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APPENDIX 4-2

PEAT AND SPOIL MANAGEMENT PLAN

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Seskin Wind Farm

Peat and Spoil Management Plan

MKO

02 May 2024

AFRY Ireland Ltd
The Hyde Building
The Park
Carrickmines
Dublin
Ireland

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Project Number	ICPR1268
Revision Number	REV 8
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3	Peat and spoil volumes updated	19/12/2023	MS	19/12/2023	LP
4	Cut and Fill Assessment updated	19/01/2024	MS	24/01/2024	LP
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6	Updated after comments from the client	01/05/2024	MS	01/05/2024	LP
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1. EXECUTIVE SUMMARY

AFRY Ireland ("AFRY") has been commissioned by MKO on behalf of EDF Renewables Ireland Ltd ('the Applicant') to complete a Peat & Spoil Management Plan (PSMP) as part of an application for planning permission for the proposed Seskin Wind Farm in Co. Carlow.

As detailed in Section 1.1.1 in Chapter 1, for the purposes of this EIAR, the various project components are described and assessed using the following references: 'Proposed Project', 'Proposed Wind Farm', 'Proposed Grid Connection Route', and the 'site'.

This report presents a PSMP for the construction phase of the Proposed Project. It outlines excavation methodologies for peat and spoil across various infrastructure locations and details how these materials will be managed, reinstated, and deposited on-site. Additionally, it highlights construction methodologies for the proposed infrastructure types, estimated material volumes, and identifies on-site repository areas. The PSMP aims to ensure efficient peat and spoil management, environmental sustainability, and compliance with regulations throughout the construction process.

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2. INTRODUCTION

2.1 AFRY Ireland Limited

AFRY Ireland (formerly Ionic Consulting) is a leading renewable energy consultancy firm in Ireland, with offices in Dublin and Edinburgh. In July 2022, the business was acquired by AFRY – a Swedish-based international consultancy business who is a European leader in engineering, design, and advisory services across multiple industries, including infrastructure, energy, and construction. Presently, the AFRY Ireland team comprises over 30 staff members with diverse technical and management expertise.

AFRY Ireland is a technology agnostic renewable energy company, offering a comprehensive range of specialist services and technical advice throughout project lifecycles providing technical and project management services to support the development, preconstruction and construction of renewable technologies including solar PV, onshore wind, energy storage and offshore wind, throughout Ireland, the UK, and Europe.

AFRY Ireland has strong corporate credentials and a first-class in-house team, supported by our new colleagues from the wider AFRY family, allowing us to adapt our offering to each geography and the specifics of every project, on a case-by-case basis.

This report has been prepared by Liam Power (AFRY Senior Project Manager) and Manasvi Srivastava (AFRY Civil Engineer, M.E. Structural Engineering, BTech. Civil Engineering). Liam Power is the head of AFRY Ireland Civil Team and has over 25 years construction experience in all aspects of large civil engineering projects, with latter years focusing on project managing large scale renewable projects. Manasvi Srivastava is a Civil Engineer with AFRY Ireland and has over five years of experience in civil, structural, and geotechnical engineering.

2.2 Project Background

AFRY has been commissioned by MKO on behalf of the Applicant to complete a PSMP as part of an application for planning permission for Proposed Project.

The Proposed Wind Farm is located in Co. Carlow, approximately 3.1km northwest of the village of Oldleighlin, Co. Carlow. The townlands in which the Proposed Project is located is listed in Table 1-1 in Chapter 1 of this EIAR: Introduction.

A full description of the Proposed Project is included in Chapter 4 of the EIAR: Description of the Proposed Project.

This report examines the peat and spoil management details at the Proposed Wind Farm site located within the site boundary as defined in Chapter 4 of this EIAR. The 'Proposed

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Project site' or 'site' in this report refers to the core of the Proposed Project site as defined in Chapter 4 of this EIAR.

2.3 Purpose

The objective of this report is to present a PSMP for the construction phase of the Proposed Project. This report outlines the methodology for excavating peat and spoil at the turbine bases, hardstands, substation and battery storage compound, temporary construction compounds, met mast, cable trenches, and access roads, as well as the how these materials will be managed, reinstated, and deposited on-site. The report also details the construction methodology and offers specific details regarding the proposed road types. Furthermore, it summarizes the estimated volumes and types of materials generated during the construction process, along with the location of on-site peat and spoil repository areas.

This report also includes a monitoring procedure to track any peat movements on site during the construction of the Proposed Project and a contingency plan in case a peat slide occurs. Although, this Peat and Spoil Management Plan provides some guidance on drainage measures for excavation and construction activities in the areas of peat, detailed information on drainage measures is included in Chapter 4 of this EIAR: Description of the Proposed Project, and Chapter 9 of this EIAR: Water.

This PSMP would be further developed upon the grant of planning permission and as project progresses through the detailed design and construction phases and will form a part of the detailed Construction Environment Management Plan (CEMP) (Appendix 4-4).

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3. GUIDELINES FOR PEAT MANAGEMENT

This report has been compiled in accordance with the following policy and best practice guidance:

- Best Practice Guidelines for the Irish Wind Energy Industry (Irish Wind Energy Association, 2012);
- Wind Energy Development Guidelines (Department of Housing, Planning and Local Government, 2006);
- Draft Revised Wind Energy Development Guidelines (Department of Housing, Planning and Local Government, 2019);
- Good Practice during Windfarm Construction (Scottish Renewables, SNH, SEPA & Forestry Commission Scotland, 4th Edition 2019);
- Guidance on Developments on Peatland: Site Surveys (Scottish Government, Scottish Natural Heritage and SEPA, 2017);
- Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste (Scottish Renewables and SEPA, 2012);
- Peat Landslide Hazard and Risk Assessments. Best Practice Guide for Proposed Electricity Generation Developments (Scottish Government, 2017); and
- Developments on Peat and Off-Site Uses of Waste Peat (SEPA, 2017).

4. DESK STUDY AND INITIAL WALKOVER

4.1 Desk Study

A desk study of Geological Survey Ireland (GSI) mapping and aerial mapping identified the following:

- The Proposed Wind Farm infrastructure is mainly underlain by sandstone and shale till as well as blanket peat.
- The bedrock at the Proposed Wind Farm site comprises shale, siltstone and sandstone.
- The GSI map indicates the presence of a north-south-oriented strike fault running through the existing access road to T5. However, no faults have been identified at the turbine bases, hardstands, substation, or the met mast location.
- The GSI landslide records indicate that there have been no recorded peat slides in this immediate area in the past. The nearest recorded landslide (Event ID: GSI_LS06-0300) occurred west off N80 in Maidenhead in County Laois. The Proposed Wind Farm site is located 14.3km south of that location. Thus, it is assumed that the site-specific causes of that previous landslide are deemed to not be pertinent to this site.

4.2 AFRY Site Walkovers

In July 2023, AFRY carried out a site walkover across all turbine locations, the substation and battery storage compound, the met mast, and the temporary construction compounds. Turbine T6, the met mast, the substation and battery storage compound, and the temporary construction compounds are located within open farmlands, which exhibit good ground conditions. The remaining turbines are located within active commercial forestry lands. During the walkover, it was noted that the areas of T1, T2, T3, T5 and T7

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had recently been felled and the area of T4 was being felled. The recently felled forest area included tree roots and stumps being left in-situ. It was also observed that some areas of the site were overlain by shallow and dry peat. Overall, the site appeared relatively flat, and indicated favourable ground conditions.

During a subsequent site walkover in November 2023, it was noted that the areas adjacent to T4, T5, and T7 displayed an irregular and notably soft to very soft ground composition. The peat in these areas was observed to be saturated, considering the time of the year. For detailed information on ground conditions and stability of peat, please refer to the Geotechnical and Peat Stability Assessment included within Chapter 8 of this EIAR: Land, Soils and Geology.

Photos from the November site walkover have been included within Appendix A of this report.

5. FIELDWORKS

5.1 Preliminary Fieldworks

Over 280 peat probes were carried out by MKO between June 2023 and August 2023 across the entire site. The peat probing results indicate that the depth of peat across the site is generally shallow, with localised deeper peat pockets identified around T3 and T5. The peat depths across the site range from 0 to 2.7 meters.

Results of the peat probe survey are included within Appendix B.

5.2 Further Site Investigation

Site investigation works were carried out by Causeway Geotech Limited in November 2023 which included 8no. trial pits, 5no. heavy dynamic probes and 28no. hand shear vanes. Testing was carried out at turbine bases, hardstands, met mast, substation and battery storage compound, temporary construction compounds, and access roads. Table 1 lists the coordinates of the trial pits and dynamic probes executed at each infrastructure location. The ground investigation factual report is included within Appendix C.

Location	Trial Pit Coordinates		Dynamic Probe Coordinates	
	Easting	Northing	Easting	Northing
T1	663468.39	669638.21	663428.07	669660.66
T2	663994.20	669652.07	-	-
T3	664203.86	669225.26	-	-
T4	663610.77	669042.36	663639.21	669071.3
T5	664146.21	668712.68	-	-
T6	663454.01	668611.05	663420.00	668598.53
T7	663554.86	668199.34	-	-
Met Mast	663744.72	669345.41	663013.37	668327.52
Substation and BESS Compound	663468.39	669638.21	-	-
Temporary Construction Compound	-	-	663762.82	669321.74

Table 1: Summary of Trial Pit and Dynamic Probe locations

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6. PEAT AND SPOIL MANAGEMENT

During the construction phase of the Proposed Project, the following activities are anticipated to generate peat and spoil:

i. Construction of new excavated access roads (Type A)
ii. Upgrading of existing access roads (Type B)
iii. Excavations in peat for turbine bases, hardstands, onsite substation, battery storage system, permanent meteorological mast, temporary construction compounds
iv. Underground cabling along the Proposed Grid Connection Route

This will result in the generation of unsuitable materials, including peat and spoil. While it is imperative to minimize the generation of such unsuitable material, it is acknowledged that some excess spoil and peat may still be generated. This unsuitable material typically consists of topsoil, peat, and glacial till. Peat and spoil management of the above construction activities are covered individually in this report.

6.1 Method of Excavation

Excavation operations on the Proposed Wind Farm site will be carried out to facilitate the construction of turbine foundations, hardstands, substation and battery storage compound, met mast, temporary construction compounds, cable trenches, and access roads.

The general principles of excavation set out in this plan will be adhered to at all times during the construction phase.

6.2 Method of Construction

6.2.1 Turbine Bases

The diameter of the turbine bases is 23.5m. In order to safely excavate to a suitable bearing stratum, batters of the excavation will be at 45 degrees. For this formation level, engineered fill (6N or equivalent) will be compacted in layers until blinding level is achieved, and also built-up at maximum 1:1 slope. The volume of peat at each turbine location will depend on the peat depth but the majority are less than 0.5m deep, and therefore the minimum formation depth. The formation depths assumed for cut and fill assessment are presented in Table 8.

The estimated peat and spoil volumes are presented in Table 5.

6.2.2 Hardstands

The crane hardstanding areas adjacent to the turbine bases will be constructed to solid sub-formation, either bedrock or firm silt/clay subsoil underlain by bedrock. It has been assumed that all the peat will be excavated and no floating type construction will be used. Hardstands will be 50m x 25m plus 15m x 3m in size, with two smaller tailing crane pads.

The Civil 3D model created for the hardstands geometric design was used to estimate the volume of engineering fill required to complete this element of infrastructure. This was carried out by creating a base of peat surface layer within the model, with offsets from the original ground surface layer based upon peat probing carried out across the site. The volume required to create the trapezoidal hardstand build-up with maximum

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batter 1(v): 2(h) is then measured directly from finished hardstand level down to solid i.e. base of peat.

The estimated peat and spoil volumes are presented in Table 5.

6.2.3 Substation and Battery Energy Storage System Compound

The substation and battery energy storage compound were modelled using Civil 3D and primarily involves the excavation to a suitable bearing stratum, which varies from 0.3m to 2.6m. As per the trial pit and peat probe data, peat is not present at this location. The topsoil is 0.3m below ground level which is underlain by glacial till and boulders.

The estimated peat and spoil volumes from the substation and battery storage compound are presented in Table 5.

6.2.1 Temporary Construction Compounds

The 2no. temporary construction compounds were modelled using Civil 3D and involve the excavation to a suitable bearing stratum, which includes removal of the topsoil and peat. The peat cover ranges between 0m and 0.5m. For this formation level, the excavation will be backfilled with 600mm of granular stone fill, compacted in layers.

The estimated peat and spoil volumes from the temporary construction compounds are presented in Table 5.

6.2.2 Proposed Grid Connection Route

A 38kV connection between the Proposed Wind Farm and the national electricity grid will be necessary to export electricity. It is proposed that the Proposed Wind Farm will connect to the national grid via the existing Kilkenny 110kV substation location in Co. Kilkenny. The Proposed Grid Connection Route is approximately 20.1km in length and is primarily located within the public road corridor.

The Proposed Grid Connection Route construction methodology, including proposals for water crossings on the underground cabling routes is described in Appendix 4-7 of the EIAR.

The Proposed Grid Connection Route will be constructed on solid ground to Eirgrid/ESB specifications. Any surplus material arisings generated during the construction of the Proposed Grid Connection Route will be disposed of in a nearby licenced waste facility and/or managed on site.

6.2.3 Turbine Delivery Route

The turbine delivery route to the Proposed Wind Farm site diverges from N78 onto a local road, L1834, approximately 10kms from the site. Given the junction's 90-degree intersection, it will not be feasible for the turbine delivery vehicles to navigate through this junction. Thus, there is a proposal to construct a new road along the turbine delivery route, specifically within the field to the south of N78 at this junction. This road section will span approximately 360 meters in length and will adopt a construction method similar to Type A Excavate and Replace type road. Steps will be taken to minimize the amount of generated material and maximize material reuse. Any surplus material arisings will be transported to and managed on-site. The estimated volume of peat and spoil generated here is already included in the material volumes resulting from the construction of access roads presented in Table 5.

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6.2.4 Access Roads

All the access tracks including new and existing roads across the site will be constructed to solid sub-formation. For excavations in peat and spoil, side slopes shall be not greater than 1(v): 2(h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes of 1(v): 3(h) or less will be required.

The Civil 3D model created for the roads geometric design was used to estimate the volume of engineering fill required to complete these access roads. This was carried out by creating a base of peat surface layer within the model, with offsets from the original ground surface layer based upon peat probing carried out across the site. The volume required to create the trapezoidal road build-up with maximum batter 1:2 is then measured directly from finished road level down to solid i.e. base of peat.

The road construction preliminary design has taken into account the following key factors:

(1) Buildability considerations

(2) Serviceability requirements for construction and wind turbine delivery and maintenance vehicles

(3) Minimise excavation arisings

(4) Requirement to minimise disruption to peat hydrology

The preliminary road construction types proposed for the Proposed Wind Farm site are summarised in Table 2.

It is to be noted that this report does not include a detailed design for the access roads on the Proposed Wind Farm or for the turbine delivery access road (off the N78). This report includes the most suitable type of road construction envisaged for each section of access road based on the ground conditions recorded during the site walkovers and site investigation results.

i. Construction of new excavated roads – Type A

For the construction of the Proposed Wind Farm, it is estimated that approximately 2.7km of new excavated access tracks will be required.

These will be constructed through excavation and the removal of organic material and soft subsoil to achieve a suitable formation level. A layer of geogrid or geotextile material will be laid at the formation level to separate the road building material from the subsoil. A minimum of 450mm of granular fill material, such as Class 6F2 stone, will then be placed and compacted in layers, as specified by the detailed designer. The road will then be finished with a 150mm layer of capping material, such as Cl. 804.

The finished road width will have a running width of 5m, with wider sections on bends and passing bays. Access road construction will be to the line and level requirements as per design/planning conditions.

A section of a new excavated road is also shown in Figure 2.

ii. Upgrade of existing roads – Type B

For the construction of the Proposed Wind Farm, it is proposed to utilise 2.8km of existing roads, 2.2km of which are forestry tracks located on Coillte lands. The existing

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roads account for 51% of the total length of roads required to access the site. During the site survey conducted by AFRY, it was observed that the existing forestry tracks are in relatively good condition. Upgrading of these existing tracks will likely involve both widening and resurfacing works. It is assumed that widening will typically take place on both sides of the road. However, in areas of steeper slopes, widening of existing tracks will take place on the upslope side of the road.

The existing roads will be widened through excavation and the removal of organic material and soft subsoil to achieve a suitable formation level. The new section of the road will be constructed by placing a minimum of 450mm of granular fill material, such as Class 6F2 stone, and compacting it in layers on top of a layer of geogrid or geotextile, depending on site conditions and as specified by the detailed designer. This road construction will be similar in build up to the construction of excavate and replace type access road. The increased road width and the existing road surface, where necessary, will be capped with a 150mm layer of Clause 804 similar material.

The finished road width will have a running width of 5m, with wider sections on bends and passing bays. Access road construction will be to the line and level requirements as per design/planning conditions.

A section of existing excavated road for upgrade is shown in Figure 3.

Construction Method	Construction Type	Ground Conditions		Comment
		Typical Peat Depth	Typical Slope Inclination	
Construction of new excavate and replace access roads	Type A	<2.0m	Varies	New access road construction technique envisaged for various locations on site (to be confirmed by designer at the detailed design stage) – Figure 2
Upgrade of existing excavated access roads	Type B	<2.0m	Varies	Upgradation of existing excavated access road to the required width and finished with a layer of selected granular fill (to be confirmed by designer at the detailed design stage) – Figure 3

Table 2: General Road Construction Techniques

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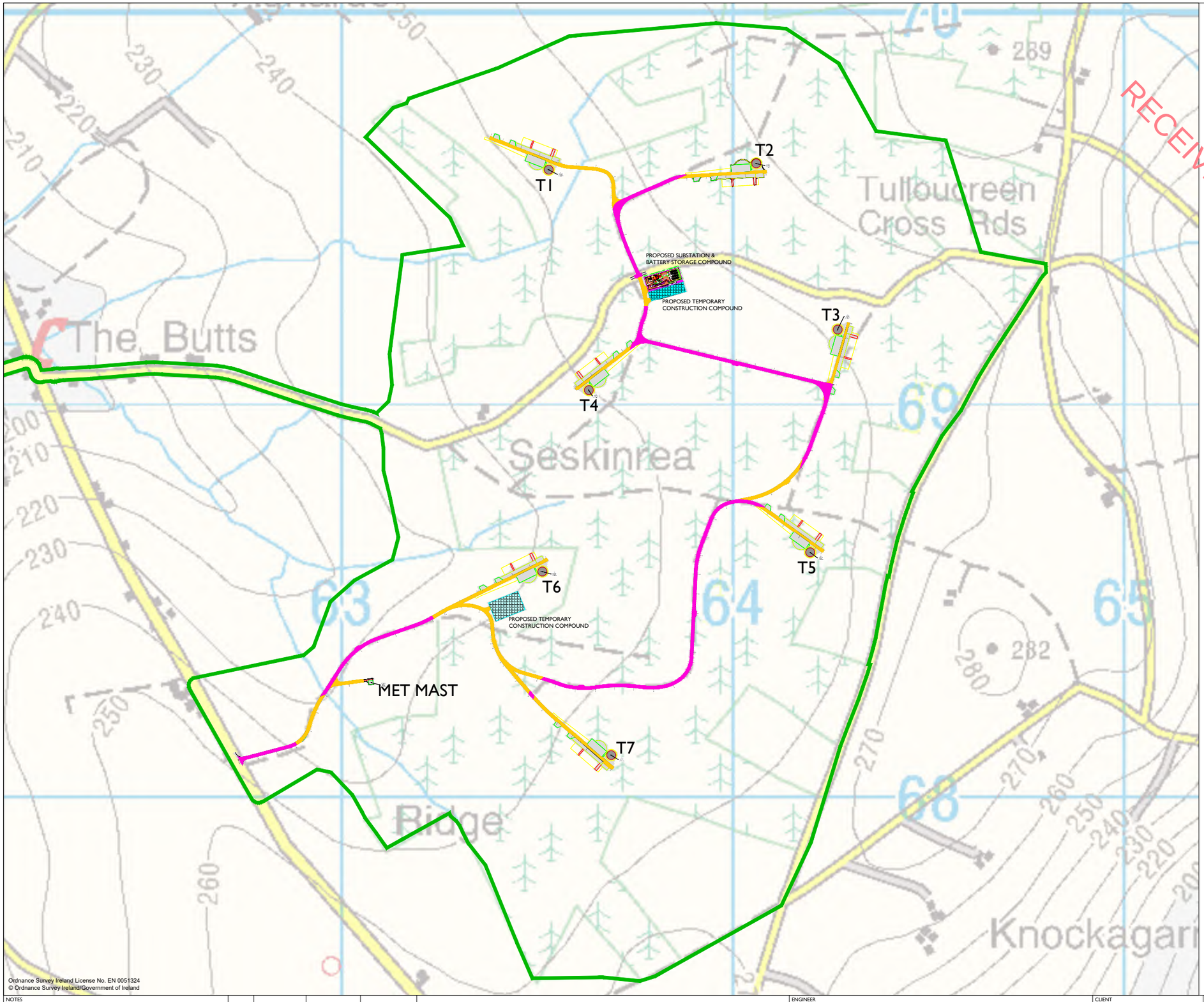

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N
W
E
S

LEGEND

- EIAR SITE BOUNDARY
- TURBINE LOCATION
- TURBINE & HARDSTAND
- TEMPORARY CONSTRUCTION COMPOUND

ROAD TYPE LEGEND

- TYPE A - NEW EXCAVATE & REPLACE ACCESS ROAD
- TYPE B - UPGRADE OF EXISTING EXCAVATED ACCESS ROAD

NOTES

REV	DATE	DRAWN BY	CHECKED BY	DETAILS
E	02.05.2024	M.S.	L.P.	EIAR SITE BOUNDARY UPDATED
D	01.05.2024	M.S.	L.P.	EIAR SITE BOUNDARY UPDATED
C	01.05.2024	M.S.	L.P.	RED LINE BOUNDARY UPDATED
B	12.01.2024	M.S.	L.P.	GENERAL REVISION
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PROJECT
SESKIN WIND FARM
CO. CARLOW

TITLE
ROAD CONSTRUCTION TYPE MAP
OVERALL PLAN

REVISION
E

DRAWING NUMBER
FIGURE 1

Plotted: 03/05/2024 17:57:28
Z:\Projects\Ireland Seskin SESKIN\Drawings\6009 Road Type Map\6009 E Road Type Map

