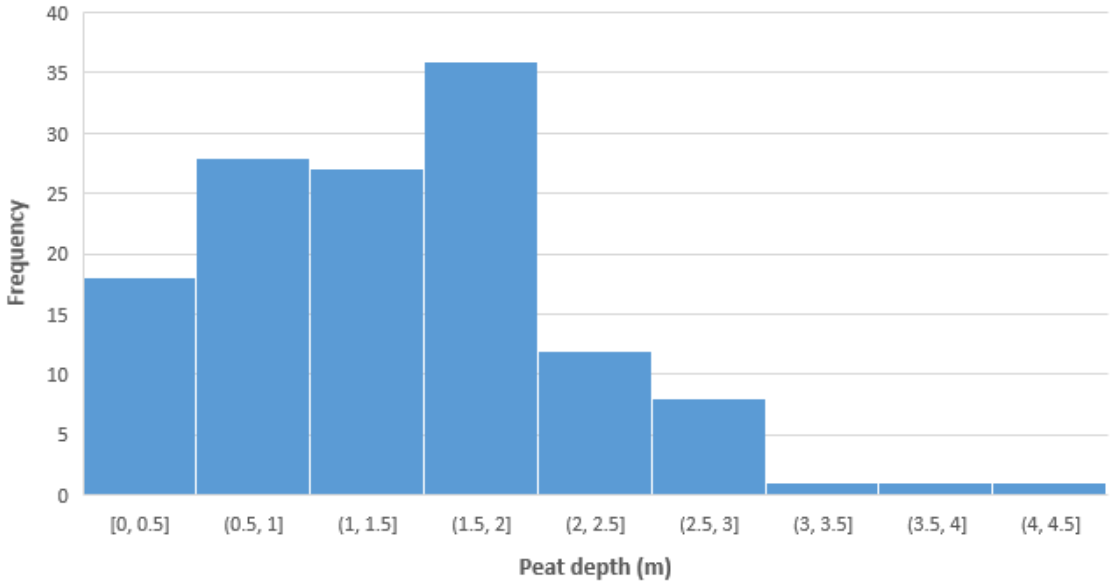

Figure 3-1: Histogram of the frequency of peat thicknesses.

3.2 Shear vane results

Shear vane tests were carried out at all the proposed turbine locations at 0.5m and 1m below ground level (bgl). A summary of shear vane strength results at the turbines is present in

Table 3-2. The characteristic undrained shear strength of the peat deposits is based in-situ hand shear vane tests at 17 no. locations with results ranging from 9kPa to 32kPa with an average value of 18.5kPa.

Table 3-2: Shear vane test results

Location	Shear strength at 0.5m bgl (kPa)	Shear strength at 1m bgl (kPa)
T01	20	25
T02	19	13
T03	17	19
T04	30	32
T05	15	17
T06	9	10
T07	33	15
T08	30 (@ 0.3m)	No peat
T09	17.5	19
T10	24	21
T11	16	14

T12	19	12
T13	20	22
T14	18	12
T15	18	21
T16	11	22
T17	17	16

For the purpose of this planning assessment GIR, the general undrained shear strength parameters for the peat material at the site is interpreted to have a lower bound estimate of 9kPa, a best estimate of 14kPa and upper bound of 20kPa.

For the development of a conservative assessment within Appendix 10-2 Peat Stability Risk Assessment further reduction factors have been used on the undrained shear strength values. The undrained shear strength value used in the Stability Factor of Safety assessment at the site have been reviewed against critical values recorded at the slip interface of past landslides as outlined in forensic case studies and in Section 4.2.2 of this report and adequately captures a potential worst-case parameter.

3.2.1 Limitation of hand shear vane testing in peat

Shear vane testing is a widely accepted method of testing the shear strength in cohesive soils. While it is used frequently in industry for testing peat, it does however have its limitations in the assessment of shear strengths in peat materials and other soft and organic soils. The presence of organic matter, fibres or wood material within the peat can affect the onsite result, producing a false reading on site. A conservative approach using shear vane results as a guide is appropriate for the assessment of shear strengths in peat. During construction it is advised that an observational approach is adopted by the contractor, reporting the characteristics of the peat material (fibres, rootlets, wood content etc) and reporting how peat behaves during construction. Results shall be reported to the detail designer regularly and the Contractor will contact the designer should the results of the insitu testing vary outside of the parameters outlined in the detail design report.

3.3 Trial pit results

Seventeen trial pits have been carried out across the site. Trial pit logs can be found in the GII Factual Geotechnical Report (Appendix D). The trial pit locations generally encountered dark brown spongy to firm PEAT, overlying an orange to grey sandy gravelly CLAY/SILT, overlying dark brown slightly sandy very clayey fine to coarse angular to surrounded GRAVEL with many angular to subrounded cobbles and occasional boulders, overlying weathered BEDROCK.

Groundwater depth ranges from 0m bgl to 2.5m bgl.

3.4 Russian core results

Twenty-five Russian core tests were carried out across the site. Three different strata layers were identified and are described as follows:

- Spongy brown pseudofibrous peat;

- Firm brown fibrous peat; and,
- Plastic brown pseudofibrous.

The most typical peat succession is spongy peat, overlying firm/plastic peat, but in some locations, the succession is inverted where plastic peat could be found over spongy peat. In locations where the spongy peat predominates, an intermediate layer of firm peat was identified as in T16.

The peat thickness identified by Russian core sampling range from 0.4m to 2.5m, with an average value of 1.3m.

3.5 Laboratory results

Laboratory analyses have been carried out at TP101, TP103, TP104, TP107, TP108, TP110 and TP112 locations which are comprised of moisture content, liquid limit, plastic limit, plasticity index and particle size distribution (PSD) analysis.

Moisture content results vary from a minimum value of 32.8% to a maximum of 1442%, with an average value of 875%, as shown in Figure 3-2.

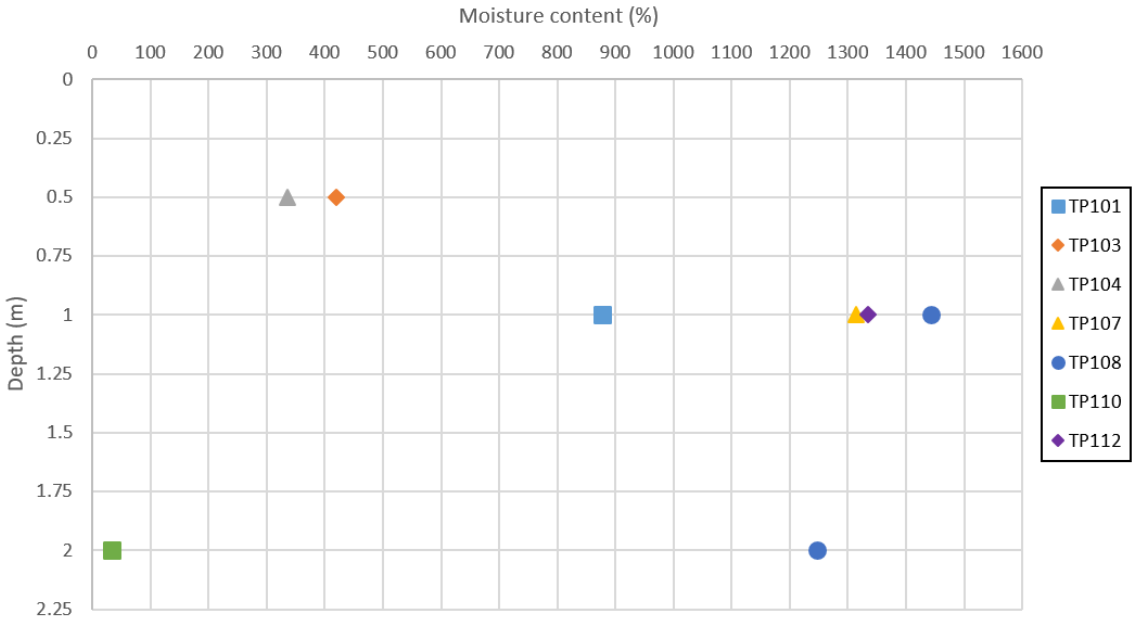

Figure 3-2: Moisture content results

The liquid limit results vary from a minimum value of 46% to a maximum value of 1380%, with an average value of 935%. The plastic limit results vary from a minimum value of 132% to a maximum of 462% with an average of 317%, as shown in Figure 3-3.

The minimum moisture content and liquid limit values were encountered in TP110.

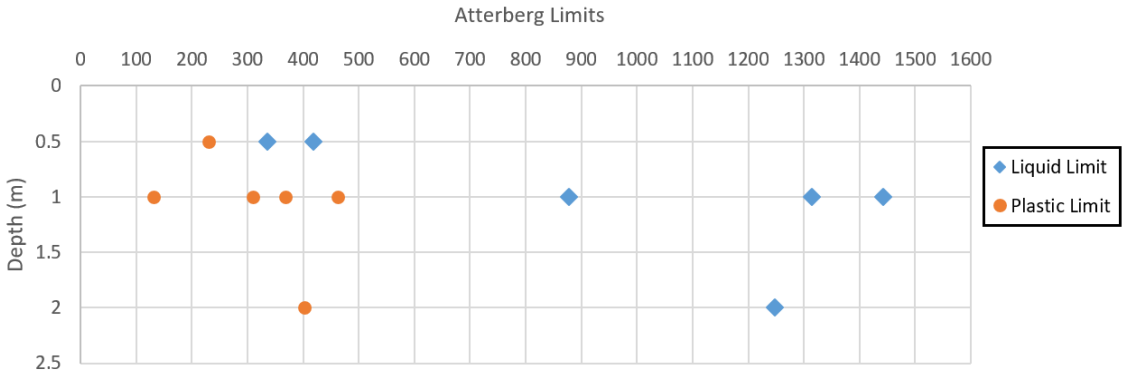

Figure 3-3: Atterberg limits results

PSD analysis was carried out on five samples from material sampled below the peat blanket at depths ranging from 1.5m bgl up to 3m bgl at TP104, TP112 and TP117.

- The PSD analysis carried out at TP104 location indicates a slightly clayey GRAVEL.
- The PSD analysis carried out at TP112 location suggests a slightly sandy gravelly SILT/CLAY.
- The PSD analysis carried out at 1.5m bgl at TP117 indicates a slightly sandy, clayey GRAVEL. The PSD carried out at 2m bgl at TP117 suggests a clayey silty GRAVEL.

Results from PSD analysis suggest that the glacial till material beneath the peat is likely to be suitable for reuse as an engineered fill based on the grading, however further geochemical testing will be required at detailed design phase. A preliminary assessment of the PSD tests suggests that four of the six samples tested are suitable for use as Class 1A, 6A and 6F and the remaining two samples are suitable as Class 1A and 2C2 material as defined in Table 6/1 of Series 600 of the TII Specification for Roadworks (TII, 2013). Further ground investigation and analysis of the feasibility of the borrow pits and the material reusability will need to be conducted by the detailed designer.

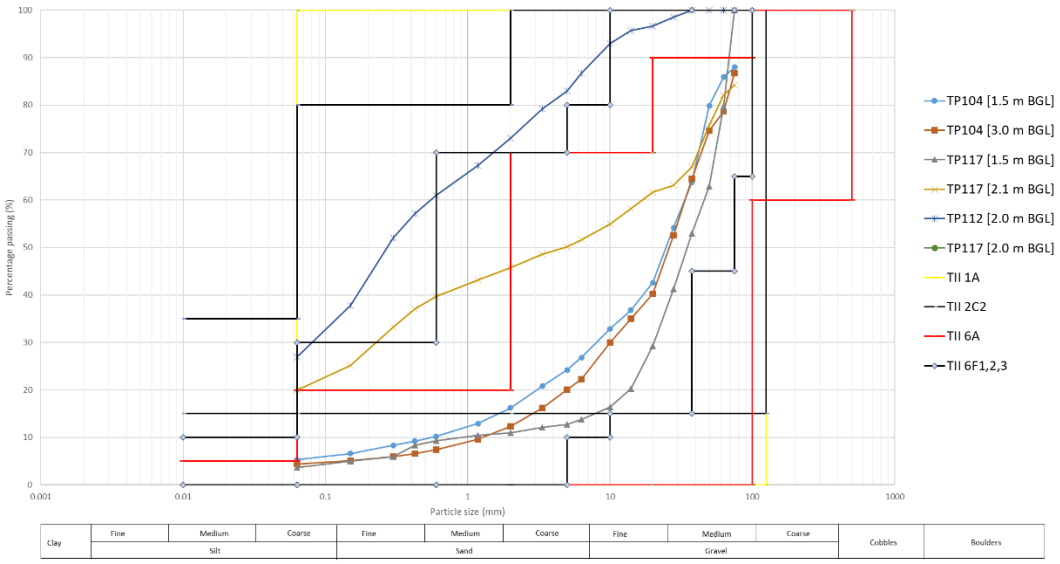

Figure 3-4: PSD results with Series 600 material classification (TII, 2013)

3.6 Highlighted geohazard features

There are many areas on the site where the topography is steep, often in areas of clear-cut forestry and peat ground conditions. These areas pose a risk of peat instability which will be assessed in the peat stability assessment and factor of safety exercise.

Generally, due to the peat harvesting and forestry works at the site, drains have been installed through many areas. The larger open areas of peat and harvested forestry are generally well-drained, but relatively deep pockets of wet and marsh ground were identified in some areas. These areas are generally in topographical lows and flat areas but have been identified close to shoulders or ridges of slopes, suggestive of a potential peat instability risk area. Further assessment of the peat stability modelling will need to be carried out in these areas.

At T4, the ground was identified as being very waterlogged along the current forestry cut line, particularly north of the currently T4 turbine location (Figure 3-5). North of the location, there is a steep 3-4m high steep cliff-type drop in topography. The slope or cliff is composed of approx. 1m of peat and a clayey GRAVEL material, possibly weathered rock, likely formed by erosion from the nearby river approx. 25m to the north. On further investigation of this steep face, a drain or stream, with water flowing at a moderate speed, surfaced from below the peat (Figure 3-6). Further assessment of the peat stability and factor of safety modelling has been carried out across the site and at this location, and a safety buffer zone has been created surrounding this area. Further details of Safety Buffer Zones are outlined in Technical Appendix 10-2 Peat Stability Risk Assessment.

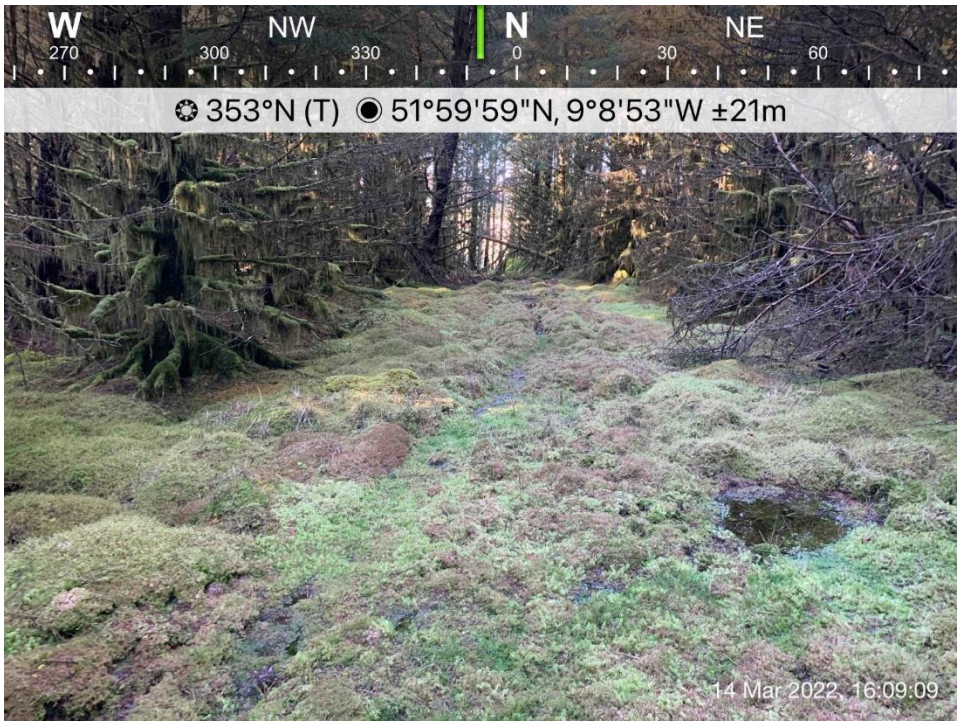

Figure 3-5: Wet area surrounding Turbine 4

Figure 3-6: Stream or drain surfacing from below peat material north of Turbine 4

A large wet, saturated peatland area was identified in a localised area north of the T16 location. This is likely due to the recent clearing of the forestry and the blocking or redundancy of the drainage in the area. The area is not very steep topographically but has identified peat thicknesses >1.5m. The area was avoided during the layout design of the Proposed Development and no works will be required near this feature.

4 Interpretation

4.1 Ground model

Table 4-1 summarised the general ground model encountered during the site investigations at each turbine location.

Table 4-1: Ground model descriptions

Location	Ground model
T01	Spongy peat, overlying slightly clayey very sandy gravel with occasional cobbles and rare boulders. A moderate groundwater seepage was identified during the excavation at 0m. The peat thickness in the area varies from 0.99m to 1.17m, with an average value of 1.08m.
T02	No trial pits were carried out at the proposed T02 location. The peat thickness in the area varies from 1.17m to 2.07m, with an average value of 1.62m.
T03	No trial pits were carried out at the proposed T03 location. The peat thickness in the area varies from 0.18m to 1.35m, with an average value of 0.93m.
T04	No trial pits were carried out at the proposed T04 location. The peat thickness in the area varies from 0.9m to 1.44m, with an average value of 1.17m.
T05	Spongy peat, an overlying firm, slightly sandy, slightly gravelly silty clay with occasional cobbles, overlying clayey sandy gravel with many cobbles and occasional boulders. The peat thickness in the area varies from 0.18m to 2.97m, with an average value of 1.575m.
T06	Spongy peat, overlying stiff, slightly sandy, gravelly clayey silt with rare cobbles and boulders. A moderate groundwater seepage was identified during the excavation at 0m. The peat thickness in the area varies from 1.17m to 2.25m with an average value of 1.71m.
T07	Spongy peat, overlying slightly sandy clayey/silty gravel with occasional cobbles, overlying weathered bedrock. A moderate groundwater seepage was identified during the excavation at 0m and 2.5m. The peat thickness in the area varies from 2.475m to 1.485m, with an average value of 1.98m.
T08	Plastic clayey pseudofibrous peat, overlying firm slightly sandy and gravelly silty clay, overlying firm slightly sandy, gravelly clay/silt with many cobbles and occasional boulders. A slow groundwater seepage was identified during the excavation at 0.5m. The peat thickness in the area varies from 0m to 1.89m, with an average value of 0.7m.
T09	No trial pits were carried out at the proposed T09 location. The peat thickness in the area varies from 1.26m to 2.7m, with an average value of 1.98m.
T10	Spongy fibrous peat, overlying firm slightly sandy, gravelly silty/clay, an overlying firm slightly sandy, gravelly clay/silt with many cobbles and

	occasional boulders. A slow groundwater seepage was identified during the excavation at 1.6m. The peat thickness in the area varies from 0.9m to 1.26m, with an average value of 1.08m.
T11	No trial pits were carried out at the proposed T11 location. The peat thickness in the area varies from 1.8m to 2.52m, with an average value of 2.04m.
T12	No trial pits were carried out at the proposed T12 location. The peat thickness in the area varies from 0.72m to 2.52m, with an average value of 1.6m.
T13	No trial pits were carried out at the proposed T13 location. The peat thickness in the area varies from 0.72m to 1.44m, with an average value of 1.05m.
T14	Plastic pseudofibrous peat, overlying weathered bedrock. A slow groundwater seepage was identified during the excavation at 0.2m. The peat thickness in the area varies from 0.9m to 1.26m, with an average value of 1.08m.
T15	No trial pits were carried out at the proposed T15 location. The peat thickness in the area varies from 1.35m to 1.98m, with an average value of 1.665m.
T16	No trial pits were carried out at the proposed T16 location. The peat thickness in the area varies from 1.26m to 1.89m, with an average value of 1.575m.
T17	Plastic pseudofibrous peat, overlying soft slightly sandy slightly gravelly clay/silt, overlying stiff slightly sandy gravelly clay/silt with occasional cobbles. The peat thickness in the area varies from 0.9m to 1.26m, with an average value of 1.08m.

