Appendix 1: EIAR Chapter 2 – Description of the Proposed Project

2.0 DESCRIPTION OF THE PROPOSED PROJECT

2.1 INTRODUCTION

This chapter of the EIAR is a description of the proposed project and provides details on the design, construction, operation and decommissioning phases of the proposed project and associated infrastructure.

The proposed project comprises:

- A proposed wind farm comprising fourteen (14) wind turbines, an on-site 110kV electrical substation and other ancillary infrastructure including access roads and drainage, within a development boundary for infrastructure of 170.5 ha within an overall boundary of 389 ha including biodiversity enhancement lands;
- A proposed grid connection comprising a 110kV underground cable approximately 32 km in length to connect the wind farm to the National Grid at an existing ESBN substation in Srananagh, Co. Sligo;
- A proposed turbine delivery route along the public road network between Killybegs, Co. Donegal and the wind farm site, which will require accommodations at specific locations to facilitate turbine and construction material delivery.

The EIA process necessarily requires an assessment of the likely significant effects of the entire project within the meaning of the EIA Directive and consequently the description provided herein describes all the components and phases of the proposed project including the construction, commissioning, operation and decommissioning of the wind turbines and associated infrastructure, the GCR and the TDR.

The proposed wind farm, GCR and TDR layouts are shown on Figures 2-1, 2-2 and 2-3, respectively.

This chapter is supported by the following appendices, which are referenced throughout.

- Appendix 2-1: Turbine Delivery Route (TDR) Report (Swept Path Analysis)
- Appendix 2-2: Substation and Grid Connection Drawings
- Appendix 2-3: Construction Methodology Lissinagroagh Wind Farm
- Appendix 2-4: Construction Environmental Management Plan (CEMP)
- Appendix 2-5: Spoil and Peat Management Plan
- Appendix 2-6 A,B,C: Ground Investigation Phase 1,2,3
- Appendix 2-7: Surface Water Management Plan:
- Appendix 2-8: Consideration of Afforestation

2.2 STATEMENT OF AUTHORITY

This Chapter has been prepared by Sinéad Ryan, Associate Director and Environmental Engineer with TOBIN, with inputs from Michael Nolan and Ryan Bragge (civil and CAD design), John Dillon (drainage/hydrology/hydrogeology) and TLI (electrical consultant). Both TOBIN and TLI have extensive experience in wind farm infrastructure siting and design.

Sinéad Ryan has over 20 years' professional experience working in the environmental sector in Ireland, with over 10 years in the planning and EIA aspects of onshore renewable energy projects. She has specific experience in constraints-led wind farm design and EIA. Michael Nolan has over 20 years' of

professional experience in building and environmental consulting and in wind farm development projects, leading the CAD/GIS design inputs, layout optimisation, and environmental modelling. Ryan Bragge is a Chartered Civil Engineer with over 20 years' of experience in both consulting and contracting roles across residential, commercial, and mixed-use developments. John Dillon (BSc, MSc, MCIWM, PGeo) is an environmental and hydrogeological specialist with over 18 years of experience in geological and hydrogeological assessment for EIA.

Further details of the project team are provided in Chapter 1 – Introduction.

2.3 PROPOSED PROJECT DESCRIPTION SUMMARY

The following is a summary description of the proposed project:

Proposed Wind Farm

- Fourteen (14) wind turbines with a blade tip height range of 180 m to 185 m inclusive, a rotor diameter range from 149 m to 163 m inclusive, a hub height range from 101 m to 110.5 m inclusive, a minimum ground clearance of 22 m, and all associated foundations, hardstanding and assembly areas;
- A permanent meteorological mast with a height of 100 m, with a lightning finial extending above the mast;
- Modifications to an existing site access on the L61801 local road in the townland of Faughary in the west of the site, to be used as a permanent access during construction and operation;
- A new temporary access on the L6184 local road in the townland of Cherrybrook for use by turbine delivery vehicles during construction only, and subsequent reinstatement;
- Modifications to an existing site access on the L61844 local road in the townland of Lissinagroagh in the southeast of the site, to be used as a temporary access during construction phase only;
- Approximately 7.95 km of new internal access tracks to include passing bays and associated drainage;
- Upgrade of approximately 8.35 km of existing access tracks, to include passing bays and associated drainage;
- Temporary and permanent drainage and sediment control systems;
- Ten (10) clear span bridges and one (1) existing culvert extension at watercourse crossings by access tracks;
- Three (3) borrow pits with a total available area of 63,352 m2 for temporary use during construction. The borrow pits will subsequently be used for storage of excavated material;
- Two (2) temporary construction compounds each on an area of 9,100 m2 to contain site offices, storage containers, bunded fuel storage, waste storage, parking areas and security fencing;
- Seven (7) permanent controlled access points on the L61801 and L6184 Local Roads in the townlands of Faughary and Boleyboy to facilitate turbine delivery and construction works which will remain in place after the construction period;
- A temporary crossing of unnamed local road in the townland of Cherrybrook to facilitate turbine delivery vehicles during construction only;
- All associated underground electrical and communications cabling connecting the wind turbines to the on-site substation (the substation is subject to a separate planning application, see details below);
- All related site works and ancillary development including landscaping and soil excavation;

- Biodiversity enhancement areas (218.5 ha) to provide nesting and foraging habitat for birds and other land improvements; and
- Ancillary forestry felling to facilitate construction and operation of the proposed project.

Proposed Turbine Delivery Route (TDR)

- Accommodation areas at fifty-seven (57) locations along a 122 km TDR to include temporary vegetation management, local strengthening of road edges and street furniture management to facilitate the transport of oversize turbine components to the wind farm site and subsequent reinstatement.

Proposed Substation and Grid Connection

- A permanent 110kV on-site electrical substation to consist of:
  - An EirGrid control building containing worker welfare facilities and equipment store;
  - An Independent Power Producer (IPP) control building containing a high voltage switch room, site offices, kitchen facilities, storeroom and toilet amenities;
  - All electrical plant and infrastructure and grid ancillary services equipment;
  - A telecommunications mast;
  - Parking;
  - Lighting;
  - Security Fencing;
  - Wastewater holding tank;
  - Rainwater harvesting equipment;
  - All associated infrastructure and services including site works and signage;
- A 110 kV underground cable from the on-site 110kV substation to the existing ESBN Srananagh Substation in the townland of Ballysumaghan, Co. Sligo, approximately 32 km in length, of which 30.6 km will be in the public road corridor;
- Eleven (11) existing bridge crossings, of which eight (8) will involve in-road HDD (Horizontal Directional Drill), two (2) will involve off-road HDD and one (1) will be a standard crossing within the bridge deck;
- Eight (8) existing culvert crossings by open trenching;
- All related site works and ancillary development.

A full set of engineering design drawings are included with the planning application and are excerpted in this EIAR where required.

A ten-year planning permission is being sought.

Given the recent advances in turbine technology, and the anticipated lifespan of wind turbines, 35 years is considered to be the optimal operational life for the proposed project. The duration of this operational life allows the proposed turbines to be used to generate clean renewable energy until they have reached the end of their life, rather than being removed prematurely. The proposed grid infrastructure will remain as a permanent part of the national infrastructure, which will be operated by the Transmission System Operator, EirGrid and owned by ESB, the Transmission System Owner.

All elements of the proposed project including the accommodations required for turbine delivery have been considered and addressed in this EIAR.



2.4 PROPOSED PROJECT LOCATION

2.4.1 Proposed Wind Farm Site

The proposed wind farm site is located within the townlands of Boleyboy, Cashelaveela, Cherrybrook, Coolodonnell, Faughary, Killea, Lissinagroagh, Lisdarush, Lugasnaghta, Raheelin, Shasmore, Tawnyfeacle, and Tullyskeherny, Co. Leitrim. The closest turbine is located approximately 3 km northeast of Manorhamilton and approximately 4 km southwest of Kiltyclogher (Refer to Figure 1-2). The proposed biodiversity enhancement lands are located to the northeast and southwest of the wind farm in the townlands of Raheelin, Killea, Lugnasaghta, Cooloodonnell and Tullyskeherney and Cashelaveela.

The proposed landholding within which the wind farm is located extends to approximately 1,096 ha, of which 785 ha are currently commercial forest owned by Coillte. The remaining 311 ha are largely privately-owned third-party lands and comprise a mix of coniferous forestry, marginal agricultural land, peatbogs and transitional scrub. The planning application site boundary extends to 389 ha (Refer to Drawing 10955-2001).

The site is located in close proximity to the Northern Ireland border in County Fermanagh which is approximately 3 km to the north. The site ranges in elevation from 170 to 380 m AOD, with the eastern part of the site bordering Dough Mountain (462m). The northern turbines are situated within the Saddle Hill (375m) Coillte property at elevations between 280 and 310 m AOD generally in undulating terrain. The southern turbines are located between 170 m and 380m AOD.

The land use/activities within the site are primarily commercial forestry, with expanses of wet grassland in the centre, northwest and southeast and upland blanket bog/open peatland particularly in the north and northwest. Site investigations undertaken within the proposed wind farm site indicate that peat depths vary from 0.1 m to 4.5 m in the north and 0.1 m to 1.8 m in the south.

There are a number of watercourses within the site. These range from naturally occurring upland streams to modified drainage channels within forested areas at mid to lower elevations. The southeastern part of the site is characterised by a number of flashy watercourses in deep ravines, the majority of which have existing crossings in place as part of existing forest road network.

The site is located within the Killarga South Groundwater Body (GWB). The aquifers underlying the site are classified as Locally Important in the west to Regionally Important – Karstified further east and southeast. Groundwater vulnerability ranges from Low in the west of the site to Moderate and High moving eastward, with areas of Extreme vulnerability to the north and west around Saddle Hill and south of Dough Mountain.

Coillte forestry within the site comprises different stages of coniferous plantation forestry including recent clear-fell, second rotation, immature, semi-mature and mature forestry.

The site can be accessed from the southeast via the L61844 Local Road diverging from the L6184 off the N16 National Road east of Manorhamilton and from the west via the L61801 diverging from the R282 Regional Road. The local roads are linked to a network of existing Coillte forestry tracks, which provide good coverage, are well maintained and in good condition.

In general terms, the area surrounding the proposed wind farm site can be described as rural with a dispersed settlement type. There are no residential dwellings within 740m (four times the maximum proposed tip height) of a proposed turbine. Residential dwellings are broadly aligned with the local road

network in the area surrounding the site and, for the most part, the site is relatively remote from settlement.

There is one operational wind farm located west of the proposed wind farm site, namely Faughary Wind Farm, comprising three turbines, 119 m in height. There are two further wind farms within 10km, namely Carrickeeny Wind Farm (4 turbines) located approximately 8km to the west and Tullynamoyle (19 turbines) located approximately 10 km to the south. Other operating wind farms at a greater distance from the site include Garvagh Glebe (13 turbines) and Moneenatieve (5 turbines) located 18-20 km to the south. Tullynahaw (11 turbines) and Altagowlan (9 turbines) are located further south in north Co. Roscommon close to the border with Co. Leitrim. Acres Wind Farm (6 turbines) is located approximately 22 km to the north in Co. Donegal. The proposed Croagh Wind Farm (10 turbines) is located approximately 17km to the southwest and Tullynamoyle New (4 turbines) adjacent to the operational Tullynamoyle Wind Farm. Refer to Figure 1-2, Chapter 1 – Introduction.

2.4.2 Proposed Turbine Delivery Route

The proposed TDR commences at the port of entry in Killybegs Co Donegal and extends southeast around Donegal Town before travelling southwest towards Sligo town before approaching Manorhamilton and the proposed Wind Farm site from the south. The total length of the route is 122 km.

Minor accommodations are potentially required at fifty-seven (57) locations along the 122-km route to facilitate the delivery of oversize turbine components to the site. Further details are provided in Appendix 2-1. These include temporary vegetation management, local strengthening of road edges and street furniture management to facilitate the transport of oversize turbine components to the wind farm site and subsequent reinstatement.

These accommodations are located within the following townlands: Cherrybrook, Cornastauk, Diffreen, Donagh Beg, Donagh More, Knocknaclassagh, Manorhamilton, Moneenshinnagh, Lugnafaughery, Sracreeghan and Meenaphuill (County Leitrim), Barroe, Ballytivnan, Cartron, Cloontyprocklis, Doonally, Drumcliff South, Drumkilsellagh, Grange, Rathquarter, Tully, Willowbrook (County Sligo), and Aighan, Aghayeevoge, Ballymagowan, Beaugreen Glebe, Bruckless, Cashelreagh Glebe, Clarcarricknagun, Coolcholly, Darney, Doonan, Drumlonagher, Dunkineely, Finner, Killybegs, Magheracar, Mullans, Tullyearl, Tullygallan (County Donegal).

2.4.3 Proposed Grid Connection Route

The proposed GCR extends from the proposed substation southwest along the public road network for approximately 32km to the existing ESBN 110/220kV Srananagh substation in Co. Sligo.

It extends through the following townlands: Curraghfore, Skreeny, Faughary, Amorset, Clooneen, Milltown, Cornastauk, Srabrick, Cloonaquin, Carrigeencor, Boihy, Aghameelta, Kilcoosy, Corrudda, Cleen, Tully, Killeen, Killanummery, Cleighran, Fawn, Drumahaire, Drumlease, and Carrowcrin Co. Leitrim and Lavally, Drumee, and Ballysumaghan, Co. Sligo.

The proposed GCR utilises the existing public road network where possible prioritising the use of Local and Regional roads to reduce likely significant effects. There are two (2) bridge locations (referred to as Bridge 3 and Bridge 8 on Drawing 05773-DR-152 and 159) where the cable will extend offroad onto private lands to facilitate Horizontal Directional Drilling (HDD) beneath the River Bonet. The private

lands are generally pastoral agriculture. Further details are provided in Appendix 2-2, Appendix 2-3 and Section 2.5.7.

2.5 DESIGN OF PROJECT LAYOUT AND INFRASTRUCTURE

2.5.1 Design Approach and Constraints Analysis

The development or examination of alternative design approaches is an iterative process where there is a balance between achieving an optimised layout, with minimal excavation that avoids risk in terms of poor ground, deep peat or negative influence on the existing drainage regime and that considers feedback received through the consultation process.

Any constraints or restrictions as to the location of infrastructure such as planning policy, environmental buffers and flood risk were also considered from the outset. This iterative process saw the initial positioning of turbines and roads infrastructure being modified as each of the assessments were completed. The turbines and substation have been re-positioned where necessary, access routes have been carefully selected, and a drainage layout developed to complement the final design and take account of flood risk. Once turbine locations were finalised, the alignment and rotation of the hardstands were designed to optimise the balance between access criteria and the required volumes of excavated and imported materials.

The layout of the proposed wind farm has been designed to minimise the likely significant effects, while at the same time optimising energy production by utilising the natural wind resource across the site. Available wind speed is a key factor in determining the economic viability of potential wind energy locations. In 2003, the Sustainable Energy Authority of Ireland (SEAI) produced a Wind Atlas with information on wind speed modelled at 50m, 75m and 100m height above the ground. With turbine technology innovation, turbine models can now capture more of the wind current and have bigger rotors that radically change the economic viability of wind power. This has been reflected in the updated SEAI 2013 Wind Atlas which re-modelled wind speed data for a much wider range of 30m-150m height above ground level. The 2013 SEAI Wind Speed Atlas identifies the site as having a wind speed of between approximately 6.5 m/s and 8.8 m/s at 100m above ground level. This indicates that the site has a suitable wind resource for a commercial wind energy development.

The development design was informed by the following key constraints:

- Turbines were sited a minimum of 740 m (four time the maximum proposed tip height) away from residential dwellings;
- No works within 50m of EPA-mapped watercourses;
- No works within sensitive ecological sites (i.e. SAC, SPA, NHA, pNHA);
- No works within identified flood risk zones;
- Avoidance of recorded monuments;
- Avoidance of telecommunications infrastructure and links, where possible;
- Avoidance of existing electricity, gas and water supply infrastructure.

2.5.2 Ground Conditions

Intrusive ground investigations (GI) were undertaken by specialist sub-consultants Ground Investigations Ireland (GII) and Causeway Geotech in a phased manner from October to February 2022, August to September 2024 and September to October 2025. The objectives of the investigations were to determine the subsurface conditions at the proposed wind farm site and inform

the design and location of wind farm infrastructure. The investigations included rotary borehole drilling, trial pit excavation, gouge augering and peat probing at potential infrastructure locations, including turbines, turbine hardstands, on-site substation, internal access roads and borrow pit locations.

The investigations revealed that the wind farm site is predominantly underlain by gravelly till with peat mainly in the northern section in areas. Soil strength generally increases with depth, transitioning from soft or firm clay to stiff clay, often containing angular to subangular gravel and cobbles. The investigations indicate that peat depths vary from 0.1 m to 4.5 m in the north and 0.1 m to 1.8 m in the south. Groundwater monitoring standpipes were installed in four boreholes (BH01, BH02, BH07 and BH08). Shallow groundwater monitoring was undertaken at four locations (GW3, GW4, GW5, GW6) to monitor the water level in the peat soils. Groundwater monitoring locations are shown on Figure 8-12, Chapter 8 – Hydrology and Hydrogeology. Groundwater monitoring results are provided in Table 8-18. The Ground Investigation and Geophysical Survey Reports are provided in Appendix 2-6 (A-C).

LiDAR (Light Detection and Ranging) surveying was also carried out to further inform the development design.

Further details of ground conditions and surveys undertaken are provided in Chapter 7 – Hydrology and Hydrogeology, Chapter 8 – Lands, Soils and Geology, Appendix 2-5 and 2-6.

2.5.3 Summary of Infrastucture Locations

The locations of the main infrastructural components of the development are summarised as follows:

Turbine T1, 2, 4, 5, 6: located in the north of the site in coniferous forestry at elevations ranging from approximately 270 m AOD (T1) to 350 m AOD (T5).

Turbine T3: on the southwestern slope of Saddle Hill at an elevation of 350-360 m AOD in upland blanket bog.

Turbines T7, T9: located in the central section of the site in marginal land/wet grassland at elevations of approximately 350 m AOD and 245m AOD, respectively.

Turbines T8, T10, T11, T12: located in the southwest of the site in coniferous forestry at elevations ranging from 175 m AOD (T12) to 320 m AOD (T8).

Turbine T13 and T14: located in the southeast of the site in coniferous forestry that ranges in elevation from 200m AOD to 280m AOD.

Access: seven (7) permanent accesses to the wind farm site from the L61801 and L6184 local roads. Two (2) temporary accesses comprising one on the L6184 for turbine delivery only and one on the L61844 for construction phase only.

Meteorological Mast: a 100m-high mast will be installed east of the substation and west of T12.

Borrow Pits: three (3) borrow pits located west of Turbine 1, south of Turbine 8, and southwest of Turbine 13.

Temporary Construction Compounds: two (2) temporary compounds; one located at the western end of the site near the proposed substation and the other located in the northern part of the site between T6 and T4.



Biodiversity Management Lands: located to the south and northeast of the wind farm site to be managed for biodiversity as outlined in Appendix 6-13.

110kV Wind Farm Substation: located in coniferous forestry in the west of the site close to the L61801 Local Road access and the western site entrance.

Grid Connection Route: a 32km-long underground 110kV cable extending from the wind farm substation to an existing ESBN substation in Srananagh, Co. Sligo.

The proposed wind farm layout is shown in Drawings 10955-2010 to 2019 and Figure 2-1. The proposed GCR and TDR are shown on Figures 2-3 and 2-4, respectively.

The layout reflects the outcome of the iterative design process. Further detail on the design approach, development constraints and facilitators, and the alternative turbine layouts and dimensions considered, is provided in Chapter 3 - Reasonable Alternatives.

8°8'30"W

8°5'5"W

54°20'24"N

54°19'12"N

590000

840000

N

T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
T13
T14



Legend

- Application Boundary
- Turbine Layout

Site Layout

- Construction Compound
- Substation Location
- Borrow Pits
- Clear Span Bridge
- Turbine Hardstands
- Site Access Tracks
- Met Mast Location
- Oversail Areas
- Turning Bays

0 0.5 1
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

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Rev	Date	Description	By	Chkd.
A	24/04/2026	First issue	S.P	S.R

Client:

Ireland FuturEnergy

Project:

Lissinagroagh Wind Farm

Title:

Figure 2-1:
Proposed Wind Farm Layout

Scale @ A3: 1:18,000

Prepared by:	Checked by:	Date:
S.Pezzetta	S.Ryan	April 2026

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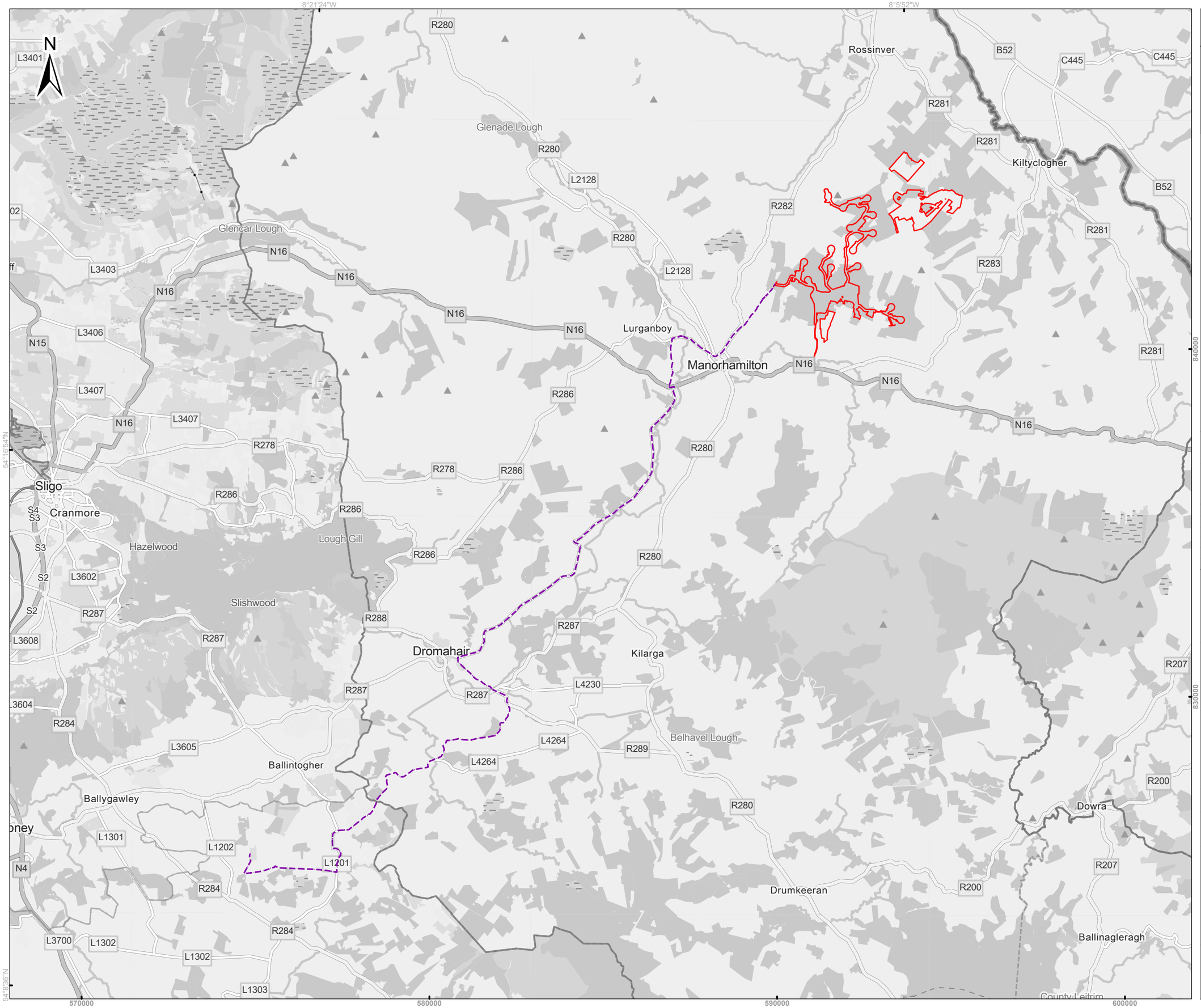
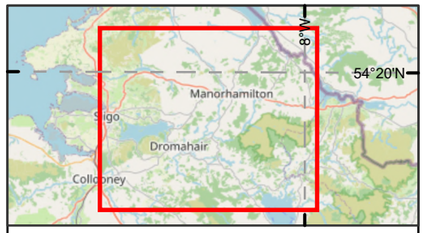
Map Ref: 10955-088-INFRA-P.App.BO-TOB-A

Draft: A





Legend

- Application Boundary
- Grid Connection Route

0 2 4
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

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A	01/05/2026	First issue	K.K	S.R

Client:
Ireland FuturEnergy

Project:
Lissinagroagh Wind Farm

Title:
Figure 2-2:
Proposed Grid Connection Route

Scale @ A3: 1:100,000

Prepared by:	Checked by:	Date:
K.Kale	S.Ryan	May 2026

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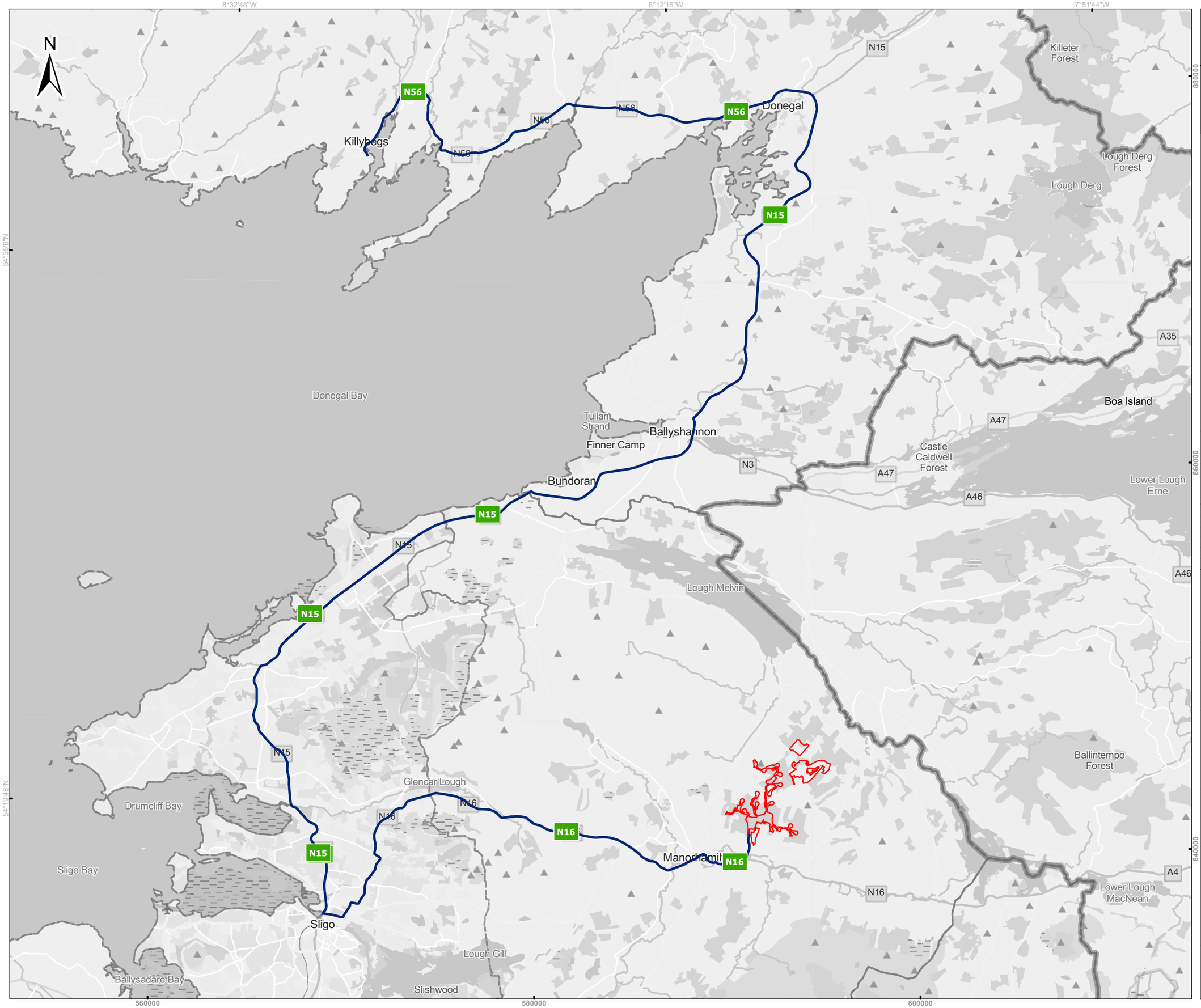

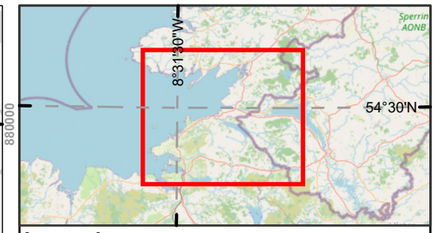

Legend

- Application Boundary
- Turbine Delivery Route

0 5 10
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

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Lissinagroagh Wind Farm

Title:
Figure 2-3:
Proposed Turbine Delivery Route

Scale @ A3: 1:180,000

Prepared by:	Checked by:	Date:
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2.5.4 Wind Turbines

The Grid Reference co-ordinates (ITM) of the proposed turbine locations are listed in Table 2-1.

Table 2-1: Turbine Locations (ITM Co-ordinates)

Turbine ID	Easting (m)	Northing (m)
T1	592596	844330
T2	591893	844060
T3	591465	844376
T4	592752	843851
T5	592751	843332
T6	592099	843475
T7	592179	842837
T8	592310	842380
T9	591553	842883
T10	591544	842345
T11	590776	842501
T12	590885	841986
T13	593280	841205
T14	593558	840837

The proposed turbine parameters which are assessed in this EIAR are detailed in Table 2-2.



Table 2-2: Proposed Turbine Parameters

Item	Parameter	Value
Turbine	Blade Tip Height	180-185 m
	Rotor Diameter	149-163 m
	Hub Height	101-110.5 m
	Min Ground Clearance	22 m
	Colour	White/ Light Grey
	Number of blades	Three bladed
	Tower type	Tubular with horizontal axis
Turbine Foundation	Diameter	28m
	Volume of concrete	1,752 m^3 per turbine
Turbine Hardstand	Volume of stone/aggregate	4,834 m^3 per turbine (Based on plan area of(7,765 m^2)

2.5.4.1 Turbine Specification

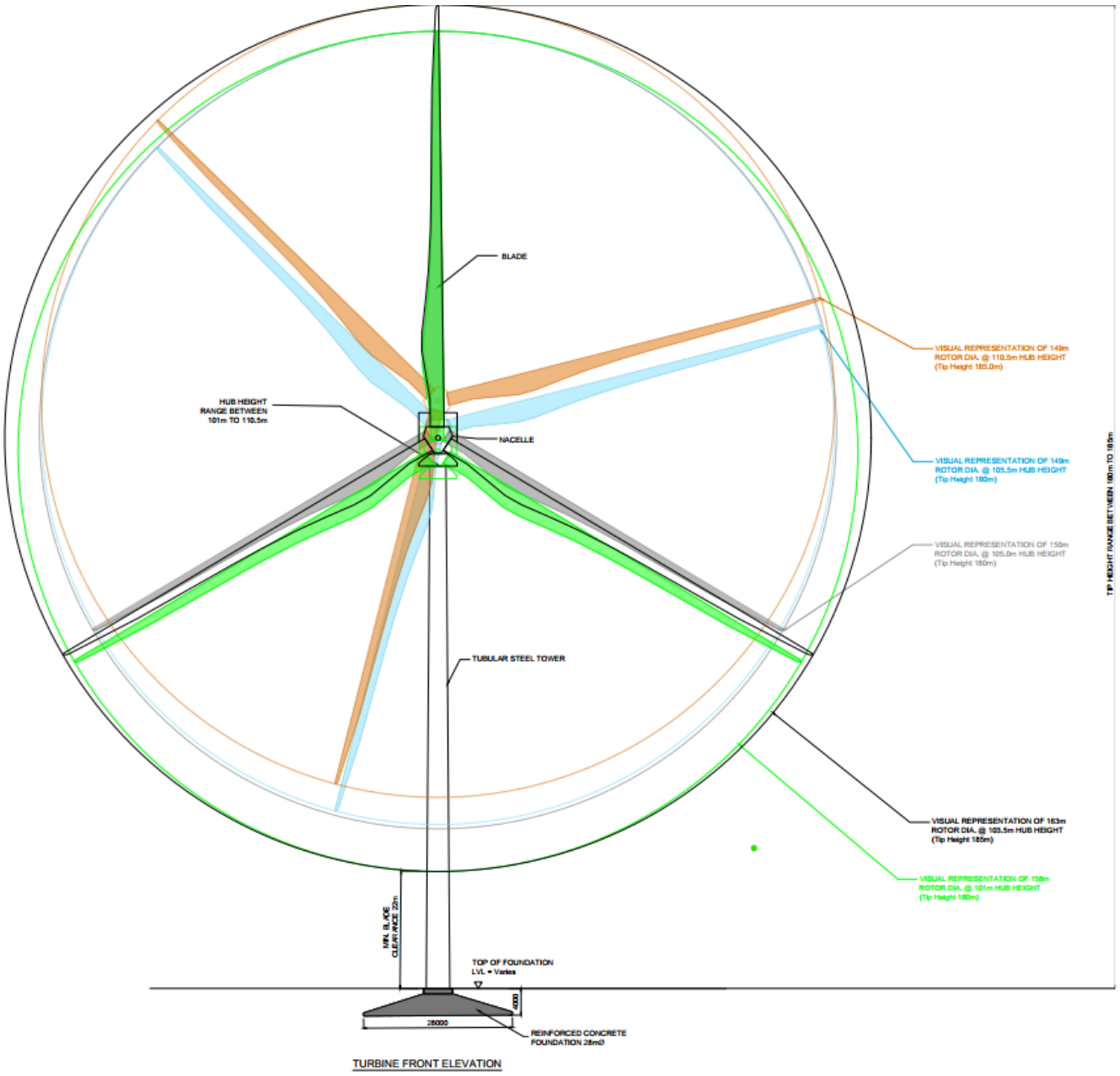
The dimensions of the proposed turbines will be within the parameters set out in the development description (i.e. blade tip height of 180-185 m, rotor diameter of 149-163 m, a hub height of 101-110.5 m), and shown in Drawing 10955-2032, excerpted as Figure 2-4.

Modern wind turbines from the main turbine manufacturers have evolved to share a common appearance and other major characteristics with only minor aesthetic details differentiating one from another. The turbines that will be installed will be conventional three-blade turbines, geared to ensure that the rotors of all turbines rotate in the same direction at all times.

The exact combination of rotor diameter and hub height will be dictated by the final selection of the turbine make and model at turbine selection stage/pre-construction. New turbine models or variants may be available, due to advancements in technology, that were not on the market at the pre-planning / EIA stage, but which will fit within the parameters assessed.

Each discipline within this EIAR has assessed the proposed turbine parameters, as presented in Table 2-2, to ensure all scenarios have been assessed.

Figure 2-4: Turbine Front Elevation showing tip height, hub height and rotor diameter ranges (Extract from Drawing 10955-2032)



The design is in line with the current Wind Energy Development Guidelines (2006), which are currently under review. The Revised Draft WEDG's were published in 2019.

At the time of writing, the Revised Draft WEDG's (2019) remain in draft, they have not been adopted and therefore may be subject to change before they are finalised. Nonetheless, the guidelines relating to noise, shadow flicker, visual amenity setback, environmental assessment, consultation obligations, community dividend and grid connections have been considered in the design of the Proposed Project and have been complied with to the extent that they represent

current best practice. This is discussed in more detail in each of the individual chapters in this EIAR.

- Shadow flicker – it is proposed to eliminate shadow flicker through the installation of control modules (further details provided in Chapter 10 – Shadow Flicker);
- Electrical grid connection – cables are proposed to be located underground; and
- Proximity to sensitive receptors – a minimum turbine set-back of four times the maximum tip height (185m) is provided.

At the time of writing this EIAR, the relevant guidelines remain those published in 2006.

2.5.4.2 Power Output

The proposed wind turbines will each have an assumed rated electrical power output of 5.5 – 7.2 MW depending on the turbine model constructed, which will be determined following a competitive procurement process.

For the purposes of this EIAR, a minimum rated output of 5.5 MW and a maximum rated output of 7.2 MW have been used to calculate the power output of the proposed wind farm, which will result in an estimated installed capacity of 77-100.8MW.

The following formula is used to calculate output: A x B x C = Megawatt Hours of electricity produced per year, as shown in Table 2-3.

Table 2-3: Power Output Calculation

A	No. of Hours in a calendar year	8,760 hours
B	Capacity Factor [1]	33%
C	Total Rated Output of Wind Turbines	77-100.8 MW
A x B x C	Annual Power Output in MWh	222,591 – 291,393 MWh

Based on the above, the proposed wind farm has the potential to produce 222,591 MWh to 291,393 MWh of electricity per year, which will be sufficient to supply the equivalent of 52,998 to 69,379 Irish households with electricity per year[2].

[1] The capacity factor of 33% takes into account the intermittent nature of the wind, the availability of wind turbines and array losses etc at the project location based on an EirGrid study of wind and solar energy in the region of the proposed project, classed as Region A in the study, dated 31 March 2025- ECP-2.4 - Solar and Wind Constraints Report - Results for Area A v1.0 (https://cms.eirgrid.ie/sites/default/files/publications/ECP-2.4-Solar-and-Wind-Constraints-Report-Results-for-Area-A-v1.0.pdf)

[2] The CRU Energy Monitoring Report 2023 (published November 2024) states that the average Irish household uses approximately 4,200 kWh (4.2 MWh) of electricity per year (https://www.cru.ie/about-us/news/cru-energy-monitoring-report-2023/).