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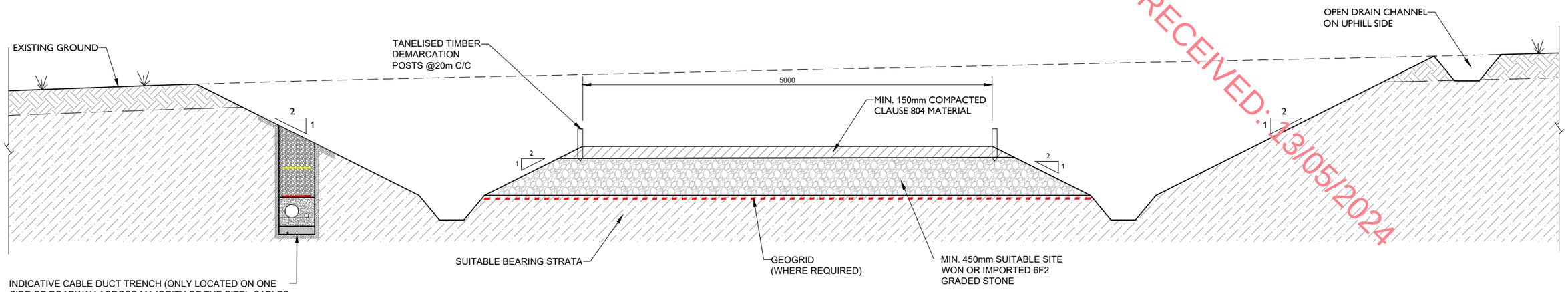
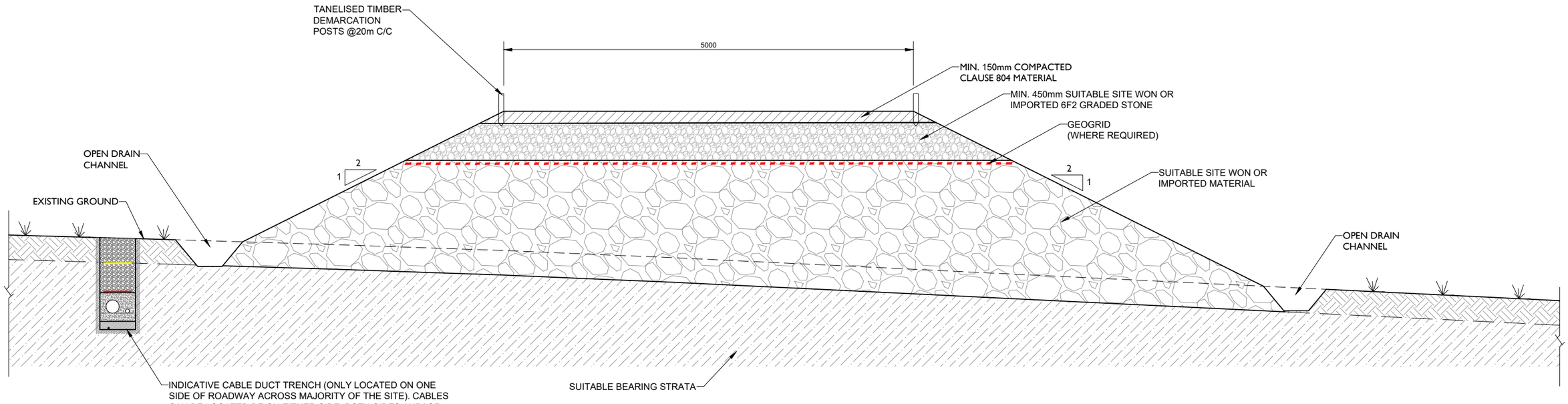


TYPE 'A' - NEW EXCAVATE & REPLACE ACCESS ROAD SECTION

(SHOWN IN CUT SCENARIO)

Scale 1:50



TYPE 'A' - NEW EXCAVATE & REPLACE ACCESS ROAD SECTION

(SHOWN IN FILL SCENARIO)

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NOTES

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CHECKED AND APPROVED	L. POWER	DATE	07/12/2023
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STATUS	FINAL		

PROJECT
SESKIN WIND FARM
CO. CARLOW

TITLE
ACCESS ROAD TYPE 'A'
CROSS SECTIONS

REVISION
B

DRAWING NUMBER
FIGURE 2

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Z:\Projects\Ireland\Seskin SESK\Drawings\0010 Typical Road And Hardstand Details\SESK 0010.1 Typical Access Road Details

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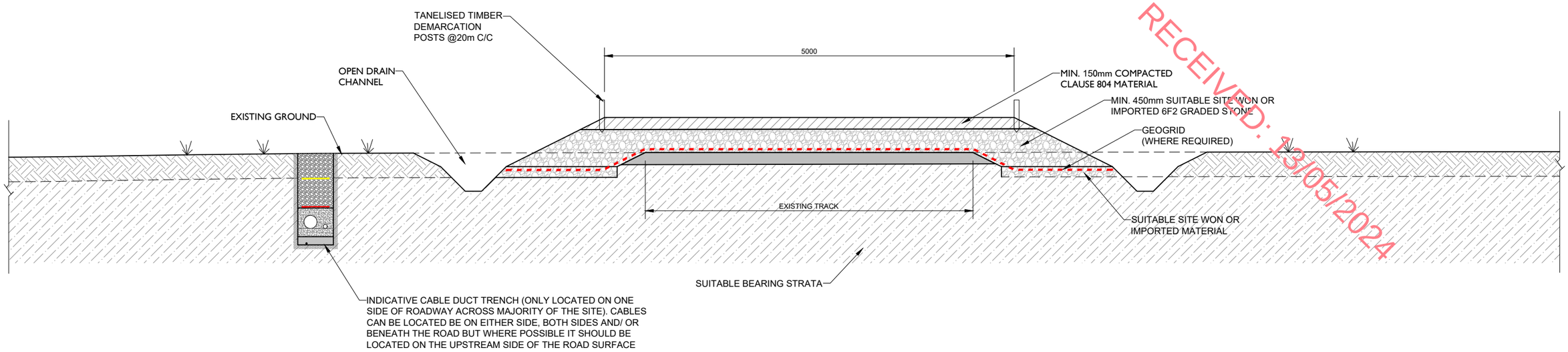
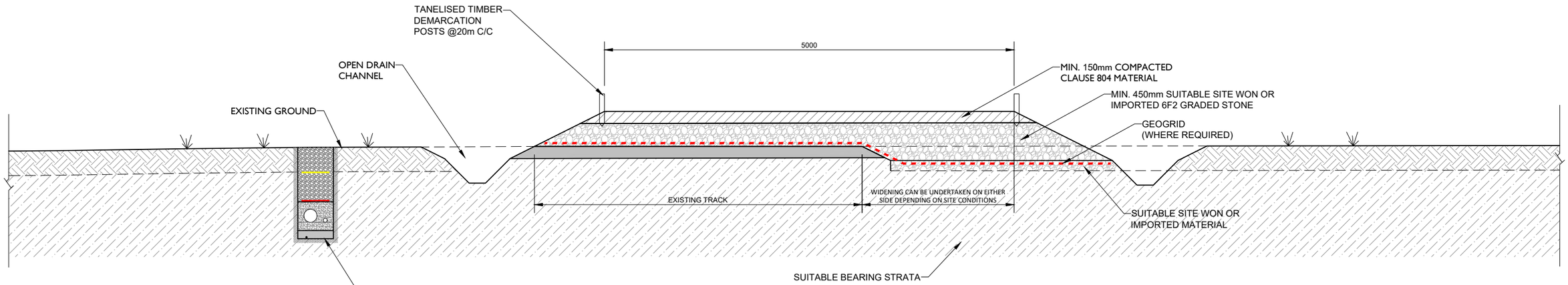


TYPE 'B' - UPGRADE OF EXISTING EXCAVATED ACCESS ROAD

(WIDENING ON BOTH SIDES)

Scale 1:50



TYPE 'B' - UPGRADE OF EXISTING EXCAVATED ACCESS ROAD

(WIDENING ON ONE SIDE)

Scale 1:50

NOTES

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PROJECT

SESKIN WIND FARM
CO. CARLOW

TITLE

ACCESS ROAD TYPE 'B'
CROSS SECTIONS

REVISION

B

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FIGURE 3

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Z:\Projects\Ireland\Seskin SESKIN\Drawings\dd\10 Typical Road And Hardstand Details\SESK DD10.1 Typical Access Road Details

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6.3 Estimated Peat and Spoil Volumes

289 peat probes have been undertaken at the Proposed Project site to date. Hand shear vane tests were carried out at T1, T2, T3, T5 and T7 and trial pits were dug at each turbine base location. This data allows the classification of peat depths across the Proposed Wind Farm site into appropriate bands. It was decided to use six depth classifications; 0m to 0.5m, 0.5m to 1m, 1m to 1.5m, 1.5m to 2m, 2 to 2.5m and greater than 2.5m. The maximum peat depth recorded on site was 2.7m near the T5 blade finger area.

The Proposed Wind Farm layout has been superimposed upon this indicative peat depth map to estimate peat depth at a particular location and is shown in Figure 4. The peat depths at main infrastructure locations and across the access roads are listed in Table 3 and Table 4.

Site Location	Peat Depths
T1	0.1m - 0.6m
T2	0.1m - 0.5m
T3	0m - 1.3m
T4	0.1m
T5	0m - 2.1m
T6	0m - 0.4m
T7	0.2m - 0.6m
Met Mast	0m
Substation and BESS Compound	0m - 0.1m
Temporary Construction Compounds	0m - 0.5m

Table 3: Estimated Peat Depths at main infrastructure locations

Site Location	Peat Depths
Spur to T1	0m - 0.5m
Spur to T2	0m - 0.2m
T4 – T1/T2 junction	0m - 0.4m
T3-T4	0m - 0.1m
T3 - T5	0m - 0.5m
T5-T6	0m - 0.4m
Spur to T6	0m - 0.1m
Spur to T7	0.3m - 0.6m

Table 4: Estimated peat depths across access roads

The quantity of peat and spoil material, requiring management on site has been calculated based on the cut and fill assessment and is shown in Table 5 below.

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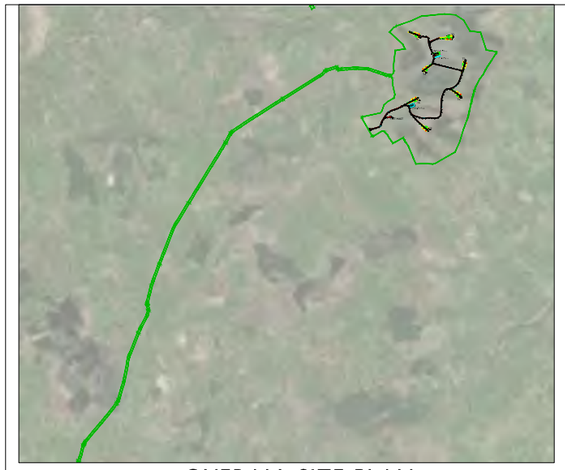

OVERALL SITE PLAN
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N
W E
S

LEGEND

- EIAR SITE BOUNDARY
- TURBINE LOCATION

PEAT DEPTHS

NUMBER	MINIMUM LEVEL	MAXIMUM LEVEL	COLOUR
1	0.0	0.5	
2	0.5	1.0	
3	1.0	1.5	
4	1.5	2.0	
5	2.0	2.5	
6	2.5	3.0	

NOTES

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E	01.05.2024	M.S.	L.P.	EIAR SITE BOUNDARY UPDATED
D	01.05.2024	M.S.	L.P.	EIAR REDLINE BOUNDARY UPDATED
C	19.01.2024	M.S.	L.P.	GENERAL REVISION
B	18.01.2024	M.B.	M.S.	GENERAL REVISION
A	08.12.2023	M.S.	L.P.	FIRST ISSUE

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PROJECT
SESKIN WIND FARM
CO. CARLOW

TITLE
PEAT DEPTH MAP

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FIGURE 4

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Location	Description	Estimated Peat Volume (m³)	Estimated Spoil Volume (m³)
7 no. turbine bases and hardstands	25.5m diameter excavation footprint for turbine foundation (23.5m turbine diameter plus 1m working area all around) with 50m x 25m plus 15m x 3m hardstand areas	17,178	18,521
Met Mast	Area 25m x 15m	0	288
Substation and BESS Compound	Area 90m x 40m	120	1,495
Temporary Construction Compounds	Areas 80m x 50m and 90m x 25m	1,800	1,725
Access Roads	Assumed 5m running surface with 6.8m wide development footprint	3,240	12,075
Total		**22,338**	**34,103**

Note 1: Assumptions used in calculation of the above volumes are detailed in Section 6.8.
Note 2: A contingency factor of 15% has been applied to excavated spoil volumes, and a bulking factor of 20% has been used for excavated peat volumes to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the site.
Note 3: Refer to table included in Section 6.8 for details on cut and fill.

Table 5: Estimated Peat and Spoil Volumes

A summary of peat and spoil management volumes is presented in Table 6 and Table 7.

6.4 Temporary Management

To manage the material arisings effectively, the following points outline specific guidelines and practices for their temporary management and handling on-site:

- For the temporary management of peat and excess spoil around the turbine base and hardstand, these materials must be stored separately in distinct stockpiles.
- Only the amount of material necessary for landscaping and deposition around the turbine and hardstand locations shall be stockpiled locally at turbine hardstands. Any surplus material would be promptly transported to the proposed repository areas shown on Figure 5.
- Before stockpiling the glacial till spoil, the proposed repository area would be stripped of topsoil/ peat which would be removed and placed in a suitable area to prevent the mixing of materials and facilitate reuse during restoration work.
- Peat can be stored on top of existing and undisturbed peat. The suitability of the underlying peat and the topography will be reviewed by a geotechnical engineer at the construction stage, and this will determine the height of peat that maybe stored.
- Glacial till will not be placed on top of peat or topsoil; instead, it will be deposited only on other glacial till material.

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- In order to prevent erosion and surface water contamination, silt fencing can be utilized to secure these stockpiles, where necessary.
- The excavated unsuitable material will not be spread over any existing heath, bog, or grassed areas.
- Following the reinstatement of the turbine bases and hardstands, all temporarily stockpiled material not required will be removed and transported to the proposed peat and spoil management areas.
- The proposed locations for the temporary stockpiling of peat and spoil will be confirmed by the geotechnical engineer at detailed design stage.

6.5 Peat Repository Areas

Peat will be managed locally within the Proposed Wind Farm site, in dedicated peat repository areas as shown in Figure 5 and Figure 6. The Proposed Project includes for the provision of peat repository areas around turbine bases and hardstands within clear felled areas, peat sidecasting along access roads, and landscaping. A summary of peat management volume is presented in Table 6.

Peat around the turbine bases and hardstands will be deposited to a maximum height of 1m in areas of gentle slopes (less than 5 degrees). Prior to the stripping of peat overburden over the peat repository areas around turbines, an interceptor drain will first be excavated upslope in order to intercept existing overland flows and divert them around the repository areas prior to discharge via a buffer zone on the downslope side. Any subsoil material underlying the peat will be excavated and stockpiled separately from the peat. The stockpile will be sealed, and a perimeter drain installed to intercept any run-off so that it can be discharged through an appropriately designed silt trap. The shallow peat overburden will then be stripped and temporarily stockpiled; vegetated side upwards where possible, adjacent to the repository areas in order for it to be re-used in its reinstatement on completion.

If peat turves are proposed to be utilised in the restoration process, the peat repository areas will need to be completed and restored in a continuous cycle so as to minimise the length of time the peat turves are stored and to allow the vegetation to be re-established as quickly as possible.

Any point source drainage from disposal areas will empty into a series of silt control measures designed in accordance with the surface water management plan. Water build-up within repository areas will not be permitted. Water will free drain to the sump of the pit from where it will be discharged utilising a 6" pump discharging to a settlement pond constructed for this purpose. Permanent design features are proposed to allow drainage function correctly over the repository areas.

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Location	Peat Volume (m³)	Comment
Peat deposition around turbines and hardstands within clear fell areas	23,360	1m in height across clear felled areas around turbine and hardstands, where slopes are relatively shallow (<5 degrees)
Peat sidecasting	1,000	0.5m in height along access roads within clear felled areas, where slopes are relatively shallow (<5 degrees)
Landscaping	340	It is estimated that approximately 340m³ of peat will be required for landscaping purposes at each of the 7no. turbine locations.
Total Volume	**24,700 m³**	

Table 6: Peat Management Volume

6.6 Spoil Repository Areas

Spoil and overburden will be managed locally within the Proposed Wind Farm site, in dedicated spoil repository areas as shown in Figure 5 and Figure 7. The Proposed Wind Farm includes deposition of spoil around turbines and hardstands and use of spoil as ballast. These areas have been selected based on the locations of spoil generation, areas suitable for spoil deposition and environmentally constrained areas. A summary of spoil management volume is presented in Table 7.

Prior to the use of any spoil repository area, an interceptor drain will first be excavated upslope in order to intercept existing overland flows and divert them around the repository areas prior to discharge via a buffer zone on the downslope side. Any point source drainage from disposal areas will empty into a series of silt control measures designed in accordance with the surface water management plan. Water build-up within repository areas will not be permitted. Water will free drain to the sump of the pit from where it will be discharged utilising a 6" pump discharging to a settlement pond constructed for this purpose. Permanent design features are proposed to allow drainage function correctly over the repository areas.

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Location	Spoil Volume (m³)	Comment
Spoil deposition around turbines and hardstands within clear fell areas	36,845	1m in height around turbine and hardstands, where slopes are relatively shallow (<5 degrees)
Reuse of material around excavated turbine base and for ballast	4,000	Excavated area around the turbine bases to be backfilled with surplus spoil material after construction of the foundation
Total Volume	**40,845 m³**	

Table 7: Spoil Management Volume

6.7 Excavated Peat and Spoil Management

Following the reinstatement of the turbine bases and hardstands, all surplus material shall be transported and disposed at the proposed repository areas. No permanent stockpiles of peat or spoil will be left anywhere on site after completion of the construction works.

The excess peat and spoil for reinstatement or landscaping purposes will be managed in a manner that prevents any negative environmental impact and avoids causing pollution in nearby streams, rivers, and other water bodies due to erosion or surface runoff. Excess peat can also be used to level out gradients near the turbine bases, hardstands and access tracks as well as infill depressions left exposed by the construction works.

Implementing the following general control measures during the construction phase at the Proposed Wind Farm site will aid in minimizing the risks associated with peat instability:

1. Excavated spoil will not be deposited on the downslope or upslope edges of adjacent peat.
2. The sides within excavated peat will be sloped back at an angle of 30 degrees to the horizontal to prevent slippage.
3. Temporary deposition of excavated soils will only be allowed in areas with peat depth less than 0.5m.
4. Materials must not be stockpiled, and heavy machinery must not be parked on peat surfaces.
5. The use of low ground bearing pressure machines to be used on areas of peat exceeding 1m depth.
6. Machinery use on peat surfaces would be minimized, and dependant on site topography the use of vibrating rollers may not be permitted.
7. The length and duration of unsupported excavations in peat will be minimized.
8. Existing drainage patterns in peat will be maintained whenever possible, and any uncontrolled discharges of water onto peat will be prevented.
9. Upslope cut-off drains must be installed in advance of construction activities to prevent water build up in excavations.
10. Deposition of excavated material must not occur outside designated areas; temporary stock piling would take place within the development footprint of turbine hardstands before reinstatement and disposal at proposed repository areas.
11. Any excavations would be immediately backfilled with suitable material when available.

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12. Regular inspections of all slopes must be carried out to monitor the development of tension cracks.
13. A qualified geotechnical and/or environmental engineer will conduct regular site visits and assessments to monitor the potential for a peat slide regularly during construction.
14. Upon commencement of the reinstatement works, guidance from a suitably qualified environmental professional will be sought to confirm the methodology and programme.
15. Exclusion zones delineating the working corridor will be established around all working areas using post and rope fences. No activity will be permitted past this fence.
16. The environmental manager or other designated person will conduct induction training and toolbox talks with site staff to explain the risks associated with working on peat, the procedures for reducing the risk of peat slides, and the location of exclusion zones.
17. Strict adherence to method statements is required at all times, and any deviation from the agreed work methodology must be approved by a suitably qualified environmental professional or the site geotechnical engineer.
18. Particular attention will be paid to conditions during and after heavy rainstorms, especially following extended dry periods when the likelihood of peat movement is higher. The Site Supervisor would suspend work if either work practices or weather conditions are deemed unsafe.
19. After reinstatement is completed, the disposal sites will be re-vegetated using the topsoil, sod or harvested peat.