4.2 Engineering characteristics

Based on the results in Section 3, an interpretation of the geotechnical parameters has been carried out in each proposed turbine location.

4.2.1 Peat characteristics

Peat thickness varies across the site from 0m to a maximum of 5.4m. An extensive peat thickness model is outlined in Appendix C. The highest peat thickness (5.4m) was found between T07 and T08, adjacent to T17, and in one localised area on the main site access road.

The composition of the peat is described using the Von Post classification system suggesting a large level of variation in the peat body across the site, with no typical trend or succession in the peat layering. The peat is predominantly described as fibrous to pseudo fibrous with varying conditions between firm, spongy and plastic. The degree of humification in the peat, a numerical rating outlining the level of decomposition in the peat, ranges between H2 and H6, generally increasing with depth. The fine fibre content typically increases with depth, and the coarse fibre content decreases with depth suggesting an increase in peat decomposition with depth. However, no wood or shrub material is described in the peat. Peat odour is described as increasing with

depth suggestive of the increase in fermentation and decomposition in the peat material.

Site assessment of the relative vertical and horizontal tensile strength of the peat material reflects the variation described in the peat condition with no clear trend in behaviour. This is reflected in the recorded shear vane results outlined in Section 3.2.

Moisture content results within the peat range between 340% and 1442%, these are typical of peat material and generally increase with depth. The Atterberg limit testing results show liquid limit results commonly >1000% typical of low strength, spongey or plastic peat material.

The level of decomposition and deformation within the peat body with depth is less than would have been expected, particularly in the locations where deep peat (>2,0m) is encountered. Often in areas of deep peat, higher levels of humification can be expected, often H6 – H8. It is possible that areas of increased decomposition may exist within the peat body and were not captured in the GI locations. This increase in the level of decomposition will have a negative impact on the material strength and can result in a reduction in the peat strength in the lower peat body.

Seventeen shear vane tests were carried out across the site. The lowest measured strength values were where the peat thickness exceeds 2m or where the groundwater was identified at the top 0.2m during the excavation of the trial pits.

During peat probing and Russian coring activities a firm layer of peat material is identified at the ground surface raging in thickness up to 0.7m. This material is likely the 'live peat' (Acrotelm) containing roots and grass material affected by the live vegetation at the site. Caution must be used when assessing the strength of this material as it can appear to be a higher strength than it is in reality due to the effect of rootlets and fibrous materials.

4.2.2 Summary of the characteristic geotechnical parameters

Due to the variation in peat composition, tensile strength and trend suggesting an increase in peat decomposition with depth, careful consideration needs to be given to the engineering parameters assigned to the peat. The characteristic geotechnical parameters are based on measured and derived values of ground properties along with relevant correlations or published values. The characteristic values have been assessed to be cautious estimates of the value governing the limit state.

Undrained Shear Strength

The undrained shear strength (c_U) of the peat has been assessed from:

- The in-situ hand shear vane measurements as detailed in Section 3.2, and
- Engineering experience of Irish Peats detailed by Long (2007), Boylan and Long (2013) and Quigley et al. (2016),

The in-situ hand shear vane measurements were completed within the peat. The results of these tests are presented in Section 3.2, with the typical c_U ranges measured between 9kPa and 32kPa.

The characteristic undrained shear strength of the Peat was validated against engineering experience presented in various peer-reviewed papers:

- Long (2007) recorded undrained shear strengths in the peat of Sligo and Cork as follows:
    - Using field vanes, cu values were measured between 1 kPa and 40 kPa,
    - Using anisotropically consolidated undrained compression triaxial tests, cu values were measured between 30 kPa and 50 kPa, and
    - Using the Lunne et al. (1997) correlations with CPTu data recorded with a piezocone head, cu values were measured between 10 kPa and 60 kPa.
- Boylan and Long (2013) recorded undrained shear strengths in peat from across the UK and Ireland as follows:
    - Using field vanes across eight sites, c_u values were measured between 6.1 kPa and 9.7 kPa and,
    - Using laboratory simple shear testing on 11 samples from across the UK and Ireland, c_u values were measured between 2.5-3kPa.
- Quigley et al. (2016) used shear vane testing to record undrained shear strengths ranging from 4 kPa to 10 kPa for peat encountered in the Terryland River Valley, Galway.

Based on this review of the hand shear vane results, and a review of the literature, a conservative lower bound undrained shear strength value of 5kPa has been interpreted for the peat material for use in the stability assessment at the site.

Effective Cohesion and Friction Angle

For the analysis of the material in its drained condition, the effective cohesion (c') and effective friction angle (ø') values are required. Due to sample disturbance and difficulties in the interpretation of testing on peat due to excessive strain, analysis of these parameters can be problematic. To determine suitable drained strength values a review of published information on peat was carried out. Table 4-2 outlines some literature used to determine the drained parameters for peat material.

Table 4-2: Literature for determination of drained peat parameters

Reference	Cohesion, c' (kPa)	Friction Angle,
Hanrahan et al. (1967)	5 to 7	36 to 43
Rowe and Mylleville (1996)	2.5	28
Landva (1980)	2 to 4	27.1 to 32.5
Landva (1980)	5 to 6	-
Carling (1986)	6.5	0
Farrell and Hebib (1998)	0	38
Farrell and Hebib (1998)	0.61	31
Rowe, Maclean and Soderman (1984)	3	27
McGreever and Farrel (1988)	6	38
McGreever and Farrel (1988)	6	31
Hungr and Evans (1985)	3.3	-
Madison et al. (1996)	10	23
Dykes and Kirk (2006)	3.2	30.4

Dykes and Kirk (2006)	4	28.8
Warburton et al (2003)	5	23.9
Warburton et al (2003)	8.74	21
Entec (2008)	3.8	36.8
Komatsu et al (2011)	8	34
Zhang and O'Kelly (2014)	0	28.9 to 30.3

The characteristic geotechnical peat parameters evaluated are outlined in Table 4-3.

Table 4-3: Characteristic geotechnical parameter of the peat strata

Stratum	Unit weight (kN/m^2)	Undrained shear strength, cu (kPa)	Effective friction angle, Ø' (degrees)	Cohesion (c')
Peat	10	5*	25	5

*5kPa is for use in the Stability Assessment as outlined in Appendix 10-2.

5 Conclusion and Recommendations

An intrusive ground investigation has been carried out to identify the thicknesses, material composition and physical parameters of the peat and soft ground materials throughout the site.

Site investigation works are composed of:

- Area walkover at all turbine and key infrastructure locations to identify any visible geohazards and environmental constraints, carry out geomorphological mapping and highlight any changes in the site condition from the satellite imagery,
- Peat probe locations throughout the site,
- Shear vane testing at turbine locations,
- Machine excavated trial pits for material identification and sampling,
- Russian core sampling in areas not accessible by excavator,
- A suite of geotechnical including moisture contents, Atterberg limits and particle size distribution,
- Geo-environmental lab testing of samples collected at trial pit locations for the assessment of the phosphate levels in soils.

Peat probing, shear vane testing and geomorphological mapping was carried out by GDG. Trial pit, Russian core sampling and lab testing were carried out by Ground Investigations Ireland (GII).

The following conclusions and interpretations are drawn from the ground investigation campaign:

- The site consists of predominantly blanket peat with extensive forestry and some areas of recent clear cut forestry and harvested raised peat bog,
- Peat thickness can vary across the site from 0m to a maximum of 5.4m,
- The highest peat thickness was found between T07 and T08, adjacent to T17, and in one localised area on the main site access road,
- Relatively deep pockets of wet and marshy ground were identified in some areas. These areas are generally in topographical lows and flat areas but have been identified close to shoulders or ridges of slopes, suggestive of a potential peat instability risk area. Further assessment of the stability of these areas will be necessary,
- The ground conditions surrounding Turbine 4 were identified as very waterlogged and a stream was identified surfacing below the peat material on a steep face north of the T4 location,
- No evidence of past peat instability or past landslides was identified during the site walkover,
- Many topographically steep areas were identified across the site. Careful consideration needs to be given to the stability assessment of the peat material surrounding these steep slopes,
- The general ground model for the site is characterised as PEAT, overlying an orange to grey sandy gravely CLAY/SILT, overlying dark brown slightly sandy clayey GRAVEL with cobbles and occasional boulders, interpreted as weathered BEDROCK,
- The peat is characterised as follows;

  - Predominantly described as fibrous to pseudo fibrous with varying conditions between firm, spongy and plastic,
  - The degree of humification, moisture content and fraction of fine fibrous material increases with depth suggestive of an increase in peat decomposition with depth. This could be suggestive of a decrease in peat strength with depth,
  - A set of characteristic geotechnical peat parameters are evaluated and outlined in Table 4-3,
- The ground conditions encountered at each turbine location are outlined in Table 4-1.

5.1 Additional Site Investigation

The ground investigation outlined in this report is for the assessment of the ground conditions for inclusion in the Environmental Impact Assessment Report (EIAR). The campaign had a particular focus on the assessment of the thickness and characterisation of the peat material for the purposes of a peat stability risk assessment study, peat management plan and hydrology assessment.

The future design of turbines and related infrastructure will require a separate extensive ground investigation campaign including a suite of insitu and lab testing for the further assessment of the ground conditions at the site.

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Appendix A – Peat Probe and Shear Vane Layout

Cummeennabuddoge Wind Farm

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Appendix A
Peat Probe and Shear Vane Layout - Access Track

Key

- GDG Peat Probe Locations
- WTG Locations
- Borrow Pits
- Peat Storage Areas
- Contractor Compounds
- Met Mast
- WTG Hardstands
- Site Access
- Site Red Line Boundary
- Secondary roads

GDG GAVIN & DOHERTY GEOSOLUTIONS

atmos CONSULTING

0 0.25 0.5 1
Kilometres

N

Scale @ A3:
1:16,000

Date of edit: 16/11/22 Turbine layout Rev 0
Drawn by: CE Checked by: SC Approved by: RM

513000 514000 515000 516000 517000
585000 584000 583000 582000 581000

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Cummeennabuddoge Wind Farm

Ireland FuturEnergy

Appendix A
Peat Probe and Shear Vane Layout - Main Site

Key

- GDG Hand Shear Vanes
- GDG Peat Probe Locations
- WTG Locations
- Borrow Pits
- Peat Storage Areas
- Contractor Compounds
- Met Mast
- WTG Hardstands
- Site Access Tracks
- Site Red Line Boundary

GDG GAVIN & DOHERTY GEOSOLUTIONS

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Kilometres

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Scale @ A3:
1:16,000

Date of edit: 16/11/22 Turbine layout Rev 0
Drawn by: CE Checked by: SC Approved by: RM

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Cummeennabuddoge Wind Farm

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Appendix A
Peat Probe and Shear Vane
Layout - Cable Route

Key

- GDG Peat Probe Locations
- Contractor Compounds
- Site Access Tracks
- Substation Layout
- Site Red Line Boundary
- Secondary roads

GDG GAVIN & DOHERTY GEOSOLUTIONS

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Scale @ A3:
1:16,000

Date of edit: 16/11/22 Turbine layout Rev 0
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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Appendix B – Trial Pit and Russian Core Layout

Cummeennabuddoge Wind Farm

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Appendix E
Trial Pit and Russian Core Layout - Access Track

513000 514000 515000 516000 517000

584000 583000 582000 581000

Key

- GDG Russian Core Locations
- GDG Trial Pit Locations
- Contractor Compounds
- Met Mast
- Site Access Tracks
- Site Red Line Boundary
- Secondary roads

GDG GAVIN & DOHERTY GEOSOLUTIONS

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Kilometres

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Scale @ A3:
1:16,000

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Appendix E
Trial Pit and Russian Core Layout - Main Site

Key

- GDG Russian Core Locations
- GDG Trial Pit Locations
- WTG Locations
- Borrow Pits
- Peat Storage Areas
- Contractor Compounds
- Met Mast
- WTG Hardstands
- Site Access Tracks
- Site Red Line Boundary

GDG GAVIN & DOHERTY GEOSOLUTIONS

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0 0.25 0.5 1
Kilometres

N

Scale @ A3:
1:16,000

Date of edit: 16/11/22 Turbine layout Rev 0
Drawn by: CE Checked by: SC Approved by: RM

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Cummeennabuddoge Wind Farm

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Appendix B
Trial Pit and Russian Core Layout - Cable Route

Key

- GDG Trial Pit Locations
- Contractor Compounds
- Site Access Tracks
- Substation Layout
- Site Red Line Boundary
- Secondary roads

GDG GAVIN & DOHERTY GEOSOLUTIONS

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Kilometres

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Scale @ A3:
1:16,000

Date of edit: 16/11/22 Turbine layout Rev 0
Drawn by: CE Checked by: SC Approved by: RM

Appendix C – Peat Thickness Map

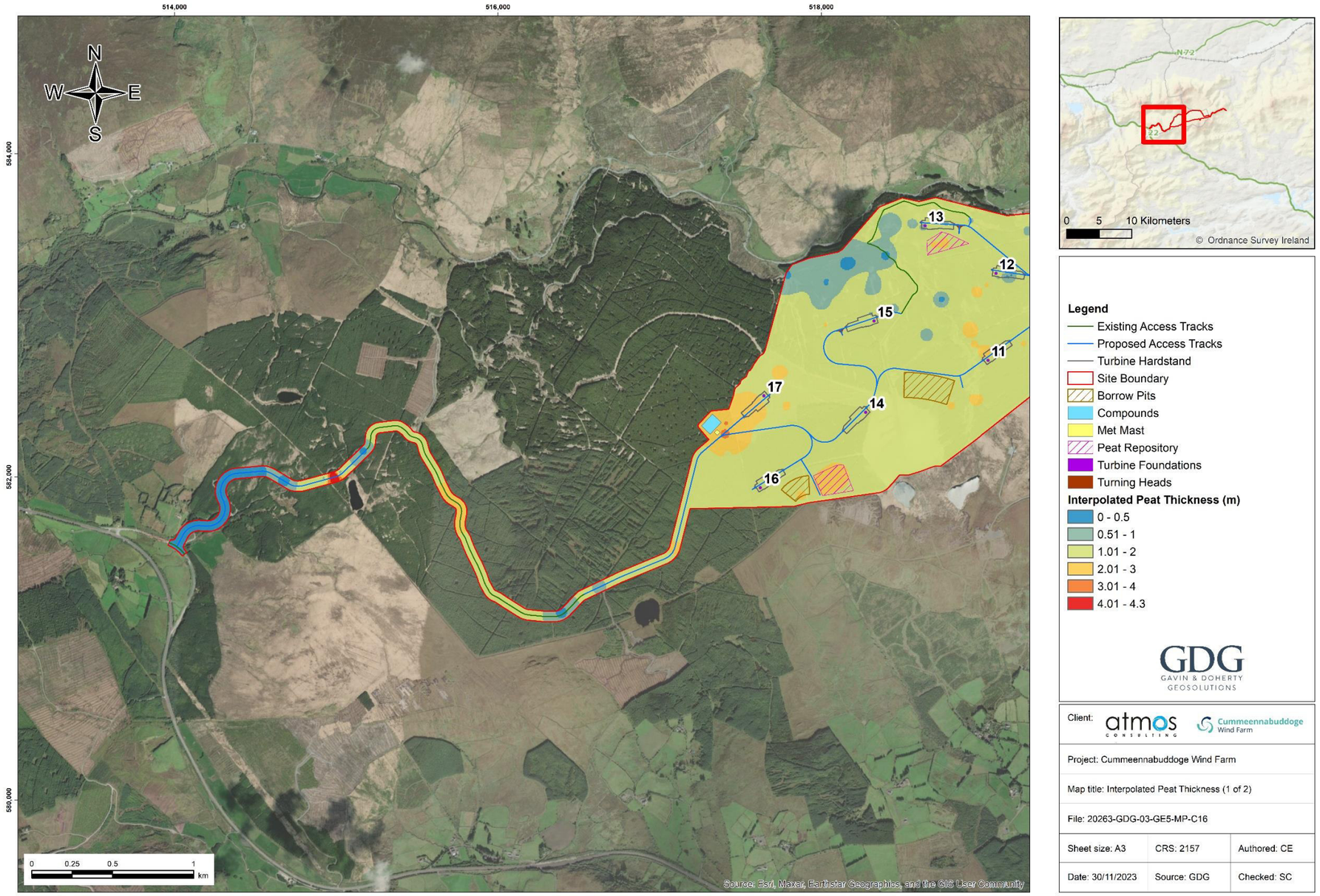

Figure C- 1: Interpolated Peat Thickness (1 of 3).