2.5.4.3 Turbine Blades and Nacelle

The turbines will be three bladed, tubular tower model with horizontal axis. The rotor blades are bolted to the central hub, which is connected to the nacelle. The nacelle holds the following turbine components:

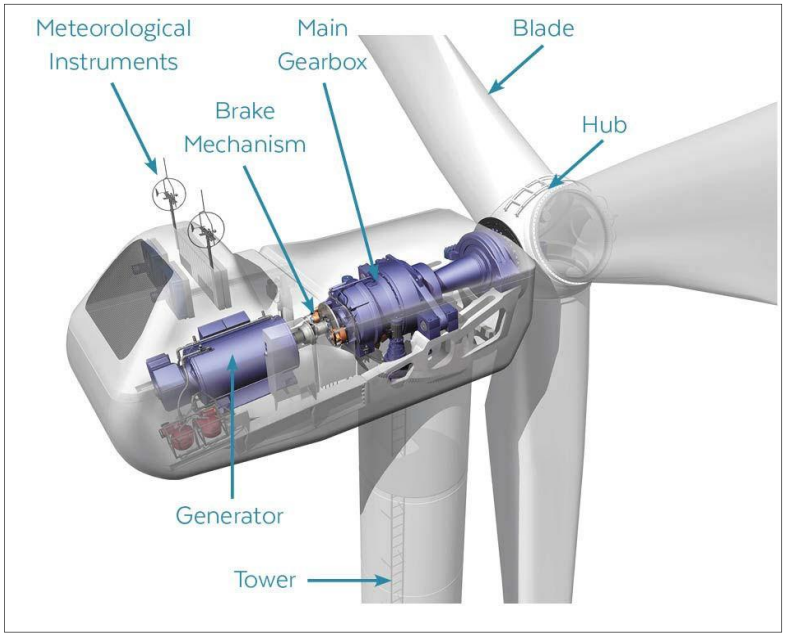
- Generator
- Electrical components
- Aviation lighting to Irish Aviation Authority specifications

The blades of modern turbines are made of fibreglass or carbon fibre reinforced polyester and are aerodynamically shaped to improve efficiency and lower noise production. The blades on this site will be fitted with serrated edges, an additional noise reduction mechanism.

A turbine blade begins generating electricity at wind speeds of 2 to 4 m/s with optimum power generation at wind speeds of approximately 9 to 16 m/s. Generation plateaus between 16 and 25 m/s and turbines shut down at wind speeds greater than 25 m/s in order to protect themselves from excessive wear, although some turbines are designed to operate at up to 30 m/s. Modern turbines turn at between 3 and 20 revolutions per minute (rpm) depending on wind speed and design of turbine.

The entire nacelle (shown in Figure 2-5) and rotor are designed to rotate, or 'yaw', in order to face the prevailing wind. A wind vane located on the nacelle of the turbine controls the yaw mechanism. Rotors of all the proposed turbines will rotate in the same direction. A control unit is located at the base of the turbine and an internal ladder or lift leads up to the nacelle where the shaft, gearbox and generator are located.

Figure 2-5: Turbine Nacelle and Hub Components



2.5.4.4 Turbine Tower

The turbine tower is a conical steel tube with multiple-layer paint finish. Towers generally comprise a steel ring at the base of the tower which is assembled on top of the concrete foundations using locally supplied concrete and then pre-stressed. The tower is delivered to site in three to six sections. The first section is bolted to the steel base, which is cast into the concrete foundation. The base of the tower is around 5m in diameter, tapering to approximately 2-3m where it is attached to the nacelle (Figure 2-5). The tower is accessed by a galvanised steel hatch door, which will be kept locked except during maintenance. The nacelle dimensions can vary depending on the final hub height and the model which is used. The exact details of the turbine tower will be dictated by final selection of the turbine make and model, but it will be within the proposed range of parameters outlined in Table 2-2 and assessed in this EIAR.

2.5.4.5 Turbine Transformer

When operating, the rotational energy of the blades is utilised to drive the wind turbine generator. The generated power is in the form of low voltage (approximately 660 volts) and connected via low voltage cables to the wind turbine transformer located within the tower or in the turbine nacelle. This transformer steps up the generated low voltage to medium voltage (approximately 33kV) which supports a reduction of electrical losses when transmitting power over large distances. The medium voltage from the wind turbine transformers connects to the proposed on-site substation which again will be stepped up to high voltage (110 kV) for connection to the transmission system.

2.5.4.6 Turbine Foundations

Each wind turbine will require a reinforced concrete foundation comprising a base slab bearing onto rock or other competent substrata with a central upstand to support the tower. The foundations for each turbine will be designed by the appointed Civil Designer. The exact size of the foundation will be dictated by the turbine manufacturer, and the final turbine selection will be the subject of a competitive tender process but will be of approximately 28m in diameter with thickness of 4m at the collar, tapering towards the edge. Different turbine manufacturers use different shaped turbine foundations, ranging from circular to hexagonal and square, depending on the requirements of the final turbine supplier. Based on a foundation design of 28m diameter and up to 4m thickness, a total of approximately 24,528 m^3 of concrete (1,752 m^3 per turbine) will be required.

Construction of the turbine foundations and hardstands will require excavation of the surrounding soil from the foundation and crane hardstanding area to founding level with access being provided from adjacent access tracks at or near the surrounding ground level. The soil will be replaced with granular fill where required.

The turbine foundation transmits any load on the wind turbine into the ground. After the foundation level of each turbine has been formed, the bottom section of the turbine tower or "can" is levelled (Plate 2-1 below). Reinforcing steel is then built up around and through the can (Plate 2-2 below), and the outside of the foundation is shuttered with demountable formwork to allow the pouring of concrete.

Plate 2-1: Levelled turbine tower "can"



Plate 2-2: Steel reinforcement being added



2.5.4.7 Turbine Colour

The turbines are multi-ply coated to protect against corrosion. Turbines will be of an off-white or light grey colour to blend into the sky background and minimise visual effects as recommended by industry best practice and guidance set out in the 2006 WEDG's and Nature Scot (2017) *Siting and Designing Windfarms in the Landscape*.

2.5.4.8 Turbine Design Flexibility

The following describes the details of the proposed project that cannot be confirmed at planning application stage and for which design flexibility is sought:

- The wind turbine blade tip height to range from 180m– 185m inclusive;
- The wind turbine rotor diameter to range from 149m – 163m inclusive;
- The wind turbine hub height to range from 101m to 110.5m inclusive.

The proposed range of wind turbine parameters is limited to a variation of 5m in tip height, 14m in rotor diameter and 9.5m in hub height.

The planning application and accompanying documents and drawings will contain the necessary information and details of the parameters set out above on which the application can be made and decided.

2.5.4.9 Crane Hardstands

The turbine supplier will have a requirement for a crane hardstand area to be constructed beside each turbine to facilitate access, turbine assembly and turbine erection. The hardstand layout chosen is an amalgamation of the requirements of a number of turbine suppliers to ensure versatility should the supplier be changed without altering the planning requirements. The layout of the hardstand is designed to accommodate the delivery of the turbine components prior to their erection and to support the cranes during erection. The hardstands are left in situ for the operational life of the turbine for maintenance purposes.

Each hardstand consists of levelled and compacted hardcore around the turbine base. It is used to accommodate large cranes used in the assembly and erection of the turbine,

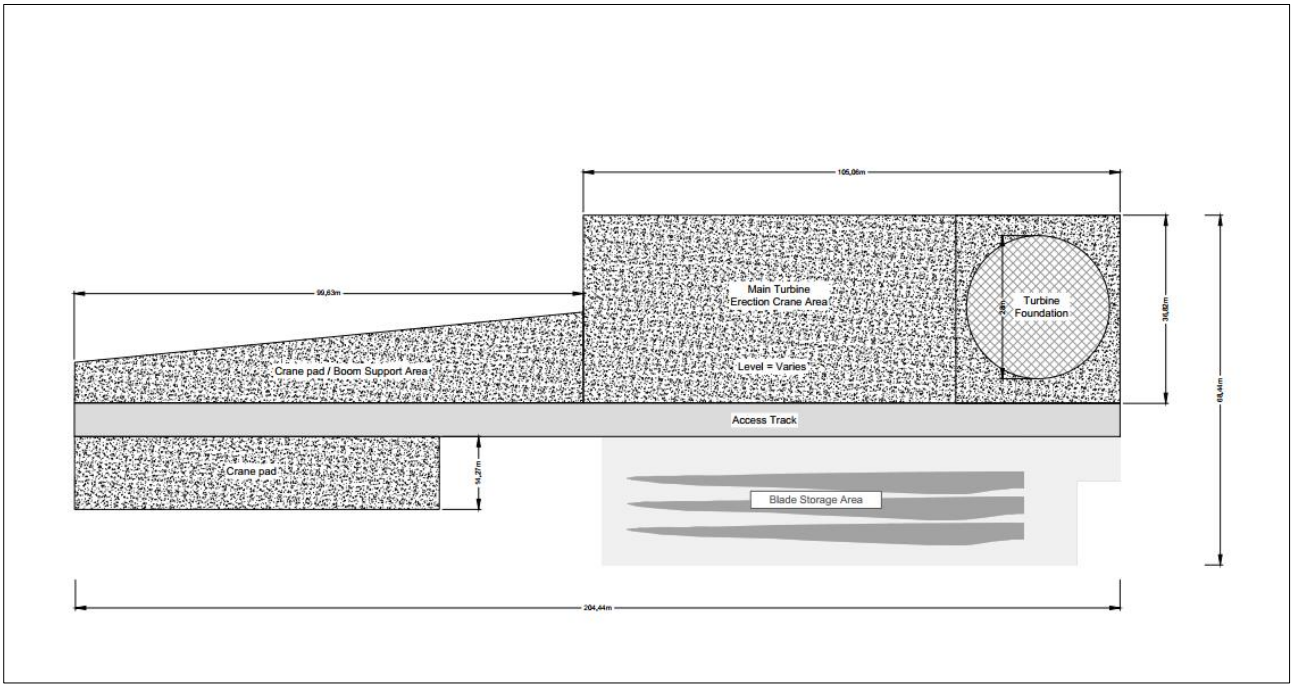
offloading and storage of turbine components, and generally provide a safe, level working area around each turbine position. The hardstands are extended to cover the turbine foundations once the turbine foundation is in place. The hard-standing area is intended to safely accommodate a large 350-750 tonne SWL crane during turbine assembly and erection.

Levelled assembly areas will be located on either side of each hardstand. These are required for offloading turbine blades, tower sections and hubs from trucks until such time as they are ready to be lifted into position by cranes. They will be partly surfaced with Clause 804 hardcore material or similar and partly cleared of vegetation / levelled. They cover an area of 105m x 37m. The hardstand area also includes two secondary crane pads on the opposite end of the hardstand to the turbine and a blade storage area adjacent to the hardstand, constructed from compacted hardcore material

The size of hardstand assessed for the purposes of this EIAR is detailed in Table 2-2, and it accounts for the proposed range of turbine parameters. The design of the hardstand crane pads and blade storage area are shown on Drawing 10955-2031 and Figure 2-6.

Occasional surface maintenance will be required in the operational phase of the proposed wind farm, but this is anticipated to be very minimal and infrequent.

Figure 2-6: Crane Hardstand Layout



2.5.5 Access from Public Roads & Internal Access Tracks

2.5.5.1 Accesses from Public Roads

There are seven (7) proposed permanent accesses to the proposed wind farm site:

Permanent Access 1

Located on the L61801 local road to the south of the proposed substation. This is an existing Coillte forest entrance, which will be upgraded to provide vehicular access for construction of the wind farm. This will provide access to the site for material and equipment deliveries (i.e. delivery of stone, steel, concrete and all materials) and staff during construction and also during operation and decommissioning. It will be used by maintenance vehicles during the operational phase, as well as for ongoing forestry and agricultural activities and will remain in place during decommissioning.

Permanent Accesses 2, 3, 4, 5, 6, 7

There are six (6) locations where the L6184 Local public road must be accessed to facilitate the internal movement of vehicles of turbine and material delivery vehicles and general construction traffic within the proposed wind farm site (referred to as Permanent Access 2, 3, 4, 5, 6 and 7 on Drawing 10955-2070). At the end of the construction phase, barriers will be erected to control access. Construction traffic arriving from off-site will not be permitted to enter or exit the proposed wind farm site at these locations, and will be instructed to use either the L61801 or L61844 accesses.

Temporary Access 1

There will be a temporary access on the L61844 local road to the south of Turbines 13 and 14. This is an existing Coillte forest entrance, which will be upgraded to provide vehicular access for construction of the wind farm. This will provide access to the site for material and equipment deliveries (i.e. delivery of stone, steel, concrete and all materials) and staff during construction.

Temporary Access 2

There will be a temporary access on a minor local road diverging from the L6184 in the townland of Cherrybrook to facilitate turbine delivery vehicles during construction only. There will be 2 crossings of the L6184 and the minor road at this location. The access will be used for turbine component deliveries only and will then be gated.

All permanent accesses have been designed to provide adequate visibility in accordance with TII guidance. Visibility splays for the permanent access points are shown on Drawings 10955-2071 to 2077.

Access locations are shown on Figure 2-7. Further details are provided in Chapter 16 - Traffic and Transportation, Appendix 16-1 Traffic Management Plan and Drawing 10955-2070.

2.5.5.2 Internal Access Tracks

The proposed wind farm has been designed to utilise existing Coillte forestry tracks as far as possible. Of the 16.3 km of internal access tracks required, over 50% or 8.35 km will consist of upgraded existing tracks and 7.95 km will consist of newly constructed tracks.

The internal access tracks will be constructed during the construction phase of the wind farm and will remain in situ for the operational life of the wind farm.

Access tracks will have a running width of approximately 5 m (5.5m including shoulders), with wider sections at passing bays, some corners and on the final approaches to turbine hardstands and substation compound. At areas with oversail, and at site entrance junctions with the public roads, additional areas will be hard-surfaced, as shown on Drawings 10955-2071 to 2079.

Required road base will be sourced from the proposed on-site borrow pits, where possible, and supplemented by local quarries as required. The final graded surface material will be sourced from local quarries listed in Table 2-4.

Excavated spoil/peat from road construction will either be placed and profiled on either side of constructed roadways or used to reinstate the borrow pits as detailed in the Spoil and Peat Management Plan (Appendix 2-5).

All new tracks will be constructed with a 2% camber to aid drainage and surface water runoff and will be excavated to suitable formation level. As peat depths beneath the proposed new tracks do not exceed 1 m, no floated roads will be required.

Details of the drainage design along the access tracks are provided in Drawings 10955-2050 to 2056.

All road-worthy vehicles will not be permitted to travel off road within the proposed wind farm site, unless for short distances using bog mats. Only specialised vehicles required for construction are permitted off-road.

Occasional surface maintenance of access tracks will be required during the operational phase, but this is anticipated to be minimal. During the operational phase, all vehicles will use the permanent access on the L61801, as described above.

8°8'30"W

8°5'5"W

54°20'24"N

54°19'12"N

590000

840000

N

T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
T13
T14



Legend

- Application Boundary
- Turbine Layout
- Site Access Tracks
- Site Access Entrance / Crossing Locations

0 0.5 1
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

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Rev	Date	Description	By	Chkd.
A	07/05/2026	First issue	K.K	S.R

Client:

Ireland FuturEnergy

Project:

Lissinagroagh Wind Farm

Title:

Figure 2-7:
Site Entrances and Access Points

Scale @ A3: 1:18,000

Prepared by:	Checked by:	Date:
K.Kale	S.Ryan	May 2026

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Map Ref: 10955-100-S.EnT-Access-TOB-A

Draft: A

2.5.7 On-Site Electrical Substation

It is proposed to construct an on-site 110kV electrical substation within a compound with an area of 11,600 m^2 secured by a 2.6m high palisade fence to transform and transmit the electricity generated by the turbines to the proposed grid connection node. The substation will be located adjacent to the L61801 access, as shown on Figure 2-1 and Drawings 10955-2010 and 2071.

The substation has been designed by TLI to EirGrid and ESB specifications, as shown on Drawings 05773-DR-130, 133, 134, 135, 136, 137, 138, 141, 150 and 151 and will be constructed in accordance with these specifications.

The construction methodology is summarised in Section 2.8.5 below and full details are provided in Appendix 2-3.

The substation compound will contain an Independent Power Producer (IPP) Medium Voltage (MV) Switch room (approximately 450m^2), an Eirgrid control building, a Transformer compound and Busbar compound and other electrical equipment. The IPP building will also contain offices and welfare facilities.

Internal fences will also be provided to segregate different areas within the compound. Lighting will be required on-site and this will be provided by lamp standards located around the substation and exterior wall mounted lights on both buildings equipped with sensors. The lights will normally remain off and be controlled by a switch at the gate when entered the compound.

The main control building and smaller switchgear building will include the Independent Power Producer and ESB control room, as well as office space and welfare facilities for staff during the operational period. Toilet facilities will be installed with a low-flush cistern and low-flow wash basin. There will be a very small water requirement for occasional toilet flushing and hand washing during periodic maintenance visits. A rainwater harvesting system will be installed to supply water to toilet facilities and bottled water will be provided for potable use.

It is proposed to manage wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank, with all wastewater being tankered off-site by a permitted waste collector to a suitable wastewater treatment plant. It is not proposed to treat wastewater on-site. The collection period for the tank will be agreed with the permitted waste collector on installation. The tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. Full details of the proposed tank alarm system will be submitted to Leitrim County Council in advance of any works commencing on-site. The wastewater storage tank alarm will be integrated with the on-site electrical equipment for alarm notification that will be monitored remotely 24 hours a day, 7 days per week.

2.5.7.1 Internal Underground Cabling

The turbines will be connected to the on-site substation by underground MV cables. Fibre-optic cables will also connect each turbine to the turbine control system located within the

control building. The electrical and fibre-optic cables running from the turbines to the on-site substation compound will be run in cable ducts approximately 1 metre below the ground surface within the proposed internal tracks and/or their verges or within clear span bridge decks where a watercourse is required to be crossed.

2.5.8 Grid Connection

The proposed on-site substation will connect via a 110 kV underground cable to an existing ESBN substation in Srananagh, Co. Sligo. A connection agreement will be sought from the grid system operator by application to EirGrid.

The total length of the connection is approximately 32 km, of which 30.6 km will be in the public road corridor, as shown in Figure 2-2. The remainder is located within Coillte lands and other private lands and a short section is within the proposed wind farm site.

The grid connection has been designed by TLI to EirGrid and ESB specifications, as shown on Drawings 05773-DR-100 to 148 and will be constructed in accordance with these specifications.

The connection will consist of three (3) 160mm diameter HDPE power cable ducts, two (2) 125mm diameter HDPE communications ducts and one (1) 125mm earth continuity conductor duct to be installed in an excavated trench, typically 825mm wide by 1,315mm deep, with variations on this design to adapt to bridge crossings, service crossings and watercourse crossings.

2.5.8.1 Watercourse Crossings

Eleven (11) existing bridge crossings are required, of which eight (10) will involve in-road HDD (Horizontal Directional Drill), two (2) will involve off-road HDD and one (1) will be a standard crossing within the bridge deck. Details of HDD crossings are provided in Drawing 05773-DR-152 to 162. There will also be eight (8) existing culvert crossings using open trenching with either an undercrossing or an overcrossing, depending on the depth of the culvert to be confirmed during pre-construction surveys. Details of culvert crossings are provided in Drawing 05773-DR-126 and 127.

The construction methodology is summarised in Section 2.8.5 below and full details are provided in Appendix 2-3.

2.5.8.2 Joint Bays

Joint bays are to be installed approximately every 700m to 850m along the route to facilitate the jointing of two lengths of cable to form one continuous cable, as shown on Drawing 05773-DR-144 and 145. They are typically 2.6m x 6m x 1.75m pre-cast concrete structures installed below finished ground level. Joint Bays will be located in the non-wheel bearing strip of roadways where possible, however given the narrow profile of local roads this may not always be possible.

In line with the Department of Transport (2026) '*Interim Guidance to Road Authorities regarding the proposed placement of Medium or High Voltage electricity assets, including ducts, cables, and associated infrastructure under public roads*', joint bays will be installed

at a minimum of 600 mm below finished road level and shall have a precast concrete cover installed prior to backfilling back up to road level.

In association with joint bays, communication chambers will be installed at each joint bay location to facilitate communication links between the proposed on-site substation and the 110/220 kV substation at Srananagh. The communications chambers will be 1.3 m x 0.98 m x 1.37 m pre-cast concrete structures.

Further details are provided in Appendix 2-3.

2.5.9 Turbine Delivery Route (TDR)

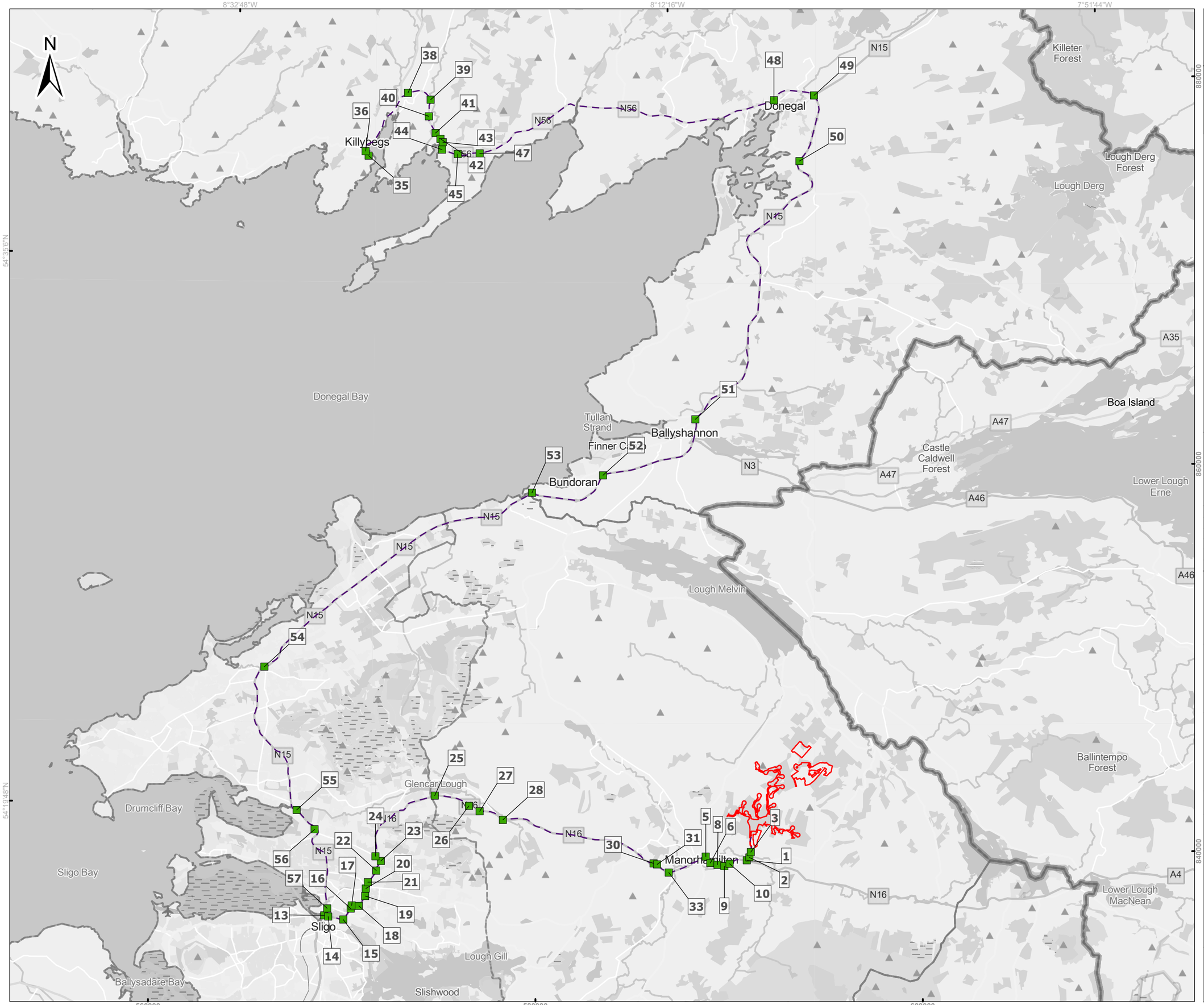
The proposed wind farm site is located approximately 2.5km north of the N16 National Primary Road at its closest point providing relatively straightforward access to the national road network in the northwest of the country. The port of entry chosen for turbine delivery is Killybegs Port in Co. Donegal, which is the closest port of entry to the site. This port has also been successfully used for the delivery of wind turbines for other Irish wind farm projects.

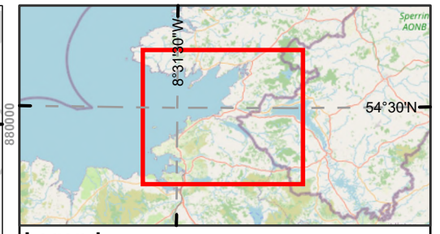
At Killybegs Port, the route travels along the R263 Regional Road before joining the N56 National Secondary Road and running south eastwards towards Donegal Town. East of Donegal Town, the route joins the N15 National Primary Road running south-westwards towards Bundoran. Southwest of Bundoran on the N15, the route enters Co. Leitrim and continues south eastwards towards Sligo Town. At the junction of the N15 and N16 in Rathquarter, Sligo Town, the route turns left onto the N16 National Primary Road travelling northeast through Manorhamilton on the N16 for 2.5 km before exiting the N16 on the L6184 Local Road for 0.6 km to the proposed wind farm southern access point. The total length of the route is 122 km. The route is shown in Figure 2-8.

The route extends through the functional areas of three local authorities – Donegal County Council, Sligo County Council and Leitrim County Council.

An assessment of the route between Killybegs Port and the proposed wind farm site was undertaken by Collett and Digital Land Surveyors. A number of potential pinch points (nodes) along the route were identified and assessed. Further assessment was carried out through topographical survey and *Autodesk Vehicle Tracking*™ to determine what, if any, accommodations are required at these pinch points to allow the turbine components to be transported to the site. Accommodations range from hedgerow trimming/clearing to facilitate oversail of turbine blades to the temporary placement of hardcore to allow the oversize vehicles to pass. Further details are provided in Appendix 2-1.

These accommodations do not form part of the current planning application although they are assessed in this environmental impact assessment. If planning consent is required for the proposed temporary accommodations for turbine delivery, a further consenting process will be used to obtain permission for the accommodations. All works associated with the route have been assessed as part of this EIAR. The decommissioning phase for the project would not require the use of the TDR as the turbine components would be cut up on site to sizes that would fit on standard articulated trucks.





Legend

- Application Boundary
- Turbine Delivery Route
- Accommodations

0 5 10
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

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Rev	Date	Description	By	Chkd.
A	07/05/2026	First issue	S.P	S.R

Client:
Ireland FuturEnergy

Project:
Lissinagroagh Wind Farm

Title:
Figure 2-8:
TDR showing Accommodation/Pinch Point Locations

Scale @ A3: 1:180,000

Prepared by:	Checked by:	Date:
S.Pezzetta	S.Ryan	May 2026

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Map Ref: 10955-089-TDR-POIs-TOB-A

Draft: A

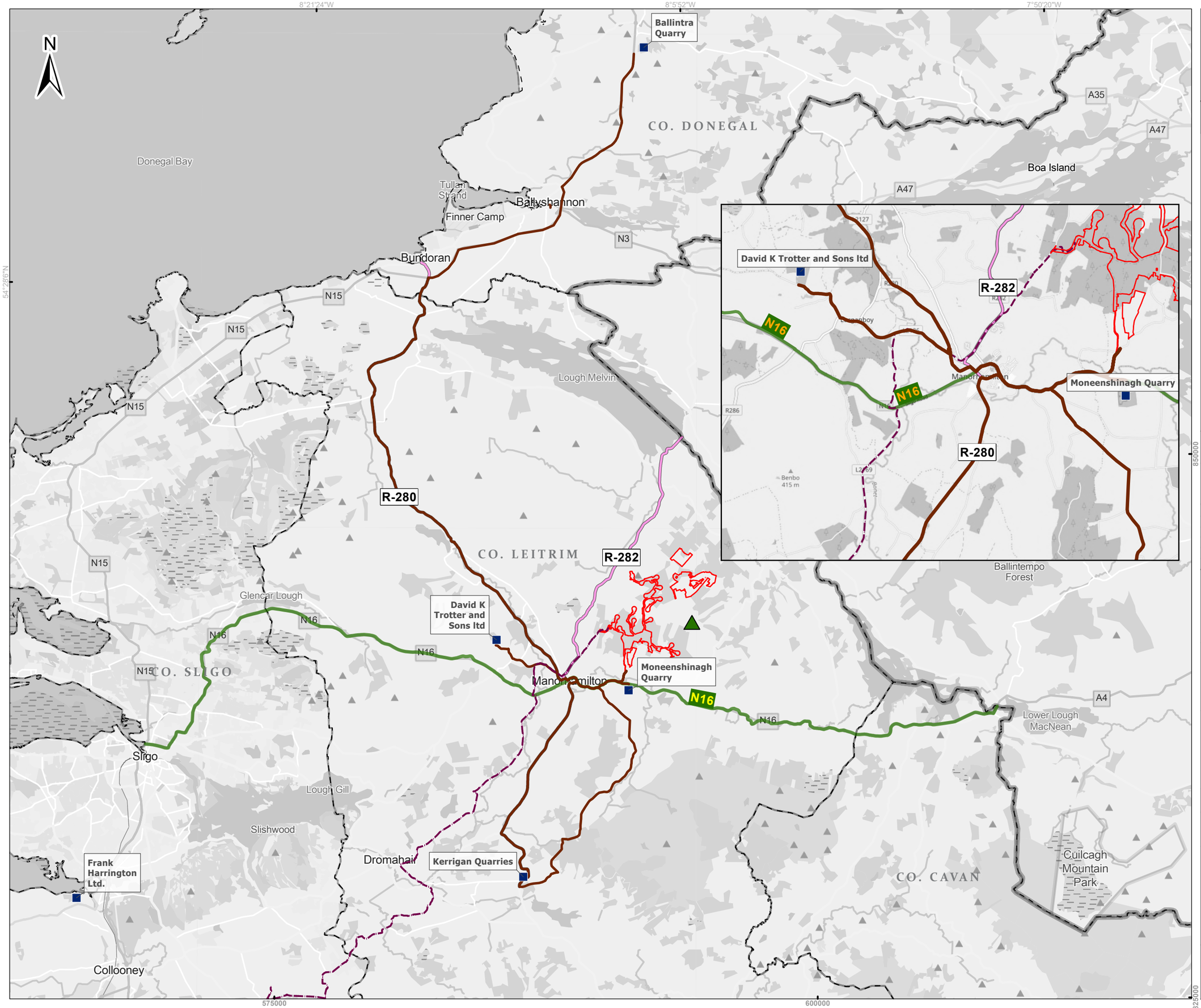
2.5.11 *Material Delivery Routes*

It is proposed that construction materials coming from the north and west will approach along the N16 and R282 accessing the western site entrance via the L61801 and materials coming from east and south will approach along the N16 and L6184 accessing the southeastern site entrance via the L61844. Material providers will be instructed to only use these routes to approach the site, regardless of their source.

The proposed quarries and delivery routes are detailed in Table 2-4 and Figure 2-9.

Table 2-4: Quarries and Delivery Routes

Quarry	Location	Access Route
Roadstone Ballintra	Ballintra, Co. Donegal	N15-R280-R282- L61801 or N16- L6184
Moneenshinagh Quarry	Moneenshinagh, Co. Leitrim	N16-L61801 or N16- L6184
Kerrigan Quarries	Dromahair, Co. Leitrim	R287-N16-R282- L61801 or N16-L6184
Frank Harrington Quarry	Abbeytown, Co. Sligo	N59-R290-R287- N16-R282- L61801 or N16-L6184
David K Trotter and Sons	Lurganboy, Co. Leitrim	L4134-L2136- R282-L61801 or N16- L6184





Legend

- Application Boundary
- Grid Connection Route
- Quarries Locations
- Construction Haul Routes
- Dough Mountain

Roads

- National Roads
- Regional Roads
- County Boundaries

0 4 8
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

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Rev	Date	Description	By	Chkd.
A	01/05/2026	First issue	K.K	S.R

Client: Ireland FuturEnergy

Project: Lissinagroagh Wind Farm

Title: Figure 2-9: Construction Material Delivery Routes

Scale @ A3: 1:160,000

Prepared by:	Checked by:	Date:
K.Kale	S.Ryan	May 2026

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Map Ref: 10955-096-Haul.R-P.App.BO-TOB-A

Draft: A

There will be 8 passing bays constructed on the L6184 which will be used to allow safe passing of vehicles on this road through all phases of the project, particularly the construction phase when HGV traffic will be highest (refer to Drawing 10955-2080). The passing bay design is in accordance with the TII Publication DN-GEO-03031 Rural Road Link Design (May 2023). The passing bays are proposed to be 40m long (including 10m tapers) and the overall width including the carriageway to be 6.5m (maximum).

2.5.12 Meteorological Mast

It is proposed to install a permanent meteorological mast, 100 m in height, within the site at the location shown on Figure 2-1. The mast will be equipped with wind monitoring equipment at various heights to provide wind data to the wind farm operator.

The mast will be a slender, free-standing lattice structure with a lightning finial extending above it and will be constructed beside a hardstanding area of 40m x 15m, which will be used to erect the mast, as shown on Drawing 10955-2036.

2.5.13 Temporary Construction Compounds

Two temporary construction compounds will be constructed to provide office space, welfare facilities, car parking and hardstands for storing materials. One will be located at the southern end of the site (south of T11), while the second will be at the northern end (north of T6). These will measure 9,100m^2, respectively, and the locations are shown on Figure 2-1 and Drawing 10955-2030.

2.5.14 Other Ancillary Infrastructure and Works

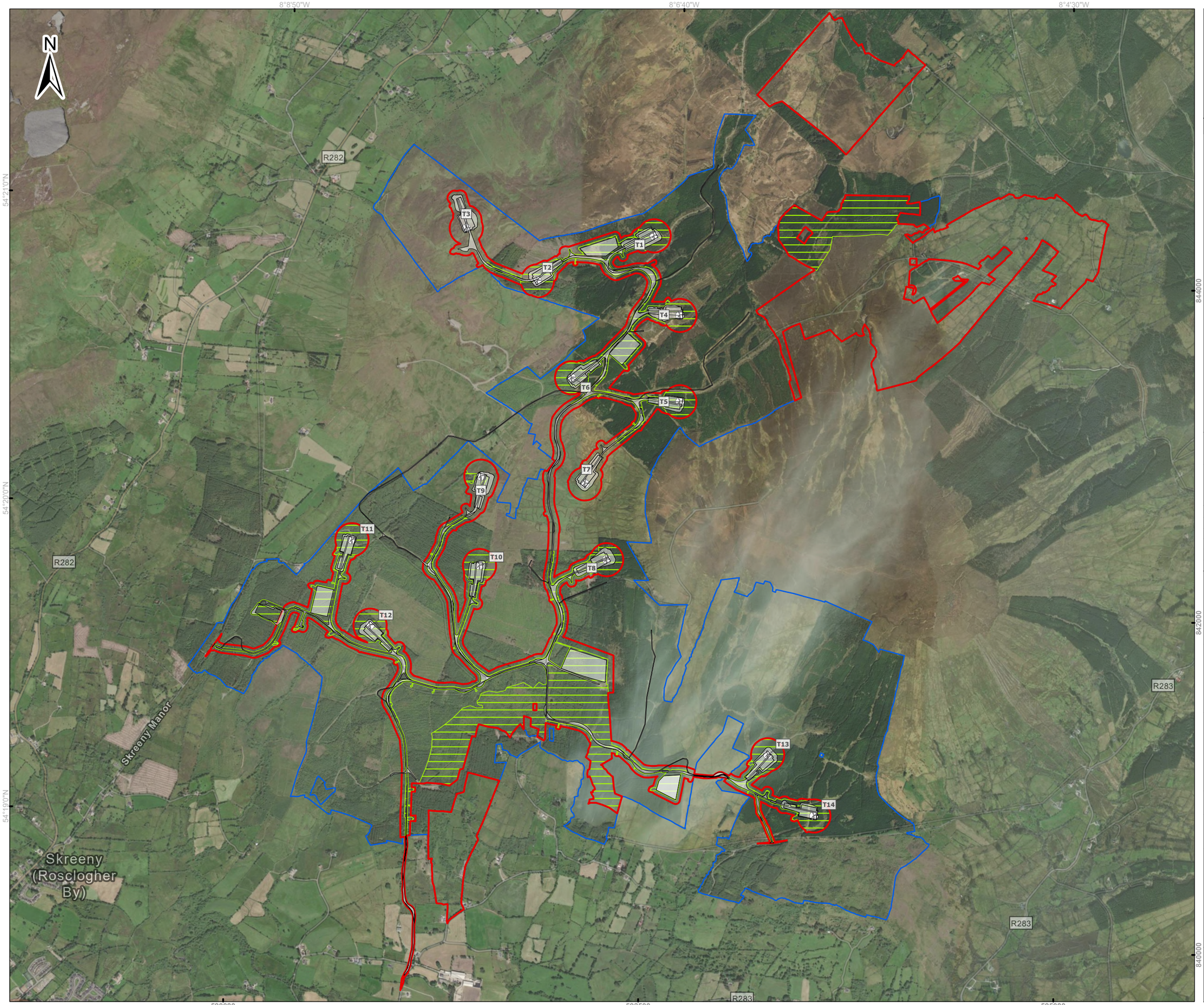
2.5.14.1 Borrow Pits

Three (3) borrow pits have been identified within the proposed wind farm site. It is proposed to utilise these to provide an on-site source of stone for construction. Borrow Pit (BP) 1 is located west of Turbine 1, BP2 is located to the south of Turbine 8, and BP3 southwest of Turbine 13. These locations were identified based on geological mapping and site investigations with areas of shallow bedrock, or suitable material. The total volume of material estimated to be available in the identified borrow pits is 248,167 m^3 (refer to Drawings 10955-2090, 2091 and 2092). The presence of a borrow pit on-site will significantly reduce materials transport to site and will minimise the depth to which the borrow pit excavations will be required. Further details of the borrow pit selection and assessment are provided in Chapter 8 - Land, Soils and Geology.