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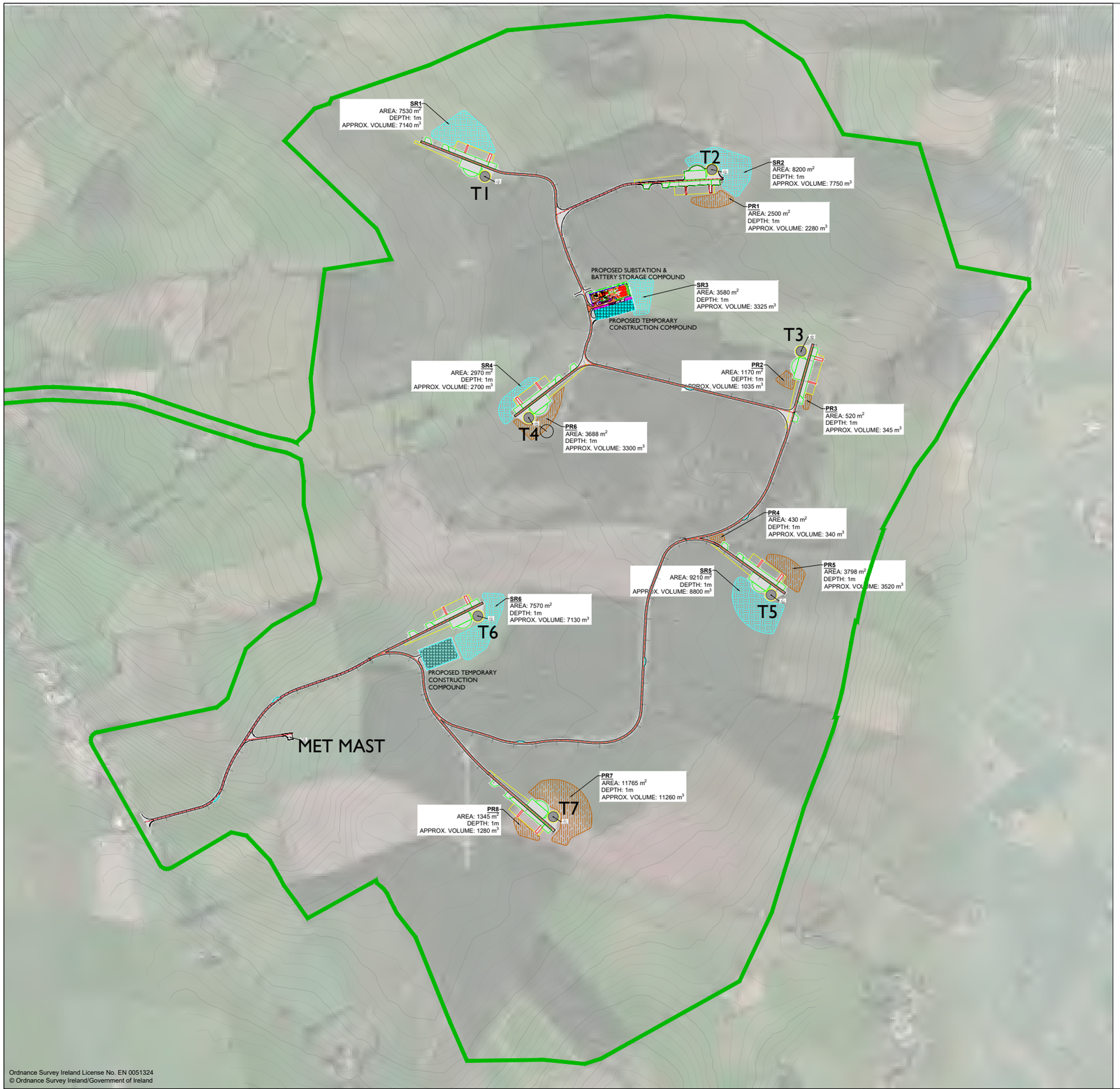

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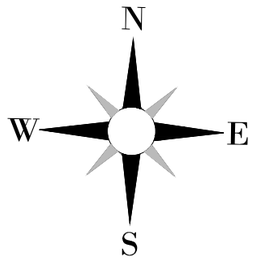

LEGEND

- EIAR SITE BOUNDARY
- PEAT REPOSITORY AREA
- SPOIL REPOSITORY AREA

NOTES

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F	02.05.2024	M.S.	L.P.	EIAR SITE BOUNDARY UPDATED
E	01.05.2024	M.S.	L.P.	EIAR SITE BOUNDARY UPDATED
D	01.05.2024	M.S.	L.P.	EIAR RED LINE BOUNDARY UPDATED
C	19.01.2024	M.S.	L.P.	REPOSITORY AREA AT T1 UPDATED
B	19.12.2023	M.S.	L.P.	AREAS UPDATED
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CO. CARLOW

TITLE
PEAT & SPOIL REPOSITORY AREAS PLAN

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FIGURE 5

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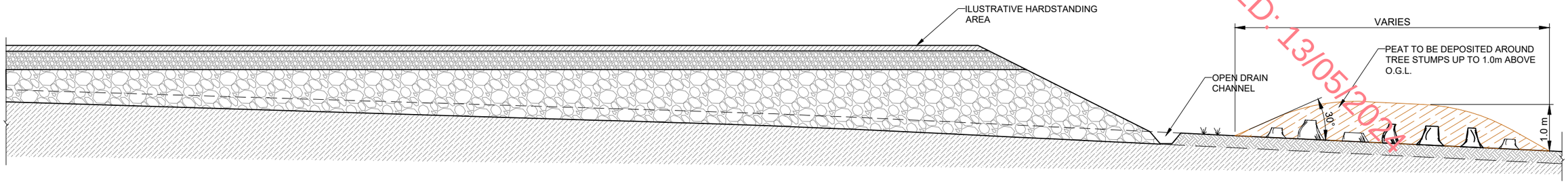

ILLUSTRATIVE PEAT REPOSITORY IN TREE FELLED AREA

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ILLUSTRATIVE PEAT REPOSITORY AREA

Scale 1:50

NOTES

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PROJECT

SESKIN WIND FARM
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TITLE

PEAT REPOSITORY AREA
CROSS SECTIONS

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FIGURE 6

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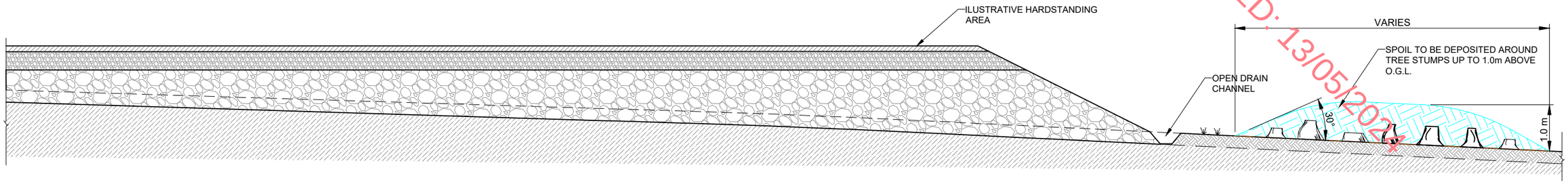

ILLUSTRATIVE PEAT REPOSITORY IN TREE FELLED AREA

Scale 1:50

ILLUSTRATIVE PEAT REPOSITORY AREA

Scale 1:50

NOTES

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TITLE

SPOIL REPOSITORY AREA
CROSS SECTIONS

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6.8 Cut and Fill Assessment

AFRY carried out an earthworks assessment for the site that quantifies the overall volume of cut and fill required for the construction of the Proposed Wind Farm. The cut and fill assessment is presented on the drawings included in Appendix 4-1 of the EIAR: Site Layout Planning Drawings.

6.8.1 Assumptions for the cut and fill assessment

- The assumed excavation footprint for the turbine foundation is the turbine base diameter of 23.5m plus 1m working area all around the base i.e. 25.5m.
- Typical hardstand requirements from turbine suppliers were assumed for the cut & fill assessment i.e. hardstand area for main crane measuring 50m x 20m plus 15m x 3m.
- The assumed width of the access tracks is 5m.
- Typical gradient requirements from turbine suppliers were assumed for the cut & fill assessment i.e. maximum gradients of 10 to 12%.
- A 1(v): 2(h) slope for all excavation faces was assumed for the cut & fill assessment.
- The assumed minimum and maximum dig depths for the cut and fill assessment at main infrastructure locations are presented in the below.

Location	Minimum Dig Depth (bgl)	Maximum Dig Depth (bgl)
T1 hardstand	0.3m	2.3m
T2 hardstand	0.8m	1.4m
T3 hardstand	0.4m	2.9m
T4 hardstand	0.4m	2.4m
T5 hardstand	0.3m	2.3m
T6 hardstand	0.4m	1.5m
T7 hardstand	0.5m	1.0m
Met Mast	0.4m	0.9m
Temporary Construction Compound 1	0.4m	0.5m
Temporary Construction Compound 2	0.3m	0.5m
Substation and BESS Compound	0.3m	2.6m

Table 8: Summary of minimum and maximum dig depths at main infrastructure locations

The results of the cut and fill earthworks assessment include the following:

- Site plan drawings showing the extent of cut & fill earthworks at all infrastructure locations across the entire site.
- A summary of cut and fill earthwork volumes provided in the table below.

A summary of excavated cut and fill volumes calculated for the Proposed Project site are given in Table 9.

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Location	Description	Estimated Peat Volume (m³)	Estimated Spoil Volume (m³)	Fill Volume (m³)	Cut Volume (Re-usable Material) (m³)	Stone Requirements (m³)
T1	25.5m diameter excavation footprint for turbine foundation (23.5m turbine diameter plus 1m working area all around) with 50m x 25m plus 15m x 3m hardstand areas	2,268	1,691	1,600	1,300	2,790
T2		1,320	5,244	6,200	200	3,100
T3		3,120	2,369	3,800	2,000	3,260
T4		810	3,433	200	5,200	3,090
T5		4,260	1,392	2,400	1,100	3,060
T6		2,160	2,714	16,300	500	3,140
T7		3,240	1,679	3,500	350	3,090
Met Mast	Area 25m x 15m	0	288	0	150	150
Substation and BESS Compound	Area 90m x 40m	120	1,495	200	3,500	2,160
Temporary Construction Compounds	Areas 80m x 50m and 90m x 25m	1,800	1,725	0	0	3,900
Access Roads	Assumed 5m running surface with 6.8m wide development footprint	3,240	12,075	11,600	1,250	14,480
Total		**22,338**	**34,103**	**45,800**	**15,550**	**42,220**

Table 9: Cut and Fill Assessment – Earthwork and Stone Volumes

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6.8.2 Commentary on Earthworks Volume

It is to be noted that the earthwork volumes given in Table 9 above are indicative and for information purposes only and subject to detailed design. This section of the report is to be read in conjunction with Sections 6.3, 6.5 and 6.6 of the report which summarise the peat and spoil volumes for site and the repository areas on site.

In summary:

1) The total volume of peat requiring management on site is estimated at 22,338m³. This material will be excavated and deposited in the proposed repository areas, with a total volume of 24,700m³, around turbine bases and hardstands, sidecast along access roads with gentle gradients, and a small quantity will be used for landscaping.
2) The total volume of spoil requiring management on site is estimated at 34,103m³. This material will be excavated and deposited in the proposed repository areas, with a total volume of 40,845m³, around turbine bases and hardstands and will also be used as ballast.
3) A contingency factor of 15% has already been applied to spoil volumes to allow for a variation in ground conditions.
4) A bulking factor of 20% has already been applied to the generated peat volumes to allow for expected bulking upon excavation and to allow for a variation in ground conditions.

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7. MONITORING PROCEDURE

7.1 Peat Stability Monitoring

The following monitoring procedure has been adopted from plans for wind farms in similar soil conditions.

To monitor possible peat movements, it is proposed to install sighting posts upslope and downslope of the access roads at staggered intervals at locations where the peat depth is greater than 2m for excavated access roads. Additional monitoring locations will be required at infrastructure locations with deeper peat deposits. The sightlines are to consist of the following:

- A line of wooden stakes (typically 1 to 1.5m long) placed vertically into the peat to form a straight line.
- Each set of sighting line shall comprise 6 no. posts at 5m centres that is a line 25m long.
- A string line shall be attached to the first and last posts and all intervening posts shall be adjusted so they are just touching the string line.
- Lines of sighting posts shall be placed across the existing slope about 5m away from the area to be worked. The posts will be located along the road at 10m intervals in areas of deep peat (say greater than 1m). Where there are relatively steeper slopes or softer ground a sighting line shall be placed down the slope, or at any location where monitoring would be deemed useful.
- Each line of sighting posts shall be uniquely referenced with each post in the line given a reference. The post reference shall be marked on each post (e.g. reference 1-1, 1-2, 1-3, 1-4, 1-5, and 1-6 for posts in line 1).
- The sighting lines shall be monitored at the beginning of each working day, and during the day where considered appropriate (e.g. when working activity is concentrated at a specific location or after each critical step in the construction process).
- Monitoring of the posts shall comprise sighting along the line and recording any relative movement of posts from the string line.
- Where increased movements are recorded the frequency of monitoring shall be increased.
- A monitoring record shall be kept of the date, time and relative movement of each post, if any. This record shall be updated and stored as a spreadsheet.

7.2 Contingency Plan

The following contingency plan has been adopted from plans for wind farms with similar soil conditions.

7.2.1 Excessive Movement

Where there is excessive movement or continuing peat movement recorded at a monitoring location or identified at any location within the site but no apparent signs of distress to the peat (e.g. cracking, surface rippling etc.) then the following shall be carried out:

i. All activities (if any) shall cease within the affected area.

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ii. Increased monitoring at the location shall be carried out. The area will be monitored, as appropriate, until such time as movements have ceased.
iii. Re-commencement of activities shall only start following a cessation of movement and agreement with all parties (geotechnical engineer, contractor, consultant and Applicant).

7.2.2 Onset of Peat Slide

Where there is the onset or actual detachment of peat (e.g. cracking, surface rippling etc.) then the following shall be carried out:

i. On alert of a peat slide incident, all activities (if any) in the area would cease and all available resources will be diverted to assist in the required mitigation procedures.
ii. Action will be taken to prevent a peat slide reaching any watercourse. This will take the form of the construction of check barrages on land. Due to the terrain and the inability to predict locations it may not be possible to implement any on-land prevention measures, in this case a watercourse check barrage will be implemented.
iii. All relevant authorities should be notified if a peat slide event occurs on site.
iv. For localised peat slides that do not represent a risk to a watercourse and have essentially come to rest, the area will be stabilised initially by rock infill, if required. The failed area and surrounding area will then be assessed by the engineering staff and stabilisation procedures implemented. The area will be monitored, as appropriate, until such time as movements have ceased.

7.2.3 Check Barrage

Whilst it is not anticipated that a significant peat slide will occur on site as a contingency a check barrage procedure is included below.

The check barrage procedure deals with preventing a peat slide from moving downstream within a watercourse. The most effective method of preventing excessive peat slide debris from travelling downstream in a watercourse is the use of a check barrage. Generally, a check barrage comprises the placement of rock fill across a watercourse. The check barrage is a highly permeable construction that will allow the passage of water but will prevent peat debris from passing through. Rock fill would comprise well-graded coarse rock pieces from about 300mm up to typically 1000mm.

The rock fill for the check barrage will be sourced as close as possible to the site. A stockpile of material will be available as a contingency measure prior to construction work commencing. The size of the barrage will vary depending on the scale of the peat debris to be contained and the geometry of the watercourse at the barrage location. In general due to the low speed of a peat slide there is generally little impact force and most of the lateral load is due to fluid pressure on the upslope face of the barrage.

Typically, the check barrage will fill the entire channel width of the watercourse up to a height of 3 to 4m with a crest width of typically 2m and side slopes of about 45 degrees depending on the geometry of the barrage location.

The check barrage procedure is as follows:

i. Access to the check barrage location shall be along the existing access roads on the wind farm site and/or along public roads, where possible. When it is necessary

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to form the barrage then rock fill will be placed across the watercourse to effectively block the passage of peat debris.

ii. Operatives employed to carry out the construction of the check barrage will need to be inducted by means of a briefing by on-site supervisors as to the proposed location of the check barrage.

iii. The check barrage provides containment for peat debris in the unlikely event of a major peat slide. Further remedial measures may be required and will be assessed by all parties and carried out as soon as physically possible when the location and extent of the failure is established.

iv. Where a barrage was constructed as a precaution and no peat debris reached the watercourse then the barrage will be removed as soon as any measures to prevent further peat sliding is agreed with all parties.

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8. SUMMARY AND CONCLUSION

Observations from site walkovers indicate that the topography of the site is predominantly flat. The findings of the site investigation data suggest favourable subsoil conditions and shallow peat depths across the site. The ground conditions at this site present several opportunities to reduce the extent of excavation and/or increase re-use opportunities as good practice measures. These include:

- reduction of dig depth required for site infrastructure.
- reducing the extent of excavation of the new access tracks by using less intrusive methods to achieve a sufficient degree of levelling.
- maximization of suitable excavated materials for engineering fill and landscaping purposes.
- appropriate utilization of excavated material for track verge reinstatement and profiling.

While several opportunities for excavated material reuse exist, it is acknowledged that some volume of material generated during the construction process will necessitate on-site management. Therefore, a range of strategies for peat and spoil management across the Proposed Project site have been identified, including designated peat and spoil repository areas, peat sidecasting, reuse as backfilling material and ballast, and landscaping. The proposal aims to either reuse or store the excavated material locally at its point of origin, thereby mitigating the impact of long-haul transportation routes.

To summarize, the total volume of peat and spoil requiring management on site is estimated at 56,441m^3. This peat and spoil will be managed within the Proposed Wind Farm site, with 60,205m^3 identified in peat and spoil repository areas, 4,000m^3 for reuse, 1,000m^3 for sidecasting along roads and 340m^3 for landscaping.

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APPENDIX A – PHOTOS FROM SITE WALKOVER

Photo 1: Access to T5 covered with brash, with uneven and soft to very soft ground surface

Photo 2: Access to T5 covered with tree stumps, with uneven and soft to very soft ground surface

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Photo 3: Ongoing tree felling near T5

Photo 4: Access to T5 showing soft and wet ground conditions

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Photo 5: Area around T7 shows replanted fir and hardwood trees, with soft, uneven ground and tree stumps

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APPENDIX B – PEAT PROBE RESULTS

X(ITM)	Y(ITM)	Peat Depth (m)
663616.44	669061.00	0.5
663616.23	669066.67	0.2
663573.34	669017.48	0.1
664002.69	669700.91	0.7
664004.05	669664.43	0.7
663969.87	669682.67	0.2
663630.12	669577.06	0.1
663586.48	669637.24	0.1
663531.34	669601.91	0.2
664243.33	668610.35	0.6
664178.97	668597.25	0.6
664175.60	668566.61	0.2
663959.54	668734.68	0.9
664024.48	668688.58	0.9
664132.93	668653.95	0.5
664145.66	668671.26	0.6
664149.69	668718.83	0.4
664131.44	668736.17	2.7
664082.24	668858.37	0.5
664129.60	668916.41	0.0
664142.33	668943.84	0.0
664177.38	669075.17	0.3
664187.96	669106.91	0.0
664217.93	669111.87	0.0
664190.94	669131.43	0.1
664185.47	669183.21	1.3
664167.19	669187.31	0.5
664219.87	669174.43	0.3
664253.68	669190.01	0.0
664207.80	669198.98	0.9
664217.91	669184.64	0.1
664211.07	669212.26	0.4
664205.46	669228.10	0.5
664224.34	669223.90	0.5
664259.25	669217.91	0.0
664204.22	669240.21	0.1
664192.30	669228.15	1.2
663676.46	669404.18	0.1
663668.50	669444.47	0.0

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663642.89	669483.42	0.0
663632.28	669546.37	0.4
663619.75	669626.89	0.1
663551.14	669635.67	0.4
663703.40	669588.37	0.2
663790.74	669617.89	0.0
663847.73	669610.41	0.1
663882.47	669647.03	0.1
663911.11	669588.98	0.4
663952.39	669610.89	0.2
663996.91	669586.66	0.5
664004.18	669608.90	0.2
664003.65	669622.92	0.1
663938.49	669631.18	0.0
663979.02	669648.52	0.1
664029.63	668763.53	2.0
664053.75	668756.40	0.4
664085.80	668742.35	0.3
664076.64	668699.72	0.3
664084.09	668672.23	0.7
664112.19	668670.82	0.4
664134.13	668675.33	0.6
664130.51	668683.63	0.4
664115.59	668699.35	0.8
664116.27	668724.84	0.5
664099.08	668743.08	0.3
664083.08	668753.89	1.2
664063.78	668763.98	0.4
664029.54	668765.54	2.1
664022.99	668770.68	2.0
663984.07	668774.17	0.3
663957.88	668778.95	1.1
663934.29	668791.88	0.1
663876.20	668738.81	0.1
663853.69	668685.10	0.2
663855.25	668597.21	0.1
663828.83	668532.55	0.2
663854.22	668454.77	0.2
663822.46	668370.11	0.0
663773.49	668325.63	0.0
663704.97	668326.51	0.0
663610.31	668317.48	0.0

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663353.22	668403.36	0.3
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663326.97	668454.65	0.1
663333.18	668491.12	0.0
663314.03	668530.60	0.5
663384.96	668547.32	0.4
663423.47	668524.12	0.4
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663449.25	668616.93	0.3
663453.52	668610.87	0.2
663439.67	668626.93	0.2
663393.90	668612.54	0.1
663371.41	668597.67	0.3
663344.27	668614.00	0.4
663330.58	668556.07	0.0
663270.84	668556.07	0.2
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663350.53	668392.53	0.2
663356.45	668383.82	0.4
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663446.54	668271.94	0.3
663487.11	668240.98	0.6
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663548.35	668177.90	0.2
663547.84	668144.85	0.3
663573.85	668132.39	0.3
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664133.78	668681.67	0.2
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APPENDIX C – GROUND INVESTIGATION FACTUAL REPORT

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CAUSEWAY GEOTECH

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Seskin Wind Farm – Ground Investigation

Client:	MKO
Client's Representative:	AFRY
Report No.:	23-1591
Date:	January 2024
Status:	Final for Issue

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Document Control Sheet

Report No.:		23-1591			
Project Title:		Seskin Wind Farm			
Client:		MKO			
Client's Representative:		AFRY			
Revision:	A00	**Status:**	Final for Issue	**Issue Date:**	12 January 2024
Prepared by:		**Reviewed by:**		**Approved by:**	
 Niamh Webb MICE		 Carin Cornwall BSc MSc PhD		 Matthew Gilbert MEarthSci PGeo FGS	

The works were conducted in accordance with:

UK Specification for Ground Investigation 2nd Edition, published by ICE Publishing (2012)

British Standards Institute (2015) BS 5930:2015+A1:2020, Code of practice for ground investigations.

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

Laboratory testing was conducted in accordance with:

British Standards Institute BS 1377:1990 parts 2, 4, 5, 7 and 9

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METHODS OF DESCRIBING SOILS AND ROCKS

Soil and rock descriptions are based on the guidance in BS5930:2015+A1:2020, The Code of Practice for Ground Investigation.

Abbreviations used on exploratory hole logs	
U	Nominal 100mm diameter undisturbed open tube sample (thick walled sampler).
UT	Nominal 100mm diameter undisturbed open tube sample (thin walled sampler).
P	Nominal 100mm diameter undisturbed piston sample.
B	Bulk disturbed sample.
LB	Large bulk disturbed sample.
SB	Sonic bulk disturbed sample.
D	Small disturbed sample.
C	Core sub-sample (displayed in the Field Records column on the logs).
L	Liner sample from dynamic sampled borehole.
W	Water sample.
ES / EW	Soil sample for environmental testing / Water sample for environmental testing.
SPT (s)	Standard penetration test using a split spoon sampler (small disturbed sample obtained).
SPT (c)	Standard penetration test using 60 degree solid cone.
(x,x/x,x,x,x)	Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length.
(Y for Z/ Y for Z)	Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given seating or test length 'Z' (mm).
N=X	SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm).
HVP / HVR	In situ hand vane test result (HVP) and vane test residual result (HVR). Results presented in kPa.
V VR	Shear vane test (borehole). Shear strength stated in kPa. V: undisturbed vane shear strength VR: remoulded vane shear strength
Soil consistency description	In cohesive soils, where samples are disturbed and there are no suitable laboratory tests, N values may be used to indicate consistency on borehole logs – a median relationship of Nx5=Cu is used (as set out in Stroud & Butler 1975).
dd-mm-yyyy	Date at the end and start of shifts, shown at the relevant borehole depth. Corresponding casing and water depths shown in the adjacent columns.
▽	Water strike: initial depth of strike.
▼	Water strike: depth water rose to.
Abbreviations relating to rock core – reference Clause 36.4.4 of BS 5930: 2015+A1:2020	
TCR (%)	Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run.
SCR (%)	Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures.
RQD (%)	Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run.
FI	Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing.
NI	Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles.
AZCL	Assessed zone of core loss: The estimated depth range where core was not recovered.
DIF	Drilling induced fracture: A fracture of non-geological origin brought about by the rock coring.
(xxx/xxx/xxx)	Spacing between discontinuities (minimum/average/maximum) measured in millimetres.