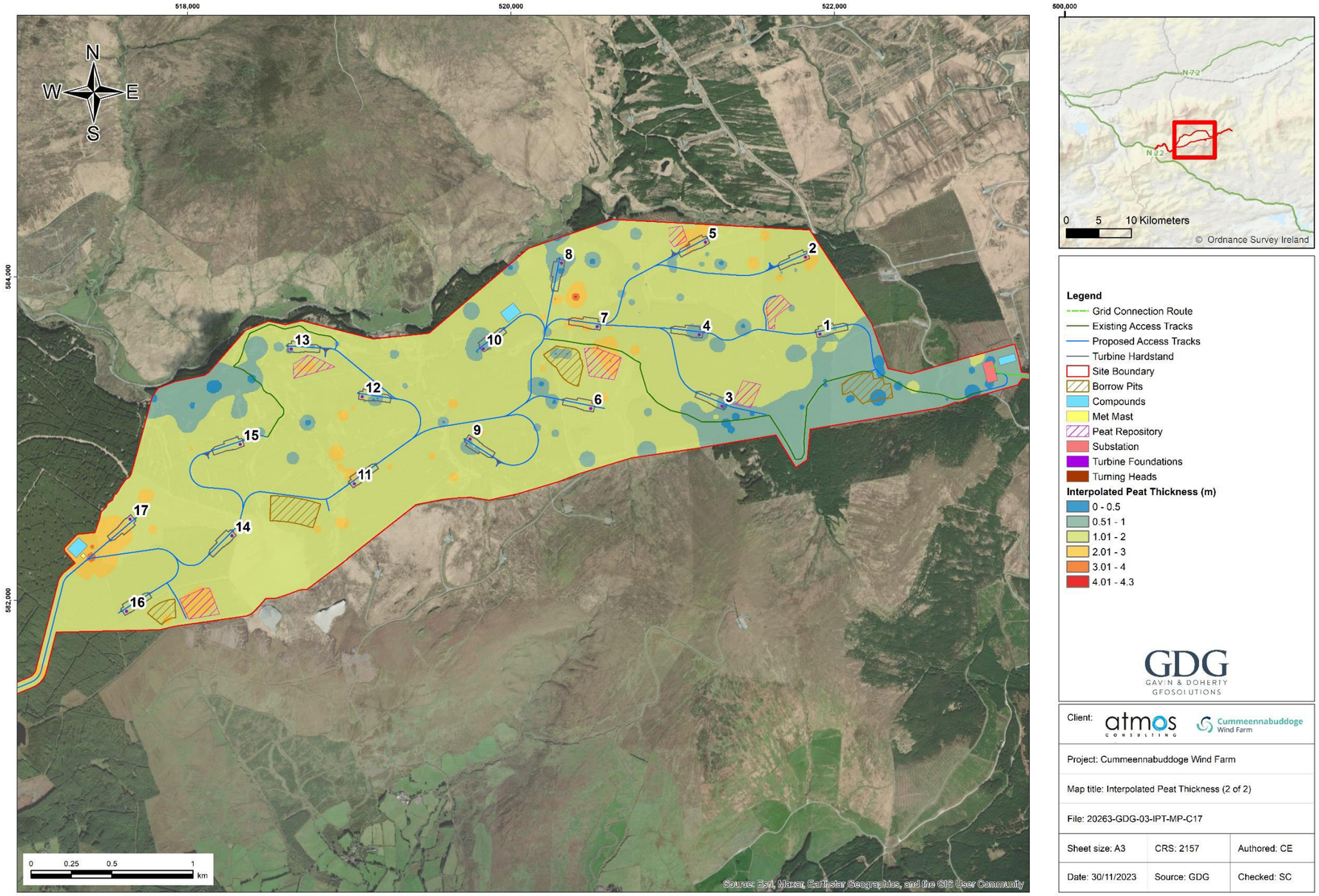

Figure C- 2: Interpolated Peat Thickness (2 of 3).

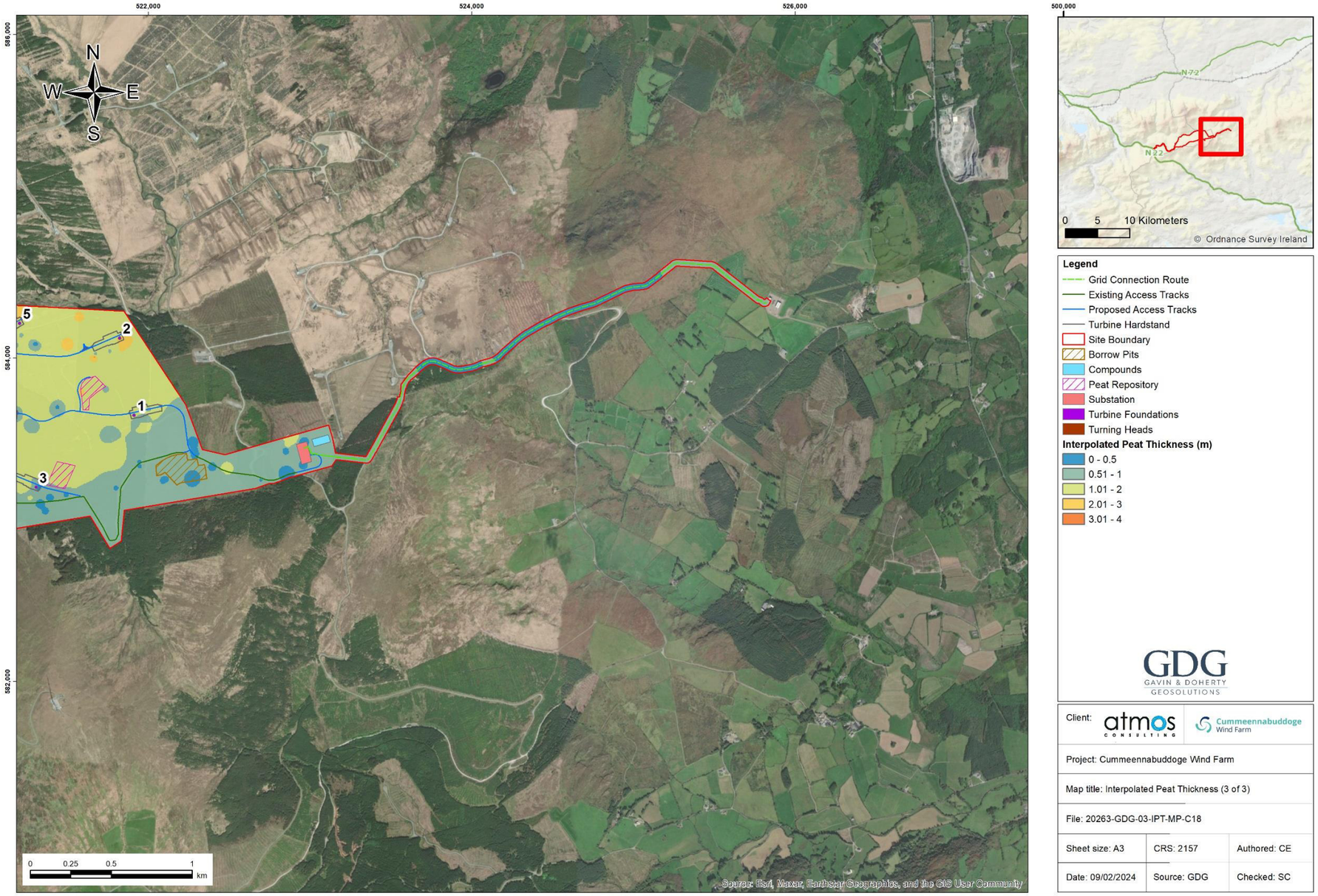

Figure C- 3: Interpolated Peat Thickness (3 of 3).

Appendix D – Factual Geotechnical Report

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Ground Investigations Ireland

Cummeenabuddoge Windfarm

Gavin & Doherty Geosolutions

Ground Investigation Report

May 2022

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DOCUMENT CONTROL SHEET

Project Title	Cummennabuddoge Windfarm
Engineer	Gavin & Doherty Geosolutions
Client	Coillte
Project No	11507-02-22
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Final	J McDowell	S Kealy	C Finnerty	Dublin	09 May 2022

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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CONTENTS

APPENDICES

1.0 Preamble

On the instructions of Gavin & Doherty Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., in March 2022 at the site of the proposed Windfarm in Cummenabuddoge, Co. Kerry.

2.0 Overview

2.1. Background

It is proposed to construct a windfarm with associated services, access roads and car parking at the proposed site. The site is currently forested and is situated approximately 12.5 km to the southwest of Millstreet, Co. Cork. The proposed construction is envisaged to consist of conventional foundations and pavement make up with some local excavations for services and plant.

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 16 No. Trial Pits to a maximum depth of 3.20m BGL
- Carry out 25 No. Russian Core Samples to retrieve samples of Peat for logging and testing
- 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 was 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.

3.2. Trial Pits

The trial pits were excavated using a 13T 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 an 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. Russian Sampling

The Russian Peat Sampler is a side filling chambered-type sampler. This discrete point sampler is inserted in the closed (empty) position. Once the target depth is reached, the “T” handle is turned clockwise to initiate the sampling while the pivotal cover plate supports the cutting action of the bore. As the sampler is turned 180 degrees, the sharpened edge of the bore longitudinally cuts a semi-cylindrical shaped sample until the opposite side of the cover plate is contacted. The contained sample can now be recovered without risk of contamination by overlying sediments. The sample is extruded from the bore by a counter clockwise rotation where sample rests on cover plate ready for sectioning. The process is carried out in 0.50m intervals and was terminated where it is not possible for the Russian sampler to penetrate deeper. The Russian sample records are provided in Appendix 3 of this Report.

3.4. Surveying

The exploratory hole locations have been recorded where possible using a KQ GEO Technologies KQ-M8 System which records the coordinates and elevation of the locations to ITM or Irish National Grid as required by the project specification. Due to dense tree coverage it was not possible to record an accurate elevation at a number of exploratory holes. The coordinates and elevations are provided on the exploratory hole logs in the appendices of this Report.

3.5. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.
Geo-environmental testing as required by the specification, including phosphate testing was carried out by Element Materials Technology Laboratory in the UK.
Geotechnical testing consisting of moisture content, Atterberg limits, Particle Size Distribution (PSD), and organic matter content.
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 insitu 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 relatively consistent across the site and generally comprised;

- Peat

- Granular Deposits
- Cohesive Deposits
- Weathered Bedrock

PEAT: Peat deposits were encountered in all the exploratory holes. These deposits were typically described as *spongy dark brown pseudofibrous PEAT* and were present to depths ranging between 0.40m and 2.70m BGL. Peat descriptions were in accordance with B.S. 5930:2015, with additional description provided using the numerical Von Post classification system (Hobb, 1986) which describes parameters including humification (H), water content (B), fine fibres (F), coarse fibres (R), wood remnants (W), shrub remnants (N), vertical and horizontal tensile strength (TV and TH), smell (A) and plasticity (P).

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Peat deposits in some of the exploratory holes and were described typically as *firm greenish grey slightly sandy gravelly CLAY/SILT with occasional angular to subangular 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. The strength of the cohesive deposits typically increased with depth and was firm to stiff or stiff below 1.80m BGL in the majority of the exploratory holes. These deposits had some, occasional or frequent cobble and boulder content where noted on the exploratory hole logs.

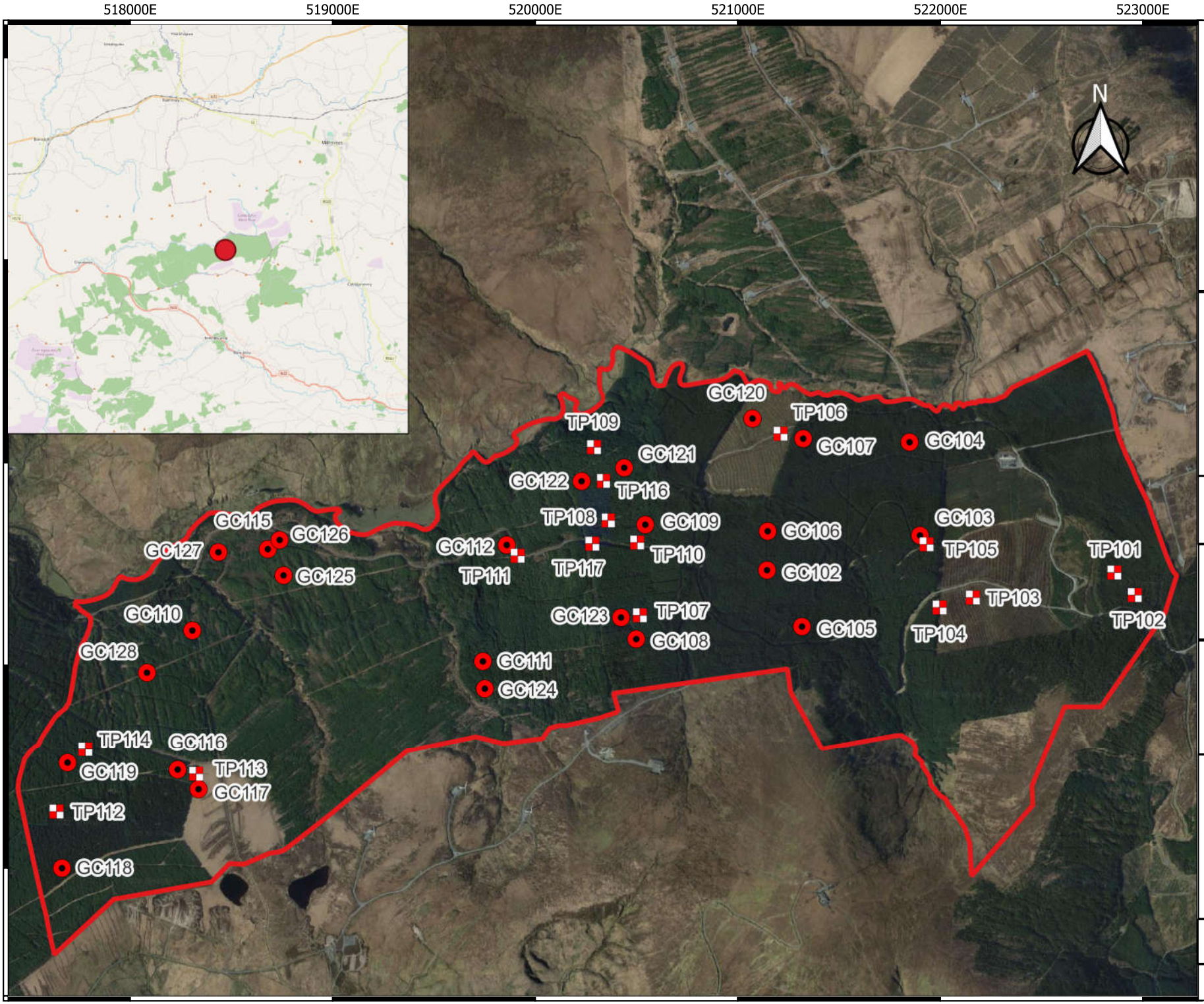
GRANULAR DEPOSITS: Granular deposits were encountered below the peat deposits in the majority of the trial pits, or beneath the cohesive deposits (where present), and were typically described as *brown clayey silty sandy fine to coarse angular to subrounded GRAVEL with occasional angular to subrounded cobbles and rare boulders.* The secondary sand/gravel and silt/clay constituents varied across the site and with depth while occasional or frequent cobble and boulder content also present where noted on the exploratory hole logs.

WEATHERED BEDROCK: Weathered bedrock deposits were encountered beneath the granular deposits in the majority of exploratory holes, and was diggable to a depth of up to 2.20m below the top of the stratum. The trial pits were terminated upon encountering more competent bedrock, in which further excavation become more difficult. This material was recovered typically as *light greyish brown slightly clayey/silty sandy fine to coarse angular to subangular Gravel of Sandstone with many angular to subangular cobbles and occasional boulders.*

4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred and where possible drilling was suspended for twenty minutes to allow the subsequent rise in groundwater to be recorded. We would point out 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 time of year, rainfall, nearby construction and other factors.

APPENDIX 1 - Site Location Plan



Site Location

Indicative Site Boundary

Trial Pit

Russian Core

Client:

atmos CONSULTING

Project Code:
11507-02-22

Project Title:
Cummeenabuddoge Wind Farm

Drawing Title:
Figure 1 - Site Location Plan

GROUND INVESTIGATIONS IRELAND
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0 200 400 600 800 1,000 m

Drawn By:	Date:
J McDowell	05/04/2022

APPENDIX 2 – Trial Pit Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP101
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 4.00m x 1.30m x 3.00m (L x W x D)	**Ground Level (mOD)** 470.05	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 522859 E 583453.9 N	**Dates** 14/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Spongy dark brown fibrous PEAT. (H3, B2, F1, R2, W2, N2, TV1, TH1, A0, P0)		
0.10-0.50	EN1			469.90	0.15	Spongy dark brown fibrous PEAT. (H4, B2, F2, R2, W0, N0, TV1, TH0, A1, P0)		
					(1.15)			
1.00 1.00	B1 T1							
				468.75	1.30	Light brown mottled orange clayey silty sandy fine to coarse angular to subrounded GRAVEL with occasional angular to subrounded cobbles.		
					(0.80)			
2.00 2.00	B2 T2			467.95	2.10	Possible Weathered Rock: Recovered as light greyish brown slightly clayey slightly silty sandy fine to coarse angular to subangular GRAVEL with many angular to subangular cobbles.		
					(0.90)			
3.00 3.00	B3 T3			467.05	3.00	Complete at 3.00m		

Plan

Remarks

No groundwater encountered
Minor spalling from 1.30m BGL
Trial pit terminated at 3.00m BGL due to risk of machine getting stuck
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP101

Ground Investigations Ireland Ltd
www.gii.ie

Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP102
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 4.00m x 1.30m x 2.50m (L x W x D)	**Ground Level (mOD)** 487.74	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 522960.1 E 583342.8 N	**Dates** 14/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	EN1				(0.40)	Spongy dark brown mottled grey pseudofibrous PEAT. (H2, B2, F1, R2, W1, N1, TV2, TH2, A0, P0)		
				487.34	0.40			
0.50 0.50	B1 T1				(0.25)	Orangeish brown clayey silty sandy fine to coarse angular to subangular GRAVEL.		
				487.09	0.65	Possible Weathered Rock: Recovered as light greyish brown slightly silty clayey sandy fine to coarse angular GRAVEL with many angular to subangular cobbles and boulders.		
1.50 1.50	B2 T2				(1.85)			
			Slow Ingress(1) at 2.40m.			2.50m BGL: OBSTRUCTION due to possible bedrock		▽1
				485.24	2.50	Complete at 2.50m		

Plan

Remarks

Groundwater encountered at 2.40m BGL
Minor spalling from 0.70m BGL
Trial pit terminated at 2.50m BGL due to hard digging, possible bedrock
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP102

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Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP103
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.00m x 1.30m x 2.20m (L x W x D)	**Ground Level (mOD)** 478.43	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 522161.1 E 583330.6 N	**Dates** 14/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	EN1				(0.60)	Firm dark brown fibrous PEAT. (H2, B2, F1, R2, W1, N1, TV2, TH2, A0, P0)		
0.50 0.50	B1 T1			477.83	0.60	Orangeish brown slightly clayey sandy fine to coarse angular to subrounded GRAVEL with occasional angular to subrounded cobbles.		
					(0.50)			
1.00 1.00	B2 T2			477.33	1.10	WEATHERED ROCK: Recovered as light grey/brown clayey silty sandy fine to coarse angular to subangular Gravel with many angular to subangular cobbles and boulders.		
					(1.10)			
2.00 2.00	B3 T3			476.23	2.20	Complete at 2.20m		