The borrow pits will be at locations with very gently sloping terrain, and any peat excavated during site excavations will be used to reinstate them. There will be no requirement for any retaining structures to be built in order to do this, as the volume of peat excavated will be relatively small (101,911 m^3), and it will be possible to store it all below the lowest point of the borrow pit edges (i.e. it will be entirely contained within the borrow pits and therefore slippage out of them will not be possible). Their reinstatement will also utilise mineral soil and stone excavated as part of the proposed project. Refer to Appendix 2-5 Spoil and Peat Management Plan for further details.

2.5.14.2 Forestry Felling

Approximately 72% of the proposed wind farm site is forested. Some of this area is located within Coillte lands, while some is located within private lands. There will be a requirement to fell forestry in the areas to accommodate the wind farm infrastructure. The total area of forestry to be felled is approximately 133 ha as shown in Figure 2-10. As a commercial crop, this forestry is scheduled to be felled in the future regardless of the proposed project being constructed or not.





Legend

- Survey Area of the proposed Wind Farm Site
- Application Boundary
- Site layout footprint
- Turbine Locations
- Forestry Felling Areas

0 0.5 1
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

Copyrights:
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community,

Rev	Date	Description	By	Chkd.
A	07/05/2026	First issue	S.P	S.R

Client: Ireland FuturEnergy

Project:
Lissinagroagh Wind Farm

Title:
Figure 2-10:
Forestry Felling Areas

Scale @ A3: 1:21,000

Prepared by:	Checked by:	Date:
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Map Ref: 10955-090-FELL-P.App.BO-TOB-A

Draft: A

For the footprint of the infrastructure and associated felling buffers, there will be full tree removal. There will also be felling in an area within the wind farm site for biodiversity enhancement. Due to the fact there are many age classes that are to be felled i.e. commercial and non-commercial timber, it is envisaged that any commercial timber will be removed from the site for haulage to a timber sawmill.

It should be noted that the clearfelling of trees requires a felling licence from the Minister for Agriculture, Food and the Marine under the Forestry Act 2014. The associated afforestation of alternative lands equivalent in area to those lands being permanently clearfelled requires an afforestation licence.

The Forest Service, Department of Agriculture, Food and the Marine is Ireland's national forest authority and is responsible for all forest licensing. In light of the above requirements, the Applicant commits that the location of any replanting (alternative afforestation) associated with the project will be greater than 10km from the proposed wind farm site and also outside any potential hydrological pathways of connectivity, i.e. outside the catchment within which the proposed project is located. On this basis, it is reasonable to conclude that there will be no more than imperceptible indirect, or in-combination effects associated with the replanting.

Furthermore, the Applicant commits to not commencing the project until both felling and afforestation licences are in place, and this ensures the afforested lands are identified, assessed and licensed appropriately by the relevant consenting authority.

The Applicants proposed approach to the afforestation requirements is outlined in Appendix 2-8.

2.5.14.3 Drainage and Surface Water Management

Temporary and permanent drainage and sediment control systems are required to manage surface water arising in the construction areas and ensure that existing drainage is tied into. Refer to Drawings 10955-2050 to 2056, Drawings 10955-2065 to 2066 and Appendix 2-7 Surface Water Management Plan.

2.5.14.4 Clear Span Bridges & Culverts

To facilitate construction of internal access tracks between the turbines and other infrastructure locations, eleven (11) watercourse crossings are required. This will involve the installation of ten (10) clear span bridges at various locations on the internal access track network and the extension of one (1) existing culvert, as shown on Drawing 10955-2010.

2.5.14.5 Electricity Supply

As part of the proposed project, a medium voltage local electricity supply will be required as a power supply to the proposed substation for light, heat and power purposes, and to the proposed met mast. The local supply will be designed and constructed by ESB Networks.

No significant works are anticipated for this (placement of local poles with cable from a nearby power line), as it will be similar to what normally occurs for new house connections. Should permission be granted the details (regarding the exact location of each pole) of the connection route and works will need to be determined by ESB Networks prior to

construction, but as it will be a local electrical connection, the works will be minimal in nature.

2.5.15 Construction Material Requirements

A significant amount of stone and aggregate fill material will be required during construction. This will be used under and around key infrastructure including the turbines, substation, site roads, hardstands and construction compounds.

The following are the estimates of the material requirements at the various main infrastructure locations:

Table 2-5: Construction Material Quantities

Infrastructure	Total Quantity (m^3)
Access Tracks	22,531
Substation & Construction Compounds	15,165
Turbines & Hardstands	93,432

Stone from off-site sources will be used for surface dressing, while stone sourced on-site will be used for the initial capping layer. By sourcing the majority of the required stone volume from the on-site borrow pits as described in Table 2-5, the volume of traffic that will occur on public roads in the area will be significantly reduced.

Further information on the proposed traffic volumes and effects are discussed in Chapter 16 - Traffic and Transportation, while further information on the offsite/external sources being considered is provided in Section 2.9.4.4.

2.6 CONSTRUCTION METHODOLOGIES

The following sections detail the construction methods that will be employed for the following infrastructure:

- Turbine Hardstands and Foundations;
- Turbine Installation;
- Internal Access Tracks;
- 110kV Substation and Internal Cabling;
- 110kV Underground Grid Connection;
- Meteorological Mast;
- Borrow Pits;
- Temporary Construction Compounds; and
- TDR Accomodation Areas.

2.6.1 Turbine Hardstands and Foundations

At each turbine location, the topsoil will be stripped where the hardstands are to be sited. The hardstands will be built up to create a level base which will be <0.5m above existing ground level.

Ground investigations in the form of trial pitting, probing, and use of augers have been carried out along the proposed turbine locations and hardstanding locations to inform the depth of excavation and upfill required (refer to Appendix 2-6A, B and C Ground Investigation Reports). The volume of fill required for the hardstands and turbine foundations is approximately 67,672 m^3 and 25,760 m^3 of stone material, respectively. This material volume will be obtained primarily from the on-site borrow pits with only the surface 150mm layer to come from local quarries which are within reasonable proximity to the site.

Each of the turbines to be erected on site will have a reinforced concrete base. Overburden will be stripped off the foundation area to a suitable formation using a 360° excavator and will be stored as detailed in Section 2.9.4.8, the CEMP (Appendix 2-4) and the Spoil and Peat Management Plan (Appendix 2-5). The sides of the excavated areas will be sloped sufficiently (2:1 for mineral soil, 1:1 for rock) to ensure that slippage does not occur. Excavations will be approximately 4 m deep.

The formation level is reached at a depth lower than the depth of the foundation, the ground level will be raised with Clause 804 hardcore material and/or lean mix concrete, compacted in layers as required. An interceptor drain will be formed around the upgradient perimeter of the turbine and hardstand to divert the clean water away from the works. This will outfall out at the lowest point to a level spreader. Water within the excavation will be treated via a settlement pond and level spreader. If the water has a heavy silt load, then an additional measure such as a *Siltbuster* will be employed to further reduce silt content.

An embankment approximately 600mm high and a fence will be constructed around the perimeter of each turbine base to prevent construction traffic from driving into the excavated hole and also to demarcate the working area. All necessary health and safety

signage will be erected to warn of deep excavations. Access to and from excavated bases will be formed by excavating a gangway to a standard 1:12 grade, thereby allowing safe passage into/out of the foundation area.

Approved lifting equipment will be used to unload reinforcing steel to required areas. The bottom mat of steel will be fixed prior to the tower cans, if used, being lifted into position and reinforcing steel will be positioned and fixed in accordance with the turbine suppliers' requirements.

Formwork to concrete bases will be propped/supported sufficiently to prevent failure by compacting stone around the outside of the forms in addition to straps to prevent expansion. Each turbine foundation will require approximately 1,724 m^3 of concrete which will be sourced from off-site suppliers. No batching of concrete will occur on site. Piling is not anticipated. Concrete for bases will be poured using a concrete pump. After a period of time when the concrete has set sufficiently, the top surface of the concrete surface will be finished with a power float.

Once the base has had sufficient curing time it will be filled with suitable fill (i.e. hardcore) up to existing ground level. The working area around the perimeter of the foundation will be backfilled with suitable material (hardcore). These hardstand areas around the turbines will be levelled, compacted and finished with a suitable surface material for traffic (Clause 804 or similar) as per the site access tracks and remainder of the hardstand areas.

2.6.2 Turbine Installation

Turbines will be installed in suitable weather windows (i.e. low wind speed). Following crane setup, the turbine tower sections will be delivered by truck and hoisted into place. This is followed by the nacelle and finally each blade. In accordance with an agreed lifting plan, turbine sections will be lifted by crane into place. Wind speeds will be monitored at all times during lifting operations. Turbine sections will be fitted together by workers within the structure. Following installation of the turbine, lightning protection, lighting and other ancillary components will be installed on the turbine and commissioned.

The turbines will be decommissioned using a similar methodology as the construction except in reverse.

2.6.3 Internal Access Tracks

2.6.3.1 New Tracks

New tracks will be excavated to formation level as per Drawing 10955-2033 (Type 1 and 2) using tracked excavators. When the topsoil has been removed and/or the formation layer (bedrock/firm subsoils) has been reached, stone from the onsite borrow pits will be placed to form the track foundation. The sub grade will be compacted with the use of a roller or other similar approved compaction method. The top dressing will be added to the track at this point. As a final measure to ensure long term stability, this layer will be checked and repaired as required after all turbine bases have been poured (i.e. after the heavy wearing traffic is largely finished).

Surplus excavated material will be managed as set out in the CEMP (refer to Appendix 2-4, EMP 1) and the Spoil and Peat Management Plan (Appendix 2-5).

All access tracks will be maintained for the duration of the construction, operational and decommissioning phases of the project. Following decommissioning of the wind farm, they will be retained for use in forestry and agricultural activities.

2.6.3.2 Upgrade of Existing Tracks

Widening of existing tracks, where required, will be carried out on both sides, and the construction methodology will be similar to that outlined in Section 2.6.3.1 above (excluding excavating the existing track material). Refer to Type 3 - Drawing 10955-2033. Surplus excavated material will be managed as outlined in Section 2.6.3.1.

There are no significant known constraints running alongside the tracks to be upgraded, but where forest or roadside drainage channels are present alongside the track (as they occur frequently through the site), they will be re-routed as required during dry weather periods where there is no moving water present within. Replacement drains will be constructed as per best practice for forestry drains (Forestry Standards and Procedures, January 2015. Forest Service, Department of Agriculture, Food and the Marine), as outlined in Appendix 2-7 Surface Water Management Plan.

All access tracks will be maintained for the duration of the construction, operational and decommissioning phases of the project. Following decommissioning of the wind farm, they will continue to be used in forestry and agricultural activities.

Further details of the construction methodology for upgrading existing site roads are provided in the Appendix 2-4 CEMP and further detail is provided in Appendix 2-5 Spoil and Peat Management Plan.

2.6.3.3 Clear Span Bridges and Culverts

The use of clear span bridges as a watercourse crossing method avoids in-stream works entirely. Therefore, there will be no direct effect on the watercourse at the crossing location or downstream. The clear span bridge will be sufficiently above the watercourse to allow unrestricted flow of water beneath.

The site access tracks will firstly be constructed to allow easy access to the works area (as described in Section 2.6.3.1 and 2.6.3.2). Sediment control measures consisting of a triple silt fence will be installed prior to commencement of the works. Following this, the topsoil will be stripped from the foundation footprint on either side of the watercourse, taking care to avoid disturbing any part of the river/stream bed or banks. Material will be removed immediately using dumpers travelling on the newly constructed roads.

Only tracked machines will be permitted to travel off the road surface. No excavations will be permitted within the watercourse channel. Suitable stone fill material (Clause 804 or similar) will be added in layers and compacted to form the base of the foundation. The precast clear-span bridge will be placed onto this either as one or more pieces using a mobile crane. There will be no requirement for large-scale casting of wet concrete. The construction work (in particular the initial excavation and stone compaction) will only take

place during a dry weather period. Following the bridge construction, barriers will be attached to the sides of the bridge structure, and the site access tracks will be constructed over the structure. Further details relating to surface water management is provided in the CEMP (Appendix 2-4)

Culverts will be used where site roads or hardstands cross minor forest drain networks. The use of culverts will only be employed for minor field/forest drains. Where culverts are required, precast concrete or plastic culverts of between 300-900mm in diameter will be provided, as shown in Drawing 10955-2066.

2.6.4 110 kV Substation and Electrical Works

The 110kV substation has been designed by TLI and will be constructed in accordance with EirGrid/ESB specifications and standards.

An area will be levelled and built to the required level with stone fill material, capped by high quality compacted stone. Two control buildings will be constructed using traditional techniques for constructing small buildings (i.e. concrete block walls, timber and slate tile roof). Foundations will be built for all of the proposed electrical infrastructure. All the electrical equipment will be installed to EirGrid/ESB requirements. Perimeter fencing will be constructed around the substation compound for security and safety purposes. Further information and drawings of the substation and electrical infrastructure are provided in Drawings 05773-DR-130, 133, 134, 135, 136, 137, 138, 139, 141, 150, 151 and the construction methodology detailed in Appendix 2-3.

A local electricity supply will be made from the nearest suitable power lines at the time of construction in the same way that residential houses are connected. Standard overhead electricity poles and cables will be installed avoiding sensitive habitats and using a minimal footprint. See Section 2.7.7 for further information.

Internal cables connecting the wind turbines to the on-site substation will be laid within or immediately adjacent to the onsite access roads. All cables will be laid in underground ducts. Ducts will be installed by open trenching. Information on trench construction methodology is provided in Section 2.8.4.

2.6.5 110kV Underground Grid Connection

Once fixed into position, the internal site cabling (between turbines and the substation), the substation and the electrical grid connection will all be commissioned. They will remain powered off until the turbines are being commissioned and the wind farm enters into service.

Details of the design of the underground grid connection, including joint bay location and design, watercourse crossings location and design, are provided in Drawings 05773-DR-100 to 129, 142 and 143. The construction methodologies for the various elements of the proposed GCR are summarised below.

The 110kV cables will be installed on the internal access track leading from the on-site substation to the L61801 local road. From there, the majority of the route is within the existing public road corridor as described in Section 2.7.6 below. Works within the public

road corridor will also be subject to further consents/agreements with the relevant local authorities (Leitrim and Sligo County Councils), for example Road Opening Licences, as appropriate.

The 110kV underground cable will be laid beneath the ground surface and/or public road using the following methodology:

- The area where excavations are planned will be the subject of a confirmatory survey, prior to the commencement of works, with a cable locating tool and all existing underground services will be identified.
- A road condition verification survey for all parts of the route within the public road and all bridge and culvert crossings will be carried out in advance of works commencing. Details of this survey will be agreed with the local authority in advance of the survey.
- Traffic management will be put in place before any works on public roads. A Traffic Management Plan has been prepared for the proposed project and is included as Appendix 16-1. This is a live document and will be updated ahead of construction, if required, to address any additional requirements of Leitrim County Council and any relevant conditions of planning.
- All cables will be laid in underground ducts. Ducts will be installed mostly by open trenching.
- A trench will be opened using an excavator to accommodate the required depth and width.
- The excavated material will be cast to the side to be reused as backfilling material where appropriate. This material will not be stored in the vicinity of any watercourse and will be smoothed with the back of an excavator bucket to minimise runoff. It will be cast on the upgradient side of the trench, so if any runoff did occur it will run into the down gradient trench. Excess material will be used on the site of the proposed wind farm for borrow pit reinstatement and local landscaping. In the case of any material deemed as contaminated, a licenced waste carrier will transfer to an appropriate waste facility.
- Silt fences will be installed alongside the road/works areas as required near streams.
- Clay dams/plugs will be installed at regular intervals (depending on the gradient) to prevent conduit flow of water within the trench. These utilise low porosity clays over the full depth of the trench at regular intervals to prevent water moving along the trench.
- Works will not be carried out during periods of heavy precipitation. In the event that some surface water does accumulate in the trench, this will be allowed to percolate into the ground naturally.
- The trench will be surfaced in accordance with the road surface specifications of the local public road, or (in the case of off-road section) an EirGrid/ESB specification gravel access track to allow very occasional access for maintenance vehicles if required.
- Cable joint pits will be located at regular intervals as shown in 05773-DR-118. Each joint pit will be approximately 2.5m x 6m in size with a communications chamber and an earth link box in close proximity to the joint pit). They will be constructed off narrow sections of the public road where this is possible (i.e. before/after it enters the road corridor, in lay-bys, etc.) A temporary surface is provided over these for safety and to allow easy

access until the cables are pulled, after which time the area will be permanently reinstated/surfaced as appropriate.

- It is anticipated that construction will be carried out by a single team (with plant items likely to include excavators and dumpers) along the route, but there is a possibility to use two separate teams to speed up the construction. It is expected that each team will lay approximately 100m of the route per day.

2.6.5.1 Watercourse Crossings

Eleven (11) existing bridge crossings are required, of which eight (10) will involve in-road HDD (Horizontal Directional Drill), two (2) will involve off-road HDD and one (1) will be a standard crossing within the bridge deck. Details of HDD crossings are provided in Drawing 05773-DR-152 to 162. There will also be eight (8) existing culvert crossings using open trenching with either an undercrossing or an overcrossing, depending on the depth of the culvert to be confirmed during pre-construction surveys. Details of culvert crossings are provided in Drawing 05773-DR-126 and 127.

The construction methodologies for the crossings are provided below. The route also contains minor forestry/field/road drains which are usually dry and only contain water during periods of heavy rainfall. These will be crossed using open trench crossings during dry periods.

Crossing Methodology – In-Road Horizontal Directional Drilling

Horizontal Directional Drilling (HDD) is an efficient, trenchless method for installing underground utilities such as pipelines and cables.

It requires the excavation of a launch and reception pit at either side of the feature to be crossed.

- Each launch and receiver pit measures approximately 1m wide, 2m long and 1m deep. Two ducts will be required at each crossing location.
- A specialised directional drill machine will be anchored to the ground and will drill at a suitable shallow angle to allow it to achieve the required depth for the bore.
- If ground conditions are unfavourable, the drilling process will be repeated using progressively larger drill heads until the required size is achieved.
- The drilling process involves pumping a drilling fluid through the drill head which is inert, natural and biodegradable (e.g. Clear BoreTM). This fluid will be used sparingly and only as required to avoid an excess and will be appropriately stored offsite in a sealed container >50m from watercourses when not in use.
- This fills voids locally around the drill head and enables the drill to progress without the hole collapsing.
- Should any excess drilling fluid occur, it will be contained and removed for disposal at a licensed waste facility.
- The duct will be positioned, and the launch and reception pits will be refilled.

Crossing Methodology – Off-Road Horizontal Directional Drilling

The methodology for the off-road HDD crossings will be similar to the in-road methodology except that that the launch and receiver pits will be located adjacent to the road carriageway rather than within it.

Full details of the construction methodologies are provided in Appendix 2-3.

2.6.6 Meteorological Mast

The met mast installation works will be carried out by a small crew and are described as follows, as illustrated on Drawing 10955-2036.

- An access track will be extended towards the mast location from the existing forestry track. The access track will be 3.5m in width. Associated drainage infrastructure will be extended also.
- A small stone crane pad will be constructed in front of the proposed mast location.
- General construction methods for the above access track and hard standing will match those described for wind farm access tracks and hard standings.
- The foundation will be excavated followed by shuttering, steel fixing and finally concrete pouring by ready mix truck. Excavation and concrete operations will be carried out in accordance with the CEMP (Appendix 2-4). The foundation will be 10m x 10m x 1.8m in size.
- Following crane setup, the mast sections will be delivered and unloaded by truck.
- In accordance with an agreed lifting plan, mast sections will be lifted by crane into place. Wind speeds will be monitored at all times during lifting operations by the lead climber and crane operator.
- Mast sections will be bolted together by climbers.
- Following erection of main mast sections, lightning protection and other ancillary components will be fixed to the mast. Guy wires are not planned as part of the met mast design.

The mast will be decommissioned using a similar methodology as the construction except in reverse.

2.6.7 Turbine Delivery Accommodation Areas

Where works are needed along the public road corridor to facilitate deliveries to site, they will be agreed in advance with the local authority and carried out to the appropriate road design standard (TII, purple book, etc.) to ensure they will be safe and durable in design.

- Where a temporary surface is required to facilitate overrun by turbine delivery vehicles, works will start with the clearing of vegetation (grass, hedgerows and scrub), and the topsoil will be stripped and either used locally for landscaping purposes for later use in local reinstatement or used for borrow pit reinstatement onsite.
- Where local use for landscaping does occur, it will be smoothed off with the back of a bucket and seeded with a suitable grass seed mix.
- Silt control curtains will also be employed where works are within 50m of a surface watercourse.

- Excess spoil will be taken to a local licensed/permitted waste facility if found to contain any contaminants such as bitumen.
- Suitable fill material (broken stone and Clause 804) will be used to create a firm running area for the passage of turbine delivery vehicles.
- The areas will be fenced off as appropriate when the delivery is not occurring.
- After the delivery of turbines to site, the site will be reinstated to the original condition with removal of the temporary surface, and any removed vegetation will be reseeded/replanted with a similar native species composition.

2.6.8 Temporary Construction Compounds

At the commencement of the construction phase, two (2) temporary compounds will be constructed, one in the west of the site near the substation and the second in the north of the site between T6 and T4.

Any mineral soils removed during construction will be stored for later use in reinstatement. At the end of the construction phase, the compounds will be removed, with any stone being used towards reinstatement of the nearest onsite borrow pits. After removal of the compound, the area will be recovered in soil and replanted with forestry.

2.6.9 Borrow Pits

Material will be extracted from three (3) on-site borrow pits to avoid the need for large stockpiles of material. There will be some small stockpiling of material as rock is broken/crushed, but these will be kept to a minimum. Further detail on the construction of the borrow pits is provided in Chapter 7 - Land, Soils and Geology.

Once the required rock has been extracted from each borrow pit, they will be reinstated using any excess excavated material from the site. Rock and fill material will need to be extracted from a number of proposed turbine foundation locations. In that case, this material will be used where possible to replace the material requirements from borrow pits. The borrow pits will be excavated into the ground and on completion of reinstatement they will be no higher than existing ground level.

There is an absence of peat at the borrow pit locations, so any soils/subsoils removed from here to open up the borrow pits will not have a significant slippage risk because they will be temporarily stockpiled in accordance with best practice. During the extraction of the first borrow pit, removed spoil will be stored in a temporary stockpile with appropriate gradient and appropriate mitigation will be used to ensure the protection of downgradient watercourses (e.g. the use of silt fences).

2.6.9.1 Rock Extraction

The rock will be extracted from the proposed borrow pits by rock breaking. Rock breaking is suitable considering the geology and soil conditions there (see Chapter 7 - Land, Soils and Geology). The absence of notable peat depths near the proposed borrow pits means that there will be no implications for peat stability around the borrow pits.

2.7 CONSTRUCTION MANAGEMENT

2.7.1 Construction Activities and Timing

It is anticipated[3] that approximately 100 personnel will be employed during the peak construction period (See Chapter 4 – Population and Human Health) and it is estimated that the construction phase will take approximately 24 months from initial site clearance and enabling works to commissioning of the turbines and substation. With the exception of commercial forestry felling, vegetation clearance will commence outside the breeding bird season, which runs from 1st March to 31st August. If any minor clearance or trimming is required within those dates, or if the initial vegetation clearance extends past 1st March due to unsuitable weather conditions, the works will be preceded by a confirmatory ecological survey (from a qualified and suitably experienced ecologist) to ensure there are no sensitivities associated with the action.

The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations will be restricted to between 7:00hrs and 19:00hrs Monday to Friday (excluding public holidays) and between 07:00hrs and 14:00hrs on Saturdays.

However, during the following critical periods longer hours will be required:

- Concrete pours for turbine foundations;
- During turbine installation when the weather is suitable (i.e. light winds);
- Delivery of oversized loads;
- In the unlikely event of an emergency.

Any such out of hours working will be agreed in advance with Leitrim County Council apart from in the case of an emergency and in line with the Schedule of Mitigation requirements of this EIAR (Chapter 19).

Due to the volume of concrete required for each turbine foundation, and the requirement for the concrete pours to be continuous, deliveries are often carried out outside normal working hours. Such activities are limited to the day of turbine foundation concrete pours, which are completed in a single day per turbine (can take >12 hours). Because of the scale of the main concrete pours that will be required to construct the proposed wind farm, the main pours will be planned weeks in advance and refined in the days leading up to the pour. Concrete pours are required for fourteen (14) wind turbines so they will require 14 days of longer working hours. A similar number of days with longer working hours will be needed for installation of the turbines during a period of calm weather (this is mostly limited to on-site activity).

To accommodate delivery of large turbine components along public routes it could be necessary on occasion to work outside of the core hours, with delivery of these oversized loads proposed to be carried out in the late evening. It is expected 23-38 delivery events will be needed on a maximum of 23-38 days for delivery of these oversized loads which usually travel in convoys of 3-5 vehicles with a Garda escort.

3 http://www.ewea.org/fileadmin/files/library/publications/reports/Wind_at_work.pdf

The construction phase can be broken down into five (5) main phases as follows (there will be overlap between these):

- 18 months – Civils (including forestry felling and vegetation clearance, drainage, construction of site roads, hardstands, turbine foundations)
- 9 months – Electrical grid connection/substation installation and commissioning
- 12 months – Site electrical (installing between turbines and substation, pulling cables)
- 4 months – Turbine deliveries and erection
- 2 months – Commissioning

The phasing and scheduling of the main construction task items are outlined in Figure 2-11, where March 2028 has been selected as a start date for construction activities (based on likely timeframe to secure planning consent, complete pre-construction design and tendering work, etc.). Where there is overlap between phases, this reflects the anticipated progression of work through the site, with different areas within the site at different stages of completeness.

2.7.1.1 Wind Farm Construction Sequencing

It is proposed that works will commence at the southern end of the proposed wind farm site, where peat is either absent or extremely shallow, and the topography is flattest. The borrow pit in the southeastern area of the site near Turbines 13 and 14 will be used to source stone material for the southern half of the site, while the second borrow pit in the centre of the site will be used to temporarily deposit excess inorganic soils. As the construction moves to the northern half of the proposed wind farm site where the topography is steeper and there is slightly more peat in some locations (albeit still shallow at mostly <0.5m), the third borrow pit will be utilised as a source of stone after any temporarily stock-piled material is transferred to the first borrow pit. Any peat that is stripped at this stage will then be deposited straight into the first borrow pit, below ground level avoiding the potential for any slippage.

2.7.2 Construction Environmental Management Plan

The requirement for a Construction and Environmental Management Plan (CEMP) to be prepared in advance of any construction works commencing on any wind farm site and submitted for agreement to the Planning Authority is now well-established. A CEMP has been prepared for the proposed project and is included in Appendix 2-4.

The CEMP will be updated prior to commencement of development to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will be submitted to the planning authority for written approval.

The construction contractor will be responsible for implementing the mitigation measures specified in the EIAR and CEMP and for communicating the requirements with all staff on-site. Their implementation of the mitigation measures will be overseen by the supervising site staff, including the Environmental Clerk of Works, Ecological Clerk of Works, site supervisor, archaeologists and/or geotechnical engineers, as appropriate.

The surface water drainage system will be inspected weekly and daily depending on the construction phase works to ensure that it is working optimally. Settlement ponds will be inspected and cleaned regularly where sediment collects. The drainage and treatment system for the proposed wind farm will be monitored more frequently during/after heavy rainfall events during the construction phase. A programme of inspection and maintenance will be designed and dedicated construction personnel assigned to manage the inspection programme.

The CEMP will be a key construction contract document, which will ensure that all mitigation measures, which are considered necessary to protect the environment are implemented. The commitments in the EIAR will be fully complied with by the contractor.

			2028			2029				2030
ID	Task Name	Task Description	Q1 Mar-Jun	Q3 Jul-Sep	Q4 Oct-Dec	Q1 Jan-Mar	Q2 Apr-Jun	Q3 Jul-Sep	Q4 Oct-Dec	2031 Q1 Jan-Mar
1	Site Health and Safety									
2	Site Compounds	Forestry felling & vegetation clearance (avoid Mar – Aug), Construct site compounds, site access, fencing, gates								
3	Access Tracks	Forestry felling & vegetation clearance, construct roads, install drainage measures, install clear span bridges, install water protection measures								
4	Turbine Hardstands	Forestry felling & vegetation clearance, excavate base, construct hardstanding areas								
5	Turbine Foundations	Fix steel, erect shuttering, concrete pour								
6	Substation Construction & Electrical Works	Construct substation and grid connection, underground cabling between turbines								
7	Backfilling & Landscaping									
8	Turbine Delivery and Erection									
9	Substation Commissioning									
10	Turbine Commissioning									

Figure 2-11: Indicative Construction Schedule

2.7.3 Surface Water Management

The proposed surface water drainage system utilises sustainable drainage devices and methods. Refer to Drawings 10955-2050 to 2056 and 2065 to 2066. SuDS are defined as "a sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques". They are designed to manage rainfall as close to where it falls, encourage natural groundwater recharge and encourage evapotranspiration from vegetation and surface water. SuDS therefore are considered an "embedded mitigation" measure as they are incorporated into a development design. SuDS measures are designed to be applied during the construction stage but will remain in place for the operational and decommissioning phases.

Surface water management on wind farm construction sites utilises well-established and well-understood techniques. These management methods are standard in the industry and they have a long-term record of a high level of efficacy. Wind farm construction has been ongoing in Ireland for over 30 years, and where the mitigation and methods are correctly implemented, adverse effects on water quality should not occur.

A Surface Water Management Plan (SWMP) has been prepared (refer to Appendix 2-7). The purpose of this plan is to ensure that all works are conducted in an environmentally responsible manner to minimise any potential adverse impacts from the proposed project on surface water quality. The plan incorporates the following specific objectives:

- Provide overall surface water management principles and guidelines for all phases of the proposed project;
- Address erosion, sedimentation and other water quality issues; and
- Present measures and management practices for the prevention and/or mitigation of potential downstream impacts.

The management measures proposed have been developed based on the CIRIA (Construction Industry Research and Information Association) C648 (Control of water pollution from linear construction projects) guidance, and that guidance has itself been developed based on site experience in Ireland and the UK over recent decades.

Construction Phase

During the construction phase, all run-off from construction areas will be controlled and treated to reduce suspended solids concentration prior to being discharged into the existing drainage network or overland.

Interceptor drains will be installed up-gradient of all proposed infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. These flows will discharge diffusely overland, within the buffer zone before entering any watercourse. Regular cross flow and energy dissipation devices will be installed to divert overland flows and prevent these flows from entering the peat deposition areas. An overview of the surface water drainage system is provided below (Figure 2-12).

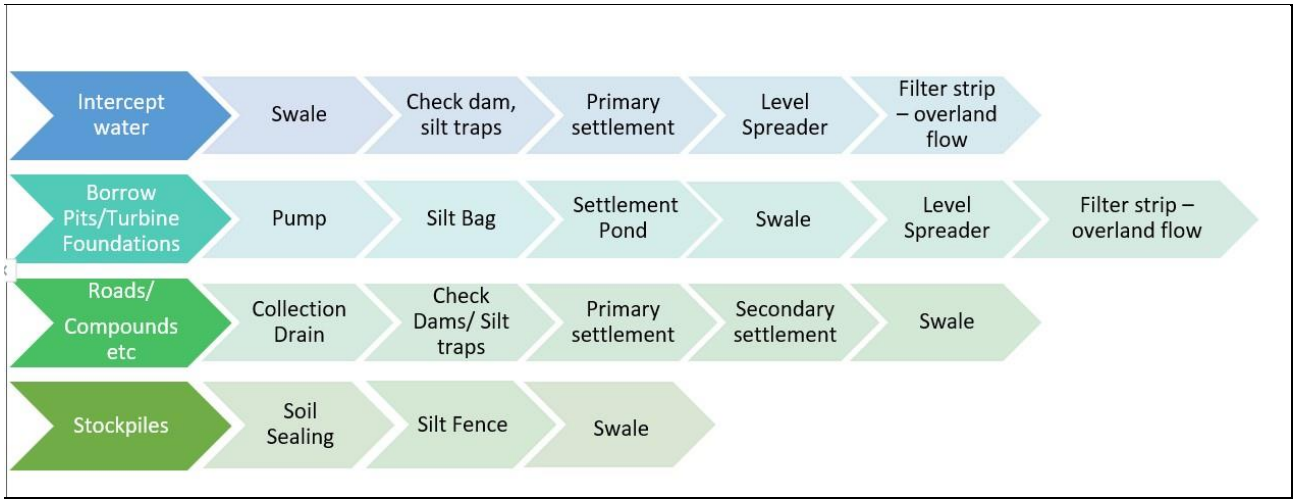


Figure 2-12: Surface Water Management & Sediment Control Flow Chart

A number of temporary settlement ponds will be established during the construction phase along roadways and in areas of high construction activity (adjacent to turbine foundations, construction compounds etc) to minimise silt laden run-off entering the drainage network (example shown on Plate 2-3). The settlement ponds will be designed to provide sufficient retention time and a low velocity environment to allow suspended solids to fall out of suspension prior to allowing the water to outfall to the receiving environment. Further information on the runoff calculations and site drainage is provided in Chapter 8 – Hydrology and Hydrogeology. The proposed locations of the permanent and temporary settlement ponds, and details of same are shown on Drawings 10955-2050 to 2056 and 2065 to 2066 and Appendix 2-7 Surface Water Management Plan.

Surface water runoff from hardstanding areas will be collected and discharged to associated settlement ponds adjacent to the proposed infrastructure. It will then be managed by gravity flow at greenfield runoff rates (i.e. the runoff of the site at natural rates without development). These level spreaders/diffusers will be used where overland discharge of water is carried out. The level spreader will prevent soil erosion at these locations by spreading out and slowing down the water, as shown in Figure 2-13.

Plate 2-3: Example of a Three-Tiered Settlement Pond with Stone Filter



A total of 25 settlement ponds will be located downstream of road swale sections and at hardstand locations, to manage/buffer volumes of runoff discharging from the drainage system during periods of high rainfall, thereby reducing the hydraulic loading to watercourses. Settlement ponds are designed in consideration of the greenfield runoff rates. The settlement pond design is based on primary settling out of suspended solids from aqueous suspension. Further details are provided in Appendix 2-7 and Drawing 10955-2065.

Track edge drainage/swales will be implemented to control run-off from the running surface to lower water levels in the subgrade, to control surface water and to carry this flow to outlet points. Swales will be installed along the internal access tracks in advance of the main construction phase. Swales will provide additional storage of storm water, located along gradient. Given the steep longitudinal gradients on some sections of access track, regular check dams will be employed within the trackside swale on these sections to reduce the flow velocity and provide settlement opportunity.

Examples of the above silt control measures are shown in Plate 2-4.