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Seskin Wind Farm

1 AUTHORITY

On the instructions of AFRY, ("the Client's Representative"), acting on the behalf of MKO ("the Client"), a ground investigation was undertaken at the above location to provide geotechnical and environmental information for input to the design and construction of a proposed wind farm and associated infrastructure.

This report details the work carried out both on site and in the geotechnical and chemical testing laboratories; it contains a description of the site and the works undertaken, the exploratory hole logs and the laboratory test results.

All information given in this report is based upon the ground conditions encountered during the ground investigation works, and on the results of the laboratory and field tests performed. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those recorded during the investigation. No responsibility can be taken for conditions not encountered through the scope of work commissioned, for example between exploratory hole points, or beneath the termination depths achieved.

This report was prepared by Causeway Geotech Ltd for the use of the Client and the Client's Representative in response to a particular set of instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

2 SCOPE

The extent of the investigation, as instructed by the Client's Representative, included trial pits, soil sampling, in-situ and laboratory testing, and the preparation of a factual report on the findings.

3 DESCRIPTION OF SITE

As shown on the site location plan in Appendix A, the works were conducted on the proposed site of Seskin Wind Farm (WF) located in the townlands of Seskinrea and Ridge in County Carlow. The site consists of forestry and farmland, and was accessed by public roads, farm tracks, and forestry lanes.

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4 SITE OPERATIONS

4.1 Summary of site works

Site operations, which were conducted between 1st and 28th November 2023, comprised:

- Eight machine dug trial pits
- Six standalone dynamic probes
- Hand vane tests at twenty-seven standalone locations

The exploratory holes and in-situ tests were located as instructed by the Client's Representative, and as shown on the exploratory hole location plan in Appendix A.

4.2 Dynamic probes

Six dynamic probes were conducted using the DPSHB method as described in BS EN ISO 22476-3:2005+A1:2011. The method entails a 63.5kg hammer falling 0.75m onto a 50.5mm diameter cone with an apex angle of 90°.

Appendix D provides the dynamic probe logs in the form of plots, against depth, of the number of blows per 100mm penetration.

4.3 Trial pits

Eight trial pits (TP–SS-01, TP-T1-01- TP-T7-07) were excavated using 8.5t tracked and 13t tracked excavators, to depths of 1.30-2.50m.

Disturbed (small jar and bulk bag) samples were taken at standard depth intervals and at change of strata.

Any water strikes encountered during excavation were recorded along with any changes in their levels as the excavation proceeded. The stability of the trial pit walls was noted on completion.

Appendix C presents the trial pit logs with photographs of the pits and arising provided in Appendix D.

Hand vane tests were carried out in all pits where soils were suitable at depths indicated on the trial pit logs provided in appendix B.

4.4 Hand vane tests

In addition to the hand vanes conducted in the trial pits, a series of hand vanes were also carried out at twenty-seven standalone locations.

Appendix E provides the results of the standalone hand vane tests.

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4.5 Surveying

The as-built exploratory hole positions were surveyed following completion of site operations by a Site Engineer from Causeway Geotech. Surveying was carried out using a Trimble R10 GPS system employing VRS and real time kinetic (RTK) techniques.

The plan coordinates (Irish Transverse Mercator) and ground elevation (mOD Malin) at each location are recorded on the individual exploratory hole logs. The exploratory hole location plan presented in Appendix A shows these as-built positions.

The monitoring records are presented in Appendix F.

5 LABORATORY WORK

Upon their receipt in the laboratory, all disturbed samples were carefully examined and accurately described, and their descriptions incorporated into the borehole logs.

5.1 Geotechnical laboratory testing of soils

Laboratory testing of soils comprised:

- **soil classification:** moisture content measurement, Atterberg Limit tests and particle size distribution analysis.
- **soil chemistry:** pH and water soluble sulphate content

Laboratory testing of soils samples was carried out in accordance with British Standards Institute: *BS 1377, Methods of test for soils for civil engineering purposes; Part 1 (2016), and Parts 2-9 (1990).*

The test results are presented in Appendix F.

6 GROUND CONDITIONS

6.1 General geology of the area

GSI Quaternary mapping indicates that the superficial deposits underlying the site comprise glacial till, peat, and occasional alluvium in the western portion of the site. These deposits are underlain by shale, sandstone, and siltstone of the Sherwood Sandstone Formation.

6.2 Ground types encountered during investigation of the site

A summary of the ground types encountered in the exploratory holes is listed below, in approximate stratigraphic order:

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- **Topsoil:** encountered in all trial pits, in 300mm-500mm thickness across the site.
- **Glacial Till:** sandy gravelly clay or silty clay, frequently with low to medium cobble content, typically firm or stiff. TP-T5-01 consisted of silty sand deposits.
- **Possible Bedrock:** TP-T2-01 and TP-T3-01 encountered sandy silty angular gravel deposits at the bottom of the trial pit. Additional ground investigation is needed to verify the presence of bedrock.

6.3 Groundwater

Details of the individual groundwater strikes, along with any relative changes in levels as works proceeded, are presented on the exploratory hole logs for each location.

Groundwater was encountered as seepage in trial pits TP-SS-01, TP-T2-01, TP-T3-01, and TP-T5-01 between 0.30-2.30m. Surface water also infiltrated TP-T3-01 and TP-T6-01 during excavation.

Seasonal variation in groundwater levels should also be factored into design considerations.

7 REFERENCES

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland.

IS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. National Standards Authority of Ireland.

BS 5930: 2015+A1:2020: Code of practice for ground investigations. British Standards Institution.

BS EN ISO 14688-1:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 1 Identification and description.

BS EN ISO 14688-2:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification.

BS 1377: 1990: Methods of test for soils for civil engineering purposes. British Standards Institution.

BS EN ISO 22476-3:2005+A1:2011: Geotechnical investigation and testing. Field testing. Standard penetration test.

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APPENDIX A

SITE AND EXPLORATORY HOLE LOCATION PLANS

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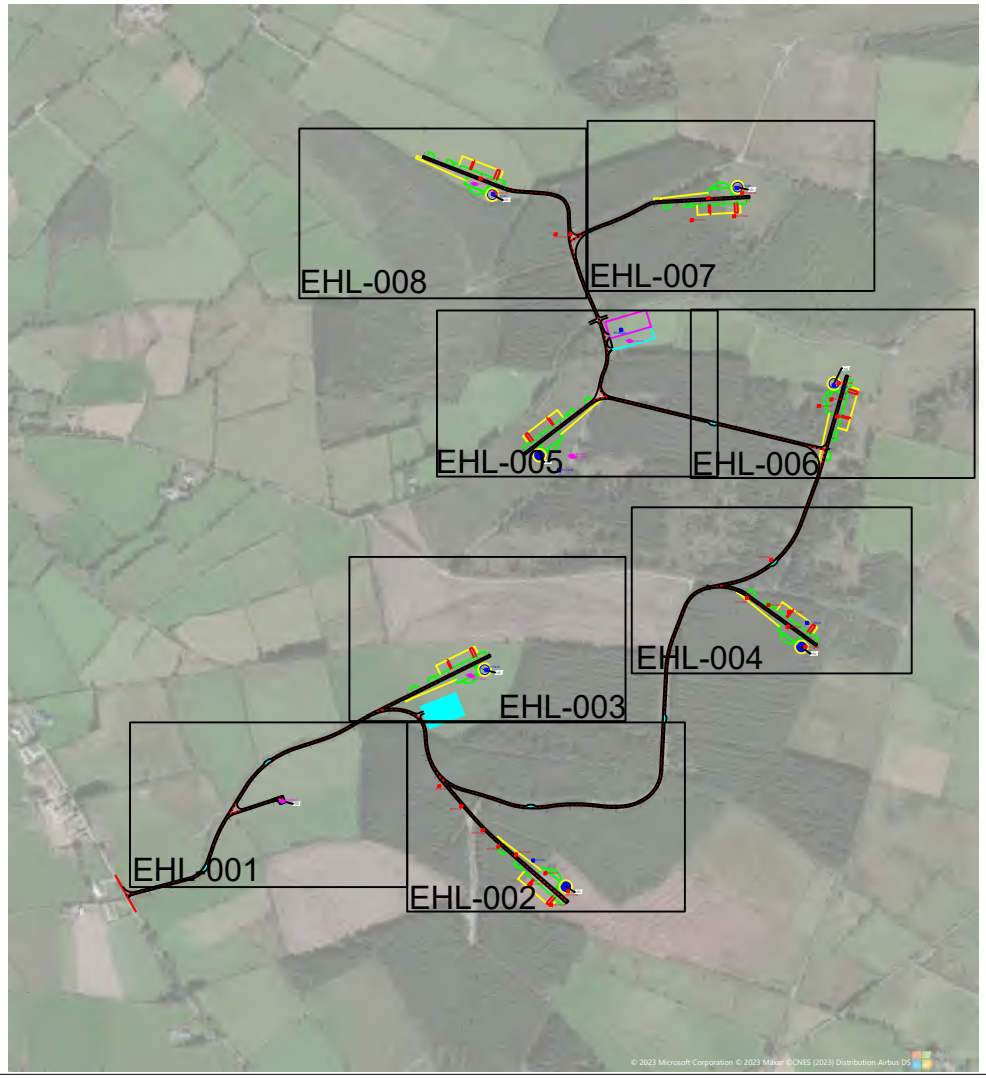
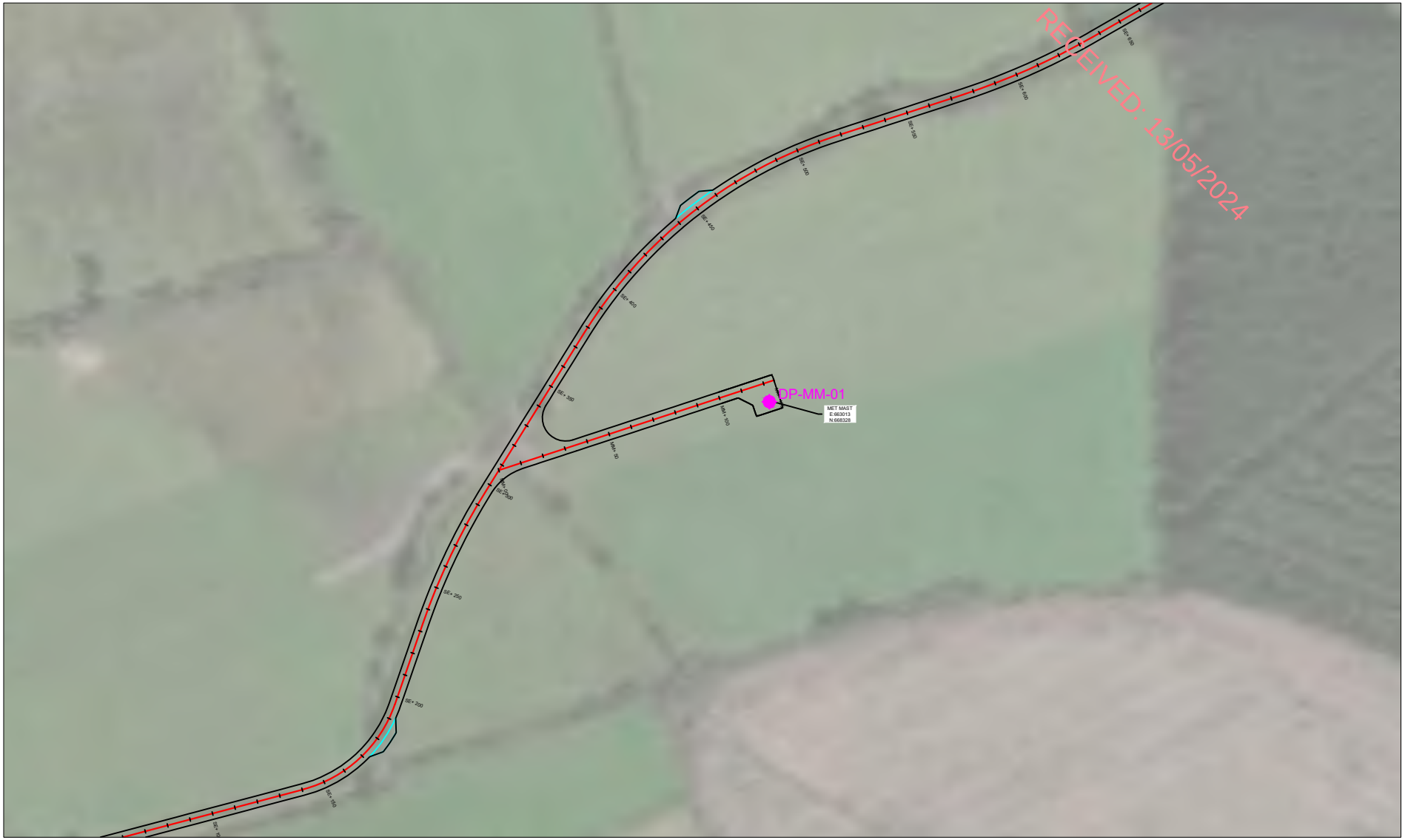


PROJECT: Seskin Wind Farm		TITLE: Exploratory hole location plan Overview			
CLIENT: MKO	KEY: Hand Vane; Trial Pit; Dynamic Probe	CAUSEWAY GEOTECH	SCALE: NTS@A3	DATE: 12/01/2024	
ENGINEER: AFRY			DRWN: BS / CHCK: MFG	SERIES: 1 of 1	DWG No: 23-1591-EHL-OW-001



PROJECT: Seskin Wind Farm		TITLE: Exploratory hole location plan			
CLIENT: MKO	KEY: Hand Vane Trial Pit Dynamic Probe	CAUSEWAY GEOTECH	SCALE: NTS@A3	DATE: 12/01/2024	
ENGINEER: AFRY			DRWN: BS CHCK: MFG	SERIES: 1 of 8	DWG No: 23-1591-EHL-001

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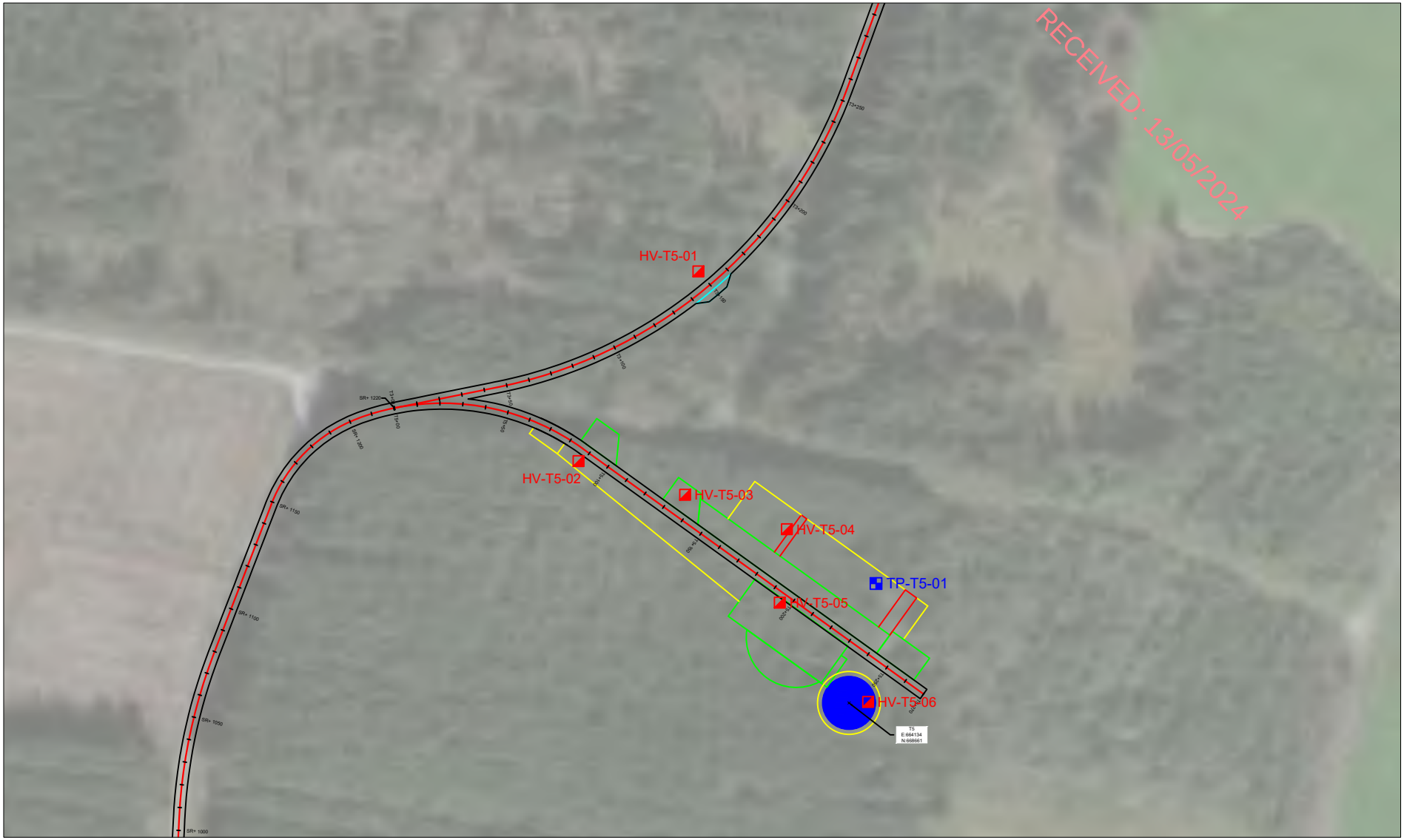
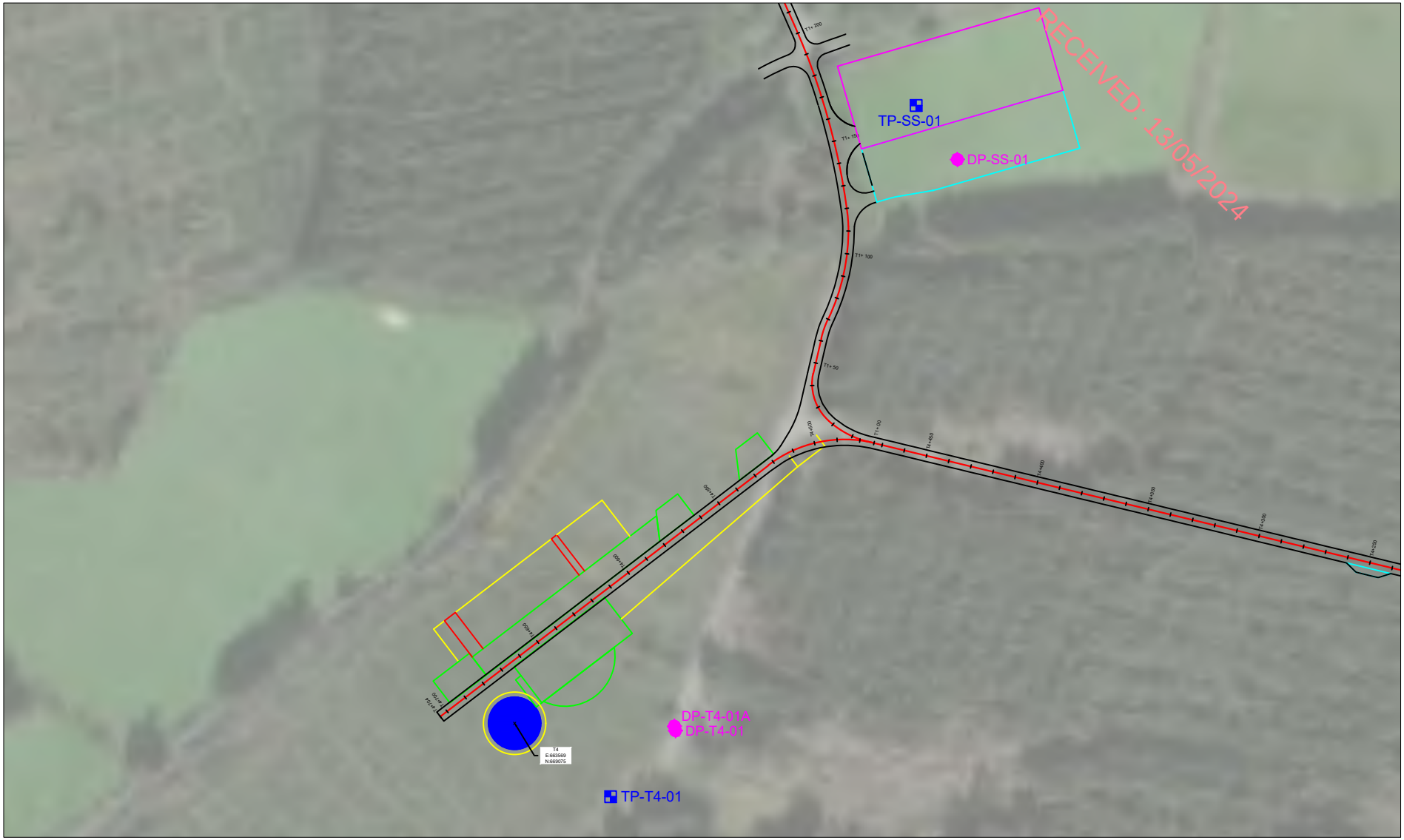
PROJECT: Seskin Wind Farm			TITLE: Exploratory hole location plan		
CLIENT: MKO	KEY: Hand Vane	CAUSEWAY GEOTECH	SCALE: NTS@A3	DATE: 12/01/2024	
ENGINEER: AFRY	Trial Pit		DRWN: BS	SERIES: 2 of 8	DWG No: 23-1591-EHL-002
	Dynamic Probe		CHCK: MFG		

PROJECT: Seskin Wind Farm		TITLE: Exploratory hole location plan			
CLIENT: MKO	KEY: Hand Vane Trial Pit Dynamic Probe	CAUSEWAY GEOTECH	SCALE: NTS@A3	DATE: 12/01/2024	
ENGINEER: AFRY			DRWN: BS CHCK: MFG	SERIES: 3 of 8	DWG No: 23-1591-EHL-003



PROJECT: Seskin Wind Farm		TITLE: Exploratory hole location plan			
CLIENT: MKO	KEY: Hand Vane Trial Pit Dynamic Probe	CAUSEWAY GEOTECH	SCALE: NTS@A3	DATE: 12/01/2024	
ENGINEER: AFRY			DRWN: BS CHCK: MFG	SERIES: 4 of 8	DWG No: 23-1591-EHL-004