Plan

Remarks

No groundwater encountered
Minor spalling from 0.60m BGL
Trial pit terminated at 2.20m BGL due to hard digging in weathered rock
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP103

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Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP104
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.00m x 1.30m x 3.00m (L x W x D)	**Ground Level (mOD)** 471.88	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 521996.9 E 583281.5 N	**Dates** 14/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	EN1				(0.80)	Firm dark brown slightly gravelly pseudofibrous PEAT. (H4, B2, F1, R2, W2, N1, TV3, TH2, A0, P0)		
0.50 0.50	B1 T1			471.08	0.80			
					(0.70)	WEATHERED ROCK: Recovered as light greyish brown clayey sandy fine to coarse angular to subangular Gravel with many angular to subangular cobbles and occasional boulders.		
1.50 1.50	B2 T2		Slow Seepage(1) at 1.50m.	470.38	1.50			▽1
					(1.50)	WEATHERED ROCK: Recovered as light greyish brown slightly clayey sandy fine to coarse angular to subangular Gravel with many angular to subangular cobbles and occasional boulders.		
3.00 3.00	B3 T3			468.88	3.00	Complete at 3.00m		

Plan

Remarks

Groundwater encountered at 1.50m BGL
Trial pit spalling from 1.00m BGL
Trial pit terminated at 3.00m due to hard digging in weathered rock
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP104

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Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP105
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.50m x 1.30m x 2.50m (L x W x D)	**Ground Level (mOD)** 430.34	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 521932.8 E 583593 N	**Dates** 14/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	EN1		Moderate Seepage(1) at 0.00m.			Spongy dark brown pseudofibrous PEAT. (H4, B2, F3, R2, W1, N1, TV3, TH2, A1, P0)		▽1
0.50 0.50	B1 T1				(0.90)			
				429.44	0.90	Stiff orangeish brown slightly gravelly silty sandy CLAY with rare cobbles.		
					(0.40)			
1.20 1.20	B2 T2			429.04	1.30	Light greyish brown slightly clayey very sandy fine to coarse subangular to subroundd GRAVEL with occasional subangular to subrounded cobbles and rare boulders.		
					(1.20)			
2.50 2.50	B3 T3			427.84	2.50	Complete at 2.50m		

Plan

Remarks

Groundwater encountered from GL to 0.90m BGL
Minor spalling from 1.00m BGL
Trial pit terminated at 2.50m BGL due to risk of machine getting stuck
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP105

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Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP106
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.00m x 1.30m x 1.80m (L x W x D)	**Ground Level (mOD)** 374.79	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 521211.8 E 584138.6 N	**Dates** 14/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	EN1				(0.90)	Spongy dark brown slightly gravelly pseudofibrous PEAT. (H3, B2, F1, R2, W3, N0, TV1, TH1, A1, P0)		
0.50 0.50	B1 T1			373.89	0.90			
1.00 1.00	B2 T2				(0.40)	Firm orangeish brown slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles.		
				373.49	1.30			
					(0.50)	Light greyish brown clayey sandy fine to coarse angular to subrounded GRAVEL with many angular to subronded cobbles and occasional boulders. 1.80m BGL: OBSTRUCTION due to presumed bedrock		
1.80 1.80	B3 T3			372.99	1.80	Complete at 1.80m		

Plan

Remarks

No groundwater encountered
Minor spalling from 1.50m BGL
Trial pit terminated at 1.80m BGL due to presumed bedrock obstruction
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP106

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Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP107
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.50m x 1.30m x 2.90m (L x W x D)	**Ground Level (mOD)** 400.95	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 520517.8 E 583242.8 N	**Dates** 15/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	EN1		Slow Seepage(1) at 0.00m.		(0.50)	Spongy dark brown fibrous PEAT. (H2, B2, F1, R2, W2, N2, TV0, TH1, A0, P0)		▽1
				400.45	0.50			
1.00 1.00	B1 T1				(1.90)	Plastic dark brown pseudofibrous PEAT. (H4, B2, F2, R2, W1, N1, TV1, TH1, A1, P0)		
2.00 2.00	B2 T2							
				398.55	2.40	Stiff light greenish grey slightly sandy gravelly CLAY/SILT with rare angular to subangular cobbles and boulders. Gravel is fine to coarse angular to subangular.		
					(0.50)			
2.90 2.90	B3 T3			398.05	2.90	Complete at 2.90m		

Plan

Remarks

Groundwater encountered from GL to 0.50m BGL
Trial pit stable
Trial pit terminated at 2.90m BGL due to risk of machine getting stuck
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP107

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Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP108
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.30m x 1.30m x 3.20m (L x W x D)	**Ground Level (mOD)** 385.35	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 520359.9 E 583711 N	**Dates** 15/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			Moderate Seepage(1) at 0.00m.		(0.20)	Spongy dark brown pseudofibrous PEAT. (H3, B2, F2, R3, W0, N1, TV3, TH2, A0, P0)		▽1
0.10-0.50	EN1			385.15	0.20	Plastic dark brown pseudofibrous PEAT. (H5, B2, F2, R2, W0, N0, TV1, TH0, A1, P0)		
1.00 1.00	B1 T1				(2.50)			
2.00 2.00	B2 T2							
				382.65	2.70	Possible Weathered Rock: Recovered as light greyish brown mottled orange slightly sandy very clayey/silty fine to coarse angular to subangular GRAVEL with occasional angular to subrounded cobbles.		
3.00 3.00	B3 T3				(0.50)	3.20m BGL: OBSTRUCTION due to presumed bedrock		
				382.15	3.20	Complete at 3.20m		

Plan

Remarks

Groundwater encountered from GL
Minor spalling from 2.40m BGL
Trial pit terminated at 3.20m BGL due to obstruction, possible bedrock
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP108

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Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP109
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.80m x 1.30m x 2.50m (L x W x D)	**Ground Level (mOD)** 371.36	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 520287.2 E 584072.4 N	**Dates** 15/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	EN1				(0.80)	Plastic dark brown to black clayey pseudofibrous PEAT. (H3, B2, F2, R2, W3, N1, TV3, TH2, A1, P1)		
0.50 0.50	B1 T1		Slow Seepage(1) at 0.50m.	370.56	0.80	Firm orangeish brown slightly sandy slightly gravelly silty CLAY.		▽1
1.00 1.00	B2 T2			370.06	(0.50) 1.30	Firm light greyish brown slightly sandy gravelly CLAY/SILT with many angular to subangular cobbles and occasional boulders. Gravel is fine to coarse angular to subangular.		
2.00 2.00	B3 T3			368.86	(1.20) 2.50	2.50m BGL: OBSTRUCTION due to possible bedrock Complete at 2.50m		

Plan

Remarks

Groundwater encountered at 0.50m BGL
Minor spalling from GL
Trial pit terminated at 2.50m BGL due to obstruction, possible bedrock
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP109

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Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP110
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.40m x 1.30m x 2.50m (L x W x D)	**Ground Level (mOD)** 387.12	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 520504.6 E 583602 N	**Dates** 15/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	EN1		Moderate Ingress(1) at 0.00m.			Spongy dark brown pseudofibrous PEAT. (H4, B2, F1, R3, W0, N1, TV2, TH1, A1, P0)		▽1
1.00 1.00	B1 T1				(2.00)			
2.00 2.00	B2 T2			385.12	2.00 (0.20)	Brown slightly sandy very clayey/silty fine to coarse angular to subrounded GRAVEL with occasional angular to subrounded cobbles.		
				384.92	2.20 (0.30)	Possible Weathered Rock: Recovered as light greenish grey slightly sandy very clayey/silty fine to coarse angular to subrounded GRAVEL with occasional angular to subrounded cobbles and rare boulders.		▽2
2.50 2.50	B3 T3		Moderate Ingress(2) at 2.50m.	384.62	2.50	Complete at 2.50m		

Plan

Remarks

Groundwater encountered at GL and 2.50m BGL
Trial pit stable
Trial pit terminated at 2.50m BGL due to groundwater ingress and ground instability for machine
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP110

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Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP111
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.50m x 1.30m x 2.70m (L x W x D)	**Ground Level (mOD)** 379.43	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 519910.8 E 583536.6 N	**Dates** 15/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	EN1					Spongy dark brown fibrous PEAT. (H3, B2, F2, R2, W0, N0, TV2, TH2, A1, P0)		
0.50 0.50	B1 T1				(1.20)			
				378.23	1.20			
					(0.20)	Firm orangeish brown slightly sandy gravelly CLAY/SILT with occasional angular to subangular cobbles. Gravel is fine to coarse angular to subangular.		
				378.03	1.40			
			Slow Seepage(1) at 1.60m.			Firm light brown slightly sandy gravelly CLAY/SILT with many angular to subangular cobbles and occasional boulders.		▽1
2.00 2.00	B2 T2				(1.30)			
				376.73	2.70			
2.70 2.70	B3 T3					Complete at 2.70m		

Plan

Remarks

Groundwater encountered at 1.60m BGL
Trial pit stable
Trial pit terminated at 2.70m BGL due to angle of excavation / digger's reach
Tral pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP111

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Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP112
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 4.00m x 1.30m x 2.50m (L x W x D)	**Ground Level (mOD)** 393.92	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 517636.6 E 582271.9 N	**Dates** 16/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	EN1		Moderate Ingress(1) at 0.50m.	393.72	(0.20) 0.20	Spongy dark brown pseudofibrous PEAT. (H3. B2. F2. R2. W3. N2, TV2, TH1, A0, P0)		
1.00 1.00	B1 T1				(1.60)	Spongy brown fibrous PEAT. (H4, B2, F1, R3, W1, N1, TV1, TH1, A0, P0)		▽1
2.00 2.00	B2 T2			392.12	1.80 (0.70)	Stiff brown mottled greenish grey slightly gravelly sandy CLAY/SILT with rare angular to subangular cobbles and boulders. 2.50m BGL: OBSTRUCTION due to presumed bedrock		
				391.42	2.50	Complete at 2.50m		

Plan

Remarks

Trial pit backfilled on completion
Groundwater encountered at 0.50m BGL
Trial pit stable
Trial pit terminated at 2.50m BGL due to presumed bedrock obstruction

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP112

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Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP113
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.80m x 1.30m x 2.40m (L x W x D)	**Ground Level (mOD)** 408.05	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 518325 E 582458 N	**Dates** 16/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	EN1		Slow Seepage(1) at 0.20m.	407.85	(0.20) 0.20	Plastic dark brown pseudofibrous PEAT. (H2, B2, F3, R2, W0, N0, TV1, TH1, A0, P0)		▽1
0.50 0.50	B1 T1				(1.70)	Plastic dark brown pseudofibrous PEAT. (H4, B2, F2, R2, W0, N1, TV1, TH1, A1, P0)		
1.50 1.50	B2 T2			406.15	1.90	WEATHERED ROCK: Recovered as light grey/brown slightly sandy very clayey/silty fine to coarse angular to subrounded Gravel with many angular to subrounded cobbles and boulders.		
2.40 2.40	B3 T3			405.65	(0.50) 2.40	Complete at 2.40m		

Plan

Remarks

Groundwater encountered from 0.20m to 1.90m BGL
Trial pit stable
Trial pit terminated at 2.40m BGL due to presumed bedrock obstruction
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP113

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Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP114
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.00m x 1.30m x 2.20m (L x W x D)	**Ground Level (mOD)** 376.33	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 517778.9 E 582580.3 N	**Dates** 16/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	EN1				(0.30)	Plastic dark brown pseudofibrous PEAT. (H3, B3, F2, R2, W0, N2, TV1, TH0, A0, P0)		
				376.03	0.30			
0.50 0.50	B1 T1				(1.10)	Plastic dark brown pseudofibrous PEAT. (H4, B2, F2, R2, W0, N1, TV2, TH2, A1, P0)		
				374.93	1.40			
1.50 1.50	B2 T2				(0.40)	Soft greenish grey slightly sandy slightly gravelly CLAY/SILT.		
				374.53	1.80			
					(0.40)	Stiff greenish grey slightly sandy gravelly CLAY/SILT with occasional angular to subangular cobbles. Gravel is fine to coarse angular to subangular.		
2.20 2.20	B3 T3			374.13	2.20	Complete at 2.20m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Trial pit terminated at 2.20m BGL due to presumed bedrock obstruction
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP114

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Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP116
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.50m x 1.30m x 2.00m (L x W x D)	**Ground Level (mOD)** 373.43	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 520336.3 E 583905.7 N	**Dates** 15/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	EN1		Fast Ingress(1) at 0.30m.			Plastic dark brown to black pseudofibrous PEAT. (H6, B3, F1, R3, W0, N1, TV1, TH0, A2, P0)		▽1
0.50 0.50	B1 T1				(2.00)			
1.50 1.50	B2 T2			371.43	2.00	Complete at 2.00m		

Plan

Remarks

Groundwater encountered at 0.30m BGL
Trial pit sidewalls collapsing from GL
Trial pit terminated at 2.00m BGL due to groundwater ingress
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP116

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Site Cummeenabuddoge Wind Farm			**Trial Pit Number** TP117
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.70m x 1.30m x 2.10m (L x W x D)	**Ground Level (mOD)** 397.30	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 520278.7 E 583596.2 N	**Dates** 15/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	EN1				(0.40)	Spongy dark brown pseudofibrous PEAT. (H2, B2, F1, R3, W3, N1, TV1, TH1, A1, P0)		
				396.90	0.40			
0.50 0.50	B1 T1				(0.60)	Spongy brown fibrous PEAT. (H5, B2, F2, R2, W1, N0, TV2, TH1, A3, P0)		
				396.30	1.00			
					(0.60)	Dark brown slightly clayey sandy fine to coarse angular to subrounded GRAVEL with many angular to subrounded cobbles and occasional boulders.		
1.50 1.50	B2 T2			395.70	1.60			
					(0.50)	Possible Weathered Rock: Recovered as light greenish grey slightly sandy very clayey/silty fine to coarse angular to subangular GRAVEL with many angular to subangular cobbles and boulders. 2.10m BGL: OBSTRUCTION due to possible bedrock		
2.10 2.10	B3 T3			395.20	2.10	Complete at 2.10m		

Plan

Remarks

Groundwater encountered at 1.80m BGL
Minor spalling from 1.00m BGL
Trial pit terminated at 2.10m BGL due to obstruction, possible bedrock
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	J McDowell	11507-02-22.TP117

Cummeenabuddoge Wind Farm
Trial Pit Photographs

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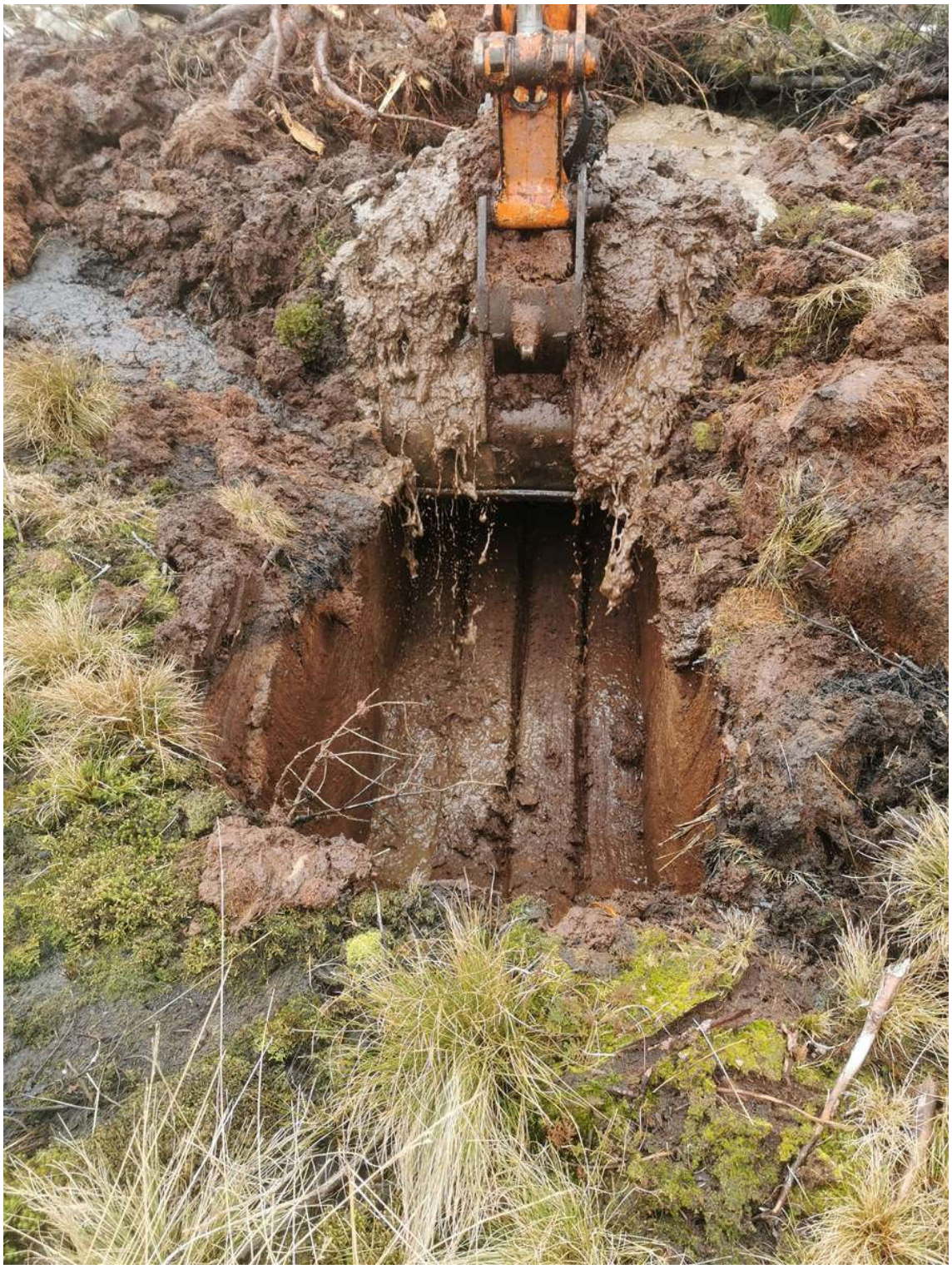

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APPENDIX 3 – Russian Core Records

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Site Cummeenabuddoge Wind Farm			**Number** GC102
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 1.30m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 521145.5 E 583474.9 N	**Dates** 21/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.20) 0.20	Plastic brown fibrous PEAT. (H2, B3, F1, R2, W0, N1, TV1, TH1, A0, P0)		
0.50-1.00	T2				(0.80)	Firm brown fibrous PEAT. (H3, B2, F2, R2, W0, N0, TV2, TH2, A0, P0)		
1.00-1.30	T3				1.00 (0.30) 1.30	Spongy brown fibrous PEAT. (H4, B2, F2, R1, W0, N0, T3, TH3, A0, P0)		
						Refusal at 1.30m		