Plate 2-4: Examples of Silt Control Measures

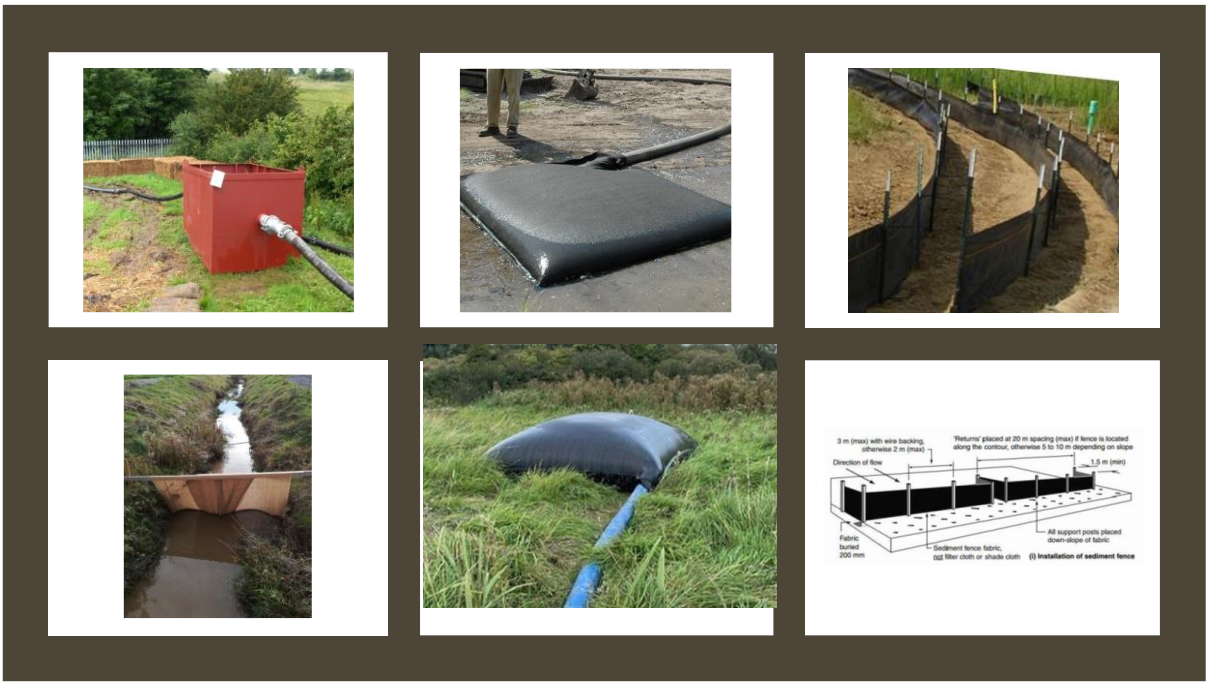
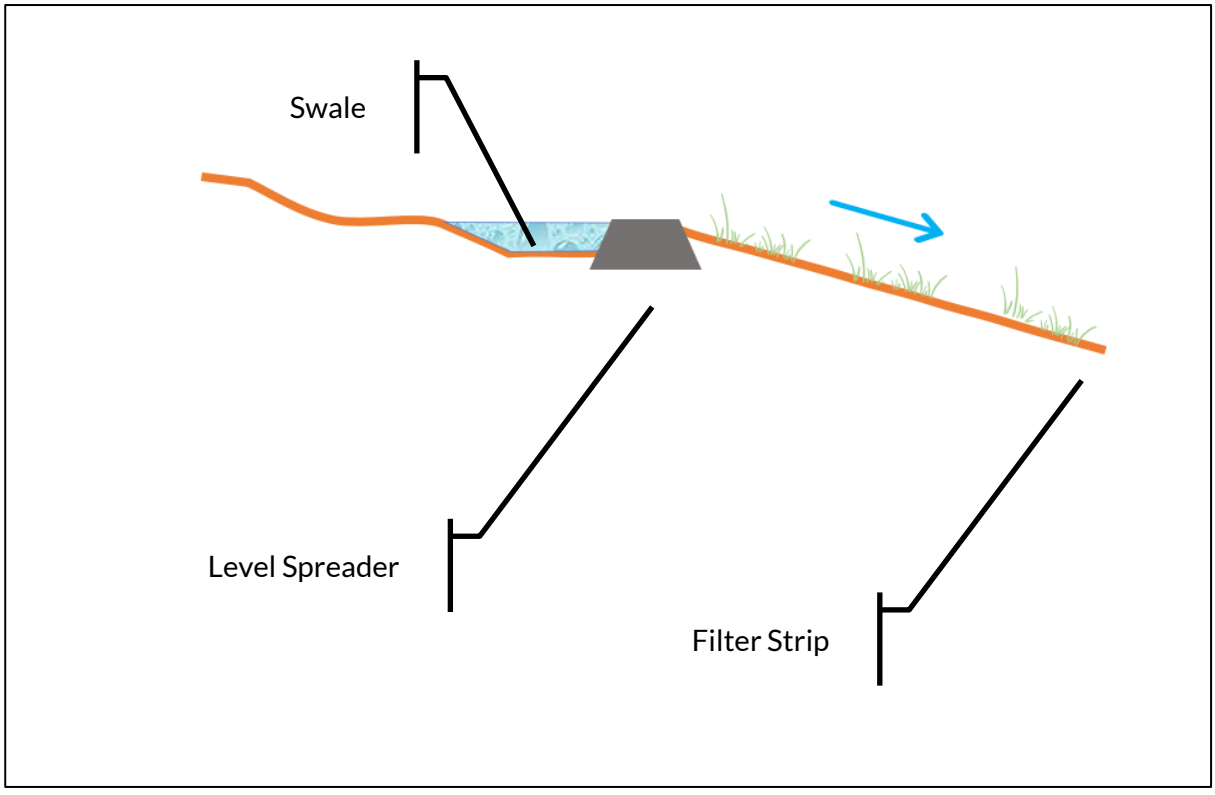


Figure 2-13: Conceptual Level Spreader and Filter Strip



Operational Phase

The drainage layout for the operational stage of the proposed project has been designed to collect surface water run-off from roads, crane pads and hardstanding areas for treatment and to

maintain the existing site discharge rates. Run-off arising from the proposed project will discharge into settlement ponds specifically constructed for managing surface water from the wind farm. Temporary settlement ponds for the construction phase (i.e. borrow pits, construction compounds) will be removed at the end of the construction phase upon reinstatement of those features. Details and locations of the proposed settlement ponds are shown on Drawings 10955-2050 and 2065.

Once treated in the settlement pond the treated surface water will then be allowed to spread across the adjacent vegetated lands via a level spreader /diffuser which will minimise any risk of soil erosion and allow further filtration of any remaining sediment particles. Level spreaders and existing vegetation will help slow and distribute runoff evenly. This treated water will ultimately percolate to ground or travel over-ground through vegetation and be assimilated into a drain or stream onsite at appropriate greenfield run-off rates (i.e. the runoff of the site at natural rates without development). There will be no direct discharges from the wind farm. The measures outlined for this project are based on the CIRIA C648 (Control of water pollution from linear construction projects) guidance, and that guidance has itself been developed based on site experience in Ireland and the UK over recent decades.

Decommissioning Phase

The decommissioning phase will not require any significant works that will impact on the drainage network, as the drainage system will remain in place to serve the access roads.

The proposed surface water management system is described in further detail in Chapter 8 - Hydrology and Hydrogeology and Appendix 2-7 Surface Water Management Plan.

2.7.4 Environmental Management

2.7.4.1 Concrete Deliveries & Pouring

Primarily ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. Localised mixing will be used for small tasks such as blockwork for building the substation. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks from large scale on-site batching. When concrete is delivered to site, only the chute of the delivery truck will be cleaned, using the smallest volume of water necessary, before leaving the site. Concrete trucks will be washed out fully at the batching plant, where facilities are already in place. The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area. These residual liquids and solids will be collected by an appropriately licensed waste collector. Where temporary lined impermeable containment areas are used, such containment areas are excavated and lined with an impermeable membrane. This washout will be located near the site entrance and also at any significant concrete pour locations (e.g. at turbine hardstand during a foundation pour) so that it is easily accessed when departing. An example of a concrete washout is shown in Figure 2-14.

Figure 2-14: Example of a Temporary Concrete Washout Facility



Although unlikely to happen any disposal of surplus concrete after completion of a pour will be off-site at the concrete production facility. Localised mixing of concrete for blockwork, etc. will only be carried out as needed, but any small volume of surplus will be disposed of in the concrete washout area.

The CEMP (Appendix 2-4) provides further details of best practice and environmental considerations in relation to concrete deliveries and concrete pouring.

2.7.4.2 Refuelling

Any easily manoeuvrable road-going vehicles (i.e. cars, jeeps, lorries, etc.) will be refuelled off-site. For any vehicles which are slow moving or tracked or those for whom regular trips off-site to refuel will not be practical, on-site fuelling will be required.

A limited amount of fuel will be stored on the site within the construction compounds for this purpose, and this will be within a double skinned and bunded mobile tank which can be moved around the site using a 4x4 vehicle to refuel. This will be stored in the construction compound when not in use.

A spill kit in the form of a supply of fuel absorbent material and mats and a drip tray will be kept with the tank at all times. The drip tray and fuel absorbent mats will be used at all times during refuelling. Similar spill kits will be stored in each construction compound, and at the on-site substation in case of emergency.

No refuelling will be carried out within 50m of a watercourse.

Only designated trained and competent operatives will be authorised to refuel plant on site.

In the event of an accidental fuel spill, the source of the spill will be fixed, fuel will be contained and cleaned as quickly as possible using the fuel absorbent material in the spill kits. The incident will be reported to the site manager and Environmental Clerk of Works, and appropriate remediation will be carried out (i.e. soil removal for safe disposal at a licensed waste facility by licensed waste collectors.

The CEMP (Appendix 2-4) provides further details of best practice and environmental considerations in relation to this.

2.7.4.3 Dust Suppression

In periods of extended dry weather, dust suppression will be implemented along haul roads and along the site roads to ensure dust does not cause a nuisance to any residential properties long the route. If necessary, during a period of extended dry weather, water will be taken from settling ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and site compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression, because this will transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water would lead to increased risk of runoff. The CEMP (Appendix 2-4) provides further details of best practice and environmental considerations in relation to this.

2.7.4.4 Waste Management

The CEMP provides an overview of the best practice in waste management during all phases of the proposed project, with a view to reducing, reusing, recycling and recovering waste produced, in that order of preference. Waste disposal will be avoided where possible. The Waste Management Plan and waste management practices associated with the proposed project are provided in the CEMP and will be in accordance with relevant provisions of the Waste Framework Directive (Directive 2008/98/EC on waste), the Waste Management Act 1996 as well as all other Irish and EU legislation.

The main site contractor will appoint an Environmental Clerk of Works who will ensure that all waste contractors have the correct permits for any waste streams they are removing from site, and that they are taking it to the appropriately licensed/permitted waste facilities. They will also ensure that all parts of the Waste Management Plan will be implemented onsite.

2.7.4.5 Vehicle Management

Vehicles will be kept on site access roads for the vast majority of the construction phase, however in the initial construction phases, there will be some requirement for off-road vehicle movements (for forestry felling, ground works, etc.). For forestry felling, standard practices and equipment/vehicles will be used.

For ground works and other off-road activity, the use of specialist vehicles that are tracked or use large low ground pressure tyres or bog mats which distribute their weight evenly across a large surface area will be used. These will minimise ground disturbance, particularly where there is a presence of peat and therefore minimise the risk of sediment entering downstream watercourses.

All vehicles will be restricted to the areas where works are required, and unnecessary off-road movements around the wider site will be avoided. Where there are any sensitive habitats present around a proposed work area, these areas will be marked out so that vehicles will not enter and damage them.

2.7.4.6 Vehicle Washing

Wheels or vehicle underbodies will be washed before leaving the site to prevent the build-up of mud on public (and site) roads. Site roads will be already formed using on-site materials before other road-going trucks begin to make regular or frequent deliveries to the site (e.g. with steel or concrete). The site roads will be well finished with compacted hardcore, and so the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt.

However, in the interest of best practice and to avoid the potential for the transfer of alien invasive plant species into the site, it is proposed to install a self-contained wheel-wash system near the project site entrance. Drawing 10955-2039 contains details and proposed location of a proposed self-contained wheel-wash system which will be installed as part of the construction phase of works. Water will be supplied for this using a water bowser. An Invasive Species Management Plan is also provided as Appendix 5-6.

A road sweeper will be available if any section of the surrounding public roads becomes soiled by vehicles associated with the proposed project.

The CEMP provides further details of best practice and environmental considerations in relation to this.

During the operational phase, the onsite access tracks will be maintained in good condition, and any vehicles that need to access the site will be generally keeping on these surfaces. As a result of this, and the low volume of traffic expected on site, it is not anticipated that a wheel washing facility will be required during the operational phase.

2.7.4.7 Major Accidents and Natural Disasters

A review of the potential for the proposed project to be a source of hazard or interact with other sources of hazard, and that could result in a major accident and/or disaster during all phases was undertaken. The potential for a major accident or natural disaster to impact on the proposed project was also considered.

This is addressed in Chapter 17 - Major Accidents and Natural Disasters.

2.7.4.8 Excavated Spoil and Peat Management

The use of the borrow pits will be phased. This will allow materials to be permanently placed in the first borrow pit while the second is in use, thereby minimising the volume of soils requiring temporary storage. In order to further reduce temporary storage requirements, soils and turves will be reinstated around infrastructure as part of restoration and landscaping works. This will be carried out during the construction phase, as soon as is practical after the completion of the works in any one area of the site. Approximately 248,167 m^3 will be excavated from the borrow pits onsite. Peat and other excess spoil will be placed at the borrow pits below the existing ground level to ensure containment. A total of 101,911.5 m^3 will be used to reinstate the borrow pit area as well as for landscaping.

Where the proposed project footprint is located on any mineral-based soil, this material will be placed adjacent to, and profiled as close to, the excavation areas as practical. In the case of peat, or where other adjacent infrastructure or constraint features might prevent adjacent placement, it will be used to reinstate the borrow pits. The sides of the excavated areas will be battered/sloped sufficiently to ensure that slippage does not occur (2:1 for mineral soil). The material will be smoothed with the back of an excavator bucket and surrounded by silt fences to minimise the potential for sediment-laden run-off occurrence. Placement will not occur within 50m of a watercourse. The placed material will be used later in backfilling the working area around the turbine foundations, or for landscaping locally or reinstatement elsewhere on site (such as the borrow pits). Further and more detailed information on the spoil and peat management is provided in Appendix 2-5 Spoil and Peat Management Plan.

Where placement in-situ is not possible, topsoil and sub-soil will be stockpiled separately. Turves will be stored turf side up and will not be allowed to dry out. Stockpiles will be isolated from any

surface drains and a minimum of 50m away from watercourses and will be located at points with easy access to internal roads within the proposed borrow pit areas which have not yet been extracted. Measures that will be employed will consist of interceptor ditches around these areas (with sediment traps within these – refer to Drawings 10955-2090, 10955-2091 and 10955-2092) deployment of double silt curtains and seeding of the piles will be incorporated to prevent runoff of suspended solids and soil erosion. No permanent spoil or stockpiles will be left on site. No stockpiles will be located on peat areas. Peat material will be used to reinstate the borrow pits (see Section 2.8.8 and Appendix 2-4 CEMP for information on sequencing of work).

Where available, vegetative sods/turves or other topsoil in keeping with the surrounding vegetation type will be used to provide a dressing for the final surface. Where sods/turves are not available, some seeding with native species will be carried out. This method for restoration of excavated or disturbed areas is to encourage stabilisation and early establishment of vegetation cover.

To prevent erosion and run-off and to facilitate vegetation reinstatement, any sloped soil embankment will be graded such that the slope angle is not too steep (i.e. 1:3) and that embankments match the surrounding ground profile. See Section 2.8.9 for further information on sequencing and spoil management.

2.7.4.9 Traffic Management

As described further in Chapter 16 - Traffic and Transportation, the successful completion of this project will require significant co-ordination and a comprehensive set of traffic management measures to be implemented before and during the construction and operational phase in order to minimise the effects of the additional traffic generated by the proposed project. A Traffic Management Plan proposed for the project is provided as Appendix 16-1.

2.8 HEALTH AND SAFETY

The proposed project will be constructed, operated and decommissioned in accordance with all relevant Health and Safety Legislation as described in the CEMP (Appendix 2-4).

Aspects of the development that will present health and safety issues include:

- Health and safety aspects of construction activities;
- General construction site safety (e.g. slip/trip, moving vehicles etc);
- On site traffic safety (during construction and operational phases) associated with localised high road embankments;
- Traffic safety during the transport of oversized loads to the site;
- Lifting of heavy loads overhead using cranes;
- Working at heights; and
- Working with electricity during commissioning.

The scale and scope of the project requires that a Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS) will be appointed in accordance with the provisions of the Safety, Health and Welfare at Work (Construction) Regulations. The PSDP role for the project is Egan Safety Solutions up to the end of the planning stage.

The PSDP and PSCS appointed for the project will be required to perform his/her duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations.

None of the construction, operational or decommissioning phases of the project are anticipated to cause a significant negative impact to safe practice of agricultural, forestry and commercial activities outside the development footprint.

It is not anticipated that the operation of the wind farm will present a danger to the public and livestock. Rigorous safety checks are conducted on the turbines during design, construction, commissioning and operation to ensure the risks posed to staff, landowners and general public are negligible.

Access to the turbines is through a door at the base of the structure, which will be locked at all times outside maintenance visits.

Signs will be erected at suitable locations across the site as required for the ease and safety of operation of the wind farm. Further details are provided in the CEMP (Appendix 2-4).

The components of a wind turbine are anticipated to have a useful lifespan of 35 years or more and are equipped with a number of safety devices to ensure safe operation during their lifetime. During the operation of the wind farm regular maintenance of the turbines will be carried out by the turbine manufacturer or appointed service company. A project or task specific Health and Safety Plan will be developed for these works in accordance with the site's health and safety requirements.

2.9 OPERATION

The proposed project has a lifespan of 35 years. This is the anticipated useful lifespan of wind turbines which are being produced for the market today. The lifespan of wind turbines has been increasing steadily in recent years and allowing this duration will improve the overall carbon balance of the development, therefore maximising the amount of fossil fuel usage that will be offset by the wind farm. Leaving the wind turbines in-situ until the end of their useful lifespan would make the most sense from an environmental viewpoint, particularly in relation to carbon savings. During this operational period the wind turbines will generally operate automatically, responding by means of equipment, measuring the speed of wind, and control systems to changes in wind speed and direction.

The wind turbines will be interconnected and data relayed from the wind turbines to a control centre off-site. Each turbine will also be monitored off-site by the wind turbine supplier or Operations and Maintenance (O&M) service provider. The monitoring of turbine output, performance, wind speeds, and responses to any key alarms will be monitored at a control centre 24-hours per day.

Each turbine will be subject to a routine maintenance programme involving a number of checks and changing of consumables, including oil changes. In addition, there will be a requirement for unscheduled maintenance, which could vary between resetting alarms to major component changes requiring a crane. Regular maintenance traffic will consist of four-wheel drive vehicles or vans. The electricity substation components and site roads and drainage will also require periodic maintenance in accordance with appropriate operation maintenance plans, procedures and health and safety plans.

Once operational, it is estimated that the wind farm will support 2-3 long term, high quality technical jobs on site in operation and maintenance as well as a more significant number of jobs in ancillary functions (estimated to be a total of between 22-32 jobs between direct and indirect

employment based on research[4]). See Chapter 5 - Population and Human Health for further information.

2.10 COMMUNITY BENEFIT PROPOSAL

The proposed project has the potential to bring significant positive benefit to the local community. The project will contribute approximately € 1.2 to 1.5 million in annual rates to Leitrim County Council and a community benefit fund will be put in place for the lifetime of the project to provide direct funding to areas surrounding the project. The RESS Terms and Conditions were published in 2025 and provide details on the Government requirements for community benefit funds for renewable energy projects that participate in the scheme. Successful RESS projects must comply with the Rulebook for Community Benefit Funds Under RESS[5]. For this project, depending on the number and details of any turbines permitted, it is expected that a significant annual community benefit fund of over €500,000 per year for the first 15 years of the project will be established in line with Government policy which will include funding for both wider community initiatives and a Near Neighbour scheme focused on houses in close proximity to the project. For the remaining lifetime of the wind farm, the Applicant commits to contributing an additional €1/MWh, which is estimated to be over €250,000 per year. Therefore, over the expected 35-year lifetime of proposed project, the Community Benefit Fund will be in the order of €12.5 million.

The Community Benefit Fund belongs to the local community. The premise of the fund is that it should be used to bring about significant, positive change in the local area. To make this happen, a benefit fund development working group will be formed that clearly represents both the closest neighbours to the project as well as nearby communities. This group will then work on designing the governance and structure of a community entity that will decide what type of projects will be supported by the fund and manage the administration of the Community Benefit Fund. In accordance with the Rulebook mentioned above, the Fund will deliver initiatives that are in alignment with the UN Sustainable Development Goals.

2.11 DECOMMISSIONING

As stated previously the wind turbines are expected to have a lifespan of 35 years. Following the end of their useful life, the wind turbines will be decommissioned fully, with the exception of the electricity substation and site roads and drainage.

Upon decommissioning of the proposed wind farm project, the wind turbines will be disassembled in reverse order to how they were erected. All above ground turbine components will be separated, cut up to allow them fit on a standard articulated lorry and removed off-site for recycling.

Turbine foundations will remain in place underground and along with hardstands will be allowed to revegetate naturally. Leaving the turbine foundations and hardstands in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete and stone from the ground could result in potentially needless environment nuisances such as noise, dust

[4] https://opus.lib.uts.edu.au/bitstream/10453/43718/1/Rutovitzetal2015Calculatingglobalenergysectorjobsmethodology.pdf

[5] https://assets.gov.ie/static/documents/Rulebook_for_CBFs_under_RESS_branded.pdf [Accessed April 2026

and/or vibration. There would be no real environmental benefit from removing the foundations, as the concrete is underground, stable and inert. The site roadways will be in use for additional purposes to the operation of the wind farm (e.g. for forest/agricultural access) by the time the decommissioning of the project is to commence, and therefore it is more appropriate to leave the site roads in situ for future use.

The on-site substation and 110kV grid connection will not be removed at the end of the useful life of the wind farm project as it will form part of the national electricity network. Therefore, the substation will be retained as a permanent structure and will not be decommissioned.

An outline decommissioning plan is contained within the CEMP (refer to Section 15, Appendix 2-4). A detailed decommissioning plan will be agreed in advance of works taking place with Leitrim County Council and any other relevant authorities.

Appendix 2-1

Turbine Delivery Route (TDR) Report

Digital Land Surveyors Ltd.

♦SWEPT PATH ANALYSIS SPECIALISTS♦

Swept Path Analysis

Delivery route for the proposed Lissinagroagh Wind Farm, Co. Leitrim.

Report for:
Future Energy Ireland Limited
27/28 Herbert Place
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Report prepared by:
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Date:
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1. Introduction

1.1. Purpose of the Report

Digital Land Surveyors Ltd were commissioned by Future Energy Ireland to undertake a Swept Path Analysis on the delivery route for the proposed Lissinagroagh Wind Farm, Co. Leitrim.

All the pinch points assessed in this report were identified by Digital Land Surveyors ltd.

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The SPA identifies where the Proposed Development may require accommodations to provide for the delivery of a 81.5m blade from the port of Killybegs, Co. Donegal to the site of the proposed Windfarm however, the detailed design of these accommodations is beyond the agreed scope of this report.

The TDR accommodations are not limited to but generally consist of temporary vegetation trimming and removal, removal of street furniture and local strengthening of road verges.

1.2. Important Notes

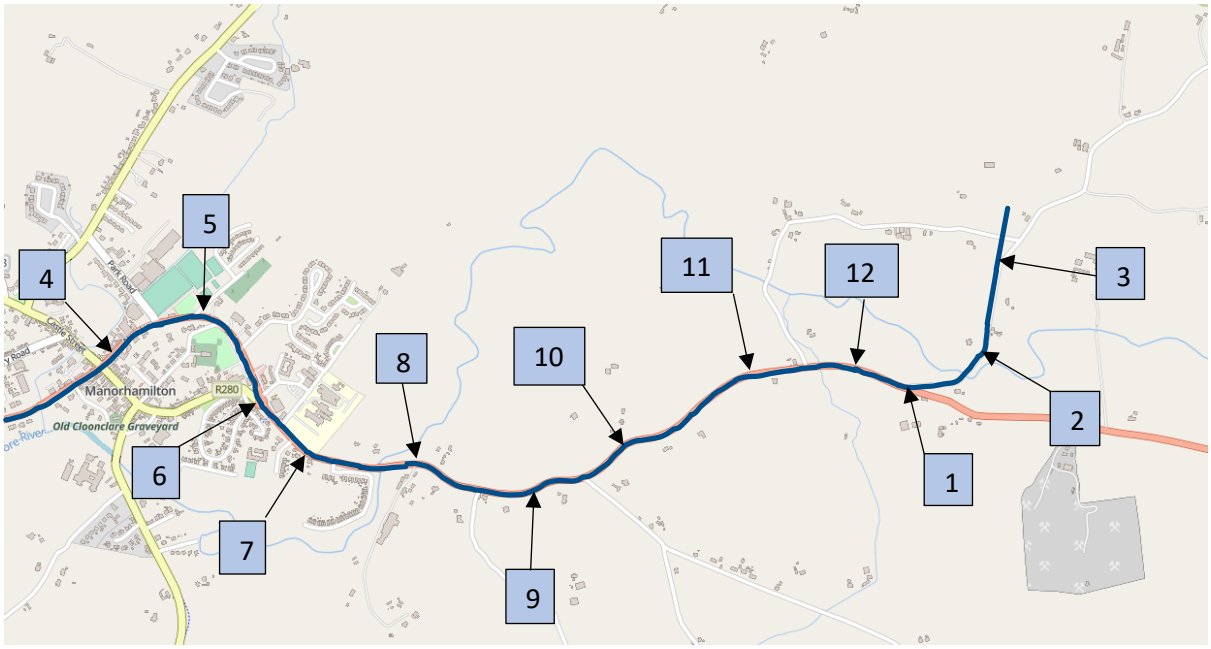
This Swept Path Analysis was carried out based on aerial imagery and a topographical survey to identify the extent of vegetation, tarmac edges, utility obstruction etc. in order to determine the least disruptive path through the pinch points outlined in Digital Land Surveyors report outlined above. Overhead utility cables have been identified as they cross or run alongside the road however their height was not measured as part of the SPA, therefore prior to delivery of the blade the utility cables should be measured, and the utility companies should be contacted regarding heights of the cables and potential remedies. Utility poles have also been identified and where required recommended to be removed. Prior to removal consultation with the relevant utility companies is required.

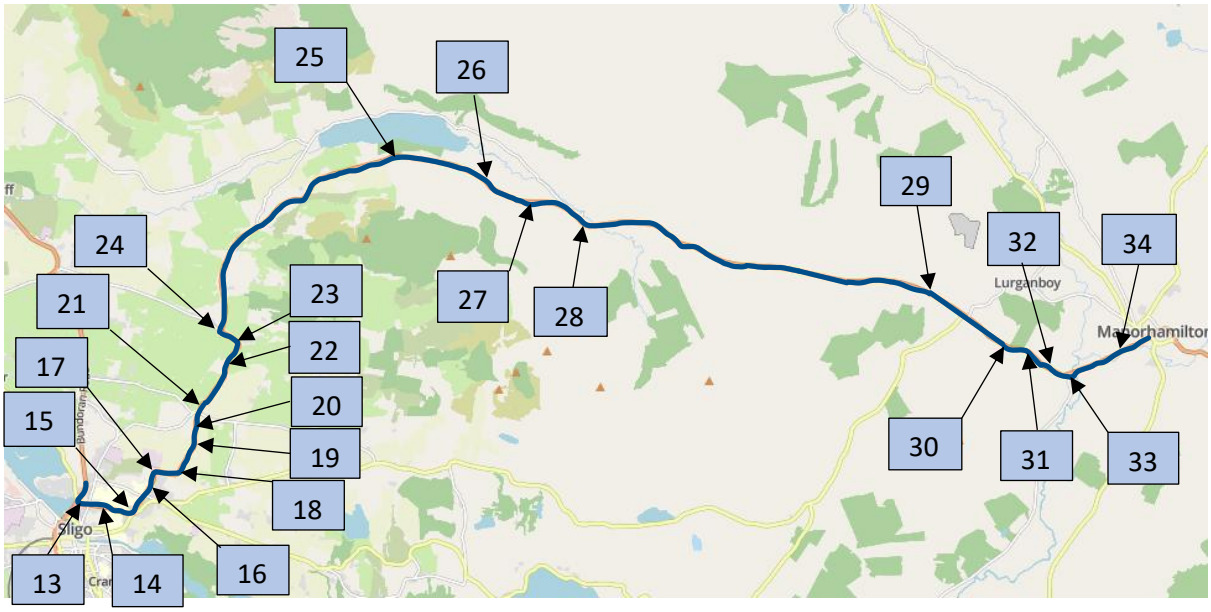
2. Drawings

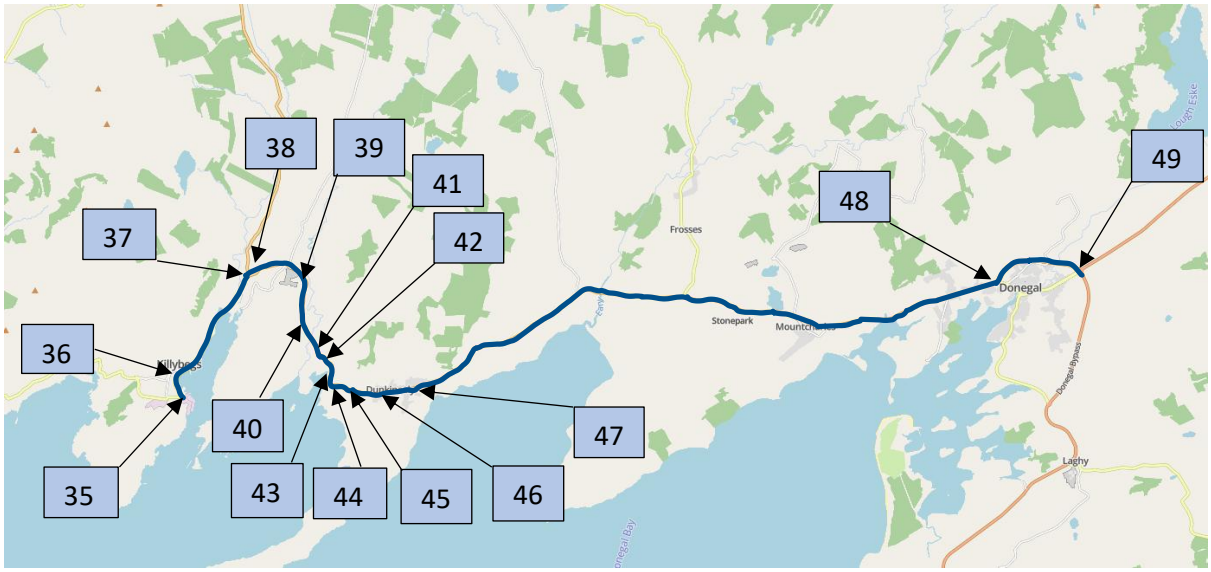
2.1. Location Overview



2.2. Pinch Points



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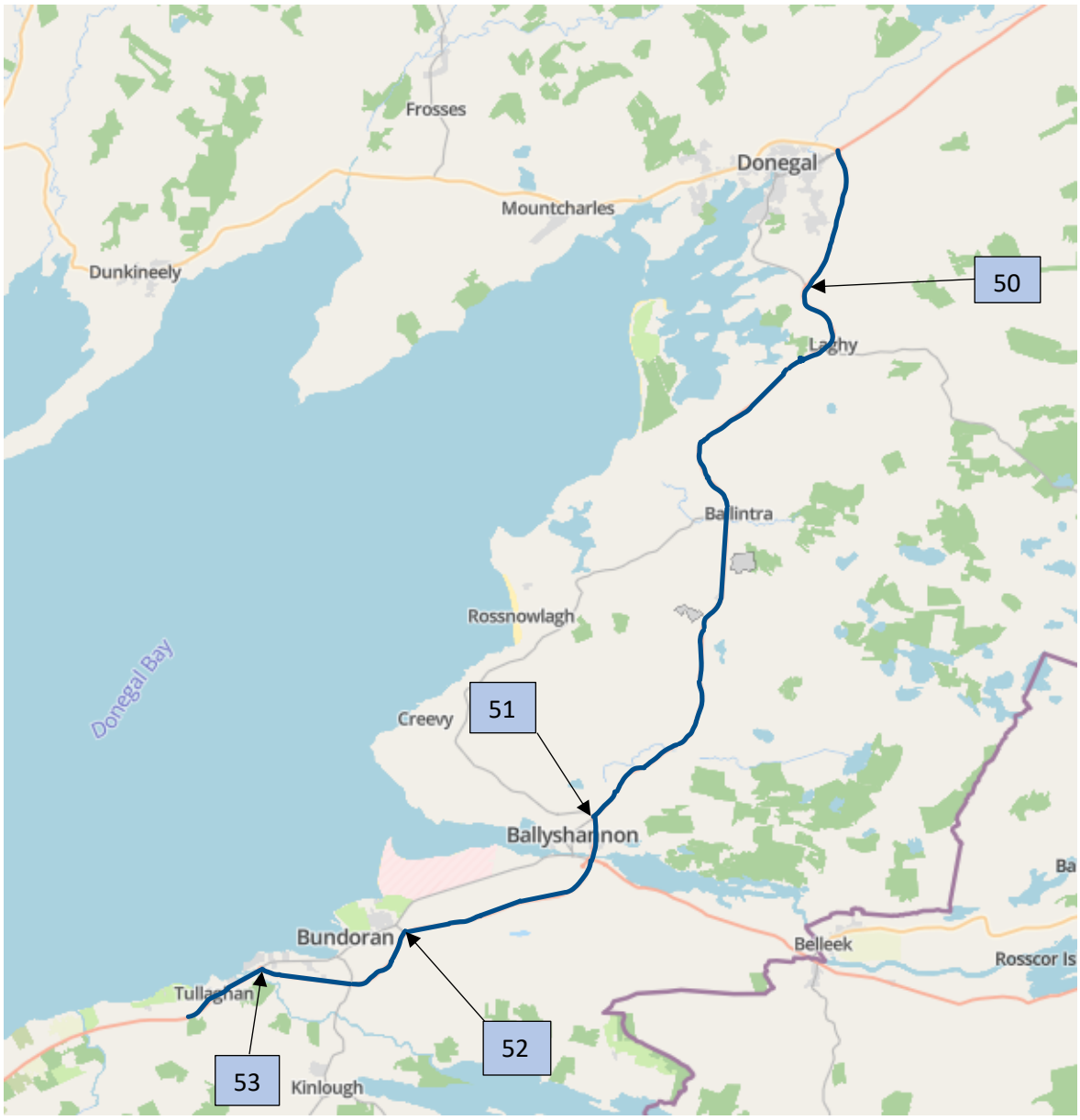
Donegal
Stonepark
Laghy


Frosses
Donegal
Mountcharles
Dunkineely
50
Laghy
Ballintra
Rossnowlagh
Donegal Bay
Creevy
51
Ballyshannon
Bundoran
Belleek
Rosscor Is
Tullaghan
52
53
Kinlough


Bundoran
Tullaghan
Mullaghmore
Kinlough
Cliffoney
Dernish Island
Connors Island
54
55
56
57
Sligo
Annagh Island

3. Swept Path Analysis Drawings

The pinch points that were analysed are as identified by Digital Land Surveyors Ltd in their Primary Route Assessment Report dated September 2024, these are as follows:

Location 1
Location 2
Location 3
Location 4
Location 5
Location 6
Location 7
Location 8
Location 9
Location 10
Location 11
Location 12
Location 13
Location 14
Location 15
Location 16
Location 17
Location 18
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Location 20
Location 21
Location 22
Location 23
Location 24
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Location 26
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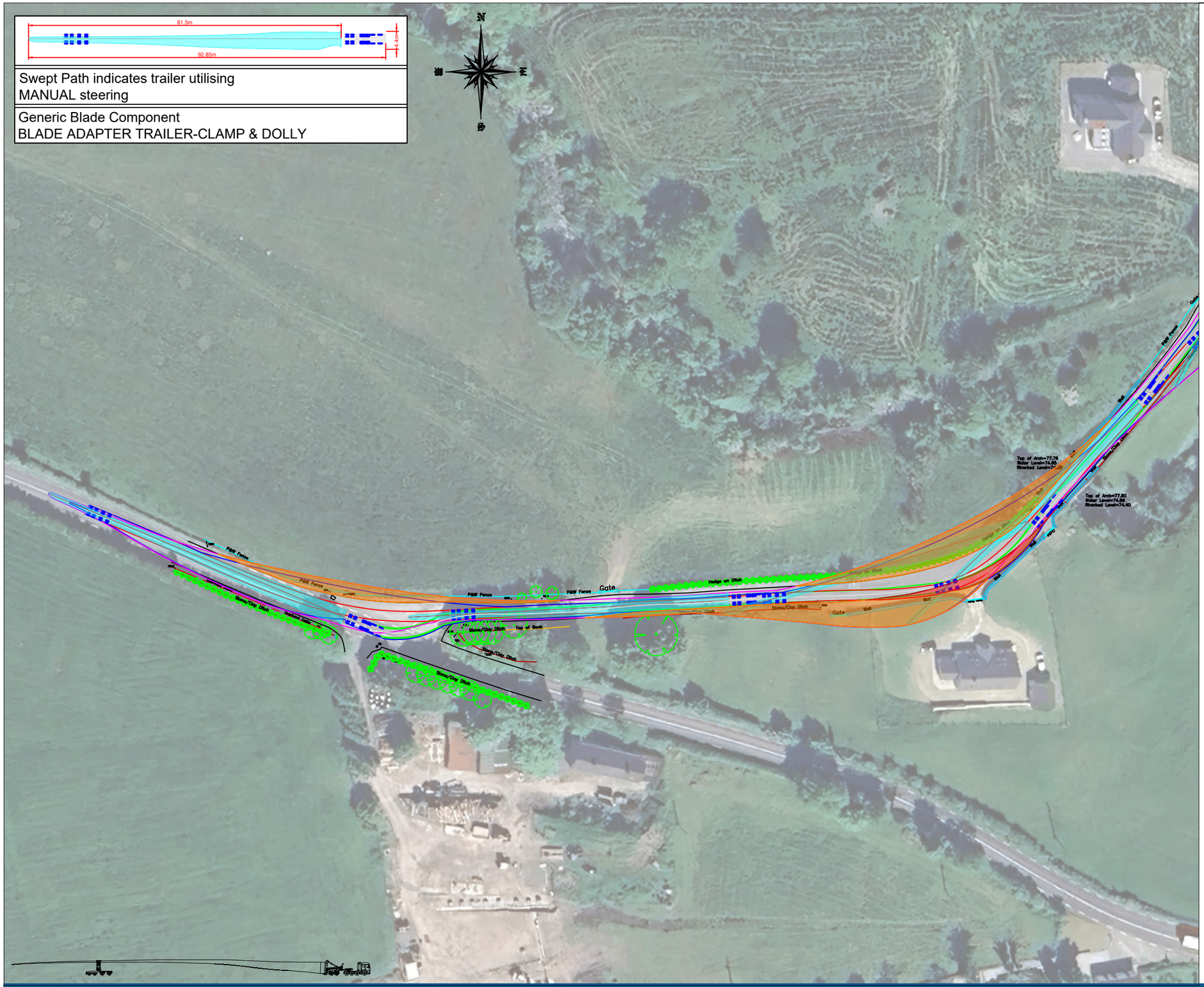
Location 55
Location 56
Location 57