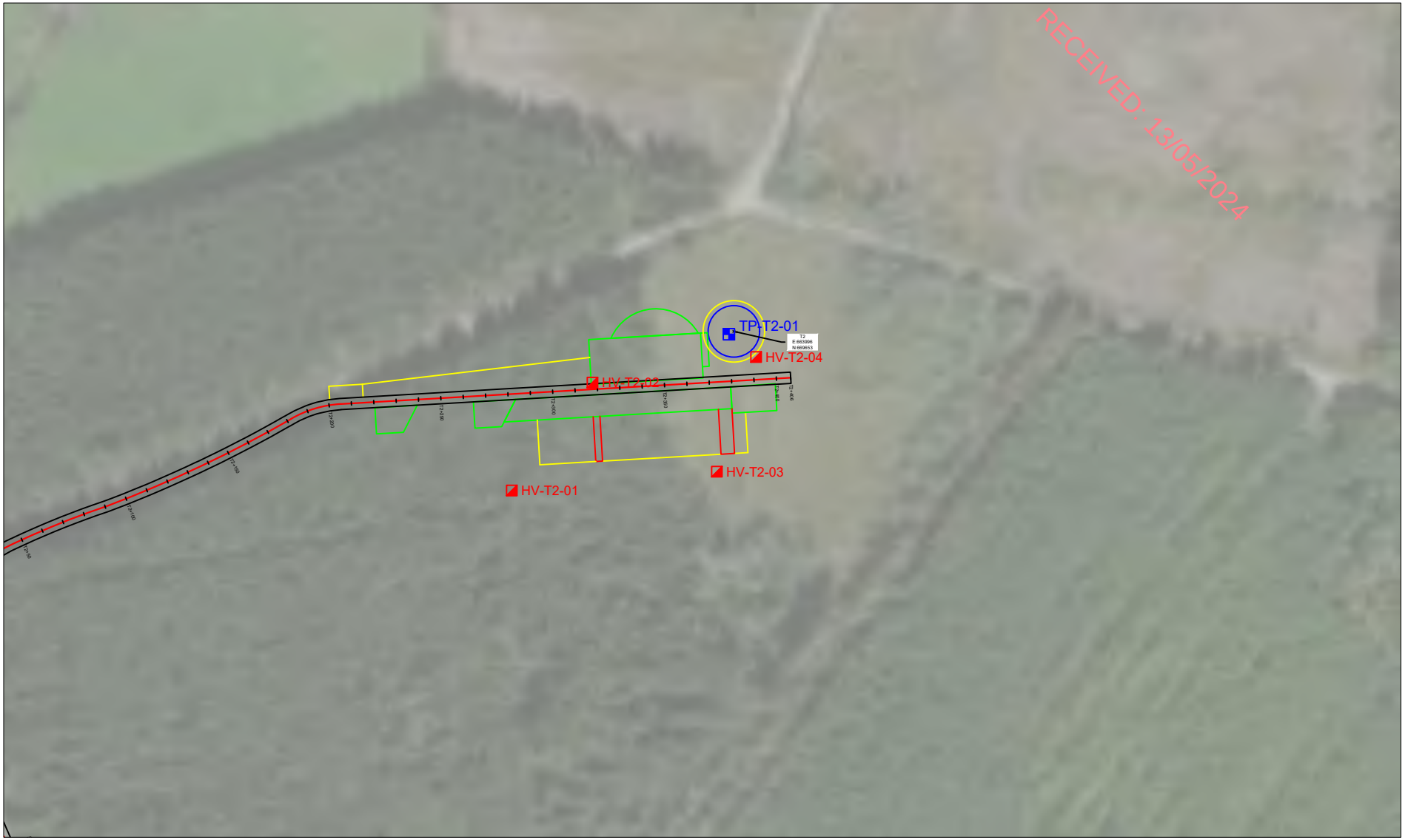


RECEIVED: 13/05/2024

PROJECT: Seskin Wind Farm		TITLE: Exploratory hole location plan			
CLIENT: MKO	KEY: Hand Vane Trial Pit Dynamic Probe	CAUSEWAY GEOTECH	SCALE: NTS@A3	DATE: 12/01/2024	
ENGINEER: AFRY			DRWN: BS CHCK: MFG	SERIES: 5 of 8	DWG No: 23-1591-EHL-005

RECEIVED: 13/05/2024

PROJECT: Seskin Wind Farm		TITLE: Exploratory hole location plan			
CLIENT: MKO	KEY: Hand Vane; Trial Pit; Dynamic Probe	CAUSEWAY GEOTECH	SCALE: NTS@A3	DATE: 12/01/2024	
ENGINEER: AFRY			DRWN: BS / CHCK: MFG	SERIES: 6 of 8	DWG No: 23-1591-EHL-006



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PROJECT: Seskin Wind Farm		TITLE: Exploratory hole location plan			
CLIENT: MKO	KEY: Hand Vane Trial Pit Dynamic Probe	CAUSEWAY GEOTECH	SCALE: NTS@A3	DATE: 12/01/2024	
ENGINEER: AFRY			DRWN: BS CHCK: MFG	SERIES: 7 of 8	DWG No: 23-1591-EHL-007

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PROJECT: Seskin Wind Farm		TITLE: Exploratory hole location plan			
CLIENT: MKO	KEY: Hand Vane, Trial Pit, Dynamic Probe	CAUSEWAY GEOTECH	SCALE: NTS@A3	DATE: 12/01/2024	
ENGINEER: AFRY			DRWN: BS / CHCK: MFG	SERIES: 8 of 8	DWG No: 23-1591-EHL-008

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APPENDIX B

TRIAL PIT LOGS

CAUSEWAY GEOTECH	**Project No.** 23-1591	**Project Name:** Seskin Wind Farm	**Trial Pit ID** TP-SS-01
	Coordinates 663744.72 E 669345.41 N	**Client:** MKO	
Method: Trial Pitting		**Client's Representative:** AFRY	Sheet 1 of 1 Scale: 1:25
Plant: 13t Tracked Excavator	**Elevation** 256.04 mOD	**Date:** 01/11/2023	**Logger:** JAC — FINAL

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Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
						TOPSOIL	
		Slight seepage at 0.30m	255.74	0.30		Firm light brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.	
0.60	B1						
0.60		HVP=104, HVR=69					
0.60		HVP=87, HVR=62					
0.60		HVP=95, HVR=36					
1.20		HVP=102, HVR=65					
1.20		HVP=125, HVR=54					
1.20		HVP=71, HVR=66					
1.40	B2						
			254.14	1.90		End of trial pit at 1.90m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks
0.30	Slight seepage at 0.30m

Depth: 1.90
Width: 0.70
Length: 2.90

Remarks:

Stability: Stable

Termination Reason: Terminated at refusal on boulders / possible bedrock.

Last Updated: 10/01/2024

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CAUSEWAY GEOTECH

Project No.	Project Name:	Trial Pit ID
23-1591	Seskin Wind Farm	TP-T1-01
Coordinates 663468.39 E 669638.21 N	**Client:** MKO	
Method: Trial Pitting	**Client's Representative:** AFRY	Sheet 1 of 1 Scale: 1:25
Plant: 13t Tracked Excavator	**Elevation** 251.45 mOD / **Date:** 01/11/2023 / **Logger:** JAC	FINAL

RECEIVED: 13/05/2024

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			251.15	0.30		TOPSOIL	
0.50	B1					Stiff light brown sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.	
0.50		HVP=125, HVR=62					
0.50		HVP=138, HVR=69					
0.50		HVP=144, HVR=72					
			250.65	0.80		Stiff grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.	
1.00		HVP=131, HVR=74					
1.00		HVP=143, HVR=77					
1.20	B2						
			249.65	1.80		Firm to stiff light brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.	
2.00	B3						
			248.95	2.50		End of trial pit at 2.50m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 2.50
Width: 0.80
Length: 3.20

Remarks: No groundwater encountered

Stability:	Termination Reason	Last Updated
Stable	Terminated at refusal on boulders / possible bedrock.	10/01/2024

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CAUSEWAY GEOTECH

Project No.	Project Name:	Trial Pit ID
23-1591	Seskin Wind Farm	TP-T2-01
Coordinates 663994.20 E 669652.07 N	**Client:** MKO	
Method: Trial Pitting	**Client's Representative:** AFRY	Sheet 1 of 1 Scale: 1:25
Plant: 8.5T Tracked Excavator	**Elevation** 268.29 mOD / **Date:** 28/11/2023 / **Logger:** JAC	FINAL

RECEIVED: 13/05/2024

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			267.99	0.30		TOPSOIL with roots and rootlets	
0.40	B1					Firm orangish brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.	
0.40	D2						
0.50		HVP=45, HVR=23					
0.50		HVP=50, HVR=21					
0.50		HVP=59, HVR=14					
			267.49	0.80		Firm to stiff grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium.	
1.00		HVP=62, HVR=29					
1.00		HVP=69, HVR=33					
1.00		HVP=74, HVR=30					
1.50	B3						
1.50	D4						
			266.39	1.90		Brown slightly sandy angular to subangular fine to coarse GRAVEL with medium cobble content. Sand is fine to coarse. (Possibly highly weathered bedrock)	
2.20	B5						
2.20	D6						▼
		Seepage at 2.30m					
			265.59	2.70		End of trial pit at 2.70m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks
2.30	Seepage at 2.30m

Depth: 2.70
Width: 1.00
Length: 2.90

Remarks:

Stability: Stable

Termination Reason: Terminated at refusal on boulders / possible bedrock.

Last Updated: 10/01/2024

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CAUSEWAY GEOTECH

Project No.	Project Name:	Trial Pit ID
23-1591	Seskin Wind Farm	TP-T3-01
Coordinates 664203.86 E 669225.26 N	**Client:** MKO	
Method: Trial Pitting	**Client's Representative:** AFRY	Sheet 1 of 1 Scale: 1:25
Plant: 13t Tracked Excavator	**Elevation** 259.72 mOD / **Date:** 01/11/2023 / **Logger:** JAC	FINAL

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Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
		Strong flow at ground level				TOPSOIL	
			259.32	0.40			
0.50	B1					Firm grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium.	
0.50		HVP=69, HVR=36					
0.50		HVP=89, HVR=48					
0.50		HVP=92, HVR=45					
1.00		HVP=104, HVR=68					
1.00		HVP=122, HVR=71					
1.00		HVP=95, HVR=47					
			258.42	1.30		Firm to stiff grey slightly sandy very gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.	
1.50	B2						
			258.12	1.60		Grey sandy slightly silty angular fine to coarse GRAVEL with low cobble content. Sand is fine to coarse. (Possibly highly weathered bedrock)	
1.80	B3						
		Light seepage at 2.20m	257.52	2.20		End of trial pit at 2.20m	

Water Strikes	
Struck at (m)	Remarks
0.00	Strong flow at ground level
2.20	Light seepage at 2.20m

Depth: 2.20
Width: 0.70
Length: 3.30

Remarks:

Stability: Stable

Termination Reason: Terminated at refusal on boulders / possible bedrock.

Last Updated: 10/01/2024

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CAUSEWAY GEOTECH

Project No. 23-1591	**Project Name:** Seskin Wind Farm		**Trial Pit ID** TP-T4-01
Coordinates 663610.77 E 669042.36 N	**Client:** MKO		
Method: Trial Pitting	**Client's Representative:** AFRY		Sheet 1 of 1 Scale: 1:25
Plant: 8.5T Tracked Excavator	**Elevation** 250.65 mOD	**Date:** 28/11/2023	**Logger:** JAC	FINAL

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Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
						TOPSOIL with roots and rootlets	
			250.25	0.40			
0.50		HVP=50, HVR=15				Firm light grey slightly sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.	
0.50		HVP=63, HVR=26					
0.50		HVP=71, HVR=23					
1.00	B1						
1.00	D2						
			249.55	1.10			
1.00	D4					Firm to stiff grey sandy gravelly SILT with medium cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.	
1.00		HVP=63, HVR=21					
1.00		HVP=71, HVR=27					
1.00		HVP=84, HVR=32					
1.50	B3						
			248.75	1.90		End of trial pit at 1.90m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 1.90
Width: 1.10
Length: 3.10

Remarks: No groundwater encountered

Stability: Stable

Termination Reason: Terminated at refusal on boulders / possible bedrock.

Last Updated: 10/01/2024

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CAUSEWAY GEOTECH

Project No. 23-1591	**Project Name:** Seskin Wind Farm		**Trial Pit ID** TP-T5-01
Coordinates 664146.21 E 668712.68 N	**Client:** MKO		
Method: Trial Pitting	**Client's Representative:** AFRY		Sheet 1 of 1 Scale: 1:25
Plant: 8.5T Tracked Excavator	**Elevation** 252.75 mOD	**Date:** 28/11/2023	**Logger:** JAC	FINAL

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Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			252.45	0.30		TOPSOIL	
						Grey very silty fine to coarse SAND.	
0.70	B1						
0.70	D2						
1.50	B3						
1.50	D4						
		Light flow at 2.10m					▼
			250.45	2.30		End of trial pit at 2.30m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks
2.10	Light flow at 2.10m

Depth: 2.30
Width:
Length:

Remarks:

Stability: Unstable

Termination Reason: Terminated due to pit walls collapsing

Last Updated: 10/01/2024

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CAUSEWAY GEOTECH	**Project No.** 23-1591	**Project Name:** Seskin Wind Farm	**Trial Pit ID** **TP-T6-01**
	Coordinates 663454.01 E 668611.05 N	**Client:** MKO	
Method: Trial Pitting		**Client's Representative:** AFRY	Sheet 1 of 1 Scale: 1:25
Plant: 13t Tracked Excavator	**Elevation** 241.64 mOD	**Date:** 01/11/2023	**Logger:** JAC FINAL

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Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
		Strong flow from surface				TOPSOIL	
			241.24	0.40			
0.50	B1					Firm to stiff light brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.	
0.50		HVP=65, HVR=32	241.04	0.60			
0.50		HVP=71, HVR=14				Stiff light grey slightly sandy slightly gravelly CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.	
0.50		HVP=87, HVR=33					
1.00	B2						
1.00		HVP=108, HVR=39					
1.00		HVP=114, HVR=30					
1.00		HVP=122, HVR=44					
			240.34	1.30		End of trial pit at 1.30m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks
0.00	Strong flow from surface

Depth: 1.30
Width: 0.70
Length: 3.20

Remarks:

Stability: Stable

Termination Reason: Terminated at refusal on boulders / possible bedrock.

Last Updated: 10/01/2024

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CAUSEWAY GEOTECH

Project No. 23-1591	**Project Name:** Seskin Wind Farm		**Trial Pit ID** TP-T7-01
Coordinates 663554.86 E 668199.34 N	**Client:** MKO		
Method: Trial Pitting	**Client's Representative:** AFRY		Sheet 1 of 1 Scale: 1:25
Plant: 8.5T Tracked Excavator	**Elevation** 250.56 mOD	**Date:** 28/11/2023	**Logger:** JAC	FINAL

RECEIVED: 13/05/2024

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
						TOPSOIL with roots and rootlets.	
			250.06	0.50		Firm light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine.	
0.70	B1						
0.70	D2						
0.70		HVP=50, HVR=17					
0.70		HVP=63, HVR=20					
0.70		HVP=74, HVR=27					
1.00		HVP=63, HVR=15					
1.00		HVP=71, HVR=21	249.46	1.10		Stiff blackish grey sandy gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.	
1.00		HVP=80, HVR=24					
1.20	B3		249.26	1.30		End of trial pit at 1.30m	
1.20	D4						

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 1.30
Width: 1.00
Length: 2.50

Remarks: No groundwater encountered

Stability: Stable

Termination Reason: Terminated at refusal on boulders / possible bedrock.

Last Updated: 10/01/2024

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CAUSEWAY GEOTECH

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APPENDIX C

TRIAL PIT PHOTOGRAPHS

Trial Pit: TP-SS-01

Trial Pit: TP-SS-01

Trial Pit: TP-SS-01

Trial Pit: TP-SS-01

Trial Pit: TP-T1-01

Trial Pit: TP-T1-01

Trial Pit: TP-T1-01

Trial Pit: TP-T2-01

Trial Pit: TP-T2-01

Trial Pit: TP-T2-01

Trial Pit: TP-T2-01

Trial Pit: TP-T2-01

Trial Pit: TP-T2-01

Trial Pit: TP-T3-01

Trial Pit: TP-T3-01

Trial Pit: TP-T3-01

Trial Pit: TP-T3-01

Trial Pit: TP-T3-01

CAUSEWAY GEOTECH

Trial Pit: TP-T3-01

Trial Pit: TP-T4-01

Trial Pit: TP-T4-01

Trial Pit: TP-T4-01

Trial Pit: TP-T4-01

Trial Pit: TP-T4-01

Trial Pit: TP-T4-01

Trial Pit: TP-T5-01

Trial Pit: TP-T5-01

Trial Pit: TP-T5-01

Trial Pit: TP-T5-01

Trial Pit: TP-T5-01

Trial Pit: TP-T5-01

Trial Pit: TP-T5-01

Trial Pit: TP-T6-01

Trial Pit: TP-T6-01

Trial Pit: TP-T6-01

Trial Pit: TP-T6-01

Trial Pit: TP-T7-01

Trial Pit: TP-T7-01

Trial Pit: TP-T7-01

Trial Pit: TP-T7-01

CAUSEWAY GEOTECH

RECEIVED: 13/05/2024

APPENDIX D

DYNAMIC PROBE LOGS

CAUSEWAY GEOTECH	**Project No.** 23-1591	**Project Name:** Seskin Wind Farm			**Probe ID** DP-MM-01
	Coordinates 663013.37 E 668327.52 N	**Client:** MKO			
Method: Dynamic Probing		**Client's Representative:** AFRY			Sheet 1 of 1 Scale: 1:50
Probe Type: DPSH-B	**Elevation** 235.58 mOD	**Final Depth:** 7.68	**Date:** 01/11/2023	**Operator:** JFSC	FINAL

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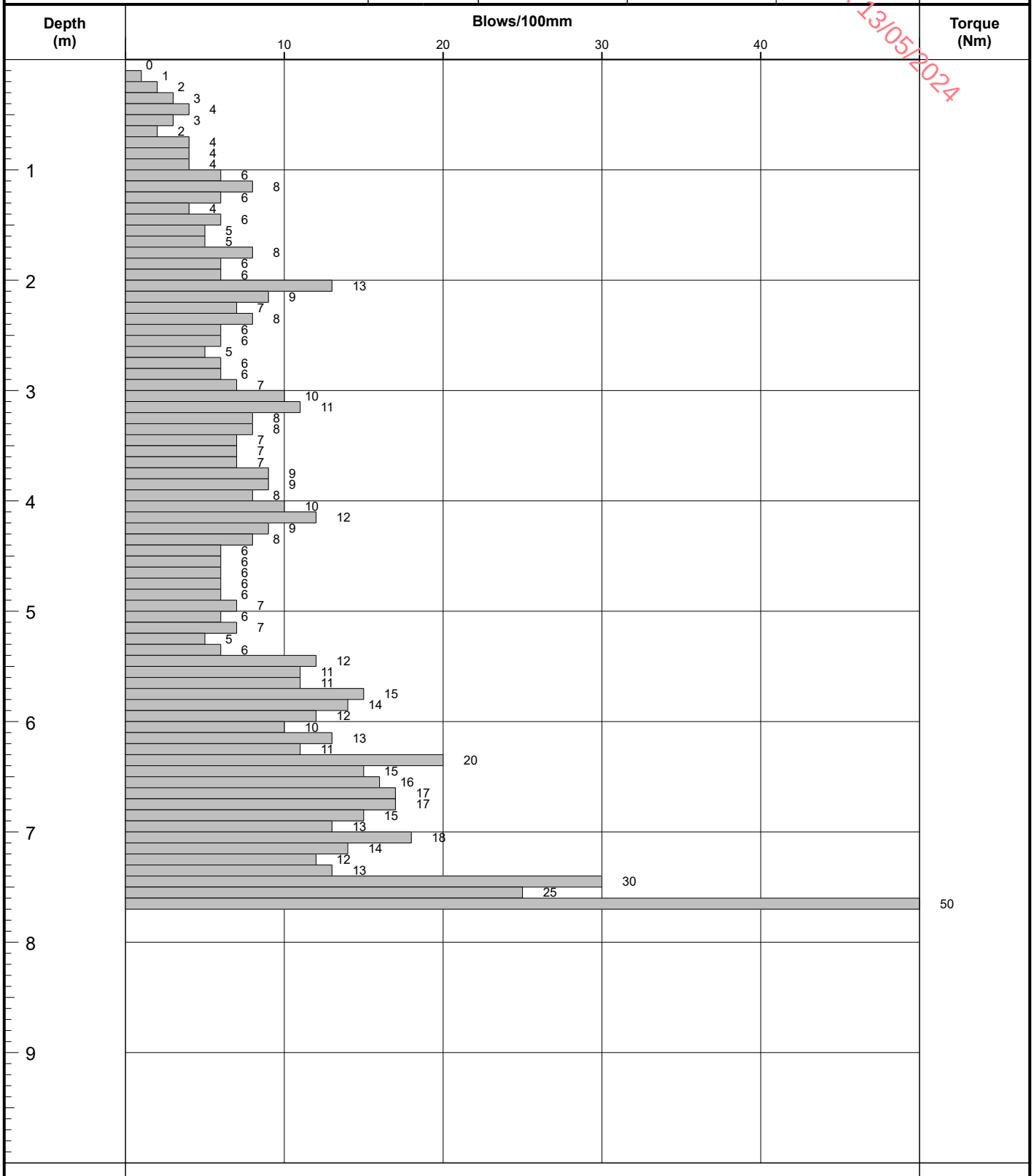

Fall Height: 750 mm	**Remarks**	
Hammer Mass: 63.5 kg		
Cone Diameter: 50.5 mm	**Termination Reason** Terminated at refusal on boulder / possible bedrock.	**Last Updated** 10/01/2024

CAUSEWAY GEOTECH

Project No.	Project Name:	Probe ID
23-1591	Seskin Wind Farm	DP-SS-01
Coordinates	**Client:**	
663762.82 E	MKO	
669321.74 N	**Client's Representative:** AFRY	Sheet 1 of 1
		Scale: 1:50

Method:	Probe Type:	Elevation	Final Depth:	Date:	Operator:	
Dynamic Probing	DPSH-B	255.84 mOD	3.90	01/11/2023	JFSC	FINAL

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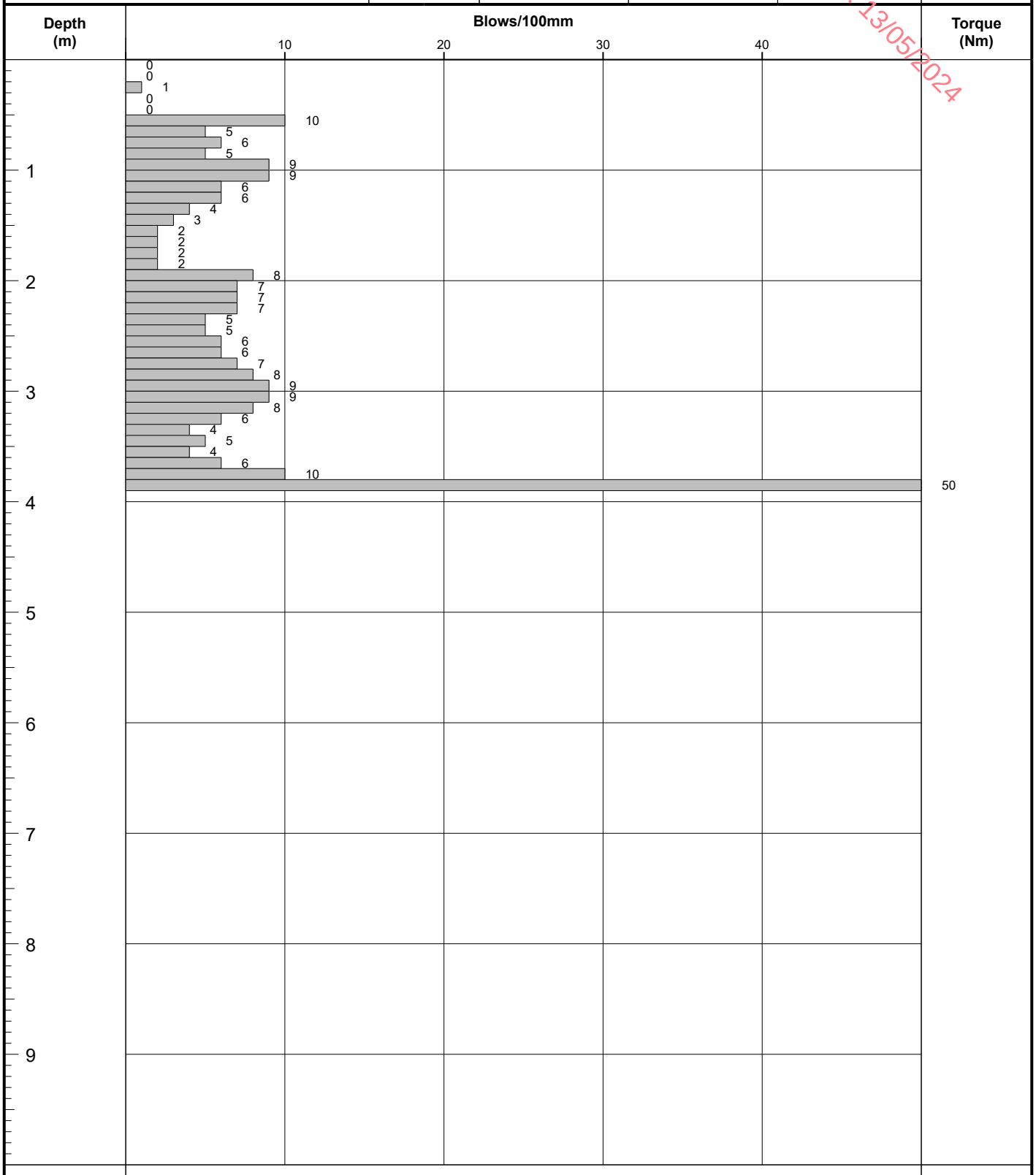

Fall Height:	Hammer Mass:	Cone Diameter:
750 mm	63.5 kg	50.5 mm

Remarks

Termination Reason

Terminated at refusal on boulder / possible bedrock.