Remarks
Refusal at 1.30m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No. 11507-02-22.GC102

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Site Cummeenabuddoge Wind Farm			**Number** GC103
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 1.00m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 521900.4 E 583646.3 N	**Dates** 21/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.10) 0.10 (0.10) 0.20	Spongy dark brown fibrous PEAT. (H2, B2, F1, R2, W1, N1, TV1, TH1, A0, P0)		
						Spongy brown fibrous PEAT. (H3, B2, F1, R2, W0, N0, TV2, TH2, A1, P0)		
0.50-1.00	T2				(0.55)	Spongy brown fibrous PEAT. (H4, B2, F2, R2, W0, N0, TV2, TH2, A1, P0)		
					0.75 (0.25)	Plastic dark brown fibrous PEAT. (H4, B2, F2, R1, W0, N0, TV1, TH1, A1, P0)		
					1.00	Refusal at 1.00m		

Remarks
Refusal at 1.00m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC103

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Site Cummeenabuddoge Wind Farm			**Number** GC104
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 2.50m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 521849 E 584106.3 N	**Dates** 21/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.20) 0.20	Spongy brown fibrous PEAT. (H2, B2, F1, R3, W0, N1, TV0, TH1, A0, P0)		
0.50-1.00	T2				(1.30)	Spongy brown fibrous PEAT. (H4, B2, F2, R2, W0, N0, TV3, TH2, A1, P0)		
1.00-1.50	T3							
1.50-2.00	T4				1.50	Plastic brown pseudofibrous PEAT. (H5, B3, F2, R2, W0, N0, TV2, TH2, A1, P0)		
2.00-2.50	T5				(1.00)			
					2.50	Refusal at 2.50m		

Remarks
Refusal at 2.50m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC104

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Site Cummeenabuddoge Wind Farm			**Number** GC105
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 0.40m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 521318 E 583196.7 N	**Dates** 21/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.40	T1				(0.10) 0.10	Spongy brown fibrous PEAT. (H2, B2, F1, R2, W0, N0, TV1, TH1, A0, P0)		
					(0.30)	Spongy brown fibrous PEAT. (H4, B2, F2, R2, W0, N0, TV2, TH2, A0, P0)		
					0.40	Refusal at 0.40m		

Remarks
Refusal at 0.40m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No. 11507-02-22.GC105

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Site Cummeenabuddoge Wind Farm			**Number** GC106
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 0.50m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 521148.9 E 583666.9 N	**Dates** 21/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.20) 0.20 (0.30) 0.50	Plastic brown fibrous PEAT. (H3, B2, F1, R2, W0, N1, TV1, TH1, A0, P0) Spongy brown fibrous PEAT. (H4, B2, F2, R2, W0, N0, TV2, TH2, A1, P0) Refusal at 0.50m		

Remarks
Refusal at 0.50m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC106

Ground Investigations Ireland Ltd
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Site Cummeenabuddoge Wind Farm			**Number** GC107
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 1.40m	**Ground Level (mOD)** 378.97	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 521323.9 E 584123.7 N	**Dates** 21/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1			378.92	0.05	Spongy brown fibrous PEAT. (H2, B2, F2, R2, W0, N1, TV1, TH0, A0, P0)		
						Spongy brown pseudofibrous PEAT. (H4, B2, F1, R2, W0, N0, TV2, TH1, A1, P0)		
0.50-1.00	T2				(0.95)			
1.00-1.40	T3			377.97	1.00	Plastic brown pseudofibrous PEAT. (H5, B2, F2, R2, W0, N1, TV2, TH0, A1, P0)		
					(0.40)			
				377.57	1.40	Refusal at 1.40m		

Remarks
Refusal at 1.40m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC107

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Site Cummeenabuddoge Wind Farm			**Number** GC108
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 1.00m	**Ground Level (mOD)** 404.77	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 520500.3 E 583134.9 N	**Dates** 22/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1			404.65	(0.12) 0.12	Firm brown fibrous PEAT. (H3, B2, F2, R2, W0, N1, TV1, TH1, A0, P0)		
0.50-1.00	T2				(0.88)	Spongy brown fibrous PEAT. (H4, B2, F2, R3, W0, N0, TV3, TH2, A1, P0)		
				403.77	1.00	Refusal at 1.00m		

Remarks
Refusal at 1.00m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC108

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Site Cummeenabuddoge Wind Farm			**Number** GC109
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 0.90m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 520545 E 583699 N	**Dates** 22/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.15) 0.15	Spongy brown fibrous PEAT. (H2, B2, F1, R2, W0, N1, TV1, TH1, A0, P0)		
0.50-0.90	T2				(0.75)	Spongy brown fibrous PEAT. (H4, B2, F2, R2, W0, N0, TV2, TH2, A1, P0)		
					0.90	Refusal at 0.90m		

Remarks
Refusal at 0.90m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC109

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Site Cummeenabuddoge Wind Farm			**Number** GC110
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 0.50m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 518307 E 583177 N	**Dates** 31/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.10) 0.10	Spongy brown pseudofibrous PEAT. (H4, B2, F1, R2, W0, N1, TV2, TH1, A0, P0)		
					(0.40)	Firm brown pseudofibrous PEAT. (H4, B2, F2, R1, W0, N1, TV2, TH2, A2, P0)		
					0.50	Refusal at 0.50m		

Remarks
Refusal at 0.50m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC110

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Site Cummeenabuddoge Wind Farm			**Number** GC111
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 2.00m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 519739.4 E 583025.1 N	**Dates** 22/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.25)	Firm brown pseudofibrous PEAT. (H2, B2, F2, R3, W0, N1, TV3, TH2, A0, P0)		
					0.25	Spongy brown fibrous PEAT. (H4, B2, F2, R3, W0, N0, TV3, TH2, A1, P0)		
0.50-1.00	T2				(0.75)			
1.00-1.50	T3				1.00	Spongy brown pseudofibrous PEAT. (H6, B3, F2, R2, W0, N0, TV2, TH1, A2, P0)		
1.50-2.00	T4				(1.00)			
					2.00	Refusal at 2.00m		

Remarks
Refusal at 2.00m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No. 11507-02-22.GC111

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Site Cummeenabuddoge Wind Farm			**Number** GC112
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 0.50m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location (Handheld GPS) 519857 E 583599 N	**Dates** 22/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.50) 0.50	Plastic brown pseudofibrous PEAT. (H5, B2, F2, R1, W0, N0, TV0, TH1, A1, P0) Refusal at 0.50m		

Remarks
Refusal at 0.50m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No. 11507-02-22.GC112

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Site Cummeenabuddoge Wind Farm			**Number** GC115
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 1.00m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 518679 E 583579 N	**Dates** 31/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.10) 0.10	Spongy brown fibrous PEAT. (H3, B2, F2, R2, W0, N1, TV1, TH1, A0, P0)		
					(0.40)	Firm brown fibrous PEAT. (H3, B2, F2, R2, W0, N1, TV3, TH3, A0, P0)		
0.50-1.00	T2				0.50			
					(0.50)	Firm brown fibrous PEAT. (H4, B2, F2, R2, W0, N1, TV3, TH1, A1, P0)		
					1.00	Refusal at 1.00m		

Remarks
Refusal at 1.00m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC115

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Site Cummeenabuddoge Wind Farm			**Number** GC116
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 1.65m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 518235 E 582488 N	**Dates** 01/04/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.10) 0.10	Spongy brown pseudofibrous PEAT. (H2, B2, F2, R2, W0, N2, TV2, TH1, A0, P0)		
					(0.40)	Firm brown fibrous PEAT. (H3, B2, F1, R2, W0, N1, TV2, TH2, A0, P0)		
0.50-1.00	T2				0.50	Spongy brown pseudofibrous PEAT. (H4, B2, F1, R2, W0, N1, TV2, TH2, A2, P0)		
1.00-1.50	T3				(1.00)			
1.50-1.65	T4				1.50 (0.15) 1.65	Spongy brown pseudofibrous PEAT. (H5, B2, F1, R1, W0, N0, TV0, TH1, A1, P0)		
						Refusal at 1.65m		

Remarks
Refusal at 1.65m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC116

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Site Cummeenabuddoge Wind Farm			**Number** GC117
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 1.30m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 518337 E 582391 N	**Dates** 31/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1					Spongy brown pseudofibrous PEAT. (H3, B2, F2, R2, W0, N1, TV2, TH1, A1, P0)		
0.50-1.00	T2				(1.00)			
1.00-1.30	T3				1.00	Spongy brown pseudofibrous PEAT. (H4, B2, F2, R1, W0, N0, TV1, TH1, A2, P0)		
					(0.30)			
					1.30	Refusal at 1.30m		

Remarks
Refusal at 1.30m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No. 11507-02-22.GC117

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Site Cummeenabuddoge Wind Farm			**Number** GC118
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 1.50m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 517664 E 582002 N	**Dates** 01/04/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.15) 0.15	Plastic brown pseudofibrous PEAT. (H4, B2, F2, R2, W0, N2, TV1, TH1, A0, P0)		
					(0.35)	Firm brown fibrous PEAT. (H4, B2, F2, R2, W0, N0, TV3, TH2, A2, P0)		
0.50-1.00	T2				0.50	Spongy brown pseudofibrous PEAT. (H4, B2, F1, R2, W0, N0, TV2, TH1, A2, P0)		
1.00-1.50	T3				(1.00)			
					1.50	Refusal at 1.50m		

Remarks
Refusal at 1.50m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC118

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Site Cummeenabuddoge Wind Farm			**Number** GC119
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 1.50m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 517691 E 582522 N	**Dates** 01/04/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.12) 0.12	Spongy brown fibrous PEAT. (H3, B2, F1, R2, W0, N2, TV1, TH1, A0, P0)		
					(0.58)	Firm brown fibrous PEAT. (H3, B2, F2, R2, W0, N0, TV3, TH3, A0, P0)		
0.50-1.00	T2				0.70			
					(0.80)	Spongy brown pseudofibrous PEAT. (H4, B2, F2, R2, W0, N0, TV2, TH2, A1, P0)		
1.00-1.50	T3				1.50	Refusal at 1.50m		

Remarks
Refusal at 1.50m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC119

Ground Investigations Ireland Ltd
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Site Cummeenabuddoge Wind Farm			**Number** GC120
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 2.50m	**Ground Level (mOD)** 366.77	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 521073.7 E 584222.6 N	**Dates** 21/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.50)	Plastic brown pseudofibrous PEAT. (H5, B3, F2, R2, W0, N1, TV1, TH1, A1, P0)		
0.50-1.00	T2			366.27	0.50	Spongy brown pseudofibrous PEAT. (H5, B2, F1, R2, W0, N0, TV2, TH1, A1, P0)		
1.00-1.50	T3				(1.70)			
1.50-2.00	T4							
2.00-2.50	T5			364.57	2.20	Plastic brown pseudofibrous PEAT. (H5, B3, F1, R2, W1, N1, TV1, TH1, A1, P0)		
					(0.30)			
				364.27	2.50	Refusal at 2.50m		

Remarks
Refusal at 2.50m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No. 11507-02-22.GC120

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Site Cummeenabuddoge Wind Farm			**Number** GC121
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 2.00m	**Ground Level (mOD)** 371.88	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 520440.6 E 583980.1 N	**Dates** 22/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.15)	Plastic brown pseudofibrous PEAT. (H4, B2, F2, R2, W0, N0, TV1, TH1, A1, P0)		
				371.73	0.15	Spongy brown pseudofibrous PEAT. (H5, B2, F2, R3, W0, N0, TV2, TH2, A2, P0)		
0.50-1.00	T2							
					(1.35)			
1.00-1.50	T3							
1.50-2.00	T4			370.38	1.50	Plastic brown pseudofibrous PEAT. (H6, B2, F2, R2, W0, N0, TV2, TH1, A1, P0)		
					(0.50)			
				369.88	2.00	Refusal at 2.00m		

Remarks
Refusal at 2.00m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC121

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Site Cummeenabuddoge Wind Farm			**Number** GC122
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 1.00m	**Ground Level (mOD)** 372.67	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 520226.2 E 583913.6 N	**Dates** 22/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.20)	Plastic brown pseudofibrous PEAT. (H3, B2, F2, R2, W0, N1, TV1, TH0, A0, P0)		
				372.47	0.20			
0.50-1.00	T2				(0.80)	Spongy brown pseudofibrous PEAT. (H4, B2, F2, R2, W0, N0, TV3, TH2, A1, P0)		
				371.67	1.00	Refusal at 1.00m		

Remarks
Refusal at 1.00m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC122

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Site Cummeenabuddoge Wind Farm			**Number** GC123
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 1.00m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 520425.2 E 583241.4 N	**Dates** 22/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				0.05 (0.10) 0.15	Firm brown fibrous PEAT. (H2, B2, F1, R3, W0, N1, TV1, TH1, A0, P0)		
						Spongy brown pseudofibrous PEAT. (H4, B3, F1, R1, W0, N0, TV1, TH0, A0, P0)		
0.50-1.00	T2				(0.85)	Spongy brown fibrous PEAT. (H4, B2, F2, R3, W0, N0, TV3, TH2, A1, P0)		
					1.00	Refusal at 1.00m		

Remarks
Refusal at 1.00m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC123

Ground Investigations Ireland Ltd
www.gii.ie

Site Cummeenabuddoge Wind Farm			**Number** GC124
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 1.00m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 519749.2 E 582890.3 N	**Dates** 22/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.20) 0.20	Spongy brown fibrous PEAT. (H3, B2, F1, R2, W0, N0, TV1, TH1, A1, P0)		
0.50-1.00	T2				(0.80) 1.00	Spongy brown fibrous PEAT. (H4, B2, F2, R2, W0, N0, TV3, TH2, A1, P0)		
						Refusal at 1.00m		

Remarks
Refusal at 1.00m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No. 11507-02-22.GC124

Ground Investigations Ireland Ltd
www.gii.ie

Site Cummeenabuddoge Wind Farm			**Number** GC125
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 2.40m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 518756 E 583449 N	**Dates** 31/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.08) 0.08	Firm brown pseudofibrous PEAT. (H2, B2, F1, R2, W0, N1, TV3, TH2, A0, P0)		
					(0.42)	Spongy brown fibrous PEAT. (H4, B2, F2, R2, W0, N1, TV3, TH3, A0, P0)		
0.50-1.00	T2				0.50	Plastic brown pseudofibrous PEAT. (H5, B2, F2, R1, W0, N0, TV2, TH2, A1, P0)		
1.00-1.50	T3				(1.00)			
1.50-2.00	T4				1.50	Plastic brown pseudofibrous PEAT. (H6, B2, F1, R1, W0, N0, TV1, TH0, A1, P0)		
2.00-2.40	T5				(0.90)			
					2.40	Refusal at 2.40m		

Remarks
Refusal at 2.40m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No. 11507-02-22.GC125

Ground Investigations Ireland Ltd
www.gii.ie

Site Cummeenabuddoge Wind Farm			**Number** GC126
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 2.50m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 518737 E 583624 N	**Dates** 31/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.50)	Firm brown fibrous PEAT. (H3, B2, F1, R2, W0, N1, TV3, TH1, A1, P0)		
0.50-1.00	T2				0.50 (0.50)	Spongy brown pseudofibrous PEAT. (H4, B2, F1, R2, W0, N0, TV2, TH2, A2, P0)		
1.00-1.50	T3				1.00 (0.50)	Spongy brown pseudofibrous PEAT. (H4, B2, F1, R2, W0, N2, TV2, TH2, A2, P0)		
1.50-2.00	T4				1.50 (1.00)	Plastic brown pseudofibrous PEAT. (H5, B2, F2, R1, W0, N0, TV1, TH1, A1, P0)		
2.00-2.50	T5				2.50	Refusal at 2.50m		

Remarks
Refusal at 2.50m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC126

Ground Investigations Ireland Ltd
www.gii.ie

Site Cummeenabuddoge Wind Farm			**Number** GC127
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 0.70m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 518435 E 583563 N	**Dates** 31/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.10) 0.10	Spongy brown pseudofibrous PEAT. (H2, B2, F1, R1, W0, N1, TV2, TH1, A1, P0)		
					(0.60)	Firm brown pseudofibrous PEAT. (H4, B2, F2, R2, W0, N0, TV3, TH1, A1, P0)		
0.50-0.70	T2				0.70	Refusal at 0.70m		

Remarks
Refusal at 0.70m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No.
11507-02-22.GC127

Ground Investigations Ireland Ltd
www.gii.ie

Site Cummeenabuddoge Wind Farm			**Number** GC128
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions** 50mm to 1.00m	**Ground Level (mOD)**	**Client** Atmos Consulting	**Job Number** 11507-02-22
	Location 518083 E 582969 N	**Dates** 31/03/2022	**Engineer** Gavin & Doherty Geosolutions	**Sheet** 1/1

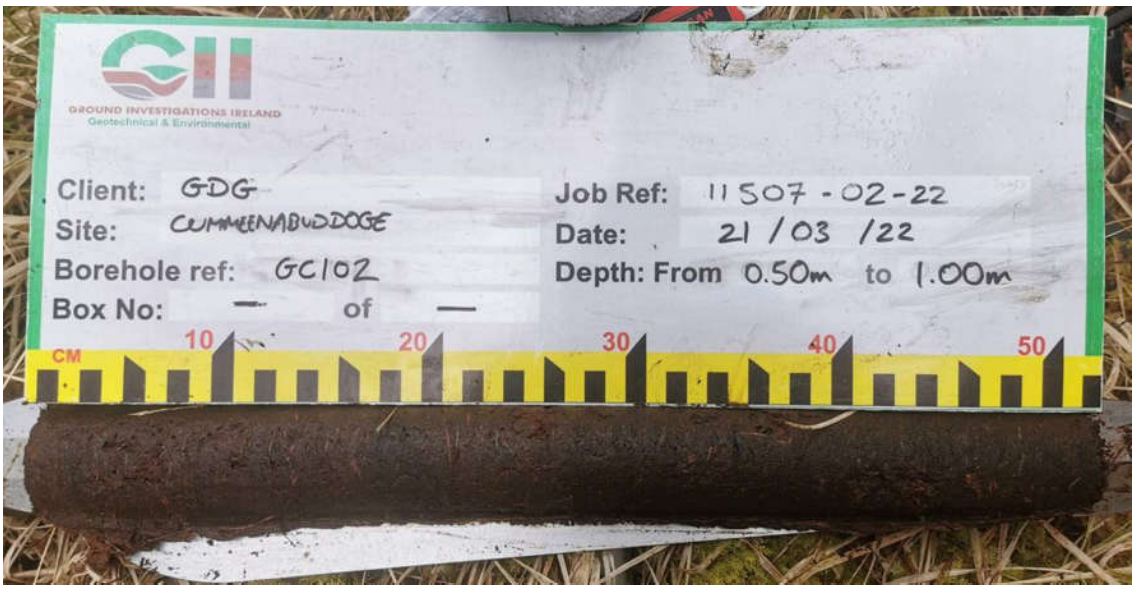
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T1				(0.10) 0.10	Spongy brown pseudofibrous PEAT. (H2, B2, F1, R2, W0, N0, TV1, TH0, A0, P0)		
					(0.20) 0.30	Firm brown pseudofibrous PEAT. (H3, B2, F2, R2, W0, N1, TV3, TH2, A0, P0)		
					(0.20) 0.50	Spongy brown pseudofibrous PEAT. (H4, B2, F2, R2, W0, N0, TV2, TH1, A1, P0)		
0.50-1.00	T2				(0.50) 1.00	Spongy brown pseudofibrous PEAT. (H4, B2, F2, R2, W0, N0, TV2, TH1, A2, P0)		
						Refusal at 1.00m		