Area within Magenta outline will be oversailed by vehicle load

Area within Blue outline will be oversailed by vehicle body

Tractor Axles outlined in Green

Trailer Axles outlined in Red

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

Area shaded RED requires ground works to enable the vehicle axles to pass including levelling and strengthening

ITM GRID REFERENCE: 590874 839524

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 01 - ATR01_81.5_01 - N16 - L6184 TURNOFF	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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EMAIL: info@landsurveyors.ie

Digital Land Surveyors Ltd
SWEPT PATH ANALYSIS SPECIALISTS



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Area within Blue outline will be oversailed by vehicle body
Tractor Axles outlined in Green
Trailer Axles outlined in Red

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ITM GRID REFERENCE: 591067 839758

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Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE	1:1000
DATE	01/04/2026
REVISION	A
SITE	LISSINAGROAGH WINDFARM
DRG NO.	E2590
TITLE	LOCATION 02 - ATR01_81.5_01 - L6184 LEFT BEND
PREPARED BY	W.GALLAGHER
CLIENT	FUTURENERGY IRELAND
SIZE	A3

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- Trailer Axles outlined in Red
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- Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 591122 839951

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Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE	1:1000
DATE	01/04/2026
REVISION	A
SITE	LISSINAGROAGH WINDFARM
DRG NO.	E2590
TITLE	LOCATION 03 - ATR01_81.5_01 - L6184 SITE ENTRANCE
PREPARED BY	W.GALLAGHER
CLIENT	FUTURENERGY IRELAND
SIZE	A3

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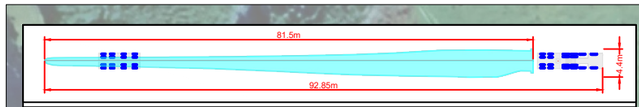
SWEPT PATH ANALYSIS SPECIALISTS



Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

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- Area within Blue outline will be oversailed by vehicle body
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- Trailer Axles outlined in Red

ITM GRID REFERENCE: 588548 839636

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 04 - ATR01_81.5_01 - N16 MANORHAMILTON	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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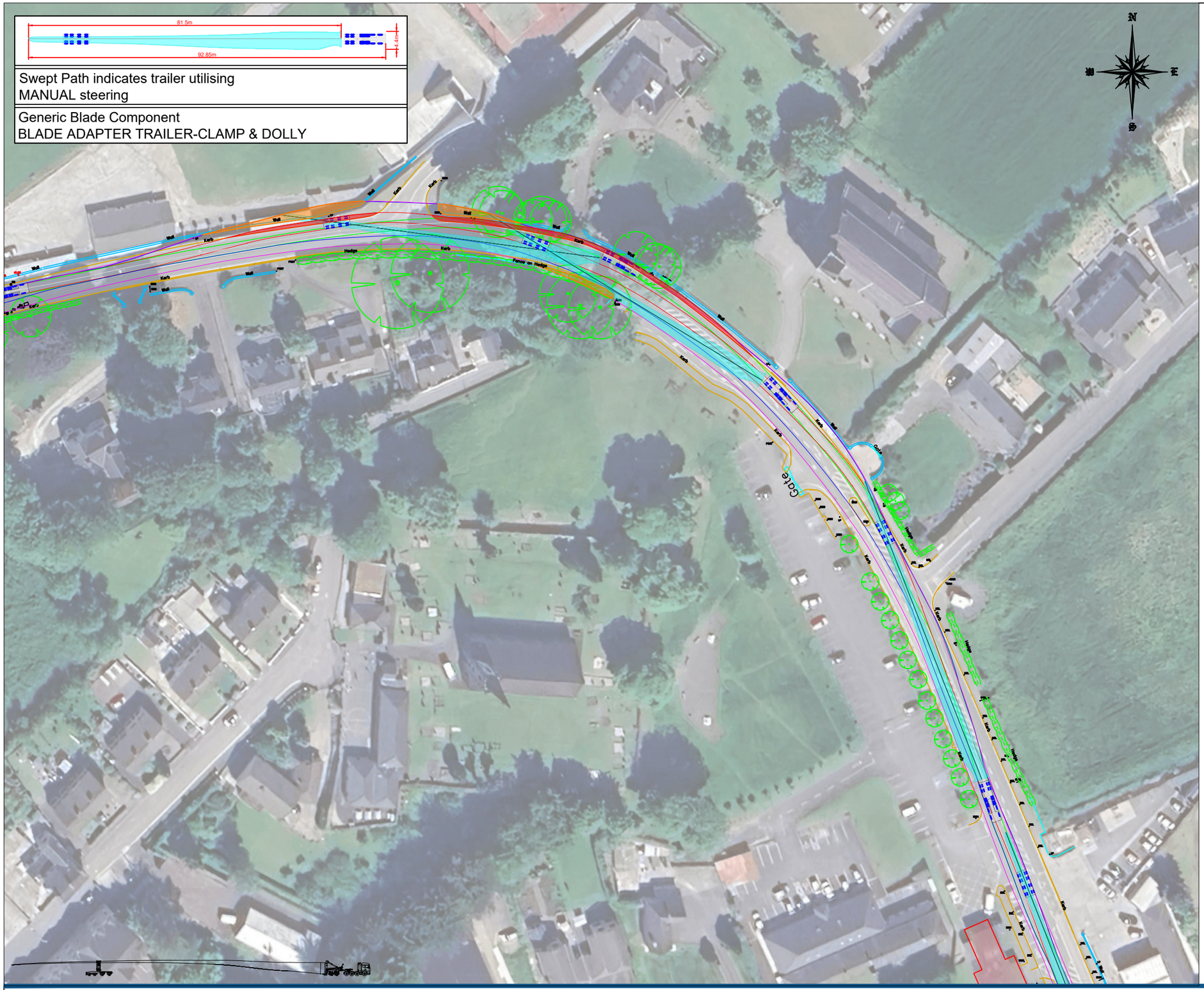

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Area within Blue outline will be oversailed by vehicle body
Tractor Axles outlined in Green
Trailer Axles outlined in Red

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

Area shaded RED requires ground works to enable the vehicle axles to pass including levelling and strengthening

ITM GRID REFERENCE: 588828 839715

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 05 - ATR01_81.5_01 - N16 MANORHAMILTON	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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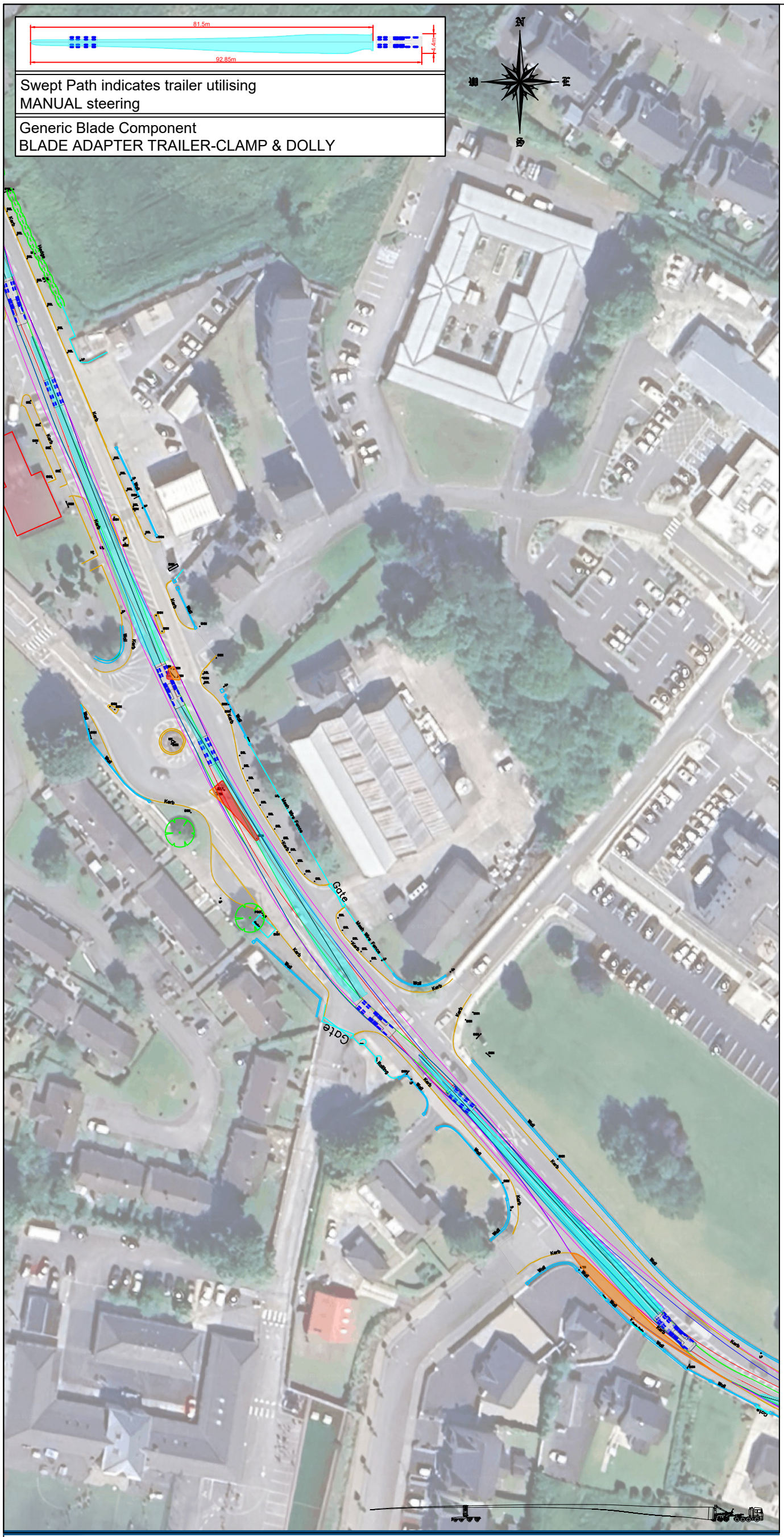

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ITM GRID REFERENCE: 588970 839467

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Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE	1:1000
DATE	01/04/2026
REVISION	A
SITE	LISSINAGROAGH WINDFARM
DRG NO.	E2590
TITLE	LOCATION 06 - ATR01_81.5_01 - N16 STATION ROAD ROUNDABOUT
PREPARED BY	W.GALLAGHER
CLIENT	FUTURENERGY IRELAND
SIZE	A3

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SWEPT PATH ANALYSIS SPECIALISTS



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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 07 - ATR01_81.5_01 - N16 STATION ROAD	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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ITM GRID REFERENCE: 589507 839249

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 08 - ATR01_81.5_01 - N16 SLIGO ROAD	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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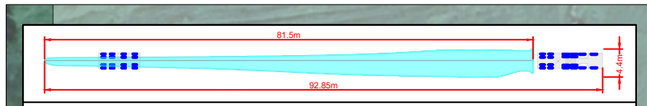

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY



- Area within Magenta outline will be oversailed by vehicle load
- Area within Blue outline will be oversailed by vehicle body
- Tractor Axles outlined in Green
- Trailer Axles outlined in Red
- Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 589010 839249

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 09 - ATR01_81.5_01 - N16 SLIGO ROAD	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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Area within Blue outline will be oversailed by vehicle body
Tractor Axles outlined in Green
Trailer Axles outlined in Red
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ITM GRID REFERENCE: 590097 839377

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 10 - ATR01_81.5_01 - N16 SLIGO ROAD	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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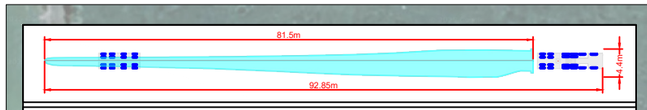

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY



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- Trailer Axles outlined in Red

ITM GRID REFERENCE: 590381 839557

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 11 - ATR01_81.5_01 - N16 MANORHAMILTON	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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Tractor Axles outlined in Green
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ITM GRID REFERENCE: 590679 839570

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 12 - ATR01_81.5_01 - N16 - L6184 JUNCTION	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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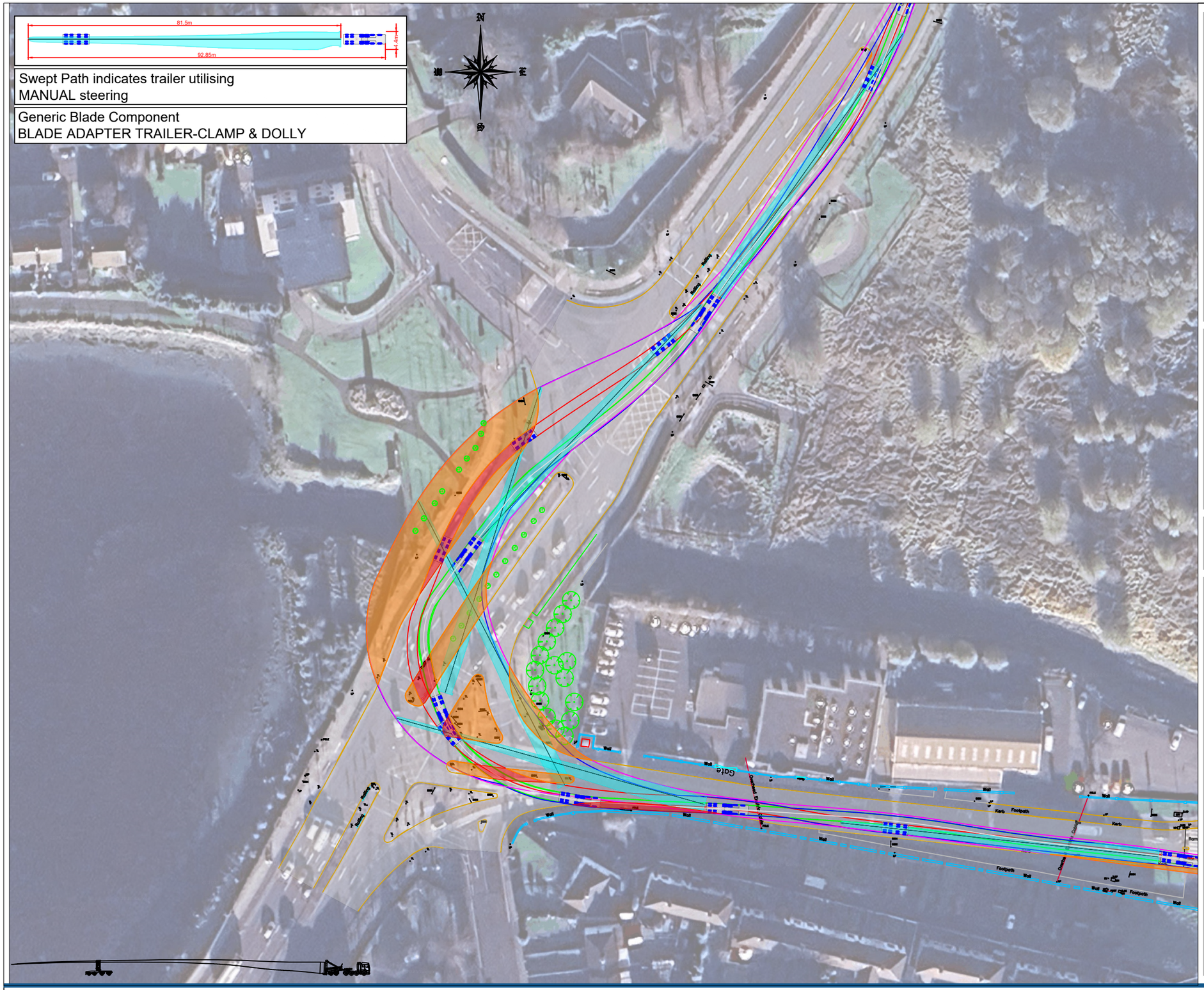

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Tractor Axles outlined in Green
Trailer Axles outlined in Red

Area shaded RED requires ground works to enable the vehicle axles to pass including levelling and strengthening

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 569092 836675

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 13 - ATR01_81.5_01 - SLIGO N15 - N16 JUNCTION	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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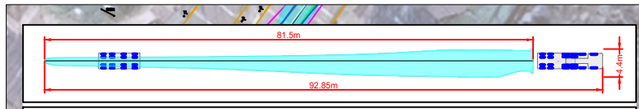

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY



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ITM GRID REFERENCE: 569297 836630

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026
TITLE LOCATION 14 - ATR01_81.5_01 - SLIGO N16 ROUNDABOUT	PREPARED BY W GALLAGHER	SCALE 1:1000
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A

Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

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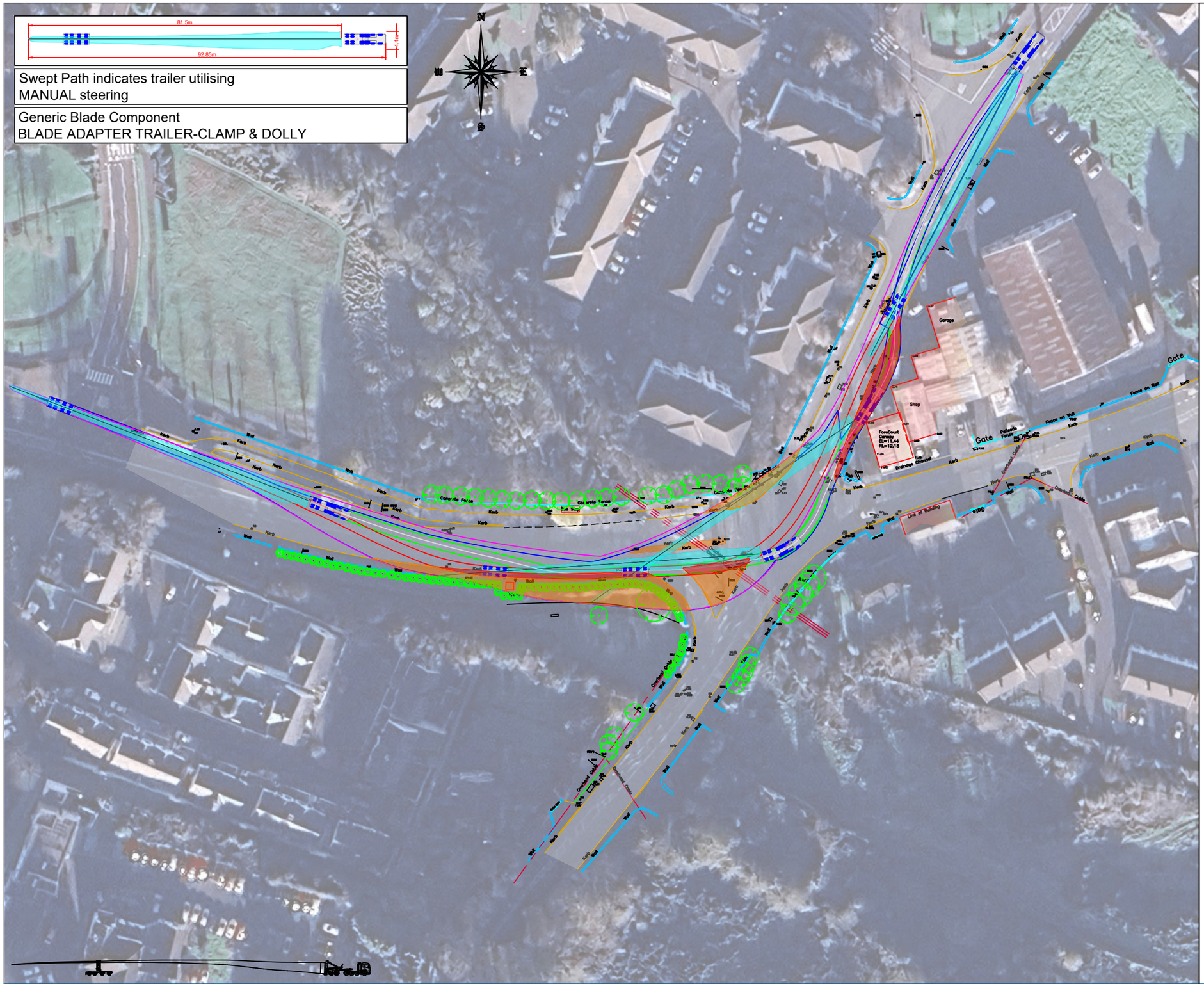

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 15 - ATR01_81.5_01 - N16 LEFT TURN - SLIGO	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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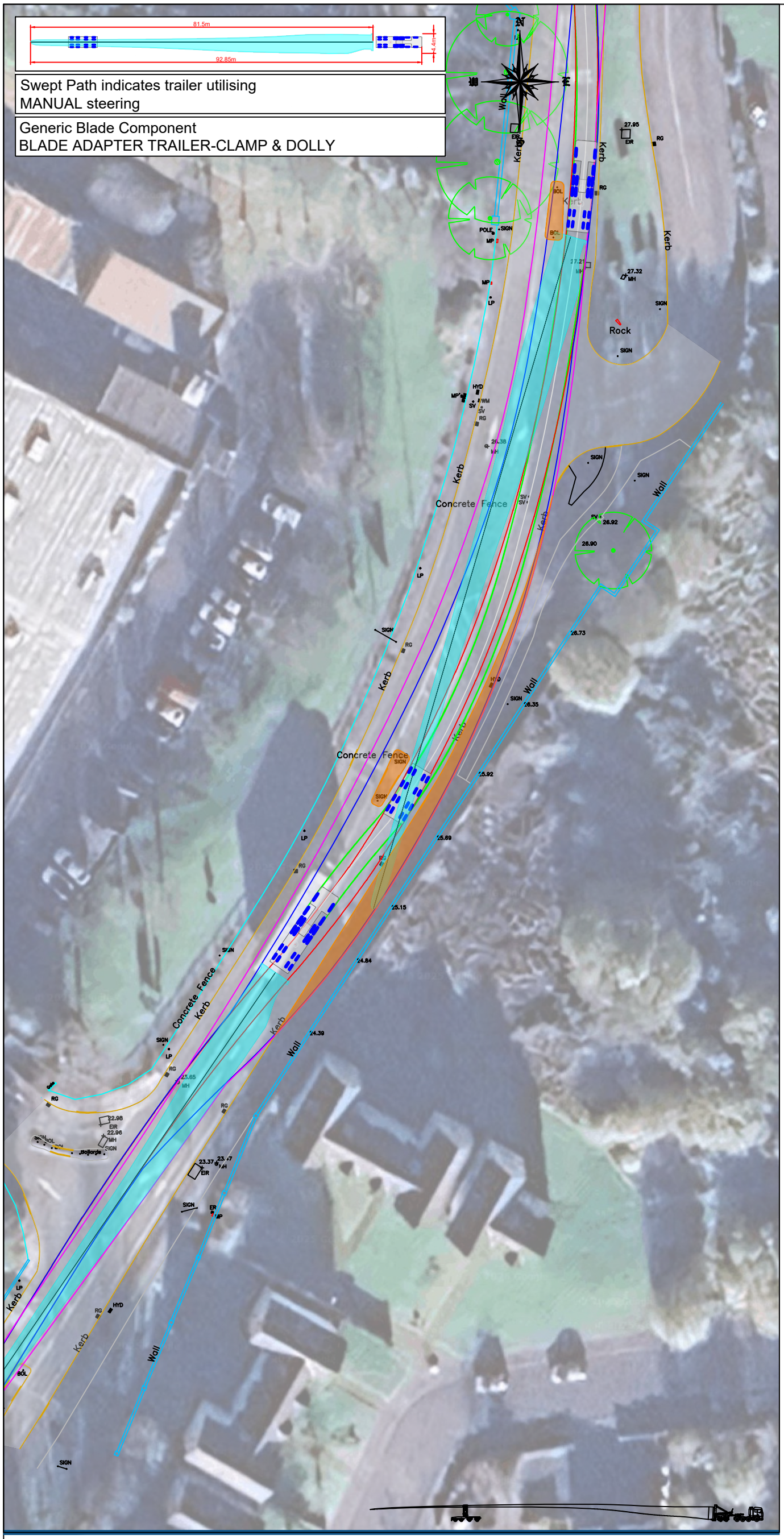

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ITM GRID REFERENCE: 570463 837035

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Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE	1:500
DATE	01/04/2026
REVISION	A
SITE	LISSINAGROAGH WINDFARM
DRG NO.	E2590
TITLE	LOCATION 16 - ATR01_81.5_01 - N16-MANARHAMILTON ROAD
PREPARED BY	W.GALLAGHER
CLIENT	FUTURENERGY IRELAND
SIZE	A3

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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EMAIL: info@landsurveyors.ie

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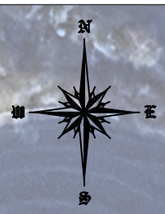
SWEPT PATH ANALYSIS SPECIALISTS



Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY



- Area within Magenta outline will be oversailed by vehicle load
- Area within Blue outline will be oversailed by vehicle body
- Tractor Axles outlined in Green
- Trailer Axles outlined in Red
- Area shaded RED requires ground works to enable the vehicle axles to pass including levelling and strengthening
- Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 570498 837207

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026
TITLE LOCATION 17 - ATR01_81.5_01 - N16 ABBVIE ROUNDABOUT	PREPARED BY W GALLAGHER	SCALE 1:1000
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION 01/04/2026

Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

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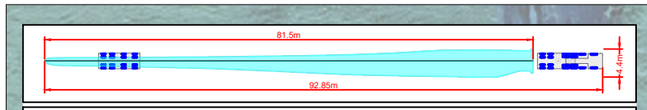
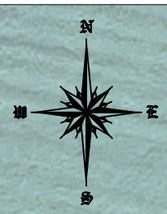


Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY



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ITM GRID REFERENCE: 570905 837169

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 18 - ATR01_81.5_01 - N16 MANORHAMILTON	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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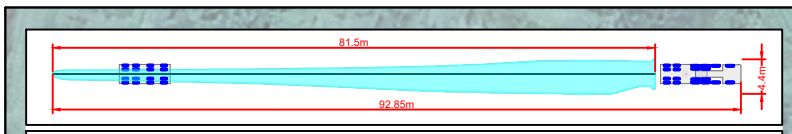

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

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Area within Blue outline will be oversailed by vehicle body
Tractor Axles outlined in Green
Trailer Axles outlined in Red

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 571218 837687

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Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE	1:1000
DATE	01/04/2026
REVISION	A
SITE	LISSINAGROAGH WINDFARM
DRG NO.	E2590
TITLE	LOCATION 19 - ATR01_81.5_01 - N16 MANORHAMILTON ROAD
PREPARED BY	W.GALLAGHER
CLIENT	FUTURENERGY IRELAND
SIZE	A3

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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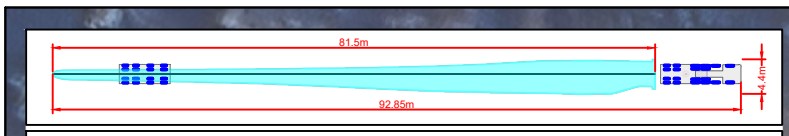

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

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Area within Blue outline will be oversailed by vehicle body
Tractor Axles outlined in Green
Trailer Axles outlined in Red

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 571246 838083

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Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE	1:1000
DATE	01/04/2026
REVISION	A
SITE	LISSINAGROAGH WINDFARM
DRG NO.	E2590
TITLE	LOCATION 20 - ATR01_81.5_01 - N16 MANORHAMILTON ROAD
PREPARED BY	W.GALLAGHER
CLIENT	FUTURENERGY IRELAND
SIZE	A3

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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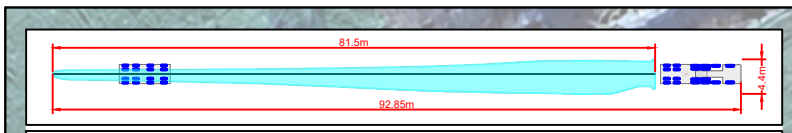

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

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Area within Blue outline will be oversailed by vehicle body
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Trailer Axles outlined in Red

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ITM GRID REFERENCE: 571346 838408

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Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE	1:1000
DATE	01/04/2026
REVISION	A
SITE	LISSINAGROAGH WINDFARM
DRG NO.	E2590
TITLE	LOCATION 21 - ATR01_81.5_01 - N16 MANORHAMILTON ROAD
PREPARED BY	W.GALLAGHER
CLIENT	FUTURENERGY IRELAND
SIZE	A3

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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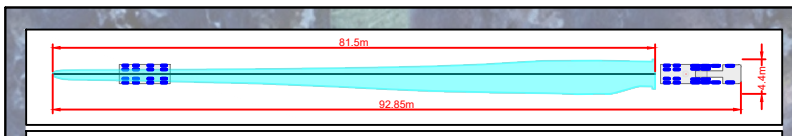

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

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Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 571755 838900

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Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE	DATE
1:1250	01/04/2026
REVISION	
A	

SITE	DRG NO.
LISSINAGROAGH WINDFARM	E2590
TITLE	PREPARED BY
LOCATION 22 - ATR01_81.5_01 - N16 MANORHAMILTON ROAD	W.GALLAGHER
CLIENT	SIZE
FUTURENERGY IRELAND	A3

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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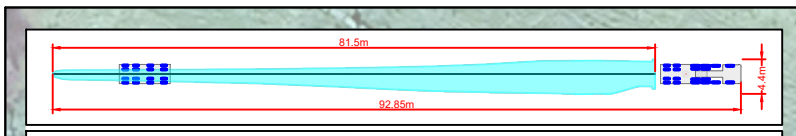

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

N
W
E
S

Area within Magenta outline will be oversailed by vehicle load
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Tractor Axles outlined in Green
Trailer Axles outlined in Red

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 572030 839525

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Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE	DATE
1:1000	01/04/2026
REVISION	
A	

SITE	DRG NO.
LISSINAGROAGH WINDFARM	E2590
TITLE	PREPARED BY
LOCATION 23 - ATR01_81.5_01 - N16 MANORHAMILTON ROAD	W.GALLAGHER
CLIENT	SIZE
FUTURENERGY IRELAND	A3

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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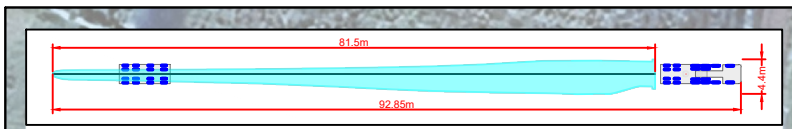

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

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Area shaded RED requires ground works to enable the vehicle axles to pass including levelling and strengthening

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 571722 839750

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Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE	1:1000
DATE	01/04/2026
REVISION	A
SITE	LISSINAGROAGH WINDFARM
DRG NO.	E2590
TITLE	LOCATION 24 - ATR01_81.5_01 - N16 DRUM ROAD ROUNDABOUT
PREPARED BY	W.GALLAGHER
CLIENT	FUTURENERGY IRELAND
SIZE	A3

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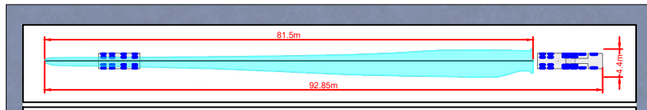

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

- Area within Magenta outline will be oversailed by vehicle load
- Area within Blue outline will be oversailed by vehicle body
- Tractor Axles outlined in Green
- Trailer Axles outlined in Red

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 574862 842888

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 25 - ATR01_81.5_01 - N16 MANORHAMILTON ROAD	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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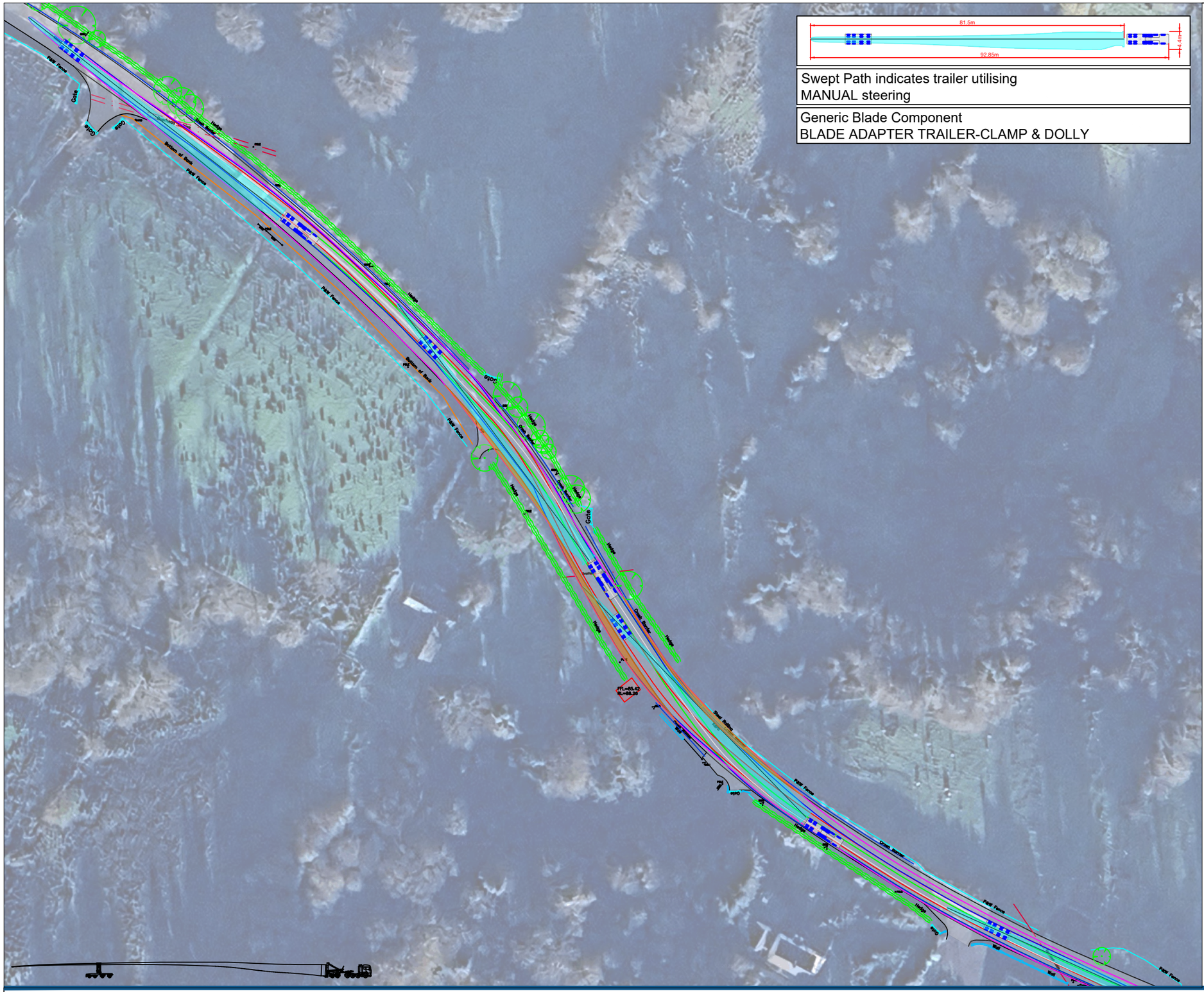

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

- Area within Magenta outline will be oversailed by vehicle load
- Area within Blue outline will be oversailed by vehicle body
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- Trailer Axles outlined in Red

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 576574 842331

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 26 - ATR01_81.5_01 - N16 MANORHAMILTON ROAD	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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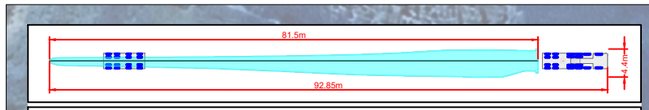

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

Area within Magenta outline will be oversailed by vehicle load
Area within Blue outline will be oversailed by vehicle body
Tractor Axles outlined in Green
Trailer Axles outlined in Red

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ITM GRID REFERENCE: 577126 842062

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 27 - ATR01_81.5_01 - N16 MANORHAMILTON ROAD	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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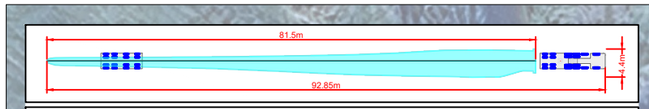

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

Area within Magenta outline will be oversailed by vehicle load
Area within Blue outline will be oversailed by vehicle body
Tractor Axles outlined in Green
Trailer Axles outlined in Red

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 578342 841607

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026
TITLE LOCATION 28 - ATR01_81.5_01 - N16 MANORHAMILTON ROAD	PREPARED BY W GALLAGHER	SCALE 1:1000
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A

Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

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Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

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ITM GRID REFERENCE: 585556 839609

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 29 - ATR01_81.5_01 - N16 MANORHAMILTON ROAD	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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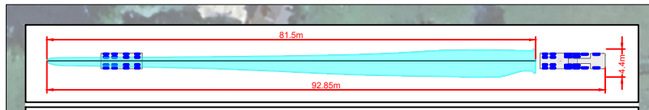

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

Area within Magenta outline will be oversailed by vehicle load
Area within Blue outline will be oversailed by vehicle body
Tractor Axles outlined in Green
Trailer Axles outlined in Red

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ITM GRID REFERENCE: 586059 839367