Last Updated

10/01/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Probe ID
23-1591	Seskin Wind Farm	DP-T1-01
Coordinates	**Client:**	
663428.07 E	MKO	
669660.66 N	**Client's Representative:** AFRY	Sheet 1 of 1
		Scale: 1:50

Method:	Probe Type:	Elevation	Final Depth:	Date:	Operator:	
Dynamic Probing	DPSH-B	250.66 mOD	7.79	01/11/2023	JFSC	FINAL

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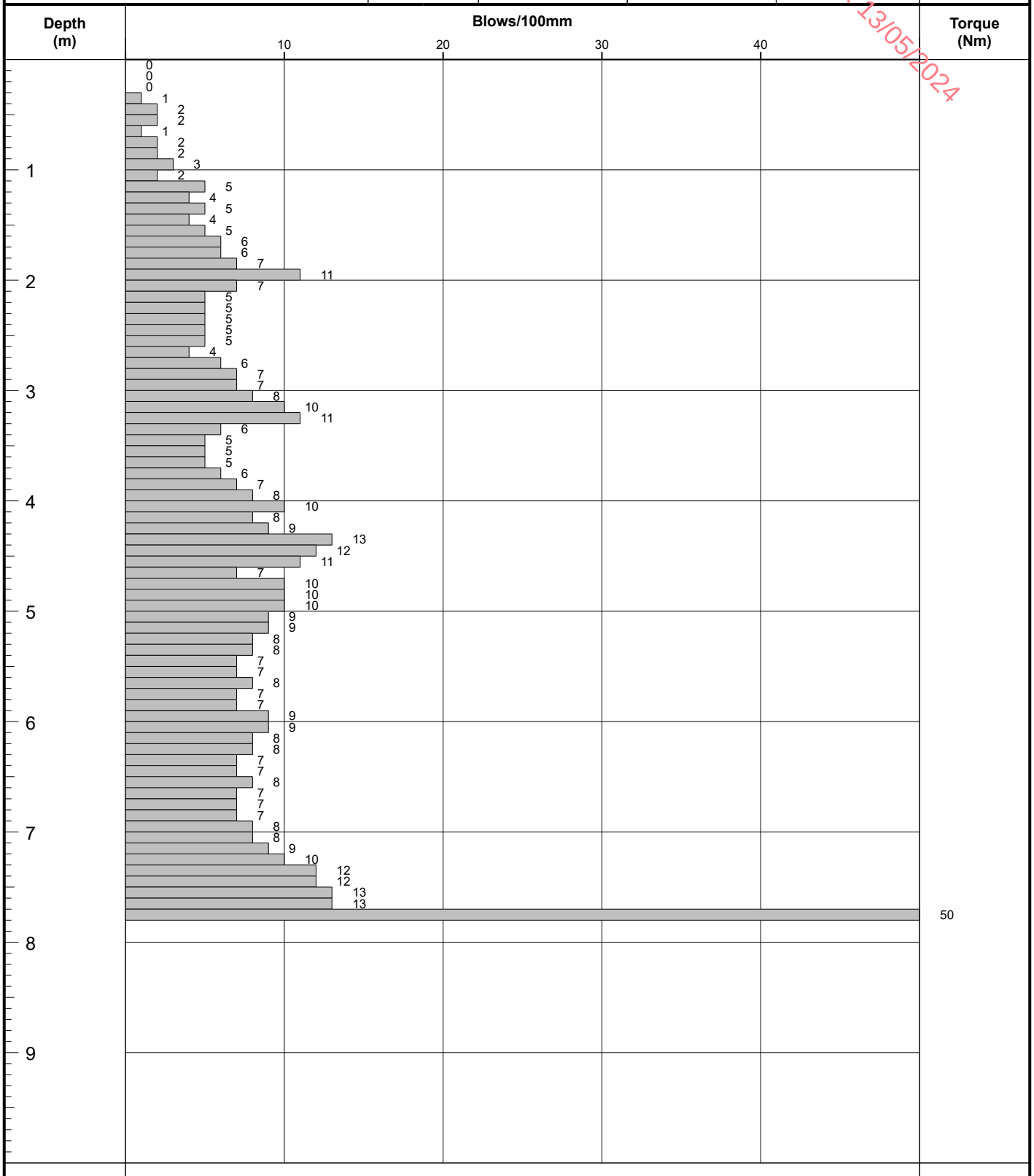

Fall Height:	Hammer Mass:	Cone Diameter:
750 mm	63.5 kg	50.5 mm

Remarks

Termination Reason

Terminated at refusal on boulder / possible bedrock.

Last Updated

10/01/2024

AGS

CAUSEWAY GEOTECH	**Project No.** 23-1591	**Project Name:** Seskin Wind Farm			**Probe ID** DP-T4-01
	Coordinates 663639.21 E 669071.30 N	**Client:** MKO			
Method: Dynamic Probing		**Client's Representative:** AFRY			Sheet 1 of 1 Scale: 1:50
Probe Type: DPSH-B	**Elevation** 250.58 mOD	**Final Depth:** 3.60	**Date:** 27/11/2023	**Operator:** IC	FINAL

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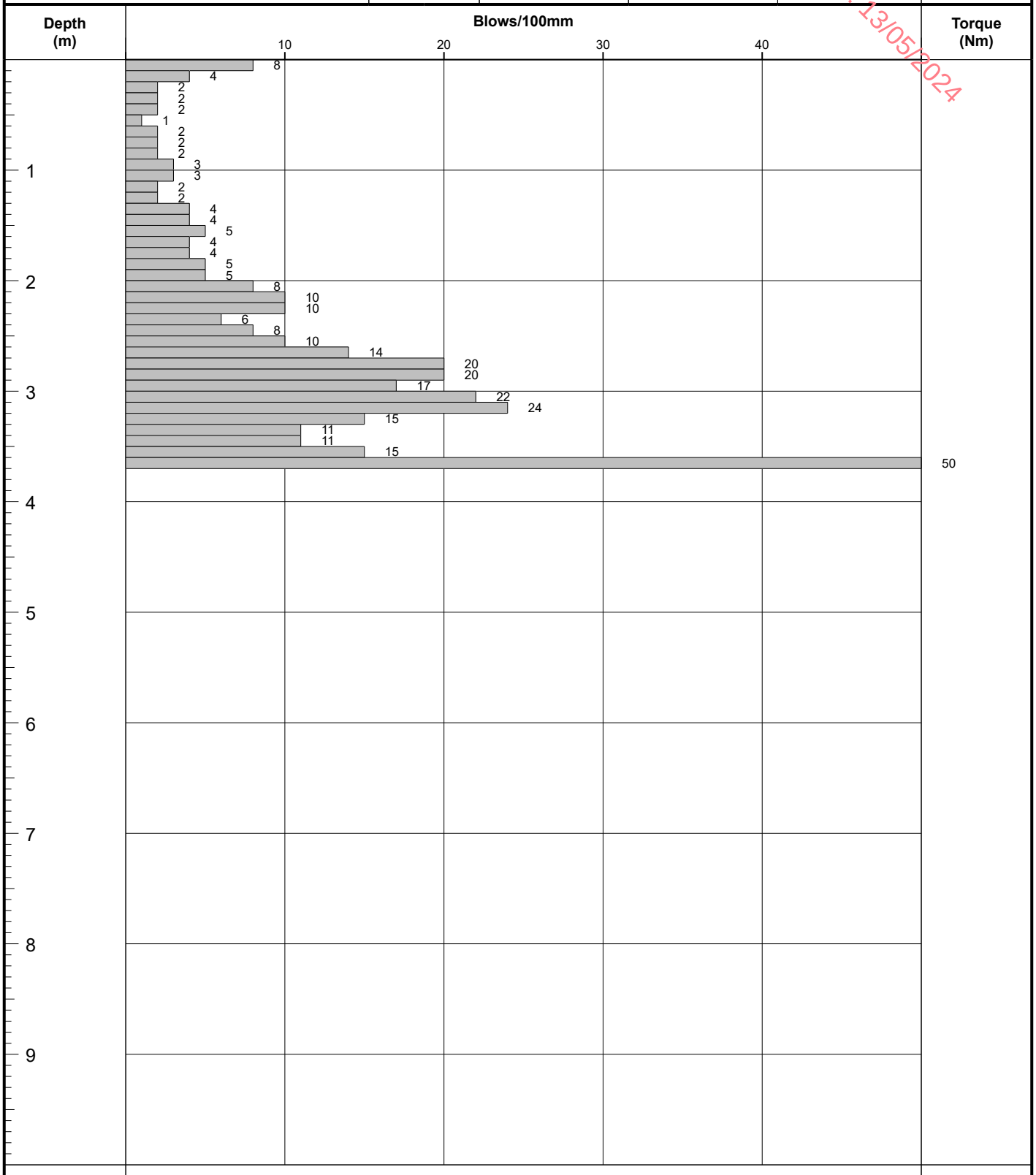

Fall Height: 750 mm	**Remarks**	
Hammer Mass: 63.5 kg	**Termination Reason**	**Last Updated**
Cone Diameter: 50.5 mm	Terminated at refusal on boulder / possible bedrock.	10/01/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Probe ID
23-1591	Seskin Wind Farm	DP-T4-01A
Coordinates	**Client:**	
663638.76 E	MKO	
669073.22 N	**Client's Representative:** AFRY	Sheet 1 of 1
		Scale: 1:50

Method:	Probe Type:	Elevation	Final Depth:	Date:	Operator:	
Dynamic Probing	DPSH-B	250.49 mOD	3.60	27/11/2023	IC	FINAL

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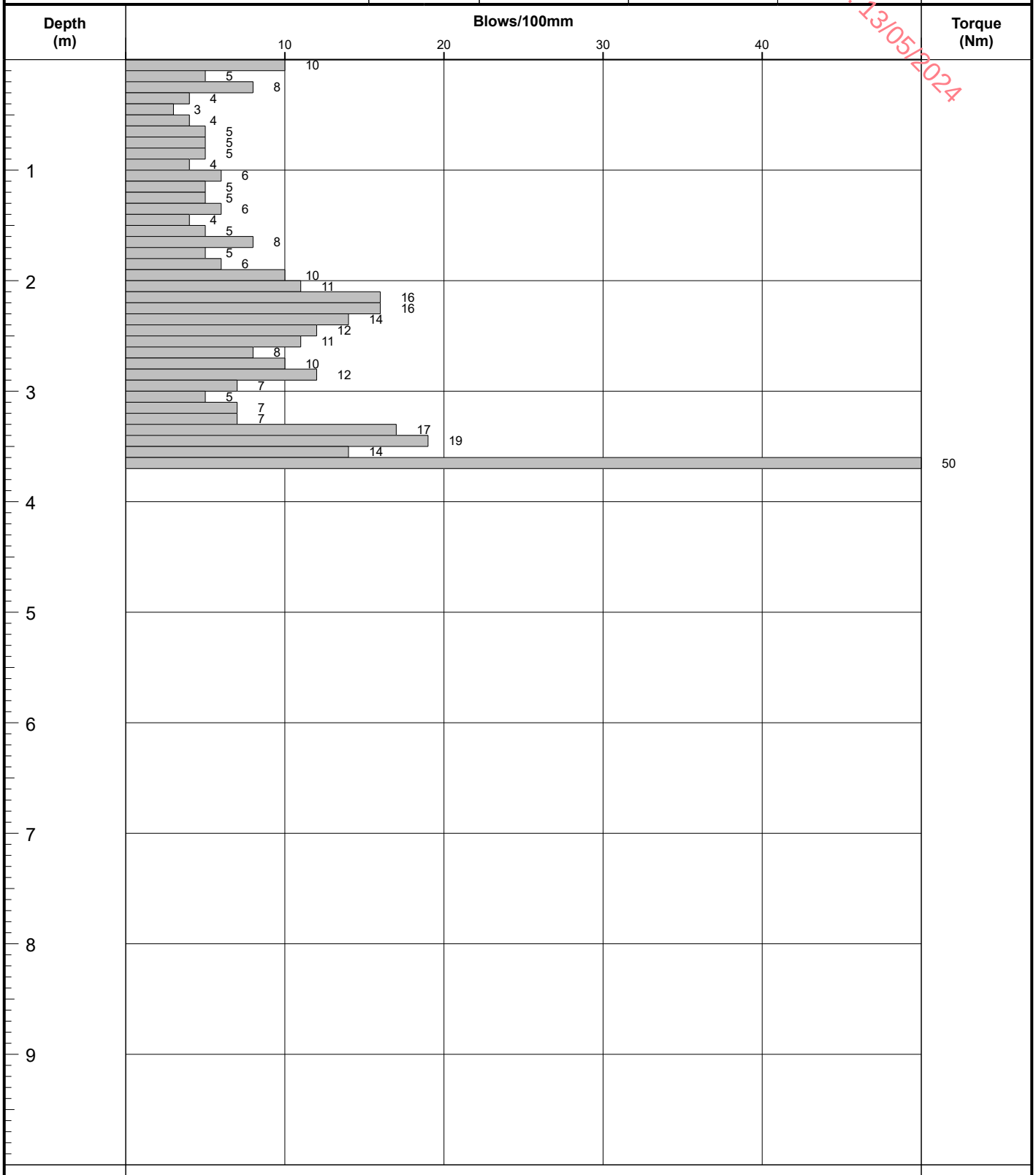

Fall Height:	Remarks
750 mm	
Hammer Mass: 63.5 kg	**Termination Reason**
Cone Diameter: 50.5 mm	Terminated at refusal on boulder / possible bedrock.

Last Updated 10/01/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Probe ID
23-1591	Seskin Wind Farm	DP-T6-01
Coordinates	**Client:**	
663420.00 E 668598.53 N	MKO	
Method:	**Client's Representative:**	Sheet 1 of 1
Dynamic Probing	AFRY	Scale: 1:50
Probe Type:	**Elevation** / **Final Depth:** / **Date:** / **Operator:**	FINAL
DPSH-B	240.12 mOD / 1.88 / 01/11/2023 / JFSC	

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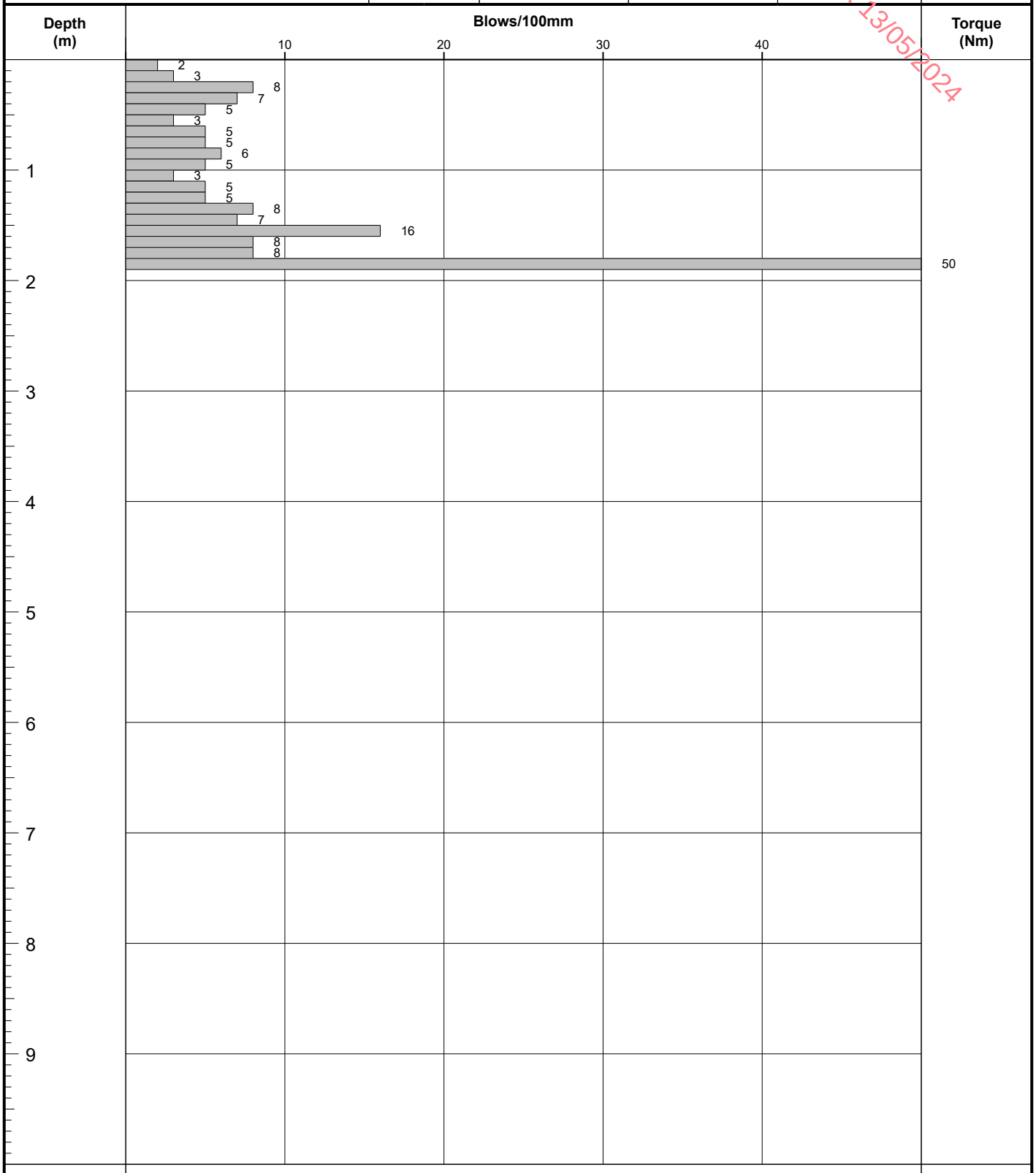

Fall Height: 750 mm	**Remarks**
Hammer Mass: 63.5 kg	
Cone Diameter: 50.5 mm	**Termination Reason**: Terminated at refusal on boulder / possible bedrock.
	Last Updated: 10/01/2024