Remarks
Refusal at 1.00m BGL due to inability to penetrate deeper

Scale (approx)	Logged By
1:25	J McDowell

Figure No. 11507-02-22.GC128

Cummeenabuddoge Wind Farm
Russian Core Photographs



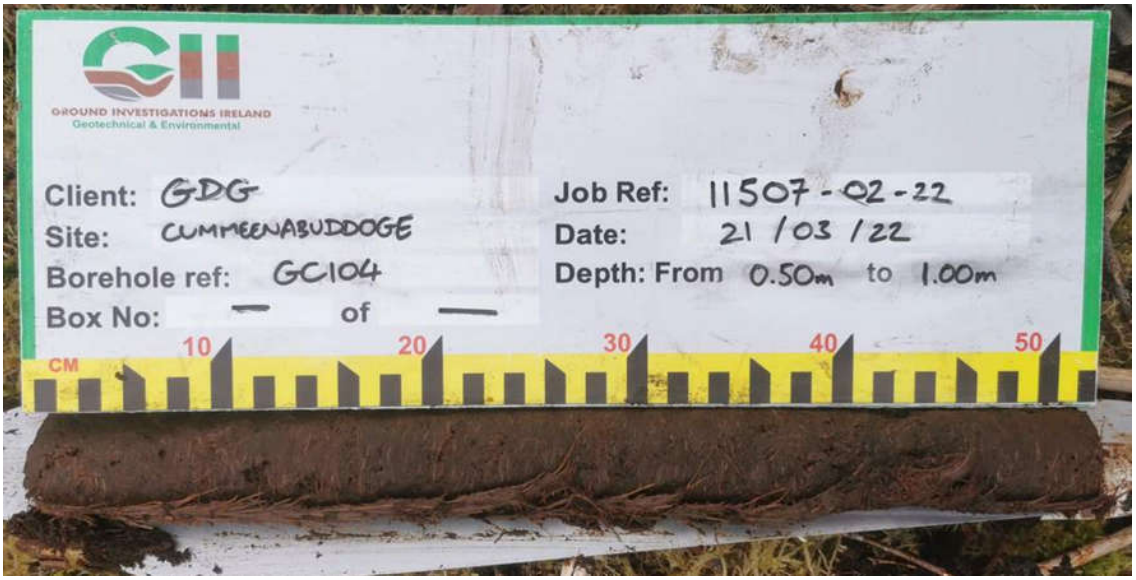
GC102


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC103
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 0.00m to 0.50m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC103
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 0.50m to 1.00m
CM 10 20 30 40 50

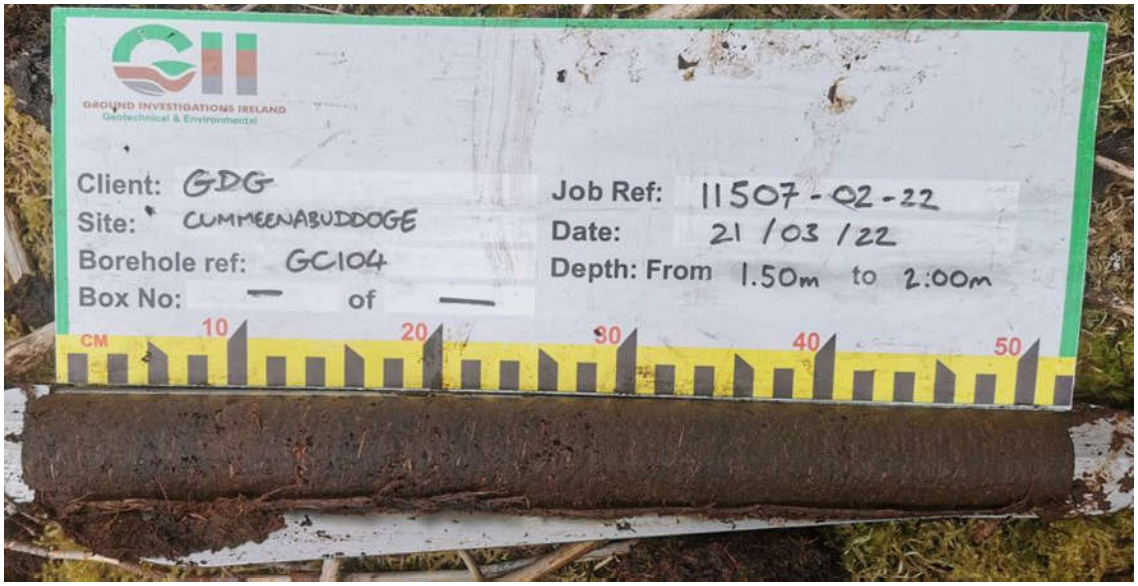
GC103


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC104
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 0.00m to 0.50m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC104
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 0.50m to 1.00m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC104
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 1.00 to 1.50m
CM 10 20 30 40 50

GC104


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC104
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 1.50m to 2.00m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC104
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 2.00m to 2.50m
CM 10 20 30 40 50

GC104


GROUND INVESTIGATIONS IRELAND
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC105
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 0.00m to 0.40m
CM
10
20
30
40
50

GC105


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Job Ref: 11507-02-22
Site: CUMMEENABUCDOGE
Date: 21/03/22
Borehole ref: GC106
Depth: From 0.00m to 0.50m
Box No: — of —
CM
10
20
30
40
50

GC106

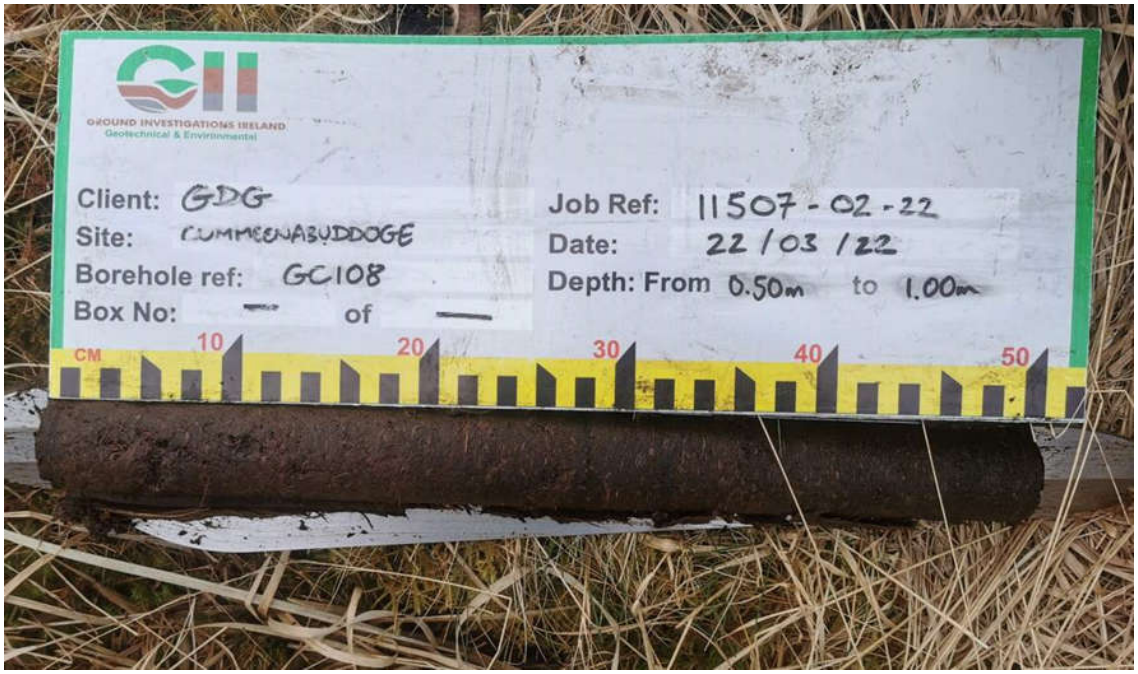

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CLAMMEENABUDDOGE
Borehole ref: GC107
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 0.00m to 0.50m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CLAMMEENABUDDOGE
Borehole ref: GC107
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 0.50m to 1.00m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CLAMMEENABUDDOGE
Borehole ref: GC107
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 1.00m to 1.40m
CM 10 20 30 40 50

GC107


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC108
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 0.00m to 0.50m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC108
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 0.50m to 1.00m
CM 10 20 30 40 50

GC108

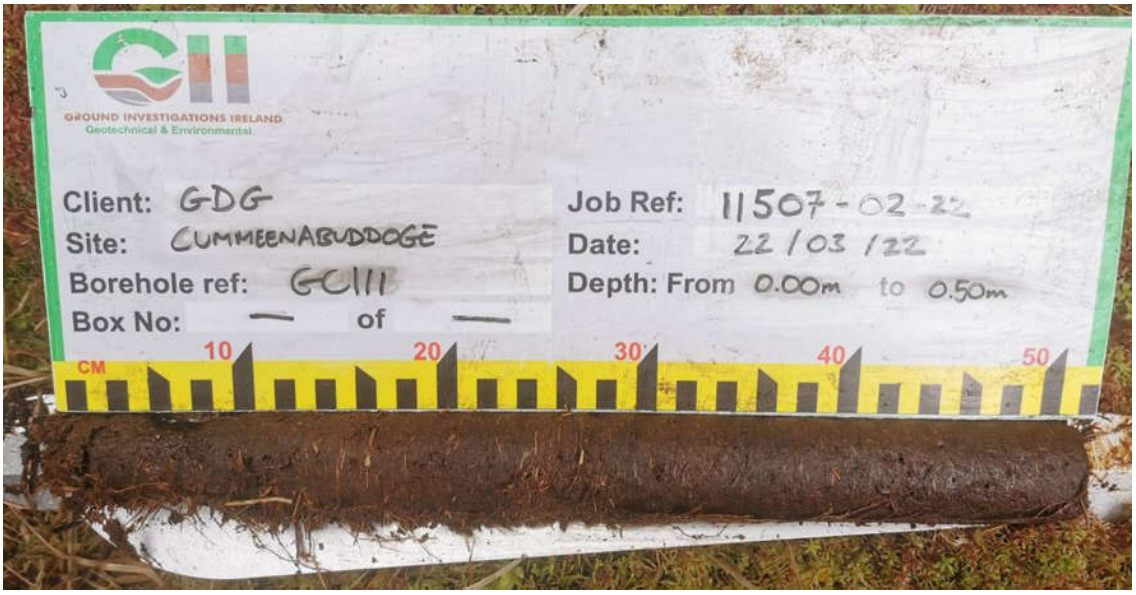

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENACUDDOGE
Borehole ref: GC109
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 0.00m to 0.50m
CM 10 20 30 40 50

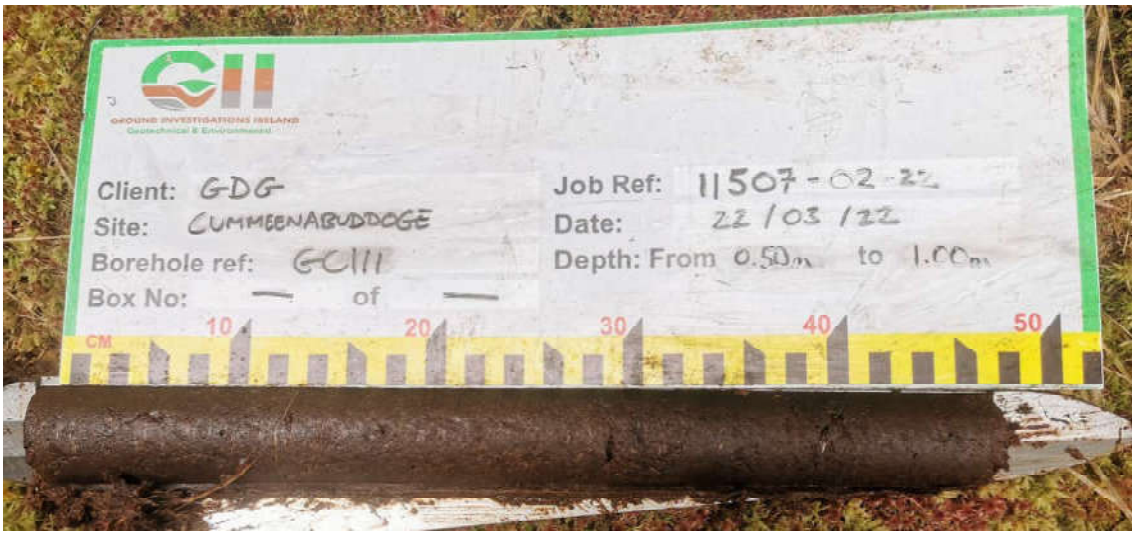

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENACUDDOGE
Borehole ref: GC109
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 0.50m to 0.90m
CM 10 20 30 40 50

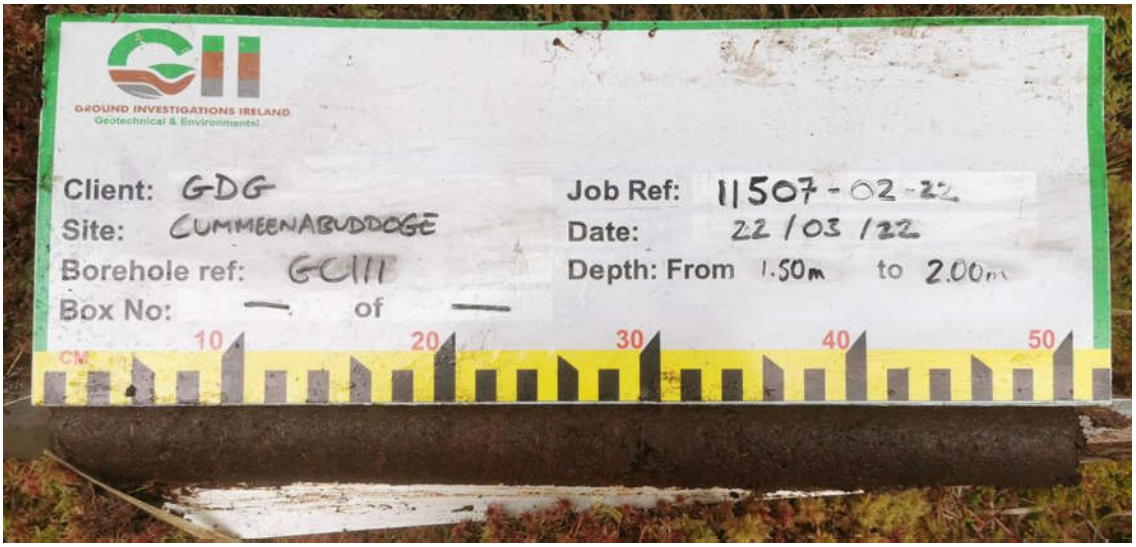
GC109


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR UDDOGE
Borehole ref: GC110
Box No: — of —
Job Ref: 11507-02-22
Date: 31/03/22
Depth: From 0.00m to 0.50m
CM
10
20
30
40
50

GC110


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC111
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 0.00m to 0.50m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC111
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 0.50m to 1.00m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC111
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 1.50m to 2.00m
CM 10 20 30 40 50

GC111


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDC
Site: CUMMEENABUDDOGE
Borehole ref: GC112
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 0.00m to 0.50m
CM
10
20
30
40
50

GC112


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAHVODOGE
Borehole ref: GC115
Box No: — of —
Job Ref: 11507-02-22
Date: 31/03/22
Depth: From 0.0m to 0.5m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAHVODOGE
Borehole ref: GC115
Box No: — of —
Job Ref: 11507-02-22
Date: 31/03/22
Depth: From 0.5m to 1.0m
CM 10 20 30 40 50

GC115


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VDDOGE
Borehole ref: GC116
Box No: — of —
Job Ref: 11507-02-22
Date: 01/04/22
Depth: From 0.00m to 0.50m
CM
10
20
30
40
50

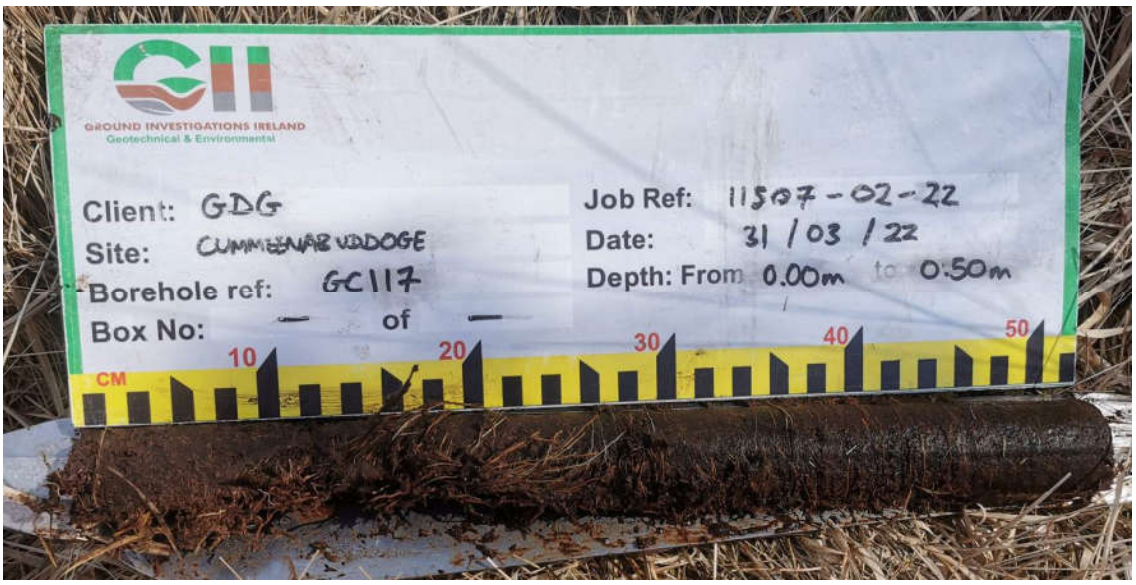
GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VDDOGE
Borehole ref: GC116
Box No: — of —
Job Ref: 11507-02-22
Date: 01/04/22
Depth: From 0.50m to 1.0m
CM
10
20
30
40
50