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 30 - ATR01_81.5_01 - N16 MANORHAMILTON ROAD	PREPARED BY W GALLAGHER	SCALE 1:1250	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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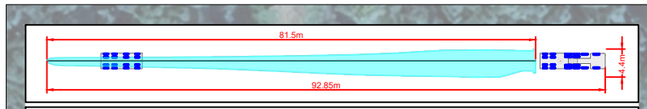

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

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ITM GRID REFERENCE: 586284 839321

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 31 - ATR01_81.5_01 - N16 MANORHAMILTON ROAD	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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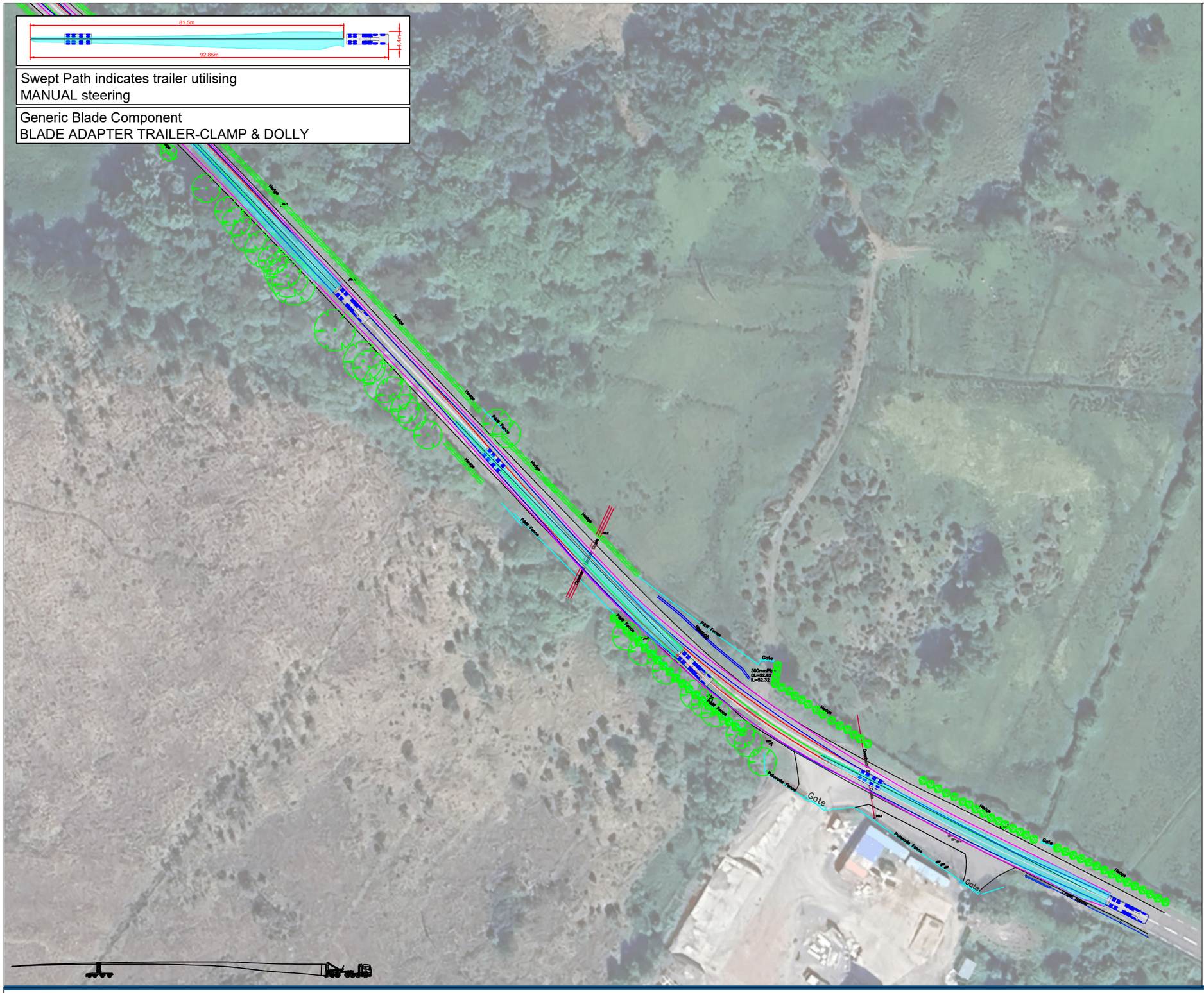

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Area within Blue outline will be oversailed by vehicle body
Tractor Axles outlined in Green
Trailer Axles outlined in Red

ITM GRID REFERENCE: 586518 839095

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 32 - ATR01_81.5_01 - N16 MANORHAMILTON ROAD	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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EMAIL: info@landsurveyors.ie

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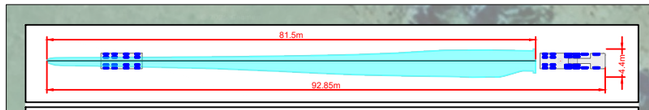

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

- Area within Magenta outline will be oversailed by vehicle load
- Area within Blue outline will be oversailed by vehicle body
- Tractor Axles outlined in Green
- Trailer Axles outlined in Red

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 586934 838893

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026
TITLE LOCATION 33 - ATR01_81.5_01 - N16 MANORHAMILTON ROAD	PREPARED BY W GALLAGHER	SCALE 1:1000
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A

Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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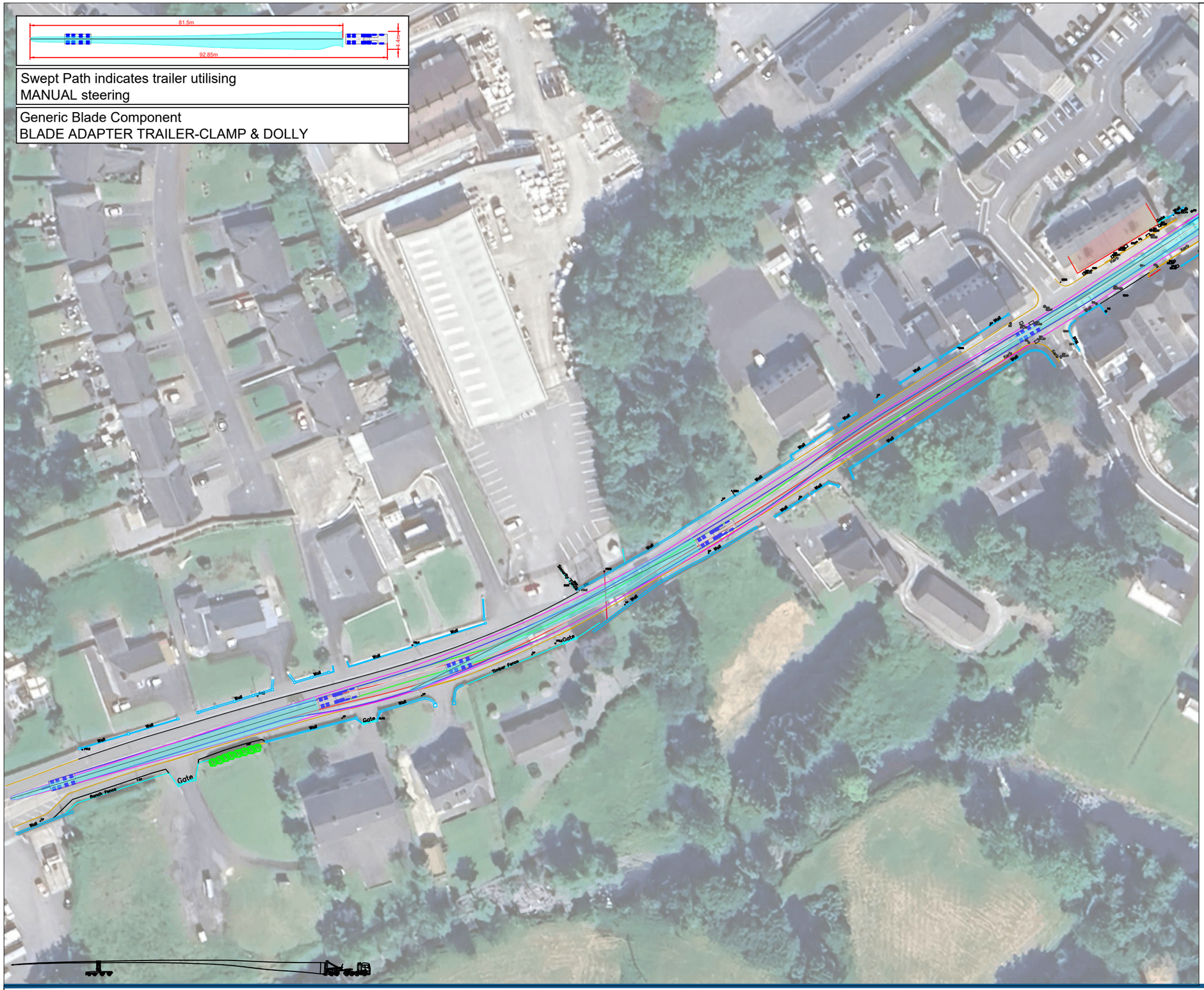

Area within Magenta outline will be oversailed by vehicle load
Area within Blue outline will be oversailed by vehicle body
Tractor Axles outlined in Green
Trailer Axles outlined in Red

ITM GRID REFERENCE: 588306 839462

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 34 - ATR01_81.5_01 - N16 MANORHAMILTON TOWN	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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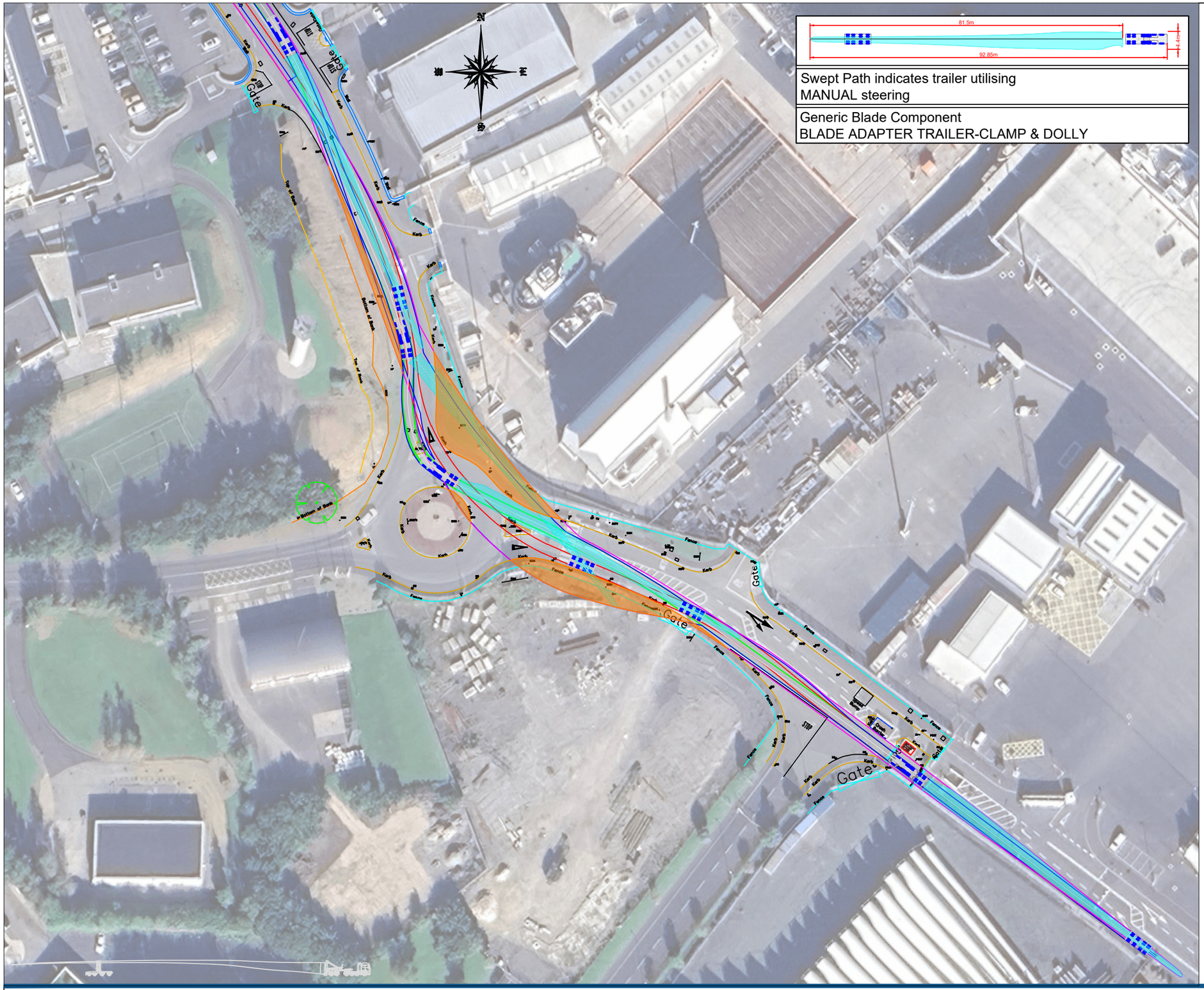

Area within Magenta outline will be oversailed by vehicle load
Area within Blue outline will be oversailed by vehicle body
Tractor Axles outlined in Green
Trailer Axles outlined in Red

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 571383 875896

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026
TITLE LOCATION 35 - ATR01_81.5_01 - PORT ROUNDABOUT KILLYBEGS	PREPARED BY W GALLAGHER	SCALE 1:1000
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A

Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

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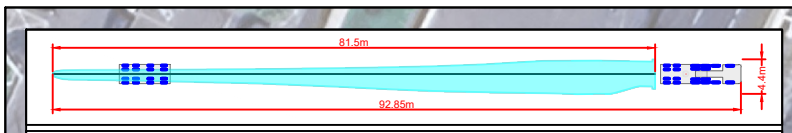

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

Area within Magenta outline will be oversailed by vehicle load
Area within Blue outline will be oversailed by vehicle body
Tractor Axles outlined in Green
Trailer Axles outlined in Red

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 571217 876180

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Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE	1:1000
DATE	01/04/2026
REVISION	A
SITE	LISSINAGROAGH WINDFARM
DRG NO.	E2590
TITLE	LOCATION 36 - ATR01_81.5_01 - R263 KILLYBEGS
PREPARED BY	W.GALLAGHER
CLIENT	FUTURENERGY IRELAND
SIZE	A3

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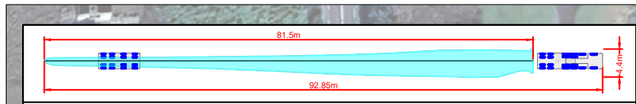

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY



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- Trailer Axles outlined in Red

ITM GRID REFERENCE: 573241 878990

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 37 - ATR01_81.5_01 - S BEND N56-ARDARA TURNOFF	PREPARED BY W GALLAGHER	SCALE 1:1250	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

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Trailer Axles outlined in Red

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ITM GRID REFERENCE: 573429 879166

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TITLE LOCATION 38 - ATR01_81.5_01 - RIGHT BEND N56	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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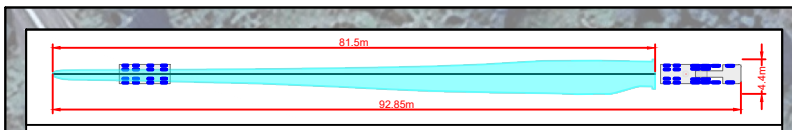

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY





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ITM GRID REFERENCE: 574598 878787

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Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE
1:1000

DATE
01/04/2026

REVISION
A

SITE
LISSINAGROAGH WINDFARM

DRG NO.
E2590

TITLE
LOCATION 39 - ATR01_81.5_01 - RIGHT BEND N56

PREPARED BY
W.GALLAGHER

CLIENT
FUTURENERGY IRELAND

SIZE
A3

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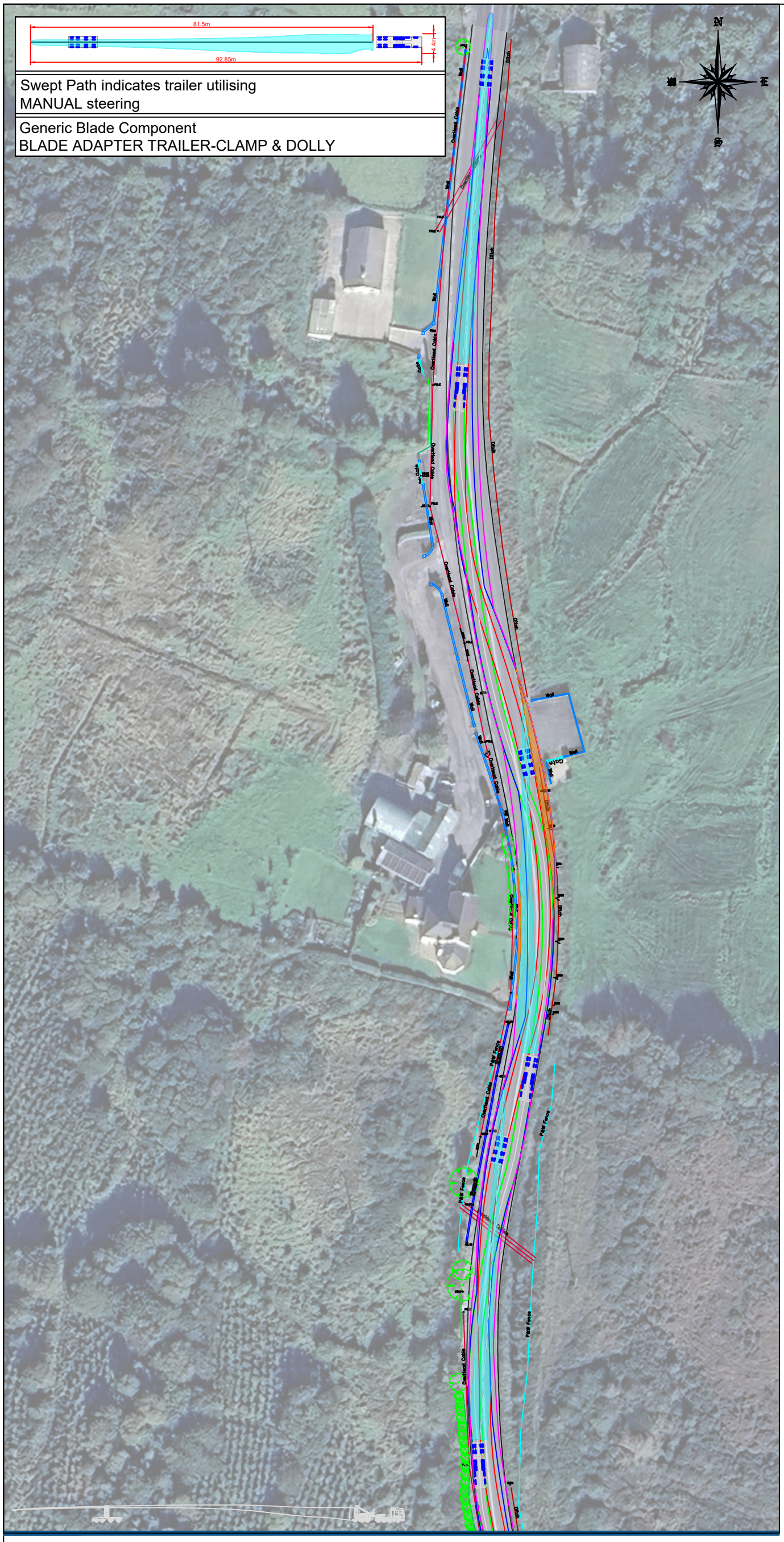

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

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Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 574493 877945

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Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE	1:1000
DATE	01/04/2026
REVISION	A
SITE	LISSINAGROAGH WINDFARM
DRG NO.	E2590
TITLE	LOCATION 40 - ATR01_81.5_01 - S BEND N56
PREPARED BY	W.GALLAGHER
CLIENT	FUTURENERGY IRELAND
SIZE	A3

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EMAIL: info@landsurveyors.ie

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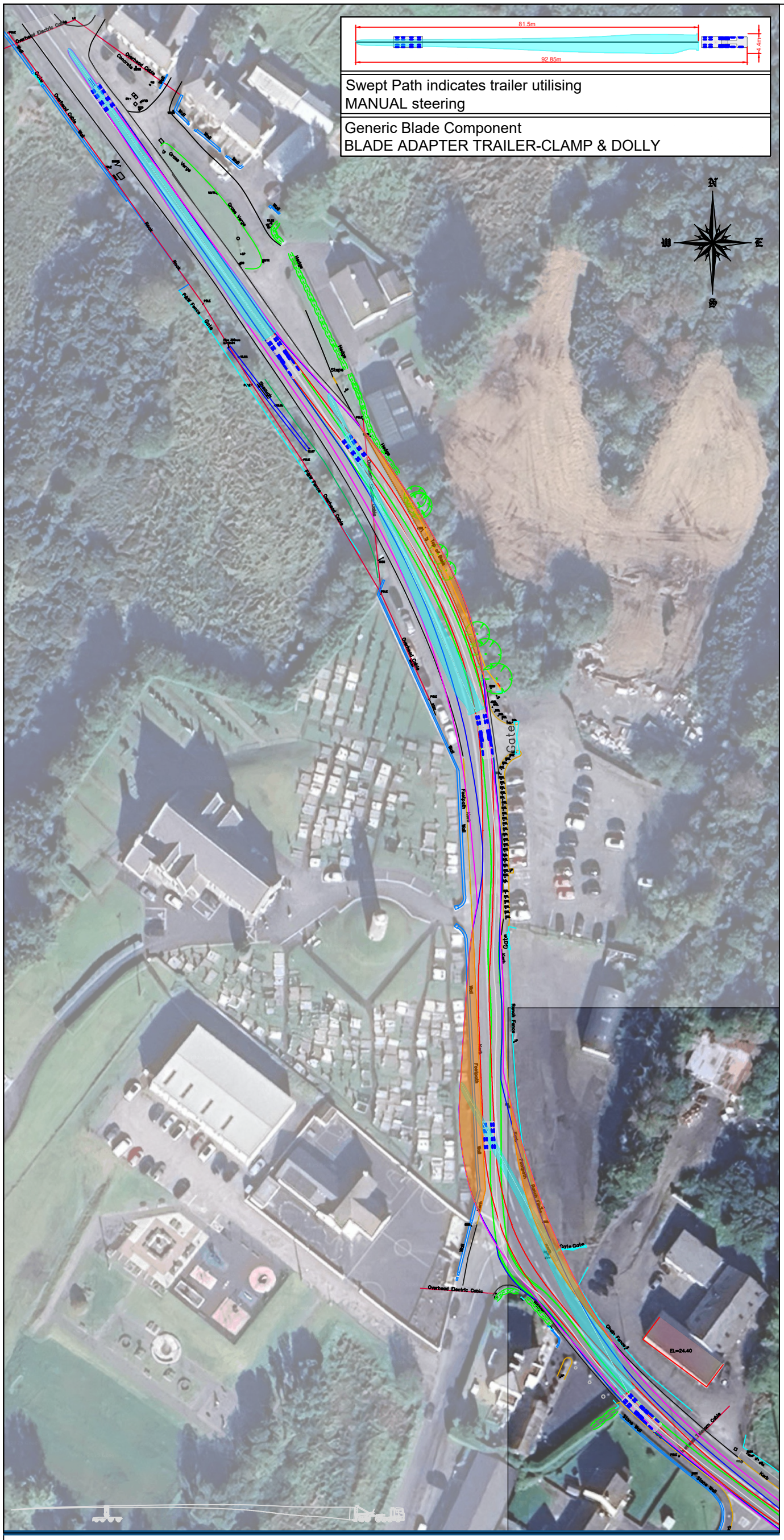

Area within Magenta outline will be oversailed by vehicle load
Area within Blue outline will be oversailed by vehicle body
Tractor Axles outlined in Green
Trailer Axles outlined in Red

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 574843 877135

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Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE	1:1000
DATE	01/04/2026
REVISION	A
SITE	LISSINAGROAGH WINDFARM
DRG NO.	E2590
TITLE	LOCATION 41 - ATR01_81.5_01 - S BEND N56 BRUCKLESS
PREPARED BY	W.GALLAGHER
CLIENT	FUTURENERGY IRELAND
SIZE	A3

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Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

- Area within Magenta outline will be oversailed by vehicle load
- Area within Blue outline will be oversailed by vehicle body
- Tractor Axles outlined in Green
- Trailer Axles outlined in Red

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 575045 876541

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 42 - ATR01_81.5_01 - N56 BRUCKLESS VILLAGE	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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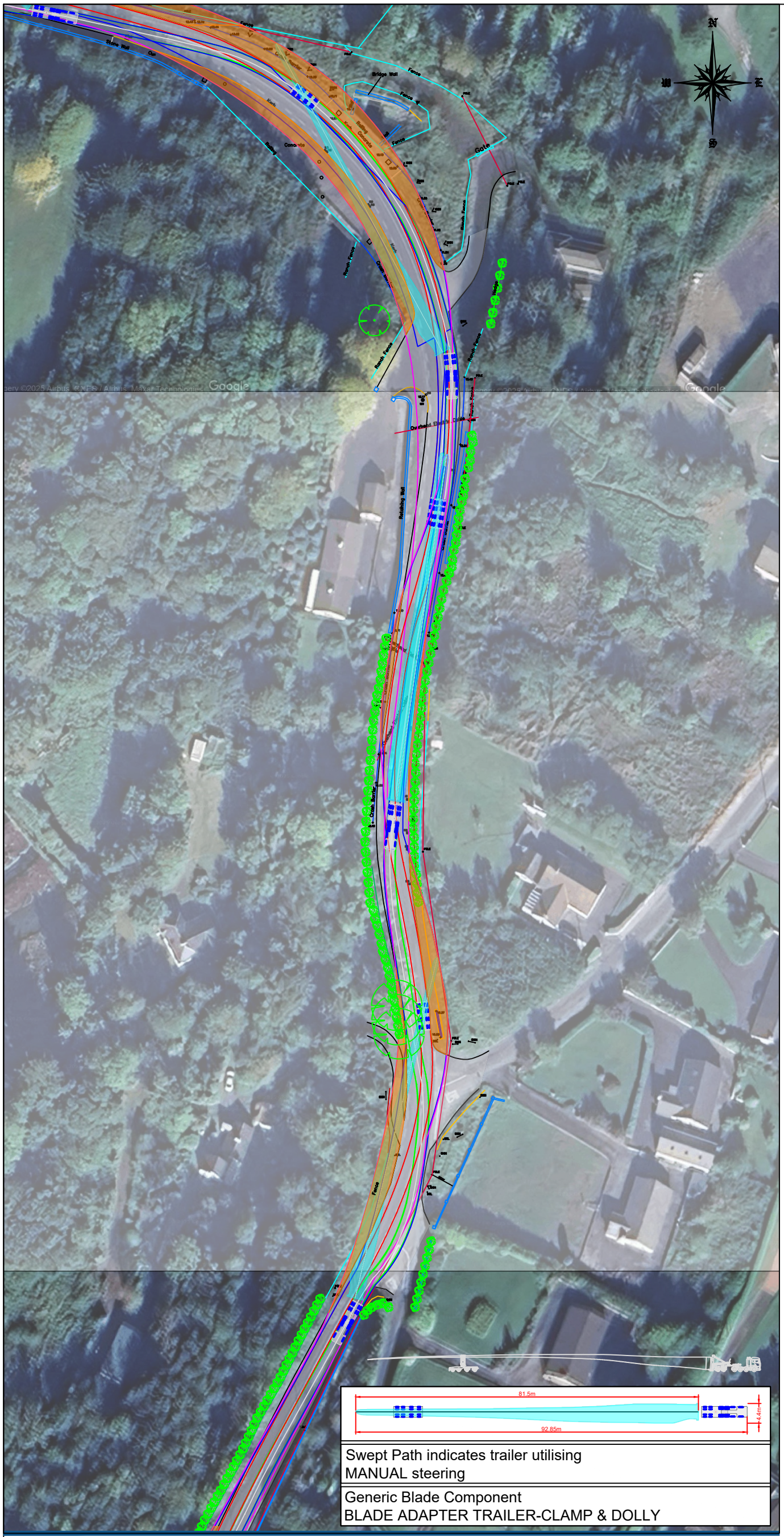

ITM GRID REFERENCE: 575227 876555

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Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE
1:1000

DATE
01/04/2026

REVISION
A

SITE
LISSINAGROAGH WINDFARM

DRG NO.
E2590

TITLE
LOCATION 43 - ATR01_81.5_01 - BRIDGE N56 BRUCKLESS

PREPARED BY
W.GALLAGHER

CLIENT
FUTURENERGY IRELAND

SIZE
A3

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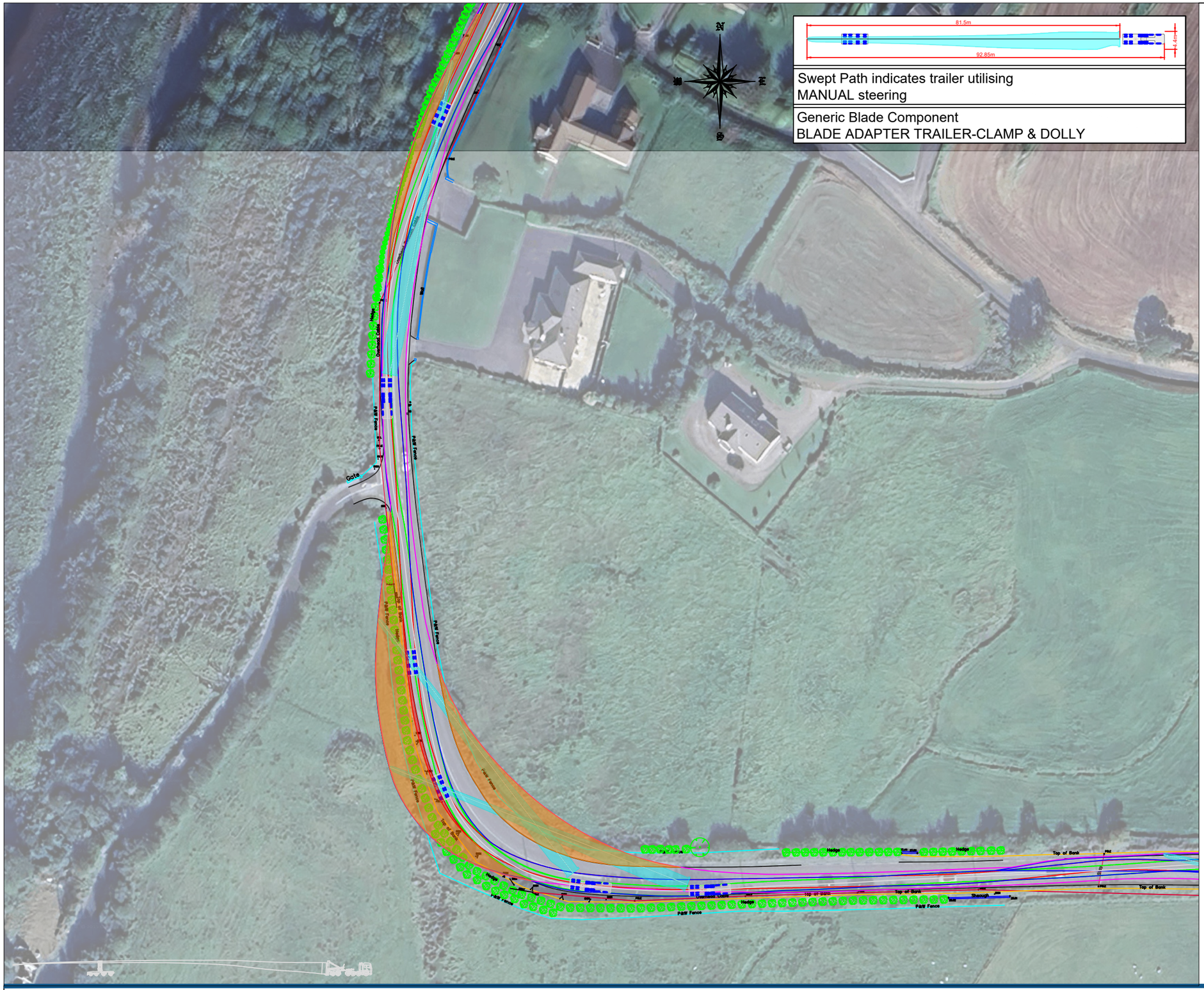

- Area within Magenta outline will be oversailed by vehicle load
- Area within Blue outline will be oversailed by vehicle body
- Tractor Axles outlined in Green
- Trailer Axles outlined in Red
- Area shaded RED requires ground works to enable the vehicle axles to pass including levelling and strengthening
- Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 575166 876239

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 44 - ATR01_81.5_01 - LEFT BEND N56	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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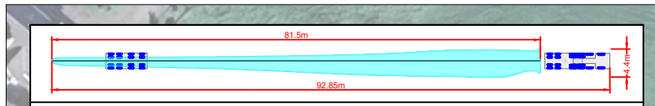

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY



- Area within Magenta outline will be oversailed by vehicle load
- Area within Blue outline will be oversailed by vehicle body
- Tractor Axles outlined in Green
- Trailer Axles outlined in Red

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 575391 876156

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 45 - ATR01_81.5_01 - RIGHT BEND N56	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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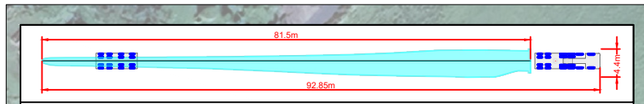
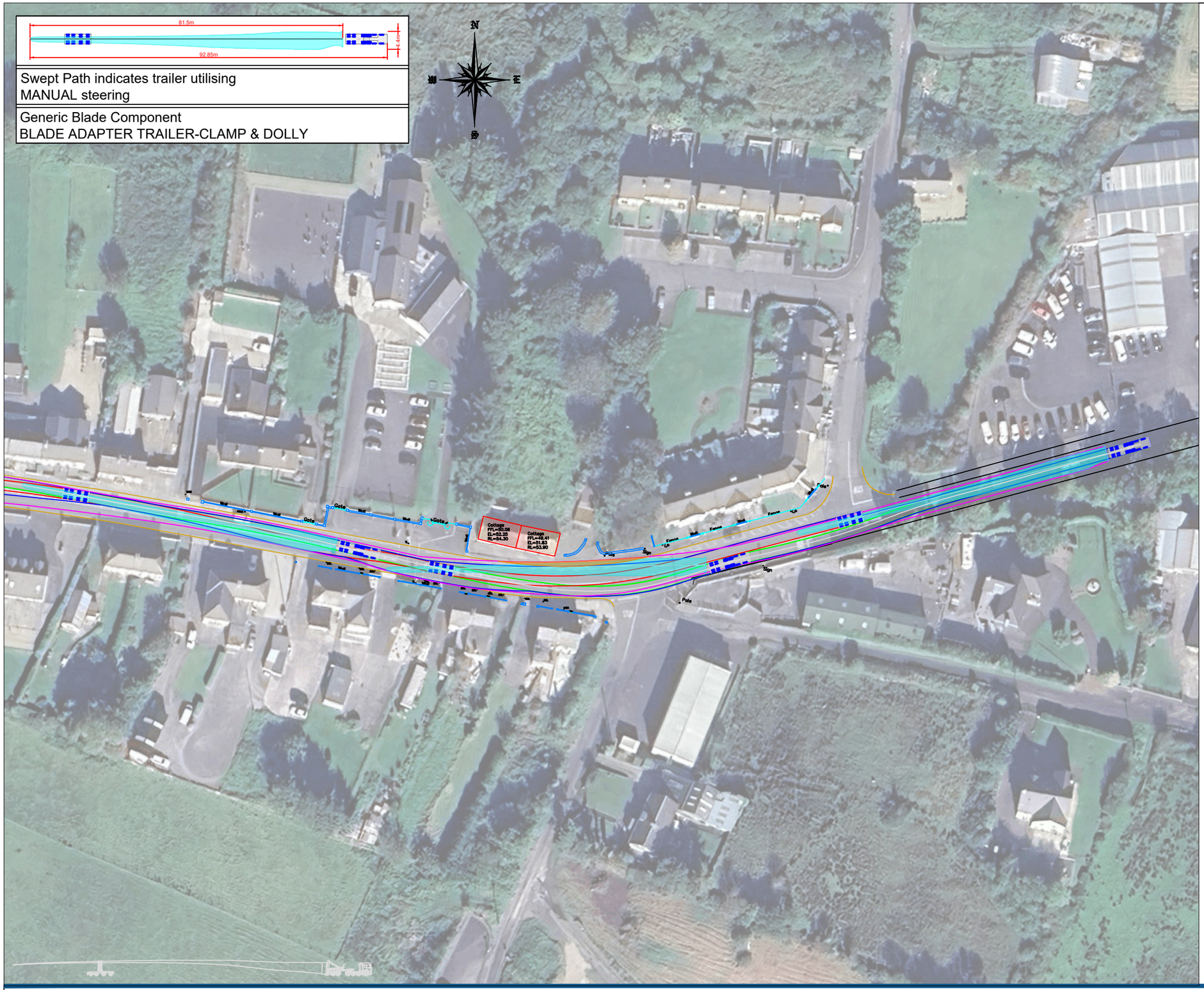


Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY



Power Pole
Power Pole on Wall
Power Pole
Power Pole on Wall
Power Pole
Power Pole
Power Pole on Wall
Power Pole
Power Pole
Power Pole



Area within Magenta outline will be oversailed by vehicle load
Area within Blue outline will be oversailed by vehicle body
Tractor Axles outlined in Green
Trailer Axles outlined in Red