AGS

CAUSEWAY GEOTECH

RECEIVED: 13/05/2024

APPENDIX E

HAND VANE TEST RESULTS

HAND VANE TEST RESULTS

Project No. 23-1591

Project Name Seskin Wind Farm

RECEIVED: 13/05/2024

Location ID	Depth (m)	Test Number	Vane Type	Result (kPa)	Residual result (kPa)
HV-T1-01	0.40	1	FIELD	59	21
HV-T1-01	0.40	2	FIELD	81	27
HV-T1-01	0.40	3	FIELD	69	21
HV-T1-02	0.40	1	FIELD	77	24
HV-T1-02	0.40	2	FIELD	89	33
HV-T1-02	0.40	3	FIELD	63	17
HV-T1-03	0.40	1	FIELD	90	77
HV-T1-03	0.40	2	FIELD	119	83
HV-T1-03	0.40	3	FIELD	111	71
HV-T1-04	0.40	1	FIELD	99	60
HV-T1-04	0.40	2	FIELD	144	75
HV-T1-04	0.40	3	FIELD	153	78
HV-T2-01	0.40	1	FIELD	56	17
HV-T2-01	0.40	2	FIELD	80	32
HV-T2-01	0.40	3	FIELD	66	27
HV-T2-02	0.40	1	FIELD	71	33
HV-T2-03	0.40	1	FIELD	27	9
HV-T2-03	0.40	2	FIELD	44	17
HV-T2-03	0.40	3	FIELD	47	18
HV-T2-04	0.40	1	FIELD	51	18
HV-T2-04	0.40	2	FIELD	84	50
HV-T2-04	0.40	3	FIELD	90	42
HV-T3-01	0.40	1	FIELD	95	32
HV-T3-01	0.40	2	FIELD	63	20
HV-T3-01	0.40	3	FIELD	84	29
HV-T3-02	0.40	1	FIELD	71	23
HV-T3-02	0.40	2	FIELD	89	27
HV-T3-02	0.40	3	FIELD	66	17
HV-T3-03	0.40	1	FIELD	87	33
HV-T3-03	0.40	2	FIELD	101	35
HV-T3-03	0.40	3	FIELD	71	29
HV-T3-04	0.40	1	FIELD	>165	N/A
HV-T3-04	0.40	2	FIELD	147	81
HV-T3-04	0.40	4	FIELD	>165	N/A
HV-T5-01	0.40	1	FIELD	66	27
HV-T5-01	0.40	2	FIELD	60	20
HV-T5-01	0.40	3	FIELD	44	15
HV-T5-02	0.40	1	FIELD	62	21
HV-T5-02	0.40	2	FIELD	45	17
HV-T5-02	0.40	3	FIELD	27	3
HV-T5-03	0.40	1	FIELD	45	14
HV-T5-03	0.40	2	FIELD	32	8
HV-T5-03	0.40	3	FIELD	42	11
HV-T5-04	0.40	1	FIELD	27	9
HV-T5-04	0.40	2	FIELD	23	12
HV-T5-04	0.40	3	FIELD	44	15
HV-T5-05	0.40	1	FIELD	51	21
HV-T5-05	0.40	2	FIELD	33	8
HV-T5-05	0.40	3	FIELD	59	23
HV-T5-06	0.40	1	FIELD	41	14
HV-T5-06	0.40	2	FIELD	35	11
HV-T5-06	0.40	3	FIELD	50	17
HV-T7-01	0.40	1	FIELD	53	18
HV-T7-01	0.40	2	FIELD	59	20
HV-T7-01	0.40	3	FIELD	74	24
HV-T7-02	0.40	1	FIELD	68	27
HV-T7-02	0.40	2	FIELD	72	27
HV-T7-02	0.40	3	FIELD	56	20
HV-T7-03	0.40	1	FIELD	56	20
HV-T7-03	0.40	2	FIELD	74	26
HV-T7-03	0.40	3	FIELD	80	30

HAND VANE TEST RESULTS

Project No. 23-1591

Project Name Seskin Wind Farm

RECEIVED: 13/05/2024

Location ID	Depth (m)	Test Number	Vane Type	Result (kPa)	Residual result (kPa)
HV-T7-04	0.40	1	FIELD	42	12
HV-T7-04	0.40	2	FIELD	54	21
HV-T7-04	0.40	3	FIELD	62	21
HV-T7-05	0.40	1	FIELD	72	24
HV-T7-05	0.40	2	FIELD	50	17
HV-T7-05	0.40	3	FIELD	68	18
HV-T7-06	0.40	1	FIELD	69	29
HV-T7-06	0.40	2	FIELD	41	12
HV-T7-06	0.40	3	FIELD	80	30
HV-T7-07	0.40	1	FIELD	56	21
HV-T7-07	0.40	2	FIELD	66	27
HV-T7-07	0.40	3	FIELD	77	27
HV-T7-08	0.40	1	FIELD	54	18
HV-T7-08	0.40	2	FIELD	41	12
HV-T7-08	0.40	3	FIELD	63	20
HV-T7-09	0.40	1	FIELD	83	33
HV-T7-09	0.40	2	FIELD	56	24
HV-T7-09	0.40	3	FIELD	45	17

CAUSEWAY GEOTECH

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APPENDIX F

GEOTECHNICAL LABORATORY TEST RESULTS

CAUSEWAY GEOTECH

HEAD OFFICE
Causeway Geotech Ltd
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Registered in Northern Ireland.
Company Number: NI610766

REGIONAL OFFICE
Causeway Geotech (IRL) Ltd
Unit 1 Fingal House
Stephenstown Industrial Estate
Balbriggan, Co Dublin, Ireland, K32 VR66
ROI: +353 (0)1 526 7465
Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

RECEIVED: 13/05/2024

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

29 November 2023

Project Name:	Seskin Wind Farm
Project No.:	23-1591
Client:	MKO
Engineer:	AFRY

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 09/11/2023 and 29/11/2023.

The attached results complete the testing requested and we would therefore wish to confirm that samples will be retained without charge for a period of 28 days from the above date after which they will be appropriately disposed of unless we receive written instructions to the contrary prior to that date.

We trust our report meets with your approval but if you have any queries or require additional information, please do not hesitate to contact the undersigned.

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

RECEIVED: 13/05/2024

Project Name: Seskin Wind Farm

Report Reference: Schedule 1

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	4
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	4
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	4
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	4

SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All sub-contracting laboratories used are UKAS accredited.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	BRE Test - Suite A		4

Summary of Classification Test Results

CAUSEWAY GEOTECH

Project No.: 23-1591

Project Name: Seskin Wind Farm

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Hole No.	Sample Ref	Top	Base	Type	Specimen Description	Density bulk Mg/m3	Density dry Mg/m3	w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
TP-SS-01	1	0.60		B	Brown sandy slightly gravelly silty CLAY.			20	85	33 -1pt	20	13		CL
TP-T1-01	2	1.20		B	Greyish brown sandy slightly gravelly silty CLAY.			13	74	32 -1pt	18	14		CL
TP-T3-01	1	0.50		B	Greyish brown sandy slightly gravelly silty CLAY.			24	94	27 -1pt	18	9		CL
TP-T6-01	2	1.00		B	Greyish brown sandy slightly gravelly silty CLAY.			22	89	34 -1pt	19	15		CL

All tests performed in accordance with BS1377:1990 unless specified otherwise

LAB 01R Version 6

Key

Density test | Linear measurement unless : wd - water displacement | wi - immersion in water

Liquid Limit | 4pt cone unless : cas - Casagrande method | 1pt - single point test

Particle density | sp - small pyknometer | gj - gas jar

Date Printed: 29/11/2023

Approved By: Stephen Watson

UKAS TESTING 10122

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-1591**
				Borehole/Pit No.	TP-SS-01
Site Name	Seskin Wind Farm			Sample No.	1
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	0.60
				Sample Depth (m) Base	
Specimen Reference	6	Specimen Depth	0.6 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2023110956

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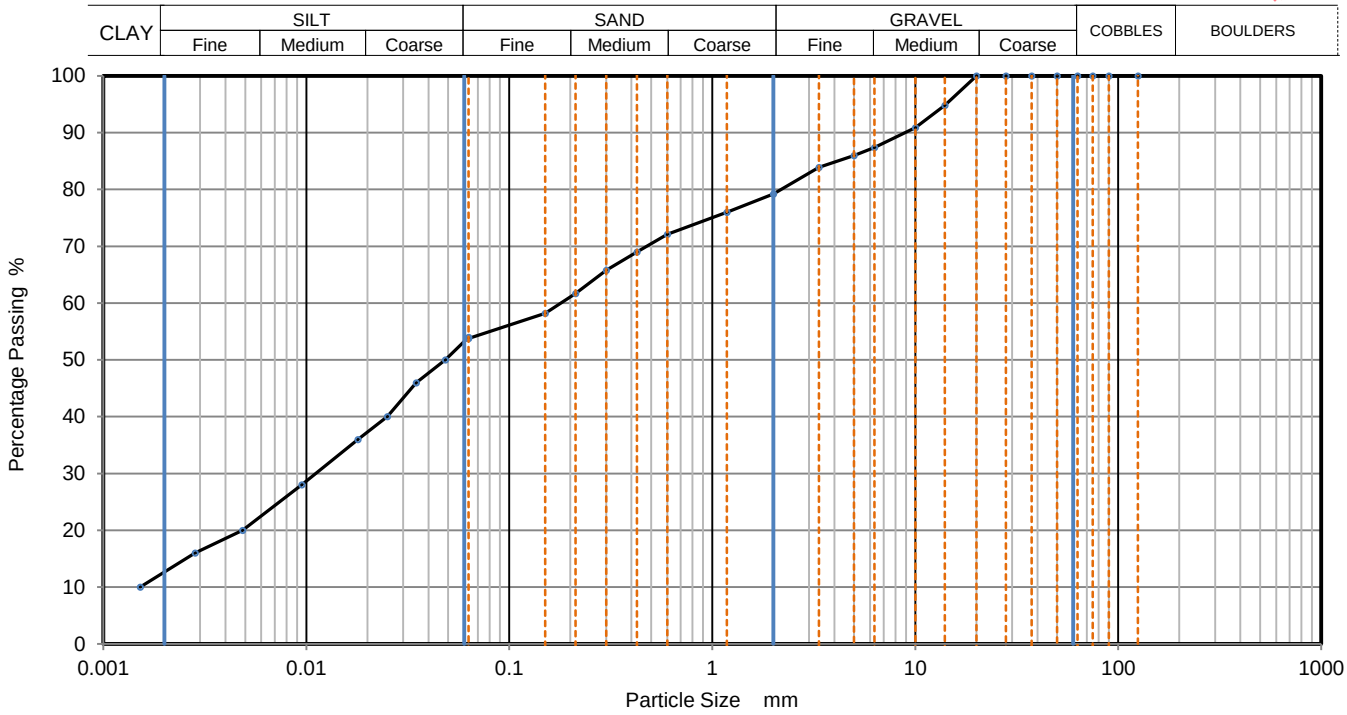


Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	54
90	100	0.04846	50
75	100	0.03473	46
63	100	0.02505	40
50	100	0.01794	36
37.5	100	0.00949	28
28	100	0.00486	20
20	100	0.00284	16
14	95	0.00152	10
10	91		
6.3	87		
5	86		
3.35	84		
2	79		
1.18	76		
0.6	72	Particle density	(assumed)
0.425	69	2.65	Mg/m3
0.3	66		
0.212	62		
0.15	58		
0.063	54		

Dry Mass of sample, g: 530

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	20.8
Sand	25.5
Silt	41.1
Clay	12.6

Grading Analysis		
D100	mm	
D60	mm	0.18
D30	mm	0.0112
D10	mm	0.00152
Uniformity Coefficient		120
Curvature Coefficient		0.46

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

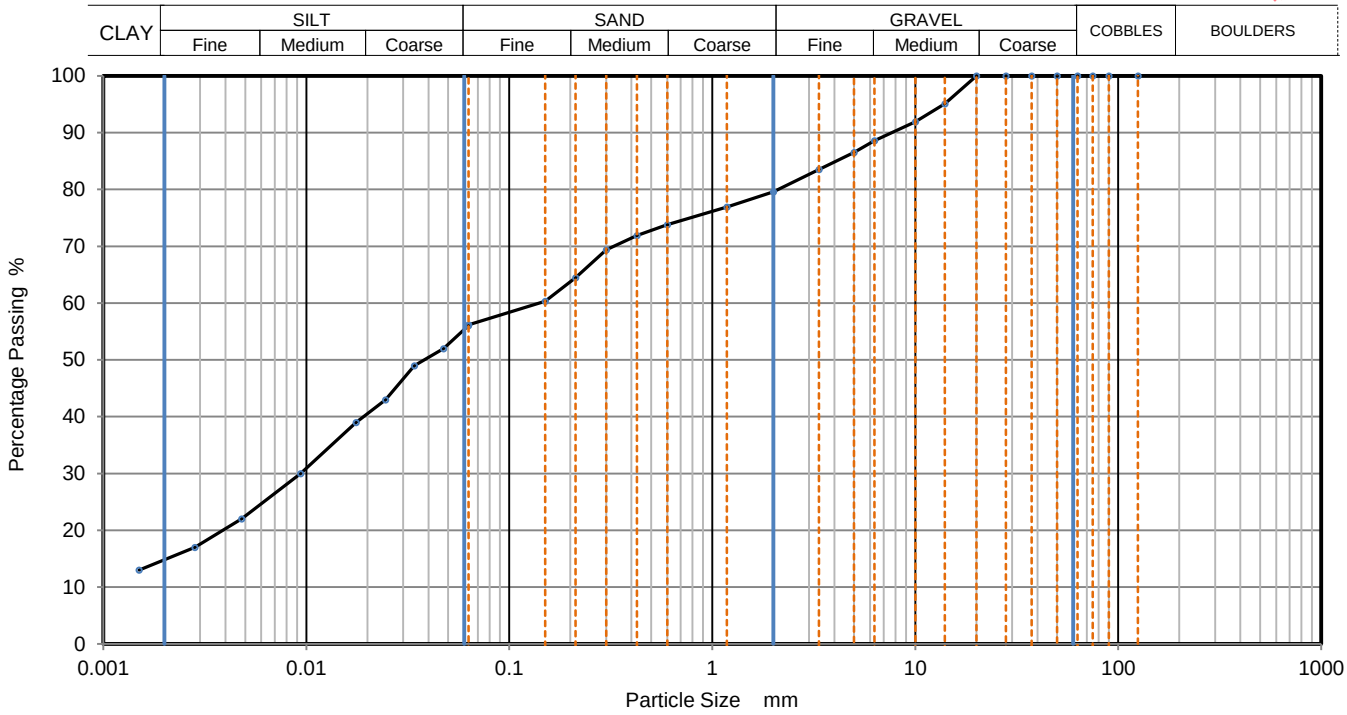
Approved
Stephen Watson

LAB 05R - Version 6

UKAS TESTING 10122

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-1591**
				Borehole/Pit No.	TP-T1-01
Site Name	Seskin Wind Farm			Sample No.	2
Specimen Description	Greyish brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	1.20
				Sample Depth (m) Base	
Specimen Reference	6	Specimen Depth	1.2 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2023110958

RECEIVED: 13/05/2024



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06289	56
90	100	0.04745	52
75	100	0.03403	49
63	100	0.02456	43
50	100	0.01760	39
37.5	100	0.00938	30
28	100	0.00480	22
20	100	0.00282	17
14	95	0.00150	13
10	92		
6.3	89		
5	87		
3.35	84		
2	80		
1.18	77		
0.6	74	Particle density	(assumed)
0.425	72	2.65	Mg/m3
0.3	69		
0.212	65		
0.15	60		
0.063	56		

Dry Mass of sample, g	521

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	20.4
Sand	23.4
Silt	41.4
Clay	14.8

Grading Analysis		
D100	mm	
D60	mm	0.142
D30	mm	0.0094
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen Watson

LAB 05R - Version 6

UKAS TESTING 10122

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION				Job Ref		23-1591
					Borehole/Pit No.		TP-T3-01
Site Name	Seskin Wind Farm				Sample No.		1
Specimen Description	Greyish brown sandy slightly gravelly silty CLAY.				Sample Depth (m)	Top	0.50
						Base	
Specimen Reference	6	Specimen Depth	0.5	m	Sample Type		B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus2023110960

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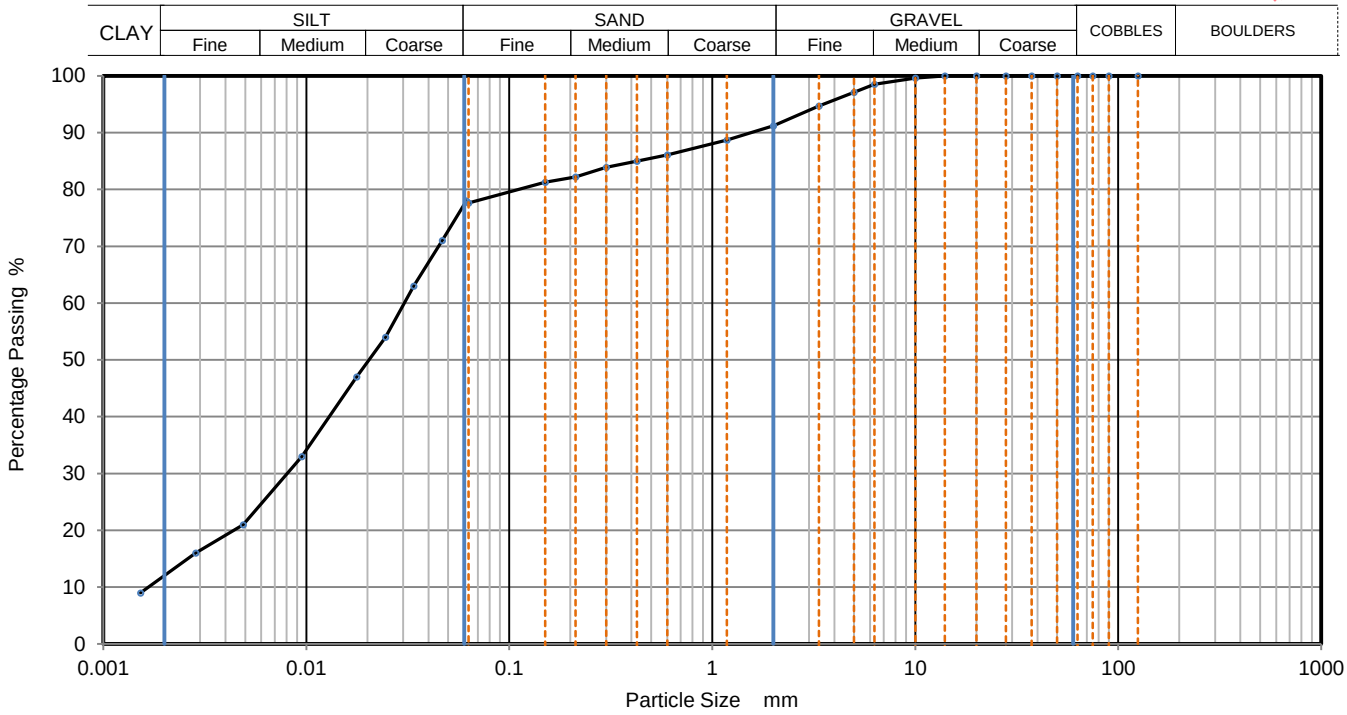


Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06148	78
90	100	0.04676	71
75	100	0.03379	63
63	100	0.02456	54
50	100	0.01771	47
37.5	100	0.00949	33
28	100	0.00489	21
20	100	0.00285	16
14	100	0.00153	9
10	100		
6.3	99		
5	97		
3.35	95		
2	91		
1.18	89		
0.6	86	Particle density	(assumed)
0.425	85	2.65	Mg/m3
0.3	84		
0.212	82		
0.15	81		
0.063	78		

Dry Mass of sample, g	371

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	8.8
Sand	13.7
Silt	65.0
Clay	12.5

Grading Analysis		
D100	mm	
D60	mm	0.03
D30	mm	0.00805
D10	mm	0.00161
Uniformity Coefficient		19
Curvature Coefficient		1.3

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

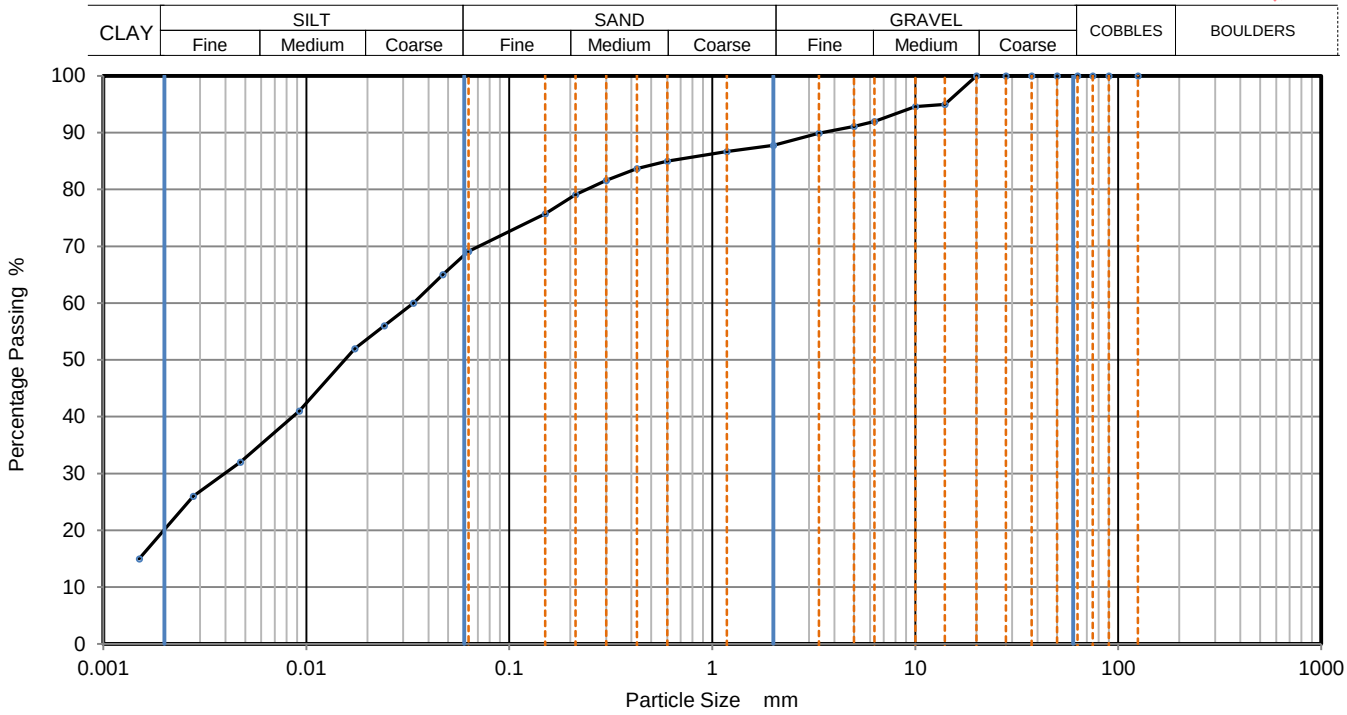
Approved
Stephen Watson

LAB 05R - Version 6

UKAS TESTING 10122

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION				Job Ref		23-1591
					Borehole/Pit No.		TP-T6-01
Site Name	Seskin Wind Farm				Sample No.		2
Specimen Description	Greyish brown sandy slightly gravelly silty CLAY.				Sample Depth (m)	Top	1.00
						Base	
Specimen Reference	6	Specimen Depth	1	m	Sample Type		B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus2023110963

RECEIVED: 13/05/2024



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06236	69
90	100	0.04704	65
75	100	0.03373	60
63	100	0.02418	56
50	100	0.01733	52
37.5	100	0.00924	41
28	100	0.00473	32
20	100	0.00278	26
14	95	0.00150	15
10	95		
6.3	92		
5	91		
3.35	90		
2	88		
1.18	87		
0.6	85	Particle density	(assumed)
0.425	84	2.65	Mg/m3
0.3	82		
0.212	79		
0.15	76		
0.063	69		

Dry Mass of sample, g	510

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	12.2
Sand	18.7
Silt	49.0
Clay	20.1

Grading Analysis		
D100	mm	
D60	mm	0.0326
D30	mm	0.00389
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen Watson

LAB 05R - Version 6

UKAS TESTING 10122

Certificate of Analysis

RECEIVED: 13/05/2024

Certificate Number	23-27229	*Issued:*	23-Nov-23

Client Causeway Geotech
8 Drumahiskey Road
Ballymoney
County Antrim
BT53 7QL

Our Reference	23-27229
Client Reference	23-1591
Order No	(not supplied)
Contract Title	SESKIN WIND FARM
Description	4 Soil samples.
Date Received	18-Nov-23
Date Started	20-Nov-23
Date Completed	23-Nov-23
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 23-27229
Client Ref 23-1591
Contract Title SESKIN WIND FARM

RECEIVED: 13/05/2024

			Lab No	2264549	2264550	2264551	2264552
			.Sample ID	TP-SS-01	TP-T1-01	TP-T3-01	TP-T6-01
			Depth	1.40	2.00	1.50	0.50
			Other ID	2	3	2	1
			Sample Type	B	B	B	B
			Sampling Date	16/11/2023	16/11/2023	16/11/2023	16/11/2023
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Inorganics							
pH	DETSC 2008#		pH	5.9	6.9	5.7	5.9
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	< 10	< 10	17	14

RECEIVED: 13/05/2024

Information in Support of the Analytical Results

Our Ref 23-27229
Client Ref 23-1591
Contract SESKIN WIND FARM

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2264549	TP-SS-01 1.40 SOIL	16/11/23	PT 500ml		
2264550	TP-T1-01 2.00 SOIL	16/11/23	PT 500ml		
2264551	TP-T3-01 1.50 SOIL	16/11/23	PT 500ml		
2264552	TP-T6-01 0.50 SOIL	16/11/23	PT 500ml		

Key: P-Plastic T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

End of Report

HEAD OFFICE
Causeway Geotech Ltd
8 Drumahiskey Road
Ballymoney
Co. Antrim, N. Ireland, BT53 7QL
NI: +44 (0)28 276 66640
Registered in Northern Ireland.
Company Number: NI610766

REGIONAL OFFICE
Causeway Geotech (IRL) Ltd
Unit 1 Fingal House
Stephenstown Industrial Estate
Balbriggan, Co Dublin, Ireland, K32 VR66
ROI: +353 (0)1 526 7465
Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

RECEIVED: 13/05/2024

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

20 December 2023

Project Name:	Seskin Wind Farm
Project No.:	23-1591
Client:	MKO
Engineer:	AFRY

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 06/12/2023 and 20/12/2023.