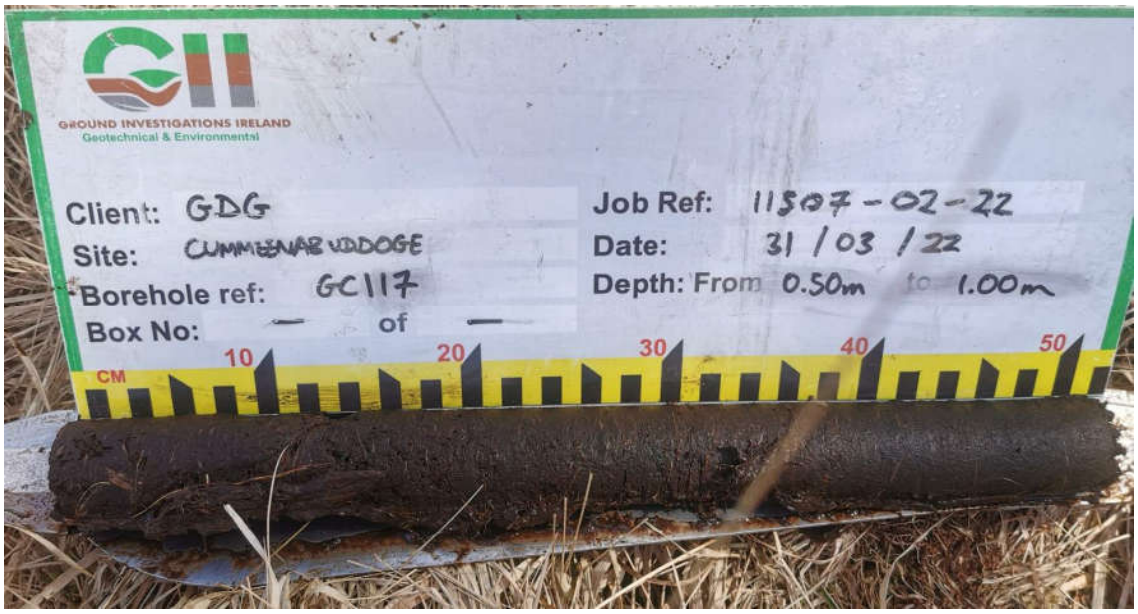
GC116


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VDDOGE
Borehole ref: GC116
Box No: — of —
Job Ref: 11507-02-22
Date: 01/04/22
Depth: From 1.0m to 1.5m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VDDOGE
Borehole ref: GC116
Box No: — of —
Job Ref: 11507-02-22
Date: 01/04/22
Depth: From 1.50m to 1.65m
CM 10 20 30 40 50

GC116


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VIDOGE
Borehole ref: GC117
Box No: — of —
Job Ref: 11507-02-22
Date: 31/03/22
Depth: From 0.00m to 0.50m
CM 10 20 30 40 50

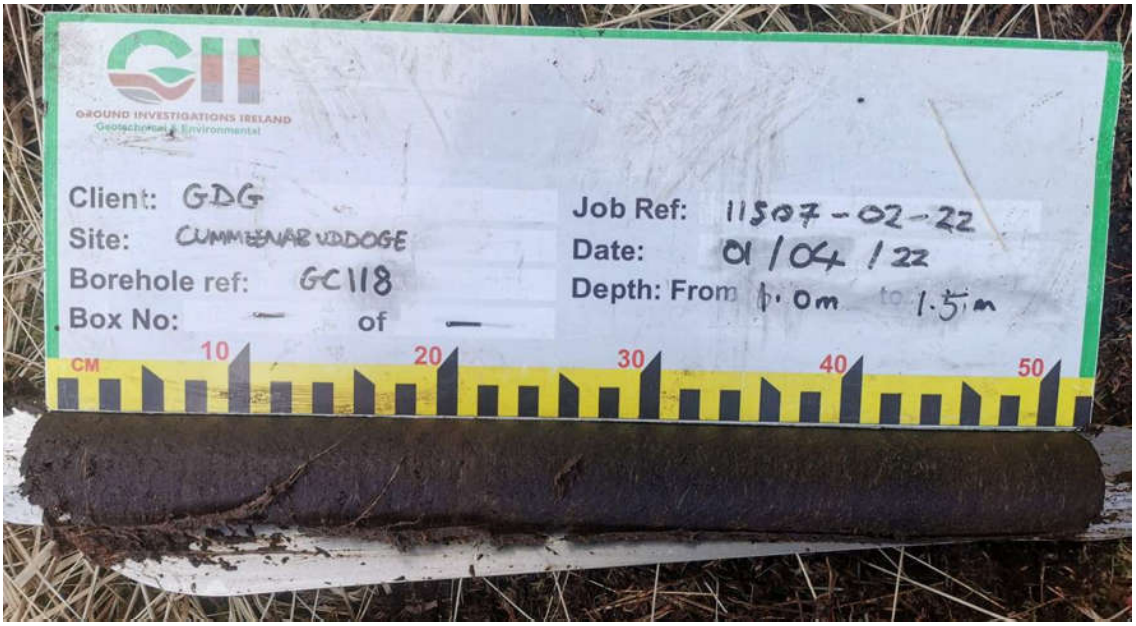

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VIDOGE
Borehole ref: GC117
Box No: — of —
Job Ref: 11507-02-22
Date: 31/03/22
Depth: From 0.50m to 1.00m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VIDOGE
Borehole ref: GC117
Box No: — of —
Job Ref: 11507-02-22
Date: 31/03/22
Depth: From 1.00m to 1.30m
CM 10 20 30 40 50

GC117


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VIADOGE
Borehole ref: GC118
Box No: — of —
Job Ref: 11507-02-22
Date: 01/04/22
Depth: From 0.00m to 0.50m
CM 10 20 30 40 50

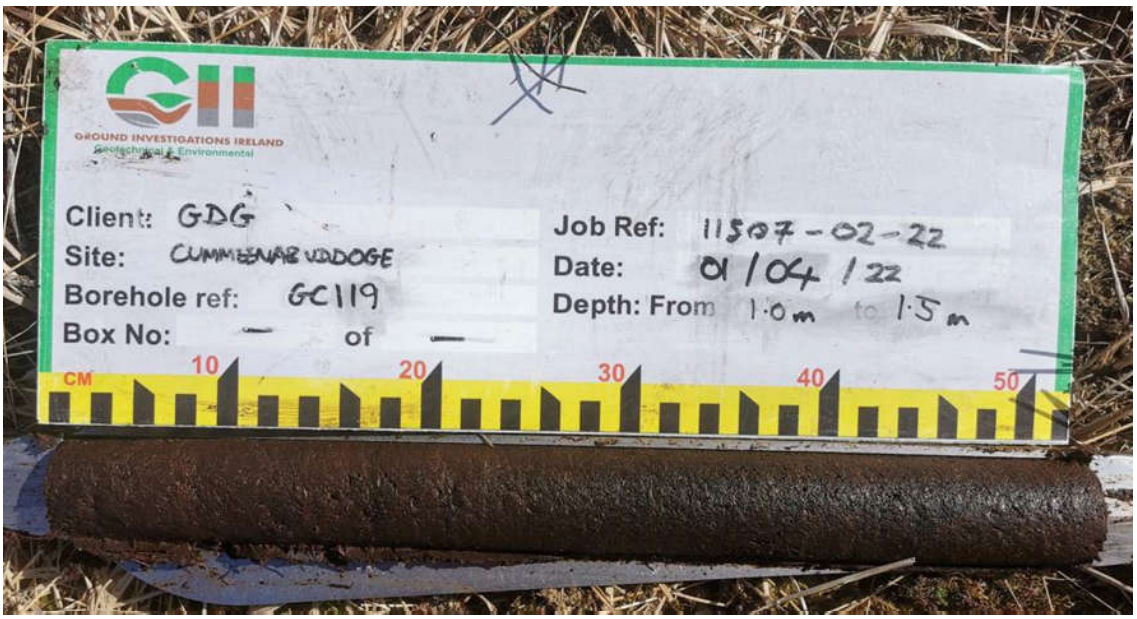

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VIADOGE
Borehole ref: GC118
Box No: — of —
Job Ref: 11507-02-22
Date: 01/04/22
Depth: From 0.50m to 1.0m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VIADOGE
Borehole ref: GC118
Box No: — of —
Job Ref: 11507-02-22
Date: 01/04/22
Depth: From 1.0m to 1.5m
CM 10 20 30 40 50

GC118


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VDDOGE
Borehole ref: GC119
Box No: — of —
Job Ref: 11507-02-22
Date: 01/04/22
Depth: From 0.0m to 0.5m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VDDOGE
Borehole ref: GC119
Box No: — of —
Job Ref: 11507-02-22
Date: 01/04/22
Depth: From 0.5m to 1.0m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VDDOGE
Borehole ref: GC119
Box No: — of —
Job Ref: 11507-02-22
Date: 01/04/22
Depth: From 1.0m to 1.5m
CM 10 20 30 40 50

GC119


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC120
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 0.00m to 0.50m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC120
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 0.50m to 1.00m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC120
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 1.00m to 1.50m
CM 10 20 30 40 50

GC120


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC120
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 1.50m to 2.00m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC120
Box No: — of —
Job Ref: 11507-02-22
Date: 21/03/22
Depth: From 2.00m to 2.50m
CM 10 20 30 40 50

GC120


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAGNDDOEE
Borehole ref: GC121
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 0.00m to 0.50m
CM
10
20
30
40
50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAGNDDOEE
Borehole ref: GC121
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 0.50m to 1.00m
CM
10
20
30
40
50

GC121


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAGUDDOCE
Borehole ref: GC121
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 1.00m to 1.50m
CM
10
20
30
40
50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAGUDDOCE
Borehole ref: GC121
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 1.50 to 2.00m
CM
10
20
30
40
50

GC121


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDC
Site: CUMMEENABUDDOE
Borehole ref: GC122
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 0.00m to 0.50m
CM
10
20
30
40
50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDC
Site: CUMMEENABUDDOE
Borehole ref: GC122
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 0.50 to 1.00m
CM
10
20
30
40
50

GC122


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC123
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 0.00m to 0.50m
CM 10 20 30 40 50

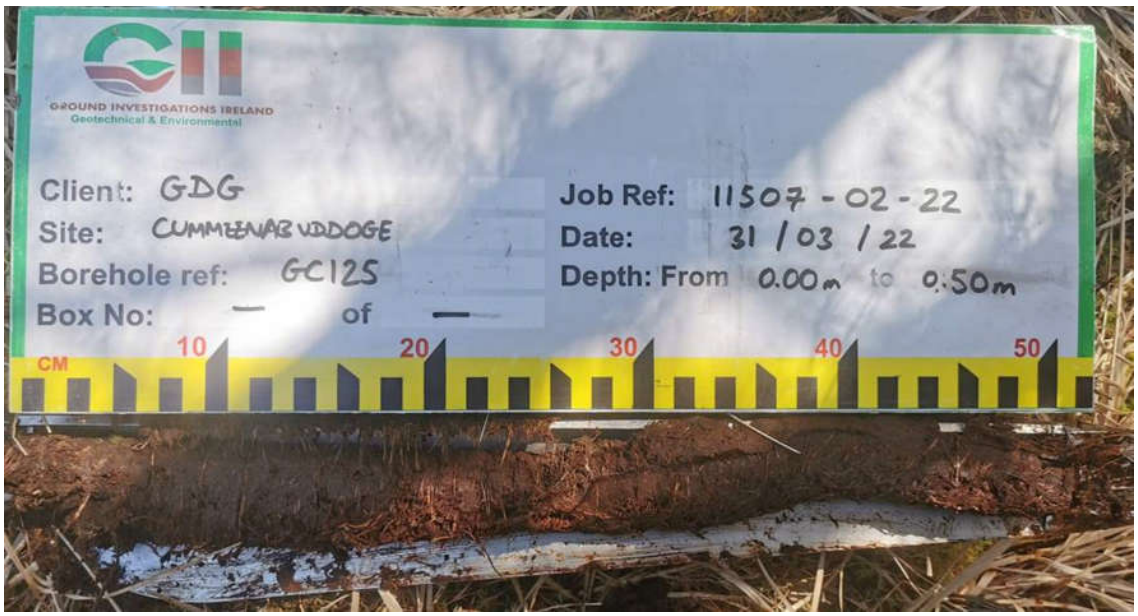

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDDOGE
Borehole ref: GC123
Box No: — of —
Job.Ref: 11507-02-22
Date: 22/03/22
Depth: From 0.50m to 1.00m
CM 10 20 30 40 50

GC123


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: G-DG
Site: CUMMEENABUDDOGE
Borehole ref: GC124
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 0.00m to 0.50m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: G-DG
Site: CUMMEENABUDDOGE
Borehole ref: GC124
Box No: — of —
Job Ref: 11507-02-22
Date: 22/03/22
Depth: From 0.50m to 1.00m
CM 10 20 30 40 50

GC124


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VIDDOGE
Borehole ref: GC125
Box No: — of —
Job Ref: 11507 - 02 - 22
Date: 31 / 03 / 22
Depth: From 0.00m to 0.50m
CM
10
20
30
40
50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VIDDOGE
Borehole ref: GC125
Box No: — of —
Job Ref: 11507 - 02 - 22
Date: 31 / 03 / 22
Depth: From 0.50m to 1.0 m
CM
10
20
30
40
50


GROUND INVESTIGATIONS IRELAND
Client: GDG
Site: CUMMEENAR VIDDOGE
Borehole ref: GC125
Box No: — of —
Job Ref: 11507 - 02 - 22
Date: 31 / 03 / 22
Depth: From 1.0 m to 1.5 m
CM
10
20
30
40
50

GC125


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VIDDOGE
Borehole ref: GC125
Box No: — of —
Job Ref: 11507 - 02 - 22
Date: 31 / 03 / 22
Depth: From 1.5m to 2.0 m
CM
10
20
30
40
50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VIDDOGE
Borehole ref: GC125
Box No: — of —
Job Ref: 11507 - 02 - 22
Date: 31 / 03 / 22
Depth: From 2.0m to 2.4 m
CM
10
20
30
40
50

GC125


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR DROGHEDA
Borehole ref: GC126
Box No: — of —
Job Ref: 11507-02-22
Date: 31/03/22
Depth: From 0.0m to 0.5m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR DROGHEDA
Borehole ref: GC126
Box No: — of —
Job Ref: 11507-02-22
Date: 31/03/22
Depth: From 0.5m to 1.0m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR DROGHEDA
Borehole ref: GC126
Box No: — of —
Job Ref: 11507-02-22
Date: 31/03/22
Depth: From 1.0m to 1.5m
CM 10 20 30 40 50

GC126


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VDDOGE
Borehole ref: GC126
Box No: — of —
Job Ref: 11507-02-22
Date: 31/03/22
Depth: From 1·5m to 2·0m
CM
10
20
30
40
50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR VDDOGE
Borehole ref: GC126
Box No: — of —
Job Ref: 11507-02-22
Date: 31/03/22
Depth: From 2·0m to 2·5m
CM
10
20
30
40
50

GC126


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR DROGHEDA
Borehole ref: GC127
Box No: — of —
Job Ref: 11507-02-22
Date: 31/03/22
Depth: From 0.00 m to 0.50 m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENAR DROGHEDA
Borehole ref: GC127
Box No: — of —
Job Ref: 11507-02-22
Date: 31/03/22
Depth: From 0.50 m to 0.70m
CM 10 20 30 40 50

GC127


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDOGE
Borehole ref: GC128
Box No: — of —
Job Ref: 11507-02-22
Date: 31/03/22
Depth: From 0.00m to 0.50m
CM 10 20 30 40 50


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: GDG
Site: CUMMEENABUDOGE
Borehole ref: GC128
Box No: — of —
Job Ref: 11507-02-22
Date: 31/03/22
Depth: From 0.50m to 1.00m
CM 10 20 30 40 50

GC128

APPENDIX 4 – Laboratory Testing

National Materials Testing Laboratory Ltd.