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 577130 876018

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TITLE LOCATION 47 - ATR01_81.5_01 - LEFT BEND N56 DUNKINEELY	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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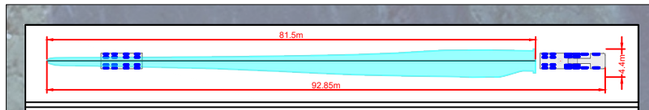

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

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Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 592309 878754

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 48 - ATR01_81.5_01 - MILL PARK HOTEL ROUNDABOUT	PREPARED BY W GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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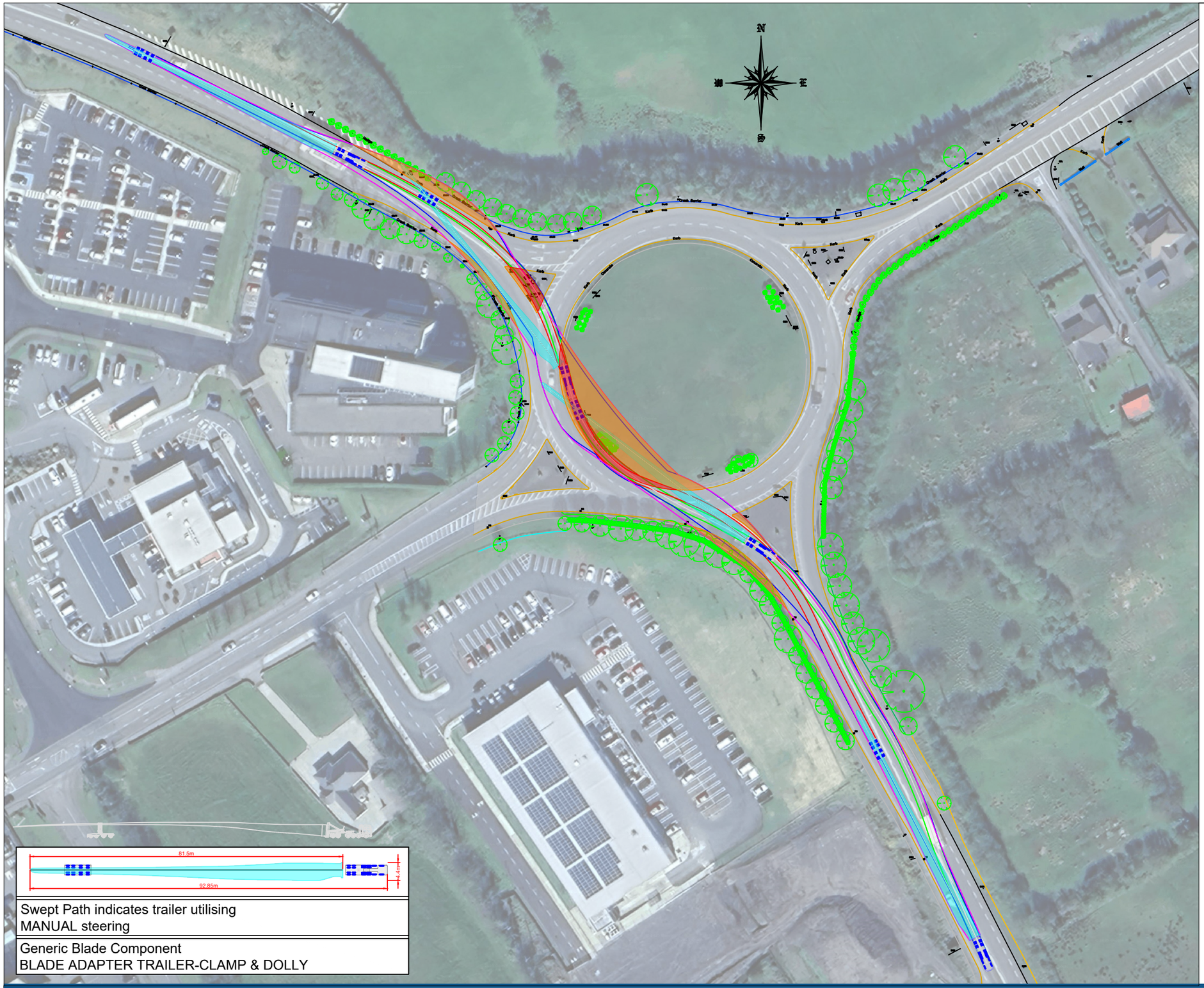

Swept Path indicates trailer utilising MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

- Area within Magenta outline will be oversailed by vehicle load
- Area within Blue outline will be oversailed by vehicle body
- Tractor Axles outlined in Green
- Trailer Axles outlined in Red
- Area shaded RED requires ground works to enable the vehicle axles to pass including levelling and strengthening
- Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 594380 879002

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- This drawing has been created from data produced from Aerial Imagery and OSI mapping.
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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 49 - ATR01_81.5_01 - DRUMLONAGHER ROUNDABOUT	PREPARED BY W GALLAGHER	SCALE 1:1250	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

UNIT 4, FIRST FLOOR, GLEN VIEW BUSINESS PARK,
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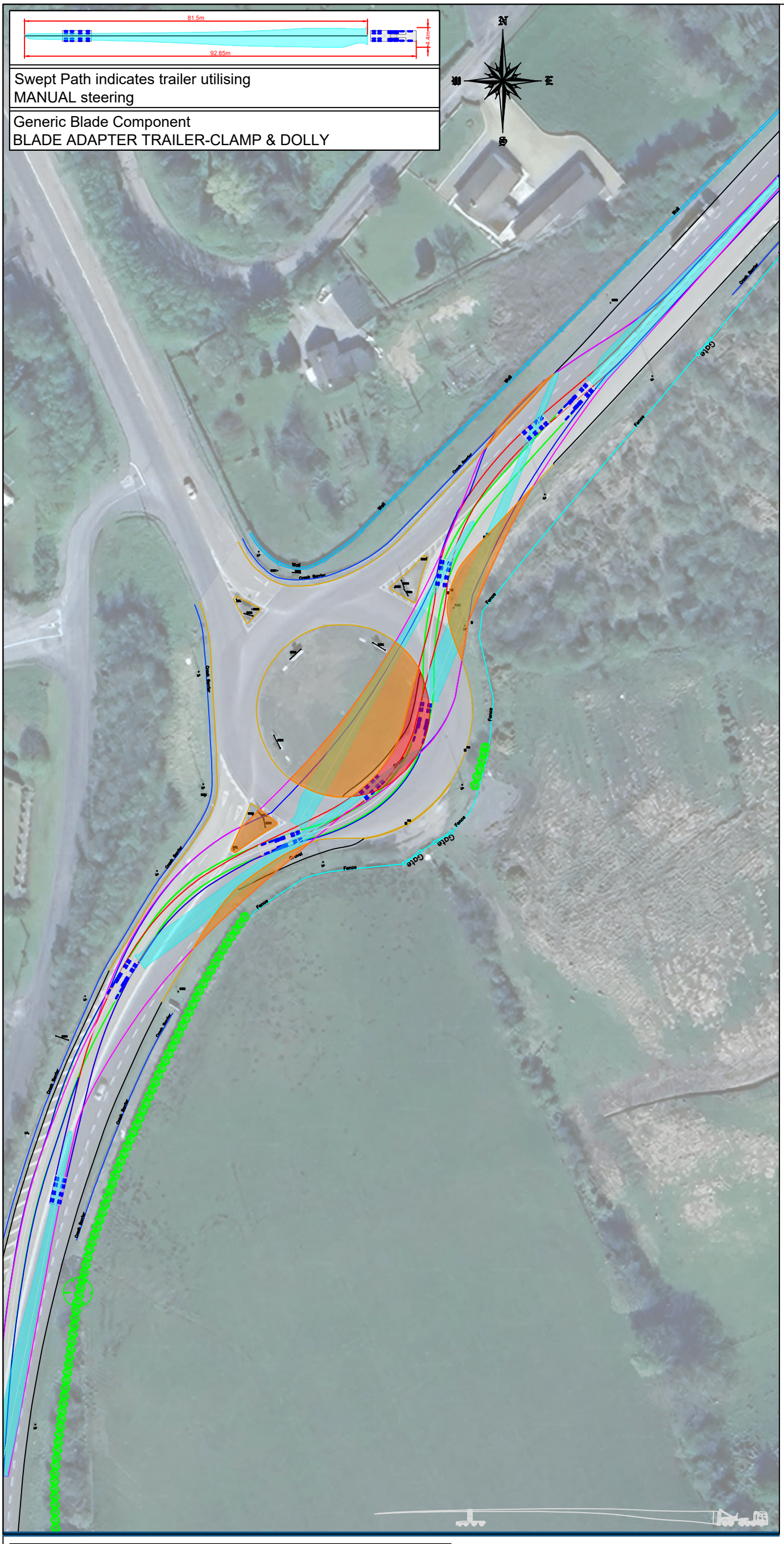

Area within Magenta outline will be oversailed by vehicle load
Area within Blue outline will be oversailed by vehicle body
Tractor Axles outlined in Green
Trailer Axles outlined in Red

Area shaded RED requires ground works to enable the vehicle axles to pass including levelling and strengthening

Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 593642 875611

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Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE
1:1000

DATE
01/04/2026

REVISION
A

SITE
LISSINAGROAGH WINDFARM

DRG NO.
E2590

TITLE
LOCATION 50 - ATR01_81.5_01 - TULLYEARL ROUNDABOUT N15

PREPARED BY
W.GALLAGHER

CLIENT
FUTURENERGY IRELAND

SIZE
A3

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ITM GRID REFERENCE: 588257 862284

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 51 - ATR01_81.5_01 - ERNE ROUNDABOUT N15	PREPARED BY W.GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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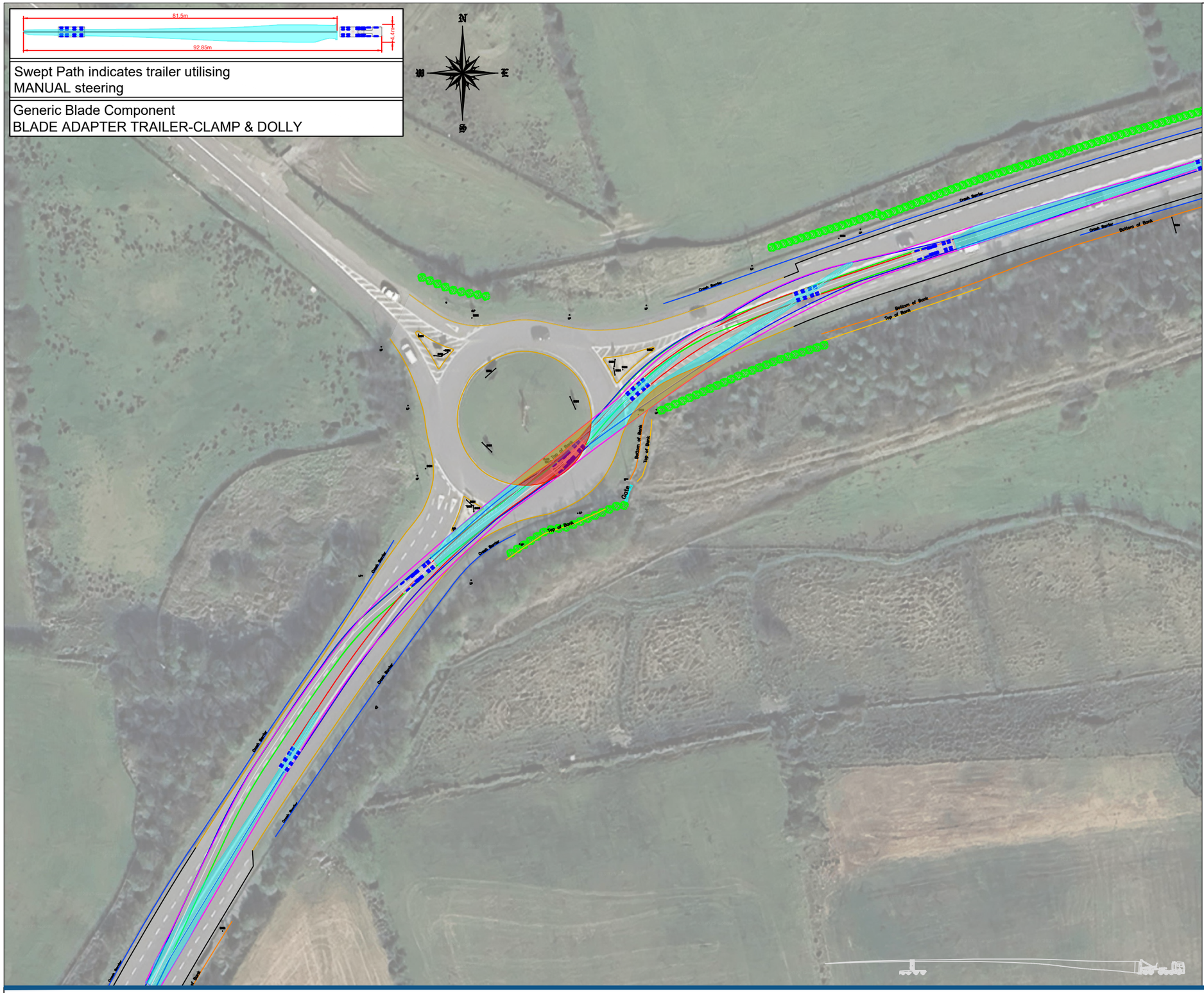

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Tractor Axles outlined in Green
Trailer Axles outlined in Red

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ITM GRID REFERENCE: 583482 859390

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 52 - ATR01_81.5_01 - DRUMACRIN ROUNDABOUT N15	PREPARED BY W.GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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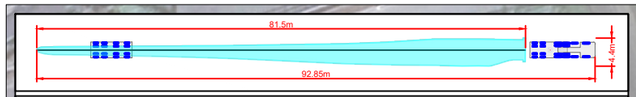

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

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ITM GRID REFERENCE: 579828 858500

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 53 - ATR01_81.5_01 - TULLAGHAN ROUNDABOUT N15	PREPARED BY W.GALLAGHER	SCALE 1:1250	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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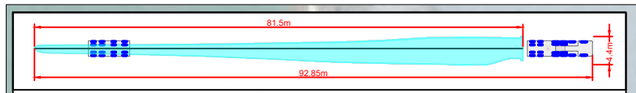

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY



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ITM GRID REFERENCE: 566331 849682

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TITLE LOCATION 54 - ATR01_81.5_01 - GRANGE N15 - PART 1	PREPARED BY W.GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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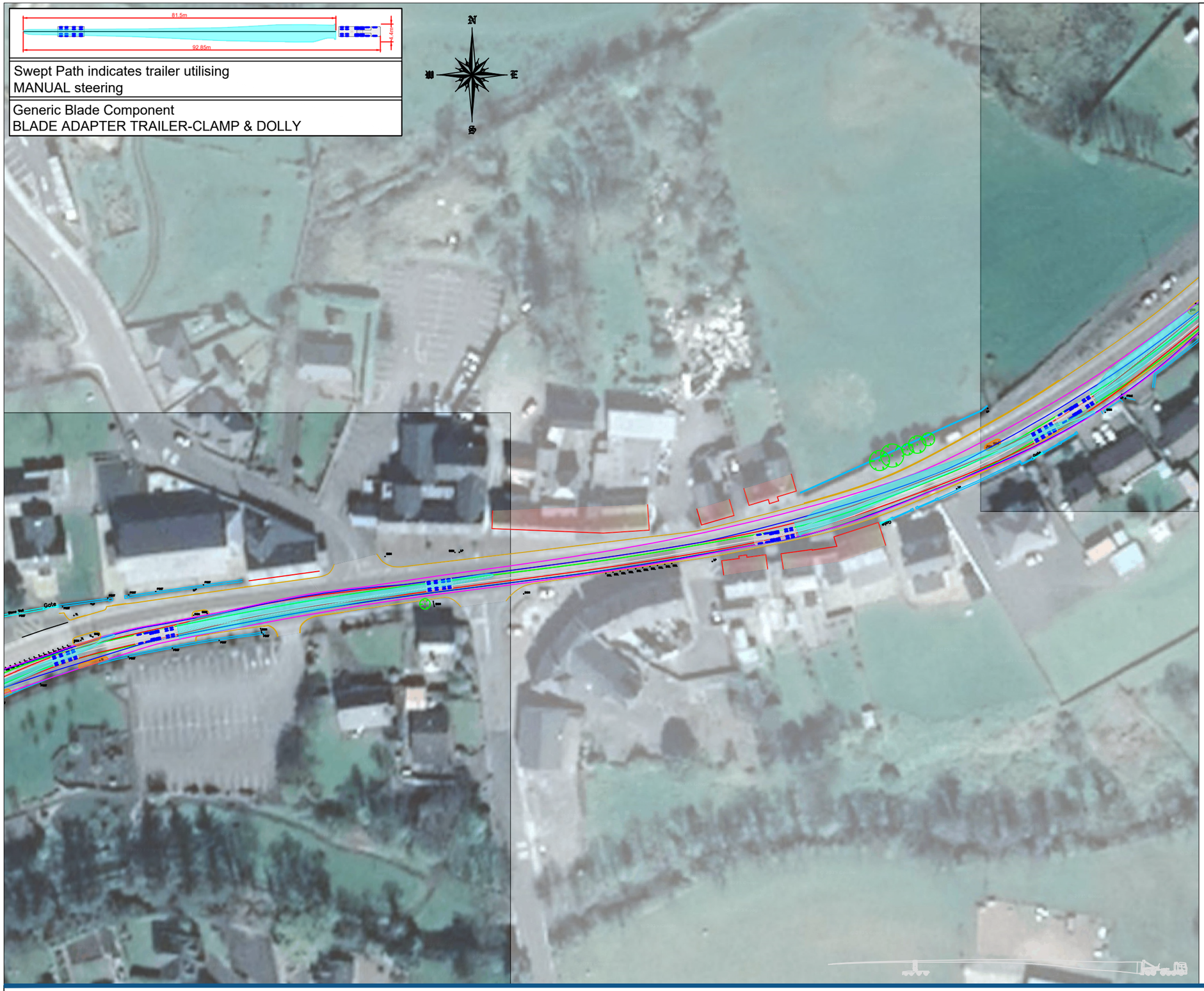

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

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ITM GRID REFERENCE: 566051 849518

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TITLE LOCATION 54 - ATR01_81.5_01 - GRANGE N15 - PART 2	PREPARED BY W.GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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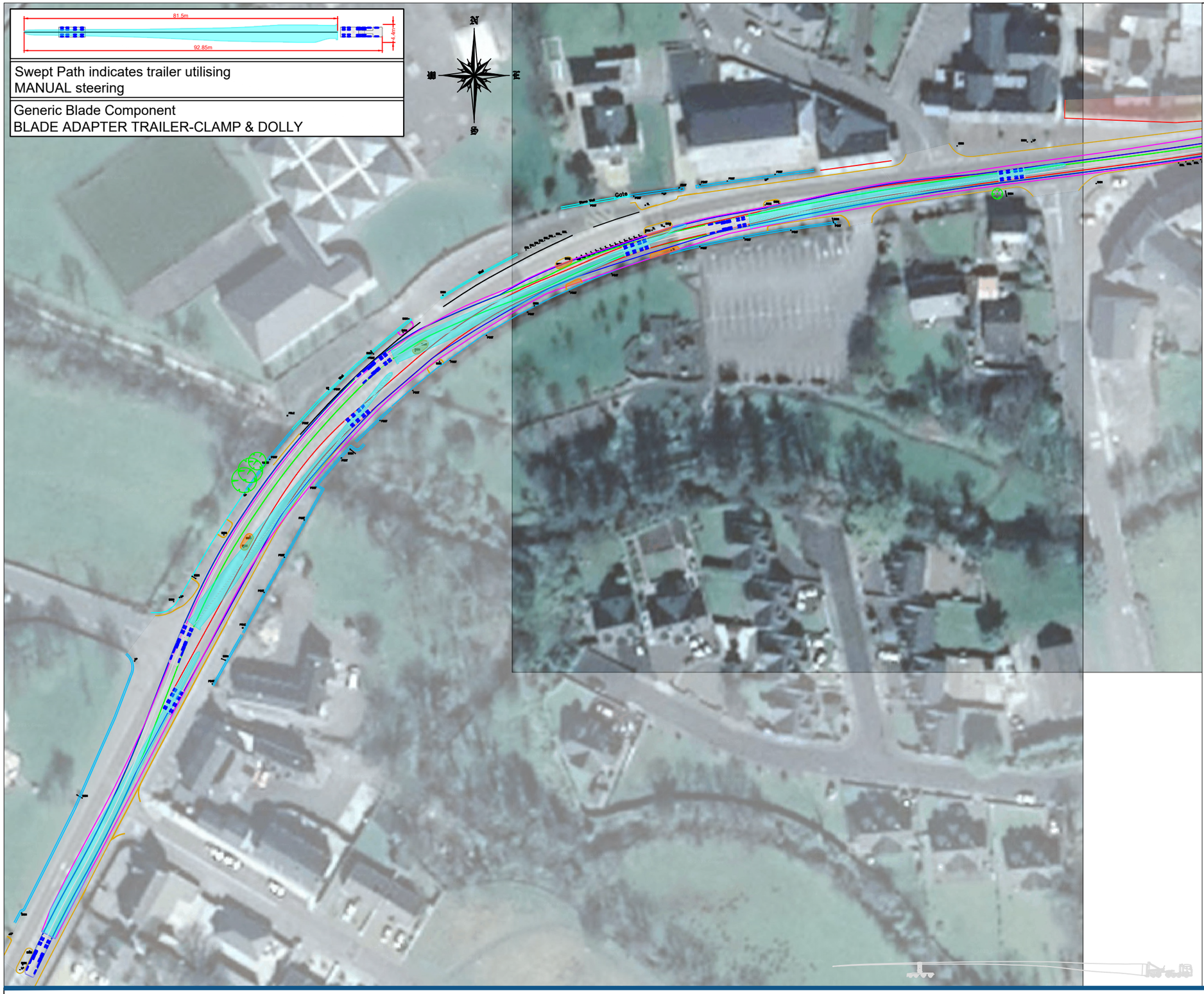

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ITM GRID REFERENCE: 565857 849466

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TITLE LOCATION 54 - ATR01_81.5_01 - GRANGE N15 - PART 3	PREPARED BY W.GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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MOB: + 353(0)87 8323916
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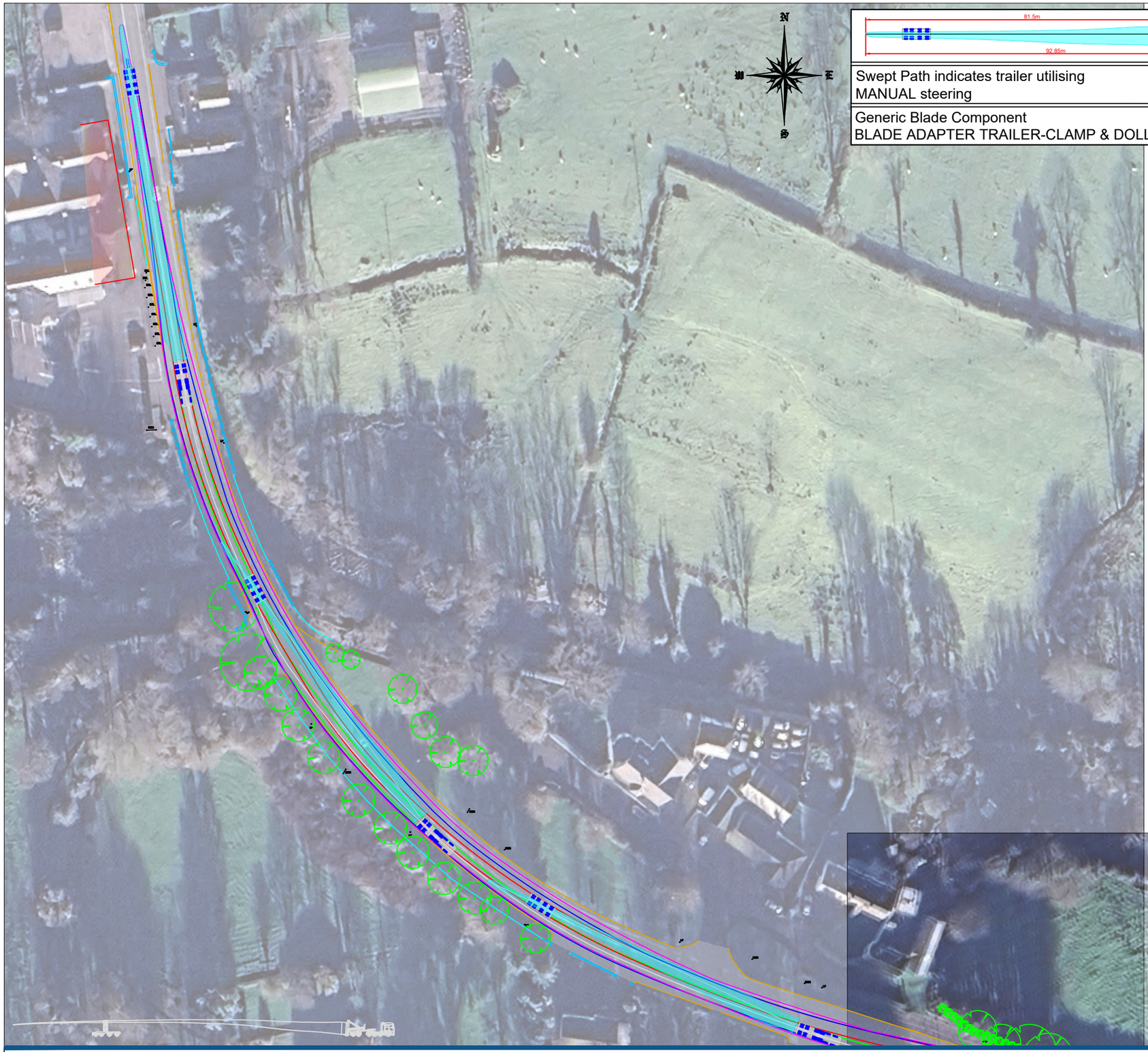

Swept Path indicates trailer utilising
MANUAL steering

Generic Blade Component
BLADE ADAPTER TRAILER-CLAMP & DOLLY

- Area within Magenta outline will be oversailed by vehicle load
- Area within Blue outline will be oversailed by vehicle body
- Tractor Axles outlined in Green
- Trailer Axles outlined in Red

ITM GRID REFERENCE: 567443 842248

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 55 - ATR01_81.5_01 - DRUMCLIFF N15 - PART 1	PREPARED BY W.GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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Swept Path indicates trailer utilising
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Area shaded Orange requires oversail by load and projections -to be cleared of all obstructions

ITM GRID REFERENCE: 567733 842085

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SITE LISSINAGROAGH WINDFARM	DRG NO. E2590	DATE 01/04/2026	Site Inspection/Survey required prior to any works commencing.
TITLE LOCATION 55 - ATR01_81.5_01 - DRUMCLIFF N15 - PART 2	PREPARED BY W.GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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ITM GRID REFERENCE: 568762 841095

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Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE	1:1000
DATE	01/04/2026
REVISION	A
SITE	LISSINAGROAGH WINDFARM
DRG NO.	E2590
TITLE	LOCATION 56 - ATR01_81.5_01 - RATHCORMAC N15 - PART 1
PREPARED BY	W.GALLAGHER
CLIENT	FUTURENERGY IRELAND
SIZE	A3

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ITM GRID REFERENCE: 568736 840871

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TITLE LOCATION 56 - ATR01_81.5_01 - RATHCORMAC N15 - PART 2	PREPARED BY W.GALLAGHER	SCALE 1:1000	Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.
CLIENT FUTURENERGY IRELAND	SIZE A3	REVISION A	

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ITM GRID REFERENCE: 569250 837021

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Site Inspection/Survey required prior to any works commencing.

Trail Run of all delivery vehicles on Delivery route to be carried out on full extents of route prior to delivery of turbine components.

SCALE
1:1000

DATE
01/04/2026

REVISION
A

SITE
LISSINAGROAGH WINDFARM

DRG NO.
E2590

TITLE
LOCATION 57 - ATR01_81.5_01 - SLIGO N15

PREPARED BY
W.GALLAGHER

CLIENT
FUTURENERGY IRELAND

SIZE
A3

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SWEPT PATH ANALYSIS SPECIALISTS

Appendix 2-2

Substation & Grid Connection Drawings

ISO A1 594mm x 841mm

Map Series:
Prime Data Vector

Discovery Tile Numbers:
OS1632, OS1832, OS1834

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CYAL50510216

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Proposed Lissinagroagh 110kV Substation

Exist. Srananagh 220kV Substation

05773-DR-101
05773-DR-102
05773-DR-103
05773-DR-104
05773-DR-105
05773-DR-106
05773-DR-107
05773-DR-108
05773-DR-109
05773-DR-110
05773-DR-111
05773-DR-112
05773-DR-113
05773-DR-114
05773-DR-115
05773-DR-116
05773-DR-117

Overall Site Location Map

SCALE 1:40000

Note: The precise siting of all UGCs, Joint Bays, Earth Sheath Link Chambers and Communication Chambers is subject to detailed design and liaison and approval by EirGrid, ESBN, and Roads Authority in an effort to assure minimal impact on the local community and traffic flow and most robust design.

Final design is subjected to site investigation and consultation with Leitrim Co.Co and ESBN/EirGrid and other stakeholders. Details are therefore indicative and subject to micrositing.

Project Management Initials: Designer: AD Checked: DR Approved: RG

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Tel: 00353 66 7135710

Regional Office
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Tel: 00 44 1256406664

PROJECT

Lissinagroagh (WF) Wind Farm 110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN CONSULTING ENGINEERS

NOTES: -

- This drawing is to be read in conjunction with relevant drawings, specifications and reports.
- Path of cable route may vary depending on site conditions and presence of existing services.
- Duct and cable sizes to be confirmed as part of detailed design.
- Other services may be encountered along the route.
- Existing road build up and reinstatement requirements to be confirmed with Leitrim Co.Co

LEGEND: -

Proposed UGC Grid Route shown thus (32.0Km)

Red Line Planning Boundary shown thus

EIAR Planning Boundary

Permanent Paved Access Roads shown thus

Windfarm Development Area

ISSUED FOR PLANNING
21.04.2026

ISSUE/REVISION

P03	21.04.26	Issued for Planning
P02	20.04.26	Issued for Planning
P01	30.01.26	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

SHEET TITLE

Overall Site Location Map

SHEET NUMBER

05773-DR-100

ISO A1 594mm x 841mm

Map Series:
Prime 2

Sheet Reference No.'s
1:2,500 | 0957-D
1:2,500 | 0958-A
1:2,500 | 0957-B
1:2,500 | 0902-C
1:2,500 | 0901-D
1:2,500 | 1135-A
1:2,500 | 1074-C

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Exist. Srananagh 220kV Substation

Joint Bay (JB01)
Comms Cham No.01
Joint Bay Co-Ordinates :
X: 574687.039, Y: 824961.212
Distance from - Substation to JB 01 : 575.4m /
JB 01 to JB 02 : 803.6m

Joint Bay (JB02)
Comms Cham No.02
Joint Bay Co-Ordinates :
X: 57404.058, Y: 825057.117
Distance from - JB 02 to JB 01 : 803.6m/
JB 02 to JB 03 : 808.8m

Irish Water Crossing
Under crossing - S 01
Ref. Dr. 05773-DR-128

Irish Water Crossing
Under crossing - S 02/03
Ref. Dr. 05773-DR-128

00 m
100 m
200 m
300 m
400 m
500 m
600 m
700 m
800 m
900 m
1000 m
1100 m
1200 m
1300 m
1400 m

REF TO 300101324-DR-102

MATCHLINE

Site Location Plan (Sheet - 01 of 17)

SCALE 1:2500

1:2500
50m 0 50m 100m 150m 200m 250m

Note: The precise siting of all UGCs, Joint Bays, Earth Sheath Link Chambers and Communication Chambers is subject to detailed design and liaison and approval by EirGrid, ESBN, and Roads Authority in an effort to assure minimal impact on the local community and traffic flow and most robust design.

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Project Management Initials:
Designer: AD
Checked: DB
Approved: RG

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PROJECT

Lissinagroagh Wind Farm 110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN CONSULTING ENGINEERS

NOTES: -

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LEGEND: -

- Proposed UGC Grid Route shown thus (32.0Km)
- Red Line Planning Boundary shown thus
- Existing Lake, River Network shown thus
- Existing Stream Network shown thus
- Existing ESB LV/MV Networks shown thus
- Existing ESB HV OHL Networks shown thus
- Existing Irish Water Services shown thus
- Notification Zone for Heritage Monument shown thus

ISSUED FOR PLANNING
21.04.2026

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P03	21.04.26	Issued for Planning
P02	20.04.26	Issued for Planning
P01	30.01.26	Issued for Planning

PROJECT NUMBER

05-773

SHEET TITLE

Site Layout Plan
Sheet 01 of 17

SHEET NUMBER

05773-DR-101

ISO A1 594mm x 841mm

Map Series:
Prime 2

Sheet Reference No.'s
1:2,500 | 0957-D
1:2,500 | 0958-A
1:2,500 | 0957-B
1:2,500 | 0902-C
1:2,500 | 0901-D
1:2,500 | 1135-A
1:2,500 | 1074-C

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REF TO 300101324-DR-101

MATCHLINE

REF TO 300101324-DR-103

MATCHLINE

Joint Bay (JB03)
Comms Cham No.03
Joint Bay Co-Ordinates :
X: 576182.241, Y: 825061.475
Distance from - JB 03 to JB 02 : 808.8m/
JB 03 to JB 04 : 798.3m

Joint Bay (JB04)
Comms Cham No.04
Joint Bay Co-Ordinates :
X: 576970.954, Y: 825006.628
Distance from - JB 04 to JB 03 : 798.3m/
JB 04 to JB 05 : 779.8m

Irish Water Crossing
Under crossing - S 06
Ref. Dr. 05773-DR-128

Irish Water Crossing
Under crossing - S 04/05
Ref. Dr. 05773-DR-128

Irish Water Crossing
Under crossing - S 07
Ref. Dr. 05773-DR-128

Irish Water Crossing
Under crossing - S 08
Ref. Dr. 05773-DR-128

Irish Water Crossing
Under crossing - S 10
Ref. Dr. 05773-DR-128

Irish Water Crossing
Under crossing - S 09
Ref. Dr. 05773-DR-128

Bridge No.1

HDD Crossing
Launch Pit within temporary works area = 20m²

HDD Crossing
Receptor Pit within temporary works area = 40m²

1400 m
1500 m
1600 m
1700 m
1800 m
1900 m
2000 m
2100 m
2200 m
2300 m
2400 m
2500 m
2600 m
2700 m
2800 m
2900 m
3000 m
3100 m

Existing LV OHL
Existing HV OHL

1:2500
50m 0 50m 100m 150m 200m 250m

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Site Location Plan (Sheet - 02 of 17)

SCALE 1:2500

Project Management Initials:
Designer: AD
Checked: DB
Approved: RG

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PROJECT

Lissinagroagh
Wind Farm
110kV Grid Connection

CLIENT

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CONSULTING ENGINEERS

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LEGEND: -

Proposed UGC Grid Route shown thus (32.0Km) — KV KV
Red Line Planning Boundary shown thus
Existing Lake, River Network shown thus
Existing Stream Network shown thus
Existing ESB LV/MV Networks shown thus
Existing ESB HV OHL Networks shown thus
Existing Irish Water Services shown thus
Notification Zone for Heritage Monument shown thus

ISSUED FOR PLANNING
21.04.2026

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P03	21.04.26	Issued for Planning
P02	20.04.26	Issued for Planning
P01	30.01.26	Issued for Planning

PROJECT NUMBER

05-773

SHEET TITLE

Site Layout Plan
Sheet 02 of 17

SHEET NUMBER

05773-DR-102

Project Management Initials: Designer: AD Checked: DB Approved: RG

Map Series:
Prime 2

Sheet Reference No.'s
1:2,500 | 0957-D
1:2,500 | 0958-A
1:2,500 | 0957-B
1:2,500 | 0902-C
1:2,500 | 0901-D
1:2,500 | 1135-A
1:2,500 | 1074-C

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Joint Bay (JB07)
Comms Cham No.07
Joint Bay Co-Ordinates :
X: 577784.449, Y: 826262.163
Distance from - JB 07 to JB 06 : 746.4m/
JB 07 to JB 08 : 755.1m

Joint Bay (JB06)
Comms Cham No.06
Joint Bay Co-Ordinates :
X: 577214.755, Y: 825930.747
Distance from - JB 06 to JB 05 : 744.2m/
JB 06 to JB 07 : 746.4m

Joint Bay (JB05)
Comms Cham No.05
Joint Bay Co-Ordinates :
X: 577385.579, Y: 825364.410
Distance from - JB 05 to JB 04 : 779.8m/
JB 05 to JB 06 : 744.2m

Irish Water Crossing
Under crossing - S 12
Ref. Dr. 05773-DR-128

Irish Water Crossing
Under crossing - S 11
Ref. Dr. 05773-DR-128

MATCHLINE REF TO 30010324-DR-102

MATCHLINE REF TO 30010324-DR-104

Site Location Plan (Sheet - 03 of 17)

SCALE 1:2500

Note: The precise siting of all UGCs, Joint Bays, Earth Sheath Link Chambers and Communication Chambers is subject to detailed design and liaison and approval by EirGrid, ESBN, and Roads Authority in an effort to assure minimal impact on the local community and traffic flow and most robust design.