The attached results complete the testing requested and we would therefore wish to confirm that samples will be retained without charge for a period of 28 days from the above date after which they will be appropriately disposed of unless we receive written instructions to the contrary prior to that date.

We trust our report meets with your approval but if you have any queries or require additional information, please do not hesitate to contact the undersigned.

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Seskin Wind Farm

Report Reference: Schedule 2

RECEIVED: 13/05/2024

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	4
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	4
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	4
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	4

SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All sub-contracting laboratories used are UKAS accredited.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	BRE Test - Suite A		4

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.: 23-1591

Project Name: Seskin Wind Farm

RECEIVED 13/05/2024

Hole No.	Sample				Specimen Description	Density bulk	Density dry	w	Passing 425µm	LL	PL	PI	Particle density	Casagrande Classification
	Ref	Top	Base	Type		Mg/m3		%	%	%	%	%	Mg/m3	
TP-T2-01	3	1.50		B	Greyish brown sandy slightly gravelly silty CLAY.			19	88	37 -1pt	21	16		CI
TP-T4-01	1	1.00		B	Brownish grey sandy slightly gravelly silty CLAY.			22	92	36 -1pt	25	11		MI/CI
TP-T7-01	1	0.70		B	Brownish grey sandy slightly gravelly silty CLAY.			29	93	42 -1pt	23	19		CI
TP-T7-01	4	1.20		D	Brownish grey sandy slightly gravelly silty CLAY.			13	73	25 -1pt	15	10		CL

All tests performed in accordance with BS1377:1990 unless specified otherwise

LAB 01R Version 6

Key

Density test | Liquid Limit | Particle density

Linear measurement unless : | 4pt cone unless : | sp - small pyknometer

wd - water displacement | cas - Casagrande method | gj - gas jar

wi - immersion in water | 1pt - single point test

Date Printed: 20/12/2023

Approved By: Stephen Watson

UKAS TESTING

10122

PARTICLE SIZE DISTRIBUTION

Job Ref					23-1591
Borehole/Pit No.					TP-T2-01
Site Name	Seskin Wind Farm			Sample No.	3
Specimen Description	Greyish brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	1.50
				Base	
Specimen Reference	6	Specimen Depth	1.5 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2023120612

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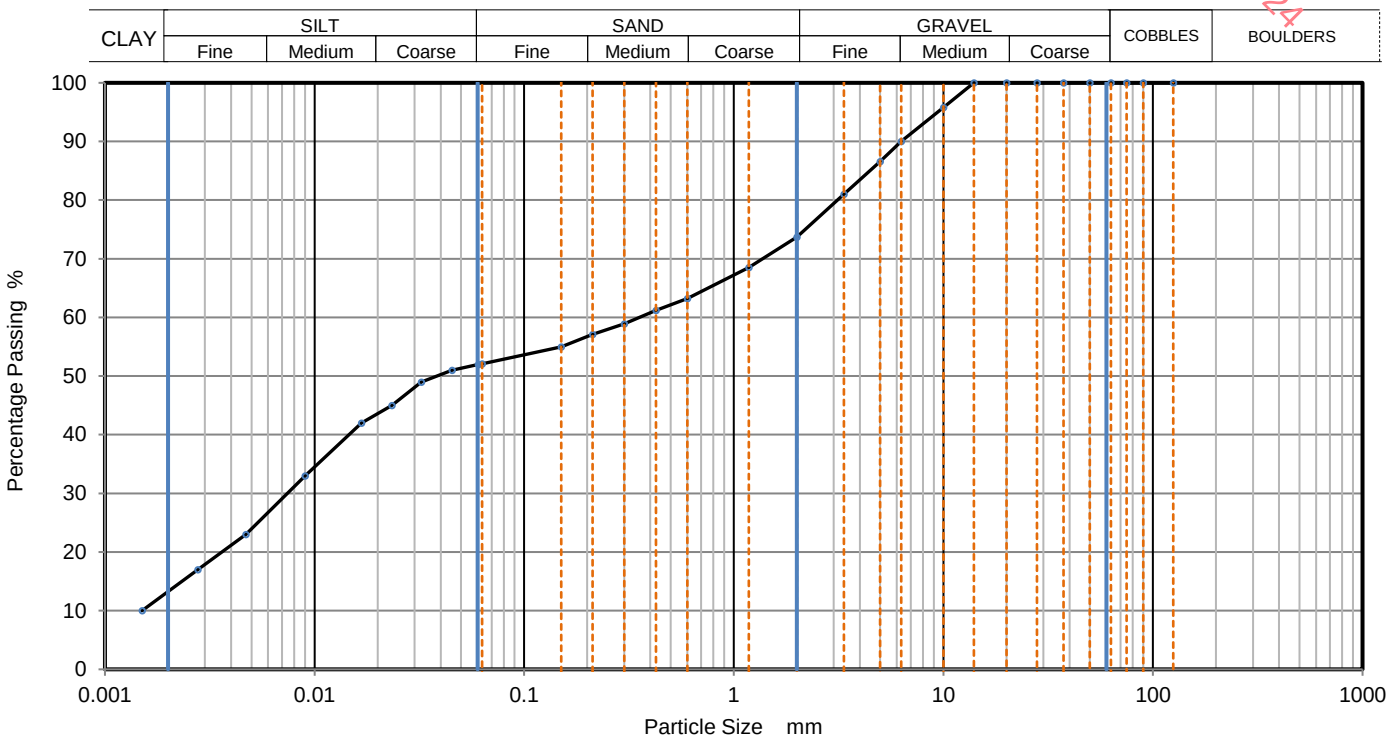


Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06050	52
90	100	0.04534	51
75	100	0.03230	49
63	100	0.02335	45
50	100	0.01675	42
37.5	100	0.00901	33
28	100	0.00470	23
20	100	0.00278	17
14	100	0.00150	10
10	96		
6.3	90		
5	87		
3.35	81		
2	74		
1.18	69		
0.6	63	Particle density	(assumed)
0.425	61	2.65	Mg/m3
0.3	59		
0.212	57		
0.15	55		
0.063	52		

Dry Mass of sample, g: 418

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	26.3
Sand	21.6
Silt	38.6
Clay	13.5

Grading Analysis		
D100	mm	
D60	mm	0.354
D30	mm	0.00729
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

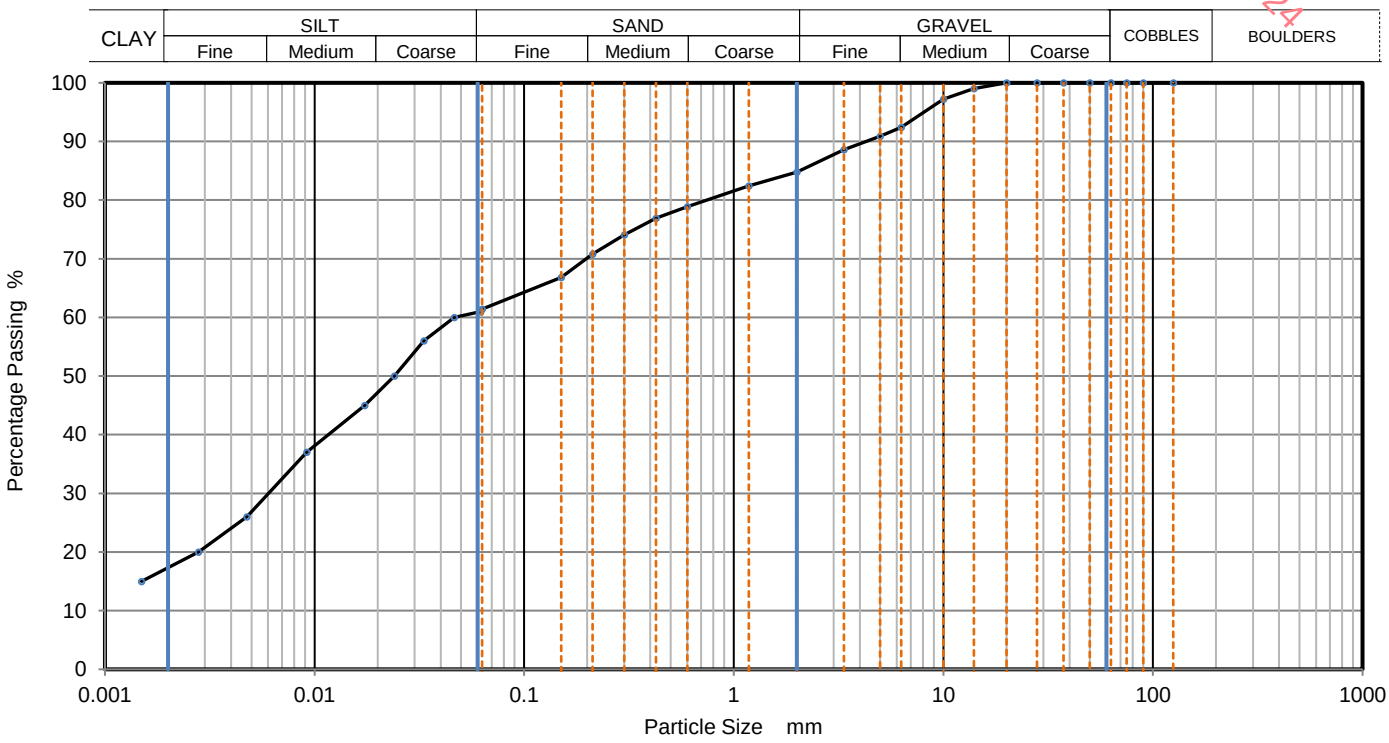
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

				Job Ref	**23-1591**
				Borehole/Pit No.	TP-T4-01
Site Name	Seskin Wind Farm			Sample No.	1
Specimen Description	Brownish grey sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	1.00
				Sample Depth (m) Base	
Specimen Reference	6	Specimen Depth	1 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2023120613

RECEIVED: 13/05/2024



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06190	61
90	100	0.04637	60
75	100	0.03326	56
63	100	0.02402	50
50	100	0.01733	45
37.5	100	0.00918	37
28	100	0.00476	26
20	100	0.00279	20
14	99	0.00149	15
10	97		
6.3	92		
5	91		
3.35	89		
2	85		
1.18	82		
0.6	79	Particle density	(assumed)
0.425	77	2.65	Mg/m3
0.3	74		
0.212	71		
0.15	67		
0.063	61		

Dry Mass of sample, g: 413

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	15.2
Sand	23.5
Silt	43.8
Clay	17.5

Grading Analysis		
D100	mm	
D60	mm	0.0498
D30	mm	0.006
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

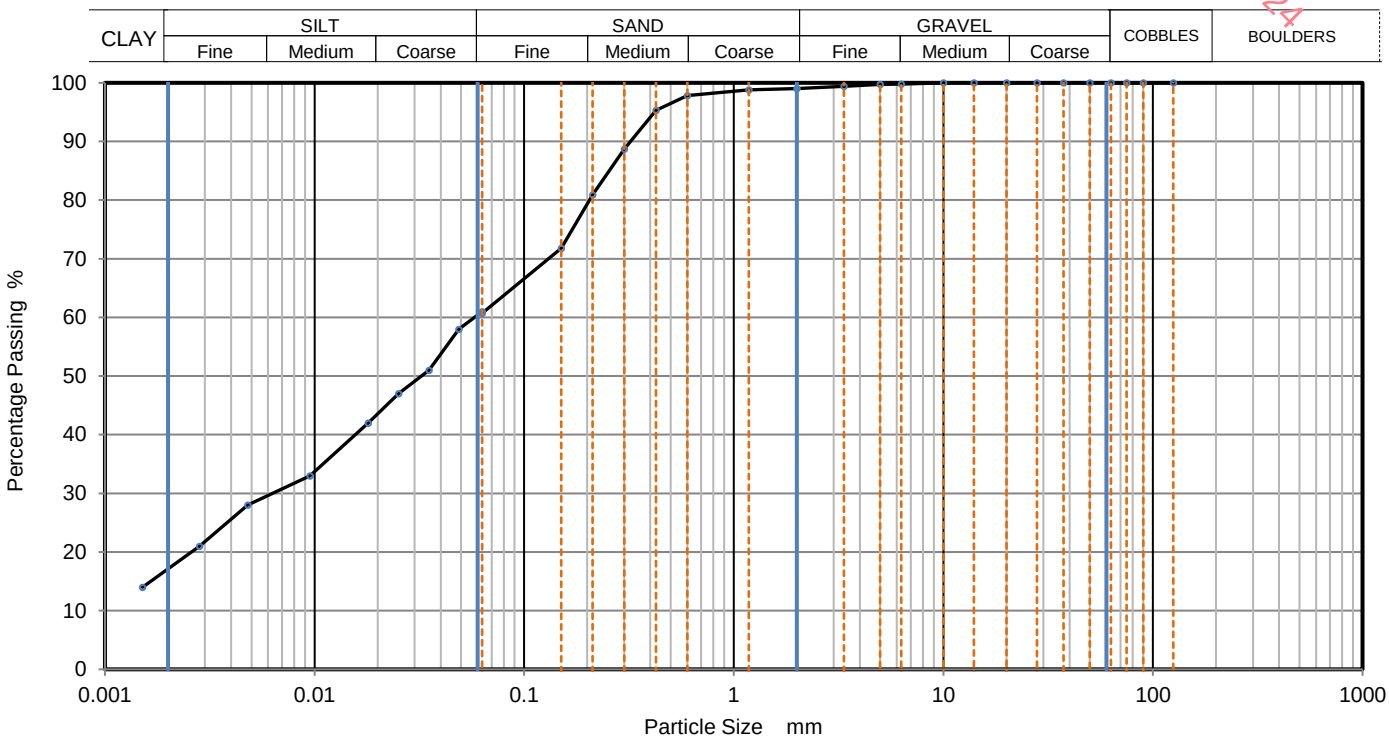
Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-1591**
				Borehole/Pit No.	TP-T5-01
Site Name	Seskin Wind Farm			Sample No.	1
Specimen Description	Brownish grey sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	0.70
				Base	
Specimen Reference	2	Specimen Depth	0.7 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2023120615

RECEIVED: 13/05/2024



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	61
90	100	0.04869	58
75	100	0.03510	51
63	100	0.02514	47
50	100	0.01800	42
37.5	100	0.00952	33
28	100	0.00481	28
20	100	0.00283	21
14	100	0.00151	14
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	99		
0.6	98	Particle density	(assumed)
0.425	95	2.65	Mg/m3
0.3	89		
0.212	81		
0.15	72		
0.063	61		

Dry Mass of sample, g: 401

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.0
Sand	38.4
Silt	43.5
Clay	17.1

Grading Analysis		
D100	mm	
D60	mm	0.0585
D30	mm	0.00615
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

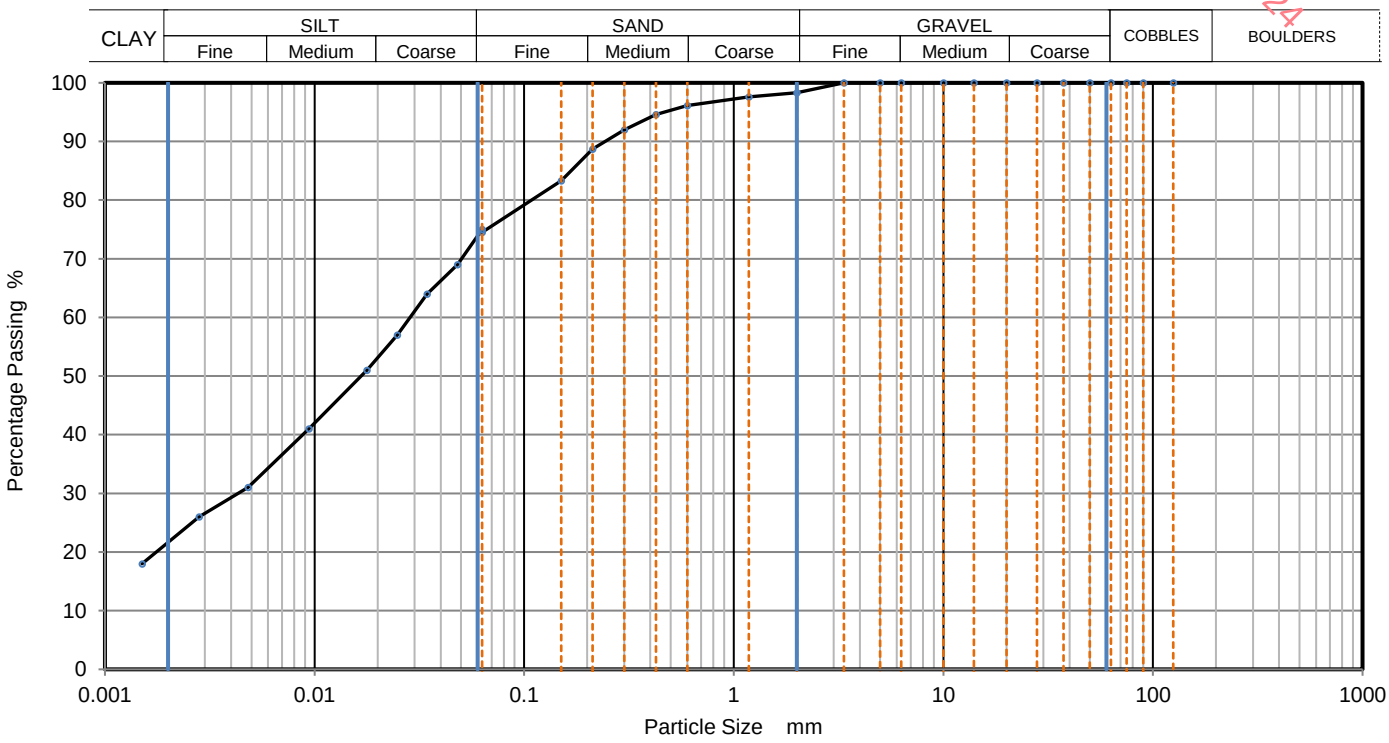
Approved
Stephen Watson

UKAS TESTING

PARTICLE SIZE DISTRIBUTION

				Job Ref	**23-1591**
				Borehole/Pit No.	TP-T7-01
Site Name	Seskin Wind Farm			Sample No.	1
Specimen Description	Brownish grey sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	0.70
				Sample Depth (m) Base	
Specimen Reference	6	Specimen Depth	0.7 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2023120617

RECEIVED: 13/05/2024



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	75
90	100	0.04803	69
75	100	0.03443	64
63	100	0.02482	57
50	100	0.01778	51
37.5	100	0.00940	41
28	100	0.00481	31
20	100	0.00281	26
14	100	0.00150	18
10	100		
6.3	100		
5	100		
3.35	100		
2	98		
1.18	98		
0.6	96	Particle density	(assumed)
0.425	95	2.65	Mg/m3
0.3	92		
0.212	89		
0.15	83		
0.063	75		

Dry Mass of sample, g: 402

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.7
Sand	23.8
Silt	53.0
Clay	21.5

Grading Analysis		
D100	mm	
D60	mm	0.0288
D30	mm	0.00441
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen Watson

Certificate of Analysis

RECEIVED: 19/06/2024

Certificate Number 23-29503 *Issued:* 19-Dec-23

Client Causeway Geotech
8 Drumahiskey Road
Ballymoney
County Antrim
BT53 7QL

Our Reference 23-29503

Client Reference 23-1591

Order No (not supplied)

Contract Title SESKIN WIND FARM

Description 4 Soil samples.

Date Received 14-Dec-23

Date Started 14-Dec-23

Date Completed 19-Dec-23

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

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 23-29503
Client Ref 23-1591
Contract Title SESKIN WIND FARM

RECEIVED: 13/05/2024

			Lab No	2277167	2277168	2277169	2277170
			.Sample ID	TP-T2-01	TP-T4-01	TP-T5-01	TP-T7-01
			Depth	0.40	1.00	1.50	0.70
			Other ID	1	2	4	2
			Sample Type	B	D	D	D
			Sampling Date	08/12/2023	08/12/2023	08/12/2023	08/12/2023
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Inorganics							
pH	DETSC 2008#		pH	7.2	6.6	6.7	5.8
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	24	14	< 10	11

Key: # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

RECEIVED: 13/05/2024

Information in Support of the Analytical Results

Our Ref 23-29503
Client Ref 23-1591
Contract SESKIN WIND FARM

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2277167	TP-T2-01 0.40 SOIL	08/12/23	PT 500ml		
2277168	TP-T4-01 1.00 SOIL	08/12/23	PT 500ml		
2277169	TP-T5-01 1.50 SOIL	08/12/23	PT 1L		
2277170	TP-T7-01 0.70 SOIL	08/12/23	PT 500ml		

Key: P-Plastic T-Tub

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Soil Analysis Notes

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

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

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

Disposal

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

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

End of Report