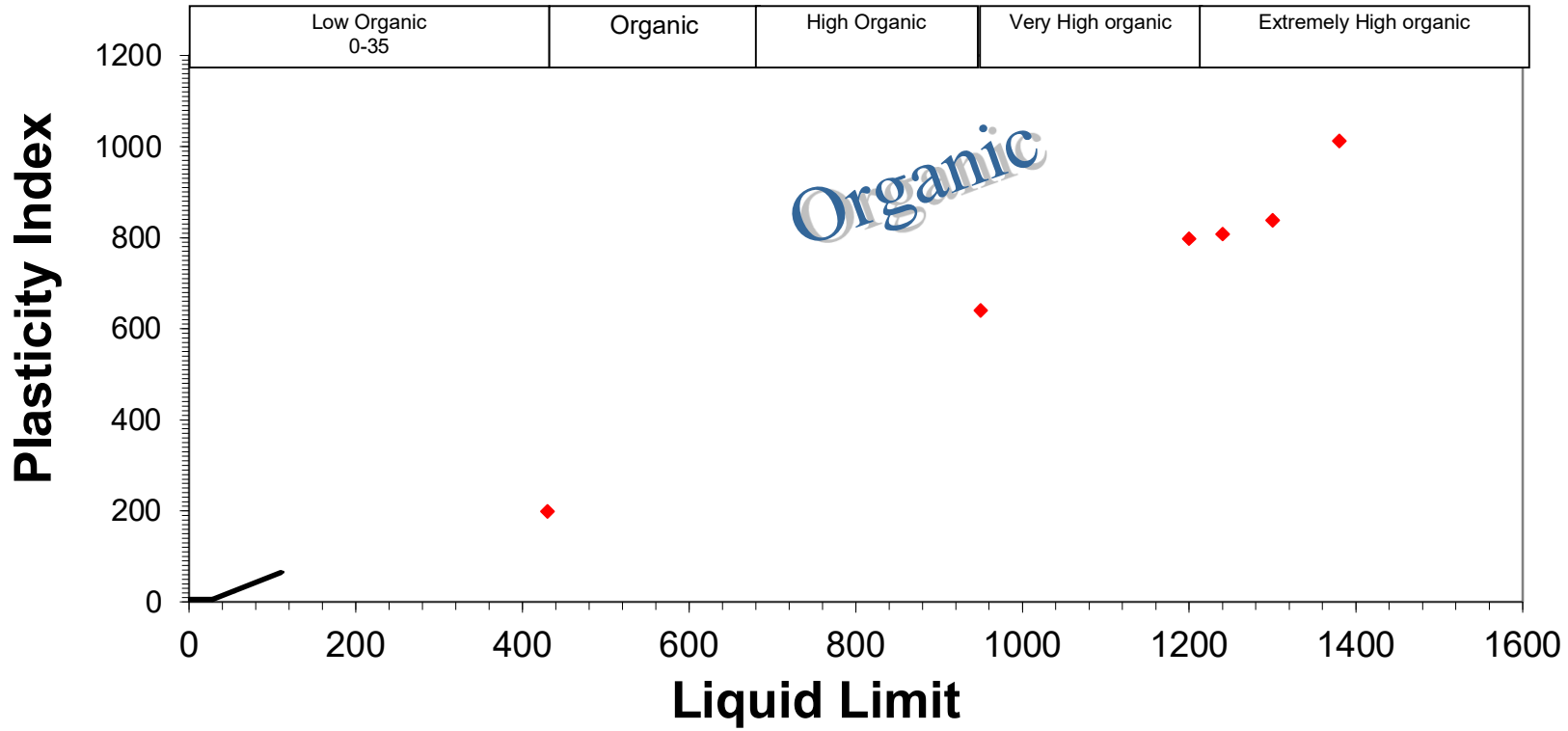
SUMMARY OF TEST RESULTS

				Particle			Index Properties		Bulk	Cell	Undrained Triaxial Tests		Lab	
BH/TP	Depth	sample	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Vane	Remarks
No	m	No.	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	
TP01	1.00	T	878.0		Natural	950	310	640						
TP103	0.50	T	419.2											Unsuitable for PSD
TP104	0.50	T	336.7		90.6	430	231	199						
TP107	1.00	T	1315.0		Natural	1380	368	1012						
TP108	1.00	T	1442.9		Natural	1300	462	838						
TP108	2.00	T	1247.7		Natural	1200	402	798						
TP110	2.00	T	32.8		58.8	46	Non Plastic							
TP112	1.00	T	1334.3		Natural	1240	432	808						

NMTL	Notes :	Job ref No.	NMTL 3525	GII Project ID:	11507-02-22
	1. All BS tests carried out using preferred (definitive) method unless otherwise stated.	Location	Commeenabuddoge Wind Farm		

NMTL LTD
Unit 18c, Tullow Industrial Estate
Tullow
County Carlow
Tel: 00353 59 9180822
Mob: 00353 872575508
billa@nmtl.ie

Contract:	**Commeenabuddoge Wind Farm**		
Client:	**Ground Investigations Ireland Ltd**		
Engineer:	**Stephen Kealy**		
GII Project ID	**11507-02-22**		
Date:	**19/04/2022**		
Tested By:	**Sb**	**Checked:**	**Bc**
Job ref No.	**NMTL 3525**		

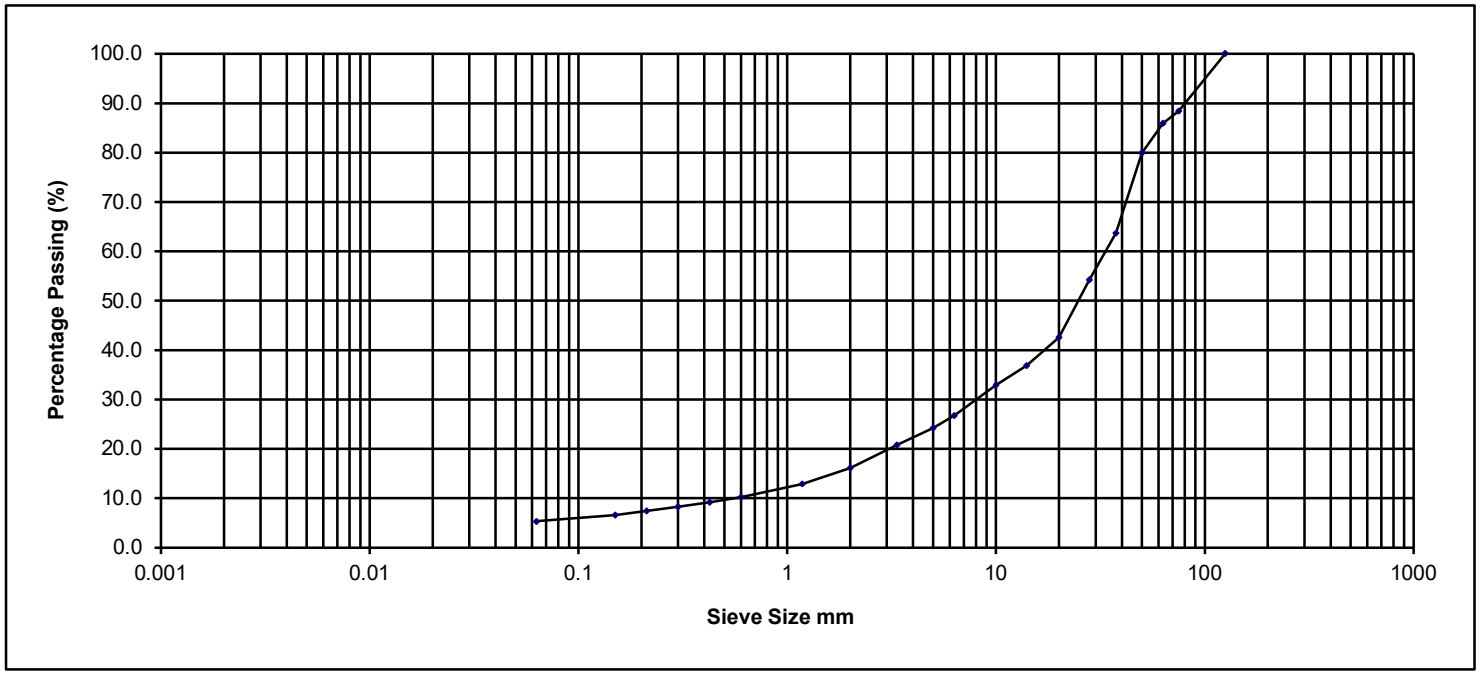


NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	88.3
63.000	85.9
50.000	79.9
37.500	63.7
28.000	54.2
20.000	42.6
14.000	36.8
10.000	32.9
6.300	26.8
5.000	24.2
3.350	20.8
2.000	16.2
1.180	12.9
0.600	10.2
0.425	9.2
0.300	8.3
0.212	7.4
0.150	6.6
0.063	5.3



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		5.3			10.8			69.7		14.1	0.0

Sample Description	Brown silty sandy fine to coarse GRAVEL.					Project No.	NMTL 3527
						BH/TP No.	TP104
Project	Cummeenabuddoge Wind Farm			GII PROJECT ID:11507-02-22		Sample No.	B
Operator	Sb	Checked	Nc	Approved	Bc	Date sample tested	13/04/2022	Depth	1.50m

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	86.3
63.000	78.7
50.000	74.6
37.500	64.5
28.000	52.6
20.000	40.2
14.000	35.0
10.000	30.0
6.300	22.3
5.000	20.1
3.350	16.2
2.000	12.3
1.180	9.6
0.600	7.4
0.425	6.6
0.300	6.0
0.212	5.5
0.150	5.1
0.063	4.4

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		4.4			7.9			66.4		21.3	0.0

Sample Description	Brown slightly silty sandy fine to coarse GRAVEL.			Project No.	NMTL 3527
				BH/TP No.	TP104
Project	Cummeenabuddoge Wind Farm		GII PROJECT ID:11507-02-22	Sample No.	B
Operator Sb	Checked Nc	Approved Bc	Date sample tested 13/04/2022	Depth	3.00m

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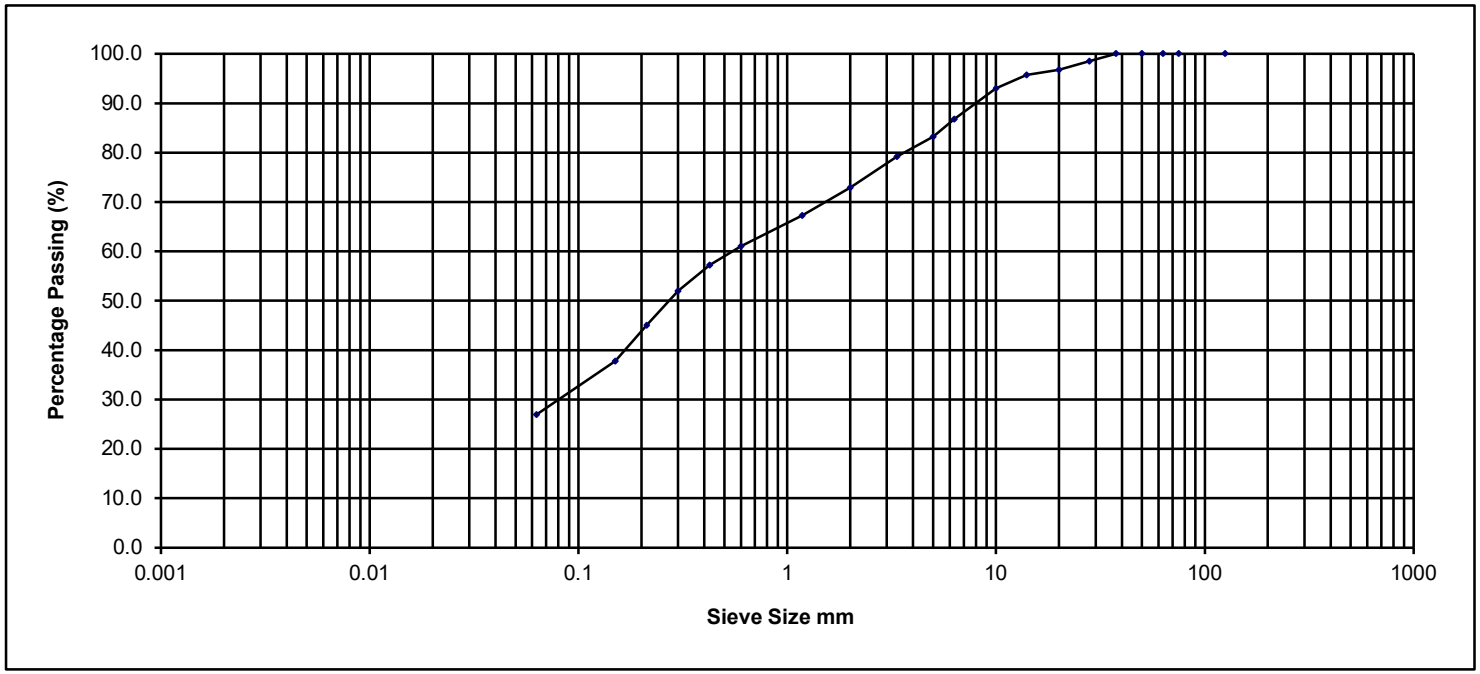
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	98.5
20.000	96.7
14.000	95.7
10.000	93.0
6.300	86.7
5.000	83.2
3.350	79.2
2.000	72.9
1.180	67.3
0.600	61.0
0.425	57.2
0.300	52.0
0.212	45.0
0.150	37.8
0.063	27.0



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		27.0			45.9			27.1		0.0	0.0

Sample Description	Grey slightly gravelly sandy slightly organic clayey SILT.						Project No.	NMTL 3527
							BH/TP No.	TP112
Project	Cummeenabuddoge Wind Farm				GII PROJECT ID:11507-02-22		Sample No.	B
Operator	Sb	Checked	Nc	Approved	Bc	Date sample tested	13/04/2022	Depth	2.00m

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	79.7
50.000	62.9
37.500	53.0
28.000	41.3
20.000	29.2
14.000	20.3
10.000	16.4
6.300	13.8
5.000	12.7
3.350	12.1
2.000	11.1
1.180	10.4
0.600	9.3
0.425	8.4
0.300	7.3
0.212	6.0
0.150	5.0
0.063	3.7

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		3.7			7.3			68.6		20.3	0.0

Sample Description	Dark brown/black slightly silty sandy fine to coarse GRAVEL.						Project No.	NMTL 3527
							BH/TP No.	TP117
Project	Cummeenabuddoge Wind Farm				GII PROJECT ID:11507-02-22		Sample No.	B
Operator	Sb	Checked	Nc	Approved	Bc	Date sample tested	13/04/2022	Depth	1.50m

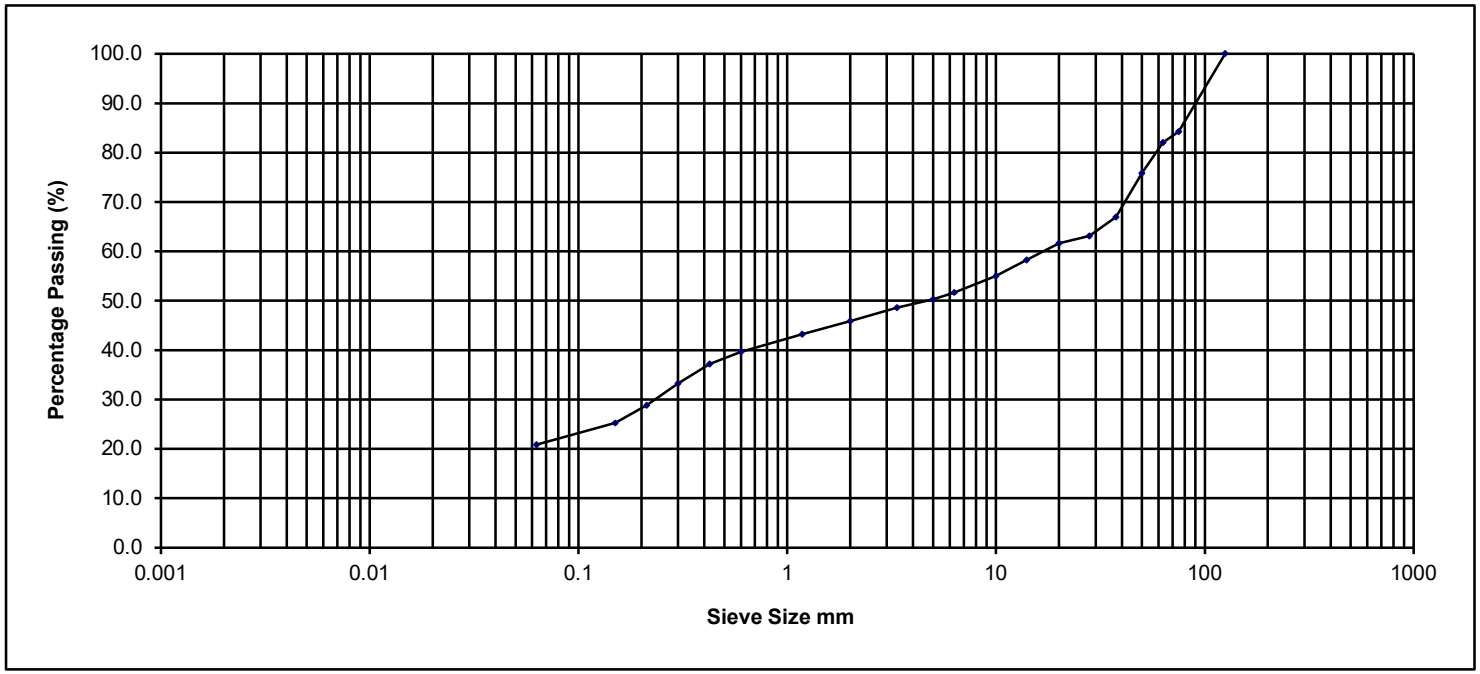
NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	84.2
63.000	82.1
50.000	75.8
37.500	67.0
28.000	63.1
20.000	61.6
14.000	58.2
10.000	55.0
6.300	51.6
5.000	50.2
3.350	48.6
2.000	45.8
1.180	43.2
0.600	39.7
0.425	37.1
0.300	33.2
0.212	28.8
0.150	25.2
0.063	20.9



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		20.9			25.0			36.2		17.9	0.0

Sample Description: Brown/grey slightly sandy gravelly slightly organic clayey SILT.

Project: Cummeenabuddoge Wind Farm

GII PROJECT ID:11507-02-22

Project No.	NMTL 3527
BH/TP No.	TP117
Sample No.	B
Depth	2.10m

Operator	Sb	Checked	Nc	Approved	Bc	Date sample tested	13/04/2022

NMTL Ltd

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Zone 3
Deeside Industrial Park
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W: www.element.com

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

Attention :	Stephen Kealy
Date :	29th April, 2022
Your reference :	11507-02-22
Our reference :	Test Report 22/5622 Batch 1
Location :	Cummeenabuddoge Wind Farm
Date samples received :	6th April, 2022
Status :	Final Report
Issue :	1

Six samples were received for analysis on 6th April, 2022 of which six 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

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 11507-02-22
Location: Cummeenabuddoge Wind Farm
Contact: Stephen Kealy
EMT Job No: 22/5622

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1	2	3	4	5	6					LOD/LOR	Units	Method No.
Sample ID	TP101	TP105	TP107	TP112	TP113	TP117							
Depth	0.10-0.50	0.10-0.50	0.10-0.50	0.10-0.50	0.10-0.50	0.10-0.50							
COC No / misc													
Containers	J	J	J	J	J	J							
Sample Date	14/03/2022	14/03/2022	15/03/2022	16/03/2022	16/03/2022	15/03/2022							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1							
Date of Receipt	06/04/2022	06/04/2022	06/04/2022	06/04/2022	06/04/2022	06/04/2022							
Phosphorus	169	272	430	199	348	463					<10	mg/kg	TM30/PM15
Ortho Phosphate as PO4	4.3	<0.3	28.1	<0.3	<0.3	23.9					<0.3	mg/kg	TM38/PM60
Available Phospohorus	See Attached	See Attached	See Attached	See Attached	See Attached	See Attached							Subcontracted

Please see attached notes for all abbreviations and acronyms

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 11507-02-22
Location: Cummeenabuddoge Wind Farm
Contact: Stephen Kealy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/5622						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/5622

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 overesitimate 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.

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: 22/5622

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	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: 2013l	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes

ANALYTICAL REPORT

Report Number	**13454-22**	**K920**	**ELEMENT ENVIRONMENTAL**	**Client 5622**	
Date Received	**21-APR-2022**		**LABS DEESIDE UNIT 3**		
Date Reported	**25-APR-2022**		**DEESIDE POINT ZONE 3**		
Project	**EMT 227375**		**DEESIDE IND PK**		
Reference	**5622**		**FLINTSHIRE**		
Order Number	**E208N22000654**		**CH5 2UA**		

Laboratory Reference		**SOIL559312**	**SOIL559313**	**SOIL559314**	**SOIL559315**	**SOIL559316**	**SOIL559317**				
Sample Reference		**5622-1**	**5622-2**	**5622-3**	**5622-4**	**5622-5**	**5622-6**				
Determinand	**Unit**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**				
Available Phosphorus (Index)	mg/l	21.4 (2)	13.0 (1)	8.3 (0)	5.8 (0)	5.9 (0)	4.7 (0)				

Notes

Analysis Notes

The sample submitted was of adequate size to complete all analysis requested.
The results as reported relate only to the item(s) submitted for testing.
The results are presented on a dry matter basis unless otherwise stipulated.

Reported by

Myles Nicholson

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