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1:2500
50m 0 50m 100m 150m 200m 250m

LEGEND: -

- Proposed UGC Grid Route shown thus (32.0Km)
- Red Line Planning Boundary shown thus
- Existing Lake, River Network shown thus
- Existing Stream Network shown thus
- Existing ESB LV/MV Networks shown thus
- Existing ESB HV OHL Networks shown thus
- Existing Irish Water Services shown thus
- Notification Zone for Heritage Monument shown thus

NOTES: -

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- Drawings are not to be scaled, use figured dimensions only.

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21.04.2026

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PROJECT

Lissinagroagh Wind Farm 110kV Grid Connection

CLIENT

FuturEnergy Ireland

CONSULTANTS

TOBIN CONSULTING ENGINEERS

ISSUE/REVISION

P03	21.04.26	Issued for Planning
P02	20.04.26	Issued for Planning
P01	30.01.26	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

SHEET TITLE

Site Layout Plan
Sheet 3 of 17

SHEET NUMBER

05773-DR-103

ISO A1 594mm x 841mm

Project Management Initials: Designer: AD Checked: DB Approved: RG

Map Series:
Prime 2

Sheet Reference No.'s
1:2,500 | 0957-D
1:2,500 | 0958-A
1:2,500 | 0957-B
1:2,500 | 0902-C
1:2,500 | 0901-D
1:2,500 | 1135-A
1:2,500 | 1074-C

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Joint Bay (JB10)
Comms Cham No.10
Joint Bay Co-Ordinates :
X: 579069.474, Y: 827784.229
Distance from - JB 10 to JB 09 : 795m/
JB 10 to JB 11 : 811.8m

Joint Bay (JB09)
Comms Cham No.09
Joint Bay Co-Ordinates :
X: 578727.541, Y: 827315.480
Distance from - JB 09 to JB 08 : 699.1m/
JB 09 to JB 10 : 795m

Joint Bay (JB08)
Comms Cham No.08
Earth Link No.05
Joint Bay Co-Ordinates :
X: 578367.311, Y: 826730.078
Distance from - JB 08 to JB 07 : 755.1m/
JB 08 to JB 09 : 699.1m

Culvert Under Crossing Detail Ref. Dr. 05773-DR-I26

MATCHLINE REF TO 30010324-DR-105

MATCHLINE REF TO 30010324-DR-103

Existing LV OHL

Existing MV OHL

5700 m
5800 m
5900 m
6000 m
6100 m
6200 m
6300 m
6400 m
6500 m
6600 m
6700 m
6800 m
6900 m
7000 m
7100 m
7200 m
7300 m
7400 m
7500 m
7600 m
7700 m

1:2500
50m 0 50m 100m 150m 200m 250m

Note: The precise siting of all UGCs, Joint Bays, Earth Sheath Link Chambers and Communication Chambers is subject to detailed design and liaison and approval by EirGrid, ESBN, and Roads Authority in an effort to assure minimal impact on the local community and traffic flow and most robust design.

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Site Location Plan (Sheet - 04 of 17)

SCALE 1:2500

LEGEND: -

- Proposed UGC Grid Route shown thus (32.0Km)
- Red Line Planning Boundary shown thus
- Existing Lake, River Network shown thus
- Existing Stream Network shown thus
- Existing ESB LV/MV Networks shown thus
- Existing ESB HV OHL Networks shown thus
- Existing Irish Water Services shown thus
- Notification Zone for Heritage Monument shown thus

NOTES: -

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ISSUED FOR PLANNING
21.04.2026

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PROJECT

Lissinagroagh
Wind Farm
110kV Grid Connection

CLIENT

FuturEnergy Ireland

CONSULTANTS

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ISSUE/REVISION

P03	21.04.26	Issued for Planning
P02	20.04.26	Issued for Planning
P01	30.01.26	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

SHEET TITLE

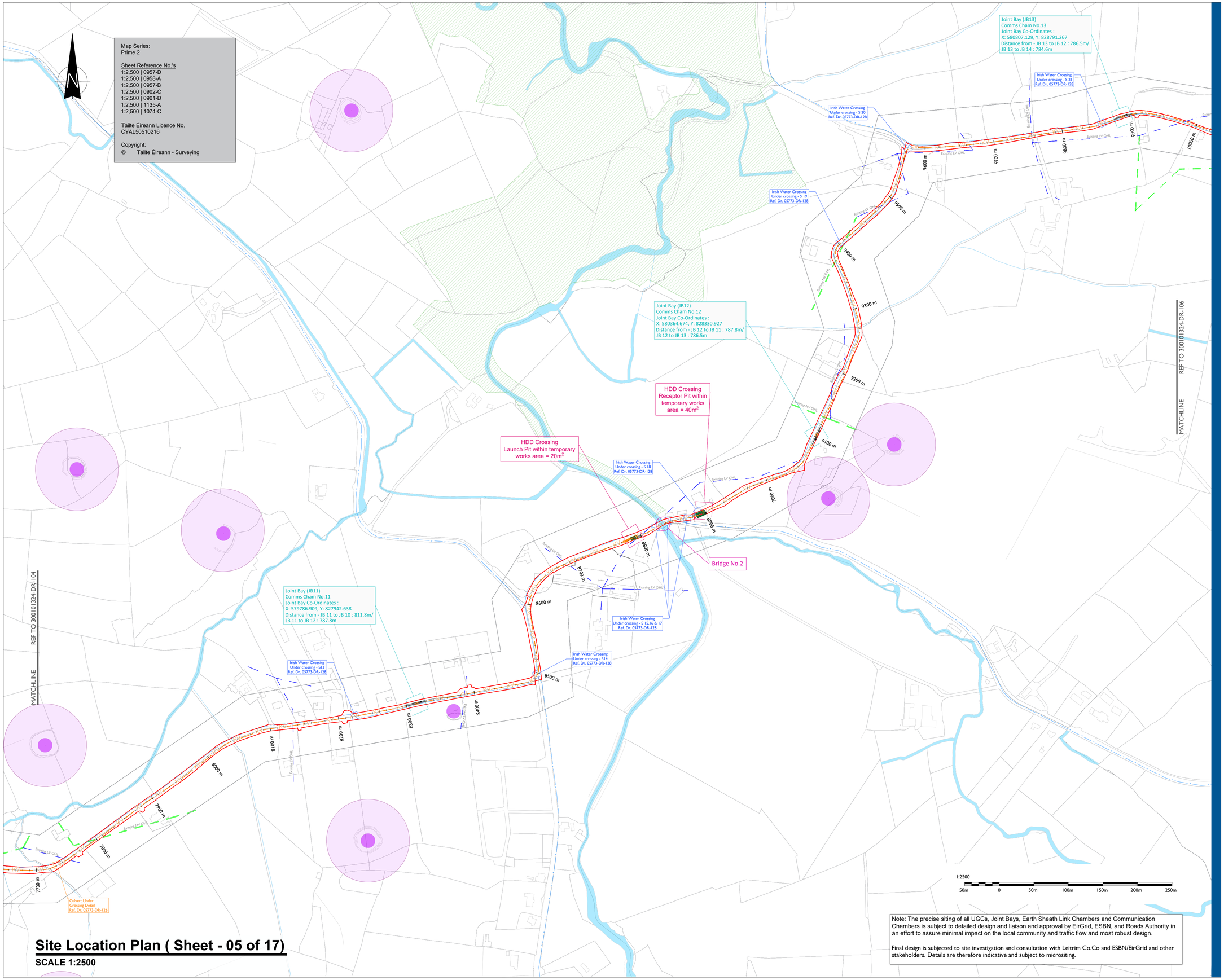
Site Layout Plan
Sheet 04 of 17

SHEET NUMBER

05773-DR-104

ISO A1 594mm x 841mm

ISO A1 594mm x 841mm



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Site Location Plan (Sheet - 05 of 17)

SCALE 1:2500

Project Management Initials: Designer: AD Checked: DB Approved: RG

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PROJECT

Lissinagroagh
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CLIENT

FuturEnergy Ireland

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LEGEND: -

Proposed UGC Grid Route shown thus (32.0Km)
Red Line Planning Boundary shown thus
Existing Lake, River Network shown thus
Existing Stream Network shown thus
Existing ESB LV/MV Networks shown thus
Existing ESB HV OHL Networks shown thus
Existing Irish Water Services shown thus
Notification Zone for Heritage Monument shown thus
Special Areas of Conservation (SAC)

ISSUED FOR PLANNING
21.04.2026

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PROJECT NUMBER

05-773

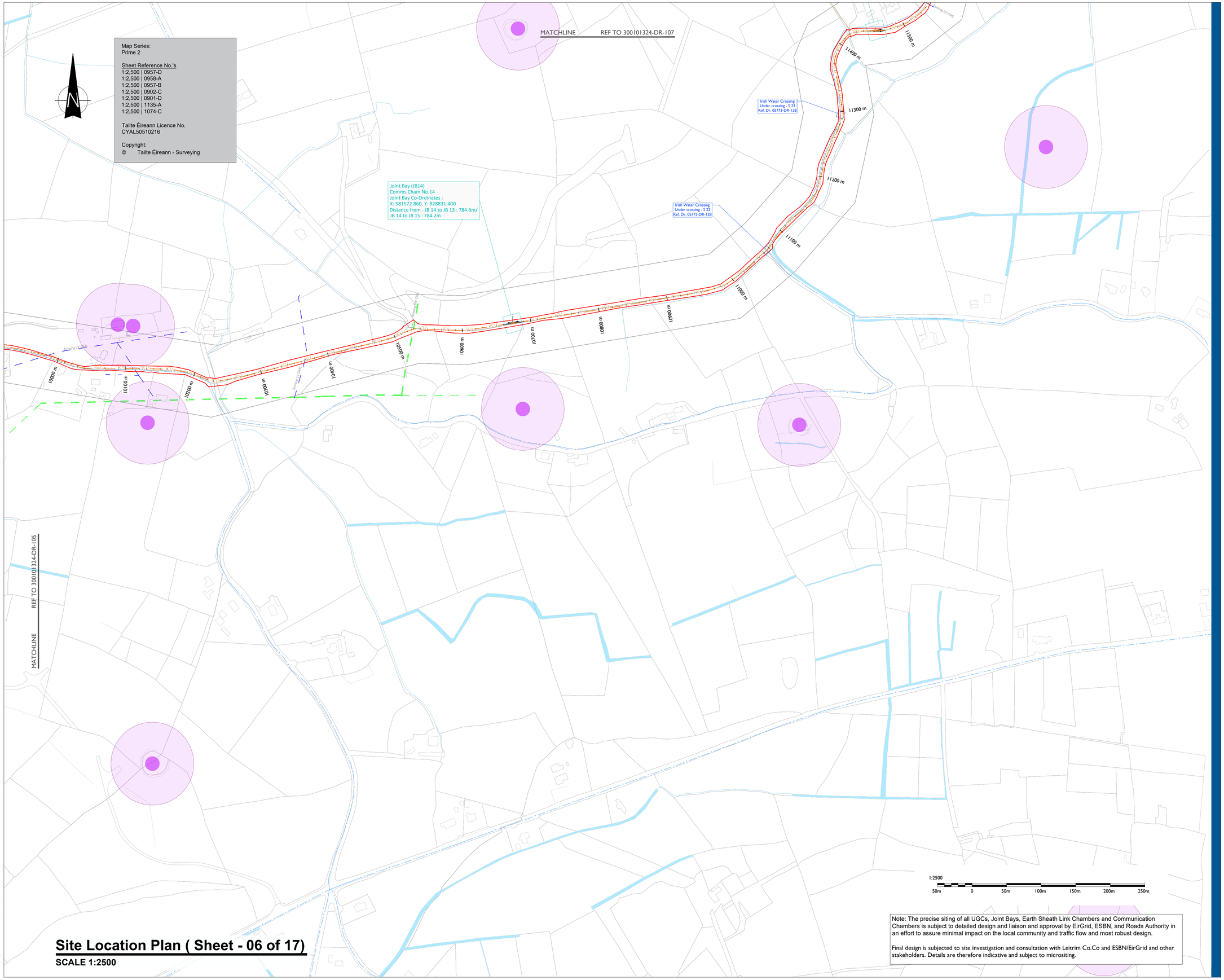
SHEET TITLE

Site Layout Plan
Sheet 05 of 17

SHEET NUMBER

05773-DR-105

ISO A1 594mm x 841mm



Site Location Plan (Sheet - 06 of 17)

SCALE 1:2500

Note: The precise siting of all UGCs, Joint Bays, Earth Sheath Link Chambers and Communication Chambers is subject to detailed design and liaison and approval by EirGrid, ESBN, and Roads Authority in an effort to assure minimal impact on the local community and traffic flow and most robust design.

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Project Management Initials: Designer: AO Checked: DB Approved: RG

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PROJECT

Lissinagroagh Wind Farm 110kV Grid Connection

CLIENT

Ireland FuturEnergy

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LEGEND: -

- Proposed UGC Grid Route shown thus (32.0Km)
- Red Line Planning Boundary shown thus
- Existing Lake, River Network shown thus
- Existing Stream Network shown thus
- Existing ESB LV/MV Networks shown thus
- Existing ESB HV OHL Networks shown thus
- Existing Irish Water Services shown thus
- Notification Zone for Heritage Monument shown thus

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PROJECT NUMBER

05-773

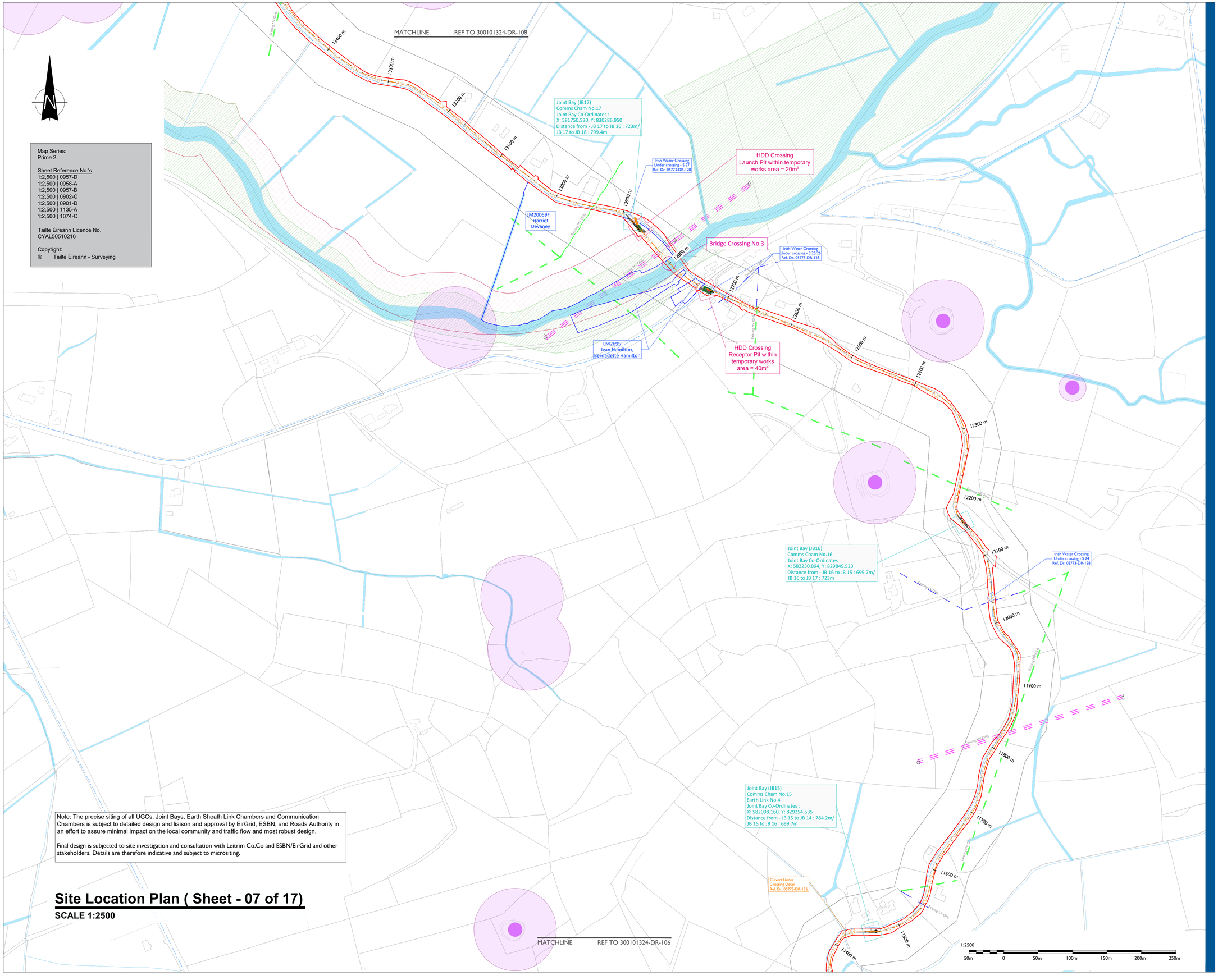
SHEET TITLE

Site Layout Plan
Sheet 06 of 17

SHEET NUMBER

05773-DR-106

ISO A1 594mm x 841mm



Map Series:
Prime 2

Sheet Reference No.'s
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1:2,500 | 0957-B
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1:2,500 | 0901-D
1:2,500 | 1135-A
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Site Location Plan (Sheet - 07 of 17)

SCALE 1:2500

Project Management Initials: Designer: AD Checked: DR Approved: RG

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PROJECT

Lissinagroagh
Wind Farm
110kV Grid Connection

CLIENT

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CONSULTANTS

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LEGEND: -

- Proposed UGC Grid Route shown thus (32.0Km)
- Red Line Planning Boundary shown thus
- Existing Lake, River Network shown thus
- Existing Stream Network shown thus
- Existing ESB LV/MV Networks shown thus
- Existing ESB HV OHL Networks shown thus
- Existing Irish Water Services shown thus
- Notification Zone for Heritage Monument shown thus
- Special Areas of Conservation (SAC)
- Proposed Natural Heritage Areas (pNHA)
- Landowners Boundary shown thus

ISSUED FOR PLANNING
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PROJECT NUMBER

05-773

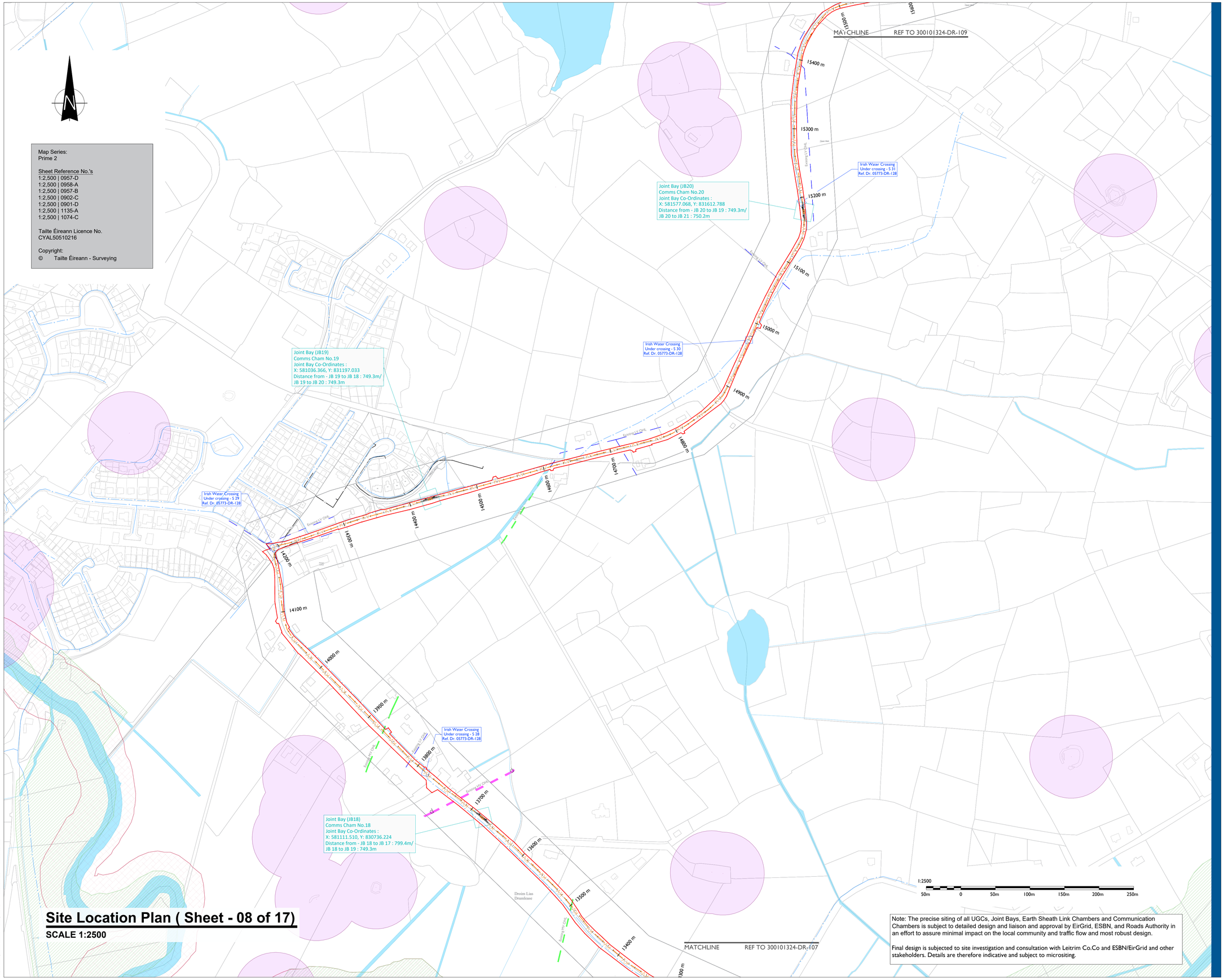
SHEET TITLE

Site Layout Plan
Sheet 07 of 17

SHEET NUMBER

05773-DR-107

ISO A1 594mm x 841mm



Site Location Plan (Sheet - 08 of 17)

SCALE 1:2500

Note: The precise siting of all UGCs, Joint Bays, Earth Sheath Link Chambers and Communication Chambers is subject to detailed design and liaison and approval by EirGrid, ESBN, and Roads Authority in an effort to assure minimal impact on the local community and traffic flow and most robust design.

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Project Management Initials: Designer: AD Checked: DR Approved: RG

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PROJECT

Lissinagroagh
Wind Farm
110kV Grid Connection

CLIENT

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CONSULTANTS

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LEGEND: -

- Proposed UGC Grid Route shown thus (32.0Km)
- Red Line Planning Boundary shown thus
- Existing ESB Underground MV cable shown thus
- Existing Lake, River Network shown thus
- Existing Stream Network shown thus
- Existing ESB LV/MV Networks shown thus
- Existing ESB HV OHL Networks shown thus
- Existing Irish Water Services shown thus
- Notification Zone for Heritage Monument shown thus
- Special Areas of Conservation (SAC)

ISSUED FOR PLANNING
21.04.2026

ISSUE/REVISION

I/R	DATE	DESCRIPTION
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P02	20.04.26	Issued for Planning
P01	30.01.26	Issued for Planning

PROJECT NUMBER

05-773

SHEET TITLE

Site Layout Plan
Sheet 08 of 17

SHEET NUMBER

05773-DR-108

ISO A1 594mm x 841mm

Map Series:
Prime 2

Sheet Reference No.'s
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1:2,500 | 0958-A
1:2,500 | 0957-B
1:2,500 | 0902-C
1:2,500 | 0901-D
1:2,500 | 1135-A
1:2,500 | 1074-C

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MATCHLINE REF TO 300101324-DR-110

Joint Bay (JB22)
Comms Cham No.22
Joint Bay Co-Ordinates :
X: 582586.590, Y: 832562.240
Distance from - JB 22 to JB 21 : 749.8m/
JB 22 to JB 23 : 748.1m

Joint Bay (JB21)
Comms Cham No.21
Joint Bay Co-Ordinates :
X: 582026.531, Y: 832065.050
Distance from - JB 21 to JB 20 : 750.2m/
JB 21 to JB 22 : 749.8m

Bridge Crossing No.4

Irish Water Crossing
Under crossing - S 32
Ref. Dr. 05773-DR-128

HDD Crossing
Receptor Pit within
temporary works
area = 40m²

HDD Crossing
Launch Pit within temporary
works area = 20m²

15400 m
15500 m
15600 m
15700 m
15800 m
15900 m
16000 m
16100 m
16200 m
16300 m
16400 m
16500 m
16600 m
16700 m
16800 m
16900 m
17000 m

1:2500
50m 0 50m 100m 150m 200m 250m

Note: The precise siting of all UGCs, Joint Bays, Earth Sheath Link Chambers and Communication Chambers is subject to detailed design and liaison and approval by EirGrid, ESBN, and Roads Authority in an effort to assure minimal impact on the local community and traffic flow and most robust design.

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MATCHLINE REF TO 300101324-DR-108

Site Location Plan (Sheet - 09 of 17)

SCALE 1:2500

Project Management Initials: Designer: AO Checked: DB Approved: RG

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PROJECT

Lissinagroagh
Wind Farm
110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

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LEGEND: -

- Proposed UGC Grid Route shown thus (32.0Km)
- Red Line Planning Boundary shown thus
- Existing Lake, River Network shown thus
- Existing Stream Network shown thus
- Existing ESB LV/MV Networks shown thus
- Existing ESB HV OHL Networks shown thus
- Existing Irish Water Services shown thus
- Notification Zone for Heritage Monument shown thus
- Special Areas of Conservation (SAC)

ISSUED FOR PLANNING
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I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

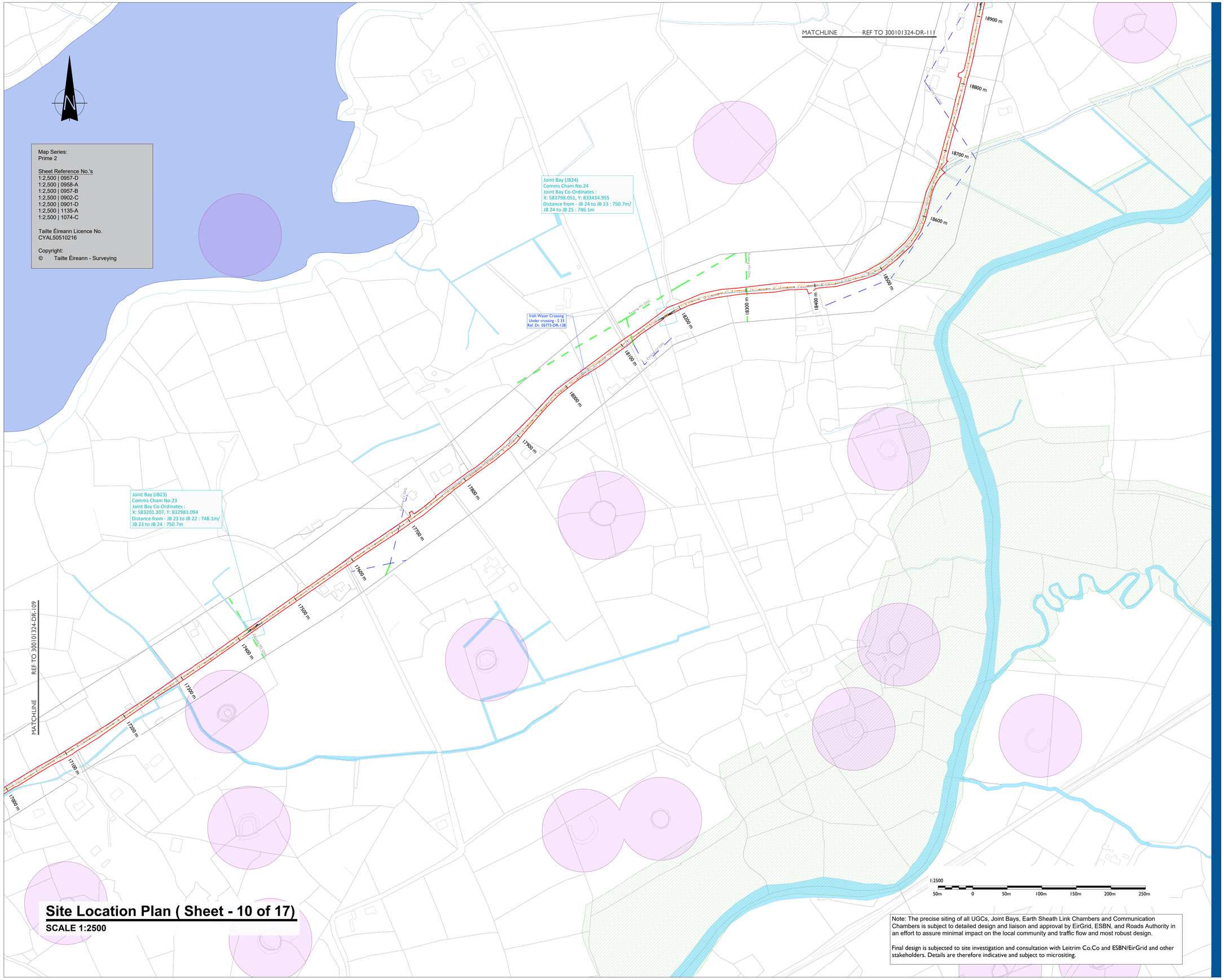
SHEET TITLE

Site Layout Plan
Sheet 09 of 17

SHEET NUMBER

05773-DR-109

ISO A1 594mm x 841mm



Site Location Plan (Sheet - 10 of 17)

SCALE 1:2500

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PROJECT

Lissinagroagh Wind Farm 110kV Grid Connection

CLIENT

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LEGEND: -

- Proposed UGC Grid Route shown thus (32.0Km)
- Red Line Planning Boundary shown thus
- Existing Lake, River Network shown thus
- Existing Stream Network shown thus
- Existing ESB LV/MV Networks shown thus
- Existing ESB HV OHL Networks shown thus
- Existing Irish Water Services shown thus
- Notification Zone for Heritage Monument shown thus
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I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

SHEET TITLE

Site Layout Plan
Sheet 10 of 17

SHEET NUMBER

05773-DR-110

ISO A1 594mm x 841mm

Map Series:
Prime 2

Sheet Reference No.'s
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1:2,500 | 0958-A
1:2,500 | 0957-B
1:2,500 | 0902-C
1:2,500 | 0901-D
1:2,500 | 1135-A
1:2,500 | 1074-C

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Joint Bay (JB27)
Comms Cham No.27
Joint Bay Co-Ordinates :
X: 584781.727, Y: 834971.802
Distance from - JB 27 to JB 26 : 749.4m/
JB 27 to JB 28 : 750.1m

Joint Bay (JB26)
Comms Cham No.26
Joint Bay Co-Ordinates :
X: 584217.310, Y: 834485.781
Distance from - JB 26 to JB 25 : 738.1m/
JB 26 to JB 27 : 749.4m

Joint Bay (JB25)
Comms Cham No.25
Joint Bay Co-Ordinates :
X: 584254.704, Y: 833890.983
Distance from - JB 25 to JB 24 : 746.1m/
JB 25 to JB 26 : 738.1m

Irish Water Crossing
Under crossing - S 34
Ref. Dr. 05773-DR-128

HDD Crossing
Launch Pit within temporary works area = 20m²

HDD Crossing
Receptor Pit within temporary works area = 40m²

HDD Crossing
Launch Pit within temporary works area = 20m²

Bridge Crossing No.5

MATCHLINE REF TO 300101324-DR-112

MATCHLINE REF TO 300101324-DR-110

1:2500
50m 0 50m 100m 150m 200m 250m

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Site Location Plan (Sheet - 11 of 17)

SCALE 1:2500

Project Management Initials: Designer: AD Checked: DB Approved: RG

tli GROUP

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PROJECT

Lissinagroagh
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- Other services may be encountered along the route.
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LEGEND: -

- Proposed UGC Grid Route shown thus (32.0Km)
- Red Line Planning Boundary shown thus
- Existing Lake, River Network shown thus
- Existing Stream Network shown thus
- Existing ESB LV/MV Networks shown thus
- Existing ESB HV OHL Networks shown thus
- Existing Irish Water Services shown thus
- Notification Zone for Heritage Monument shown thus
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PROJECT NUMBER

05-773

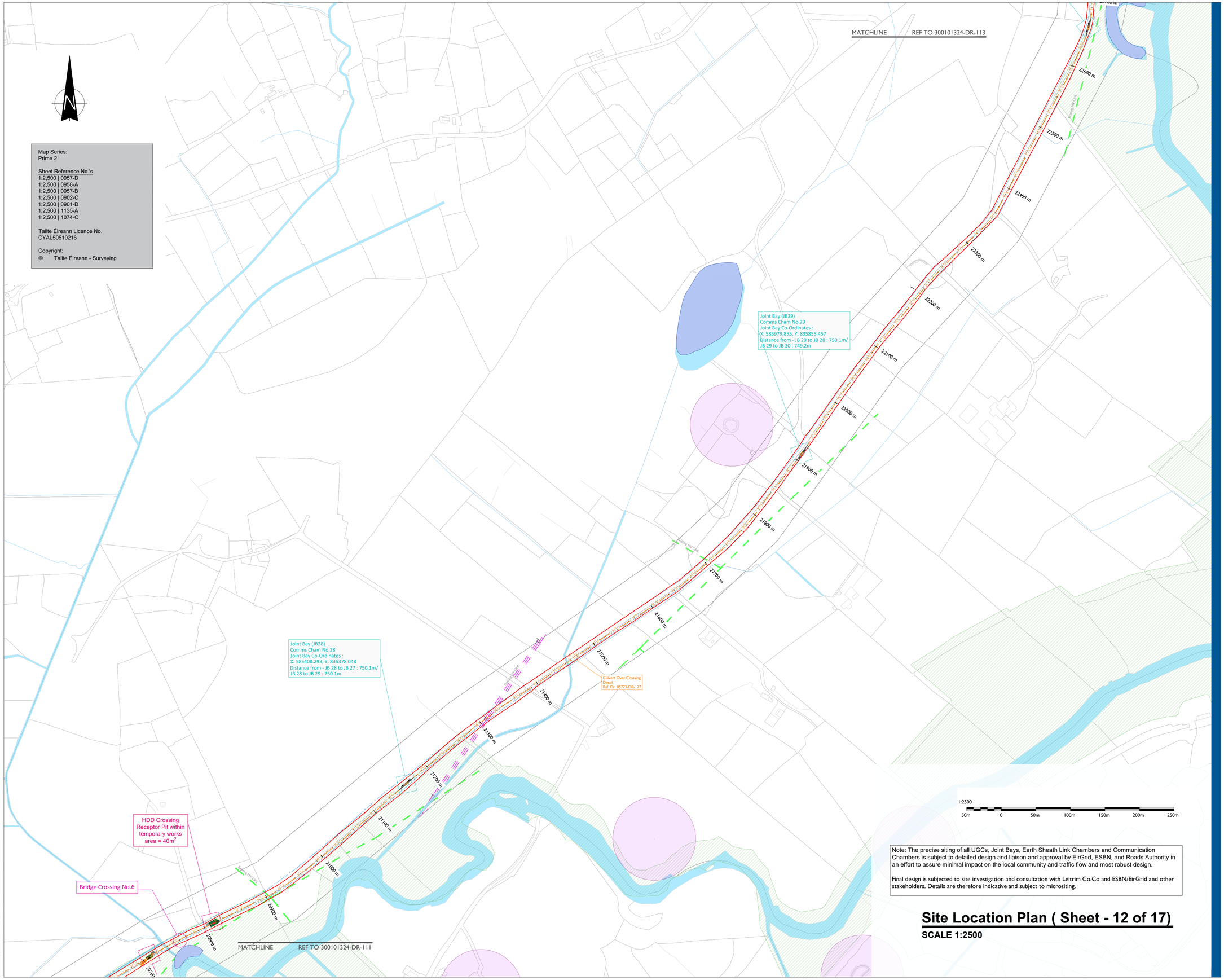
SHEET TITLE

Site Layout Plan
Sheet 11 of 17

SHEET NUMBER

05773-DR-111

ISO A1 594mm x 841mm



Map Series:
Prime 2

Sheet Reference No.'s
1:2,500 | 0957-D
1:2,500 | 0958-A
1:2,500 | 0957-B
1:2,500 | 0902-C
1:2,500 | 0901-D
1:2,500 | 1135-A
1:2,500 | 1074-C

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Note: The precise siting of all UGCs, Joint Bays, Earth Sheath Link Chambers and Communication Chambers is subject to detailed design and liaison and approval by EirGrid, ESBN, and Roads Authority in an effort to assure minimal impact on the local community and traffic flow and most robust design.

Final design is subjected to site investigation and consultation with Leitrim Co.Co and ESBN/EirGrid and other stakeholders. Details are therefore indicative and subject to micrositing.

Site Location Plan (Sheet - 12 of 17)

SCALE 1:2500

Project Management Initials: Designed: AD Checked: DB Approved: RG

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Tel: 00 44 1256406664

PROJECT

Lissinagroagh
Wind Farm
110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN CONSULTING ENGINEERS

NOTES: -

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- Other services may be encountered along the route.
- Existing road build up and reinstatement requirements to be confirmed with Leitrim Co.Co

LEGEND: -

- Proposed UGC Grid Route shown thus (32.0Km)
- Red Line Planning Boundary shown thus
- Existing Lake, River Network shown thus
- Existing Stream Network shown thus
- Existing ESB LV/MV Networks shown thus
- Existing ESB HV OHL Networks shown thus
- Existing Irish Water Services shown thus
- Notification Zone for Heritage Monument shown thus
- Special Areas of Conservation (SAC)

ISSUED FOR PLANNING
21.04.2026

ISSUE/REVISION

P03	21.04.26	Issued for Planning
P02	20.04.26	Issued for Planning
P01	30.01.26	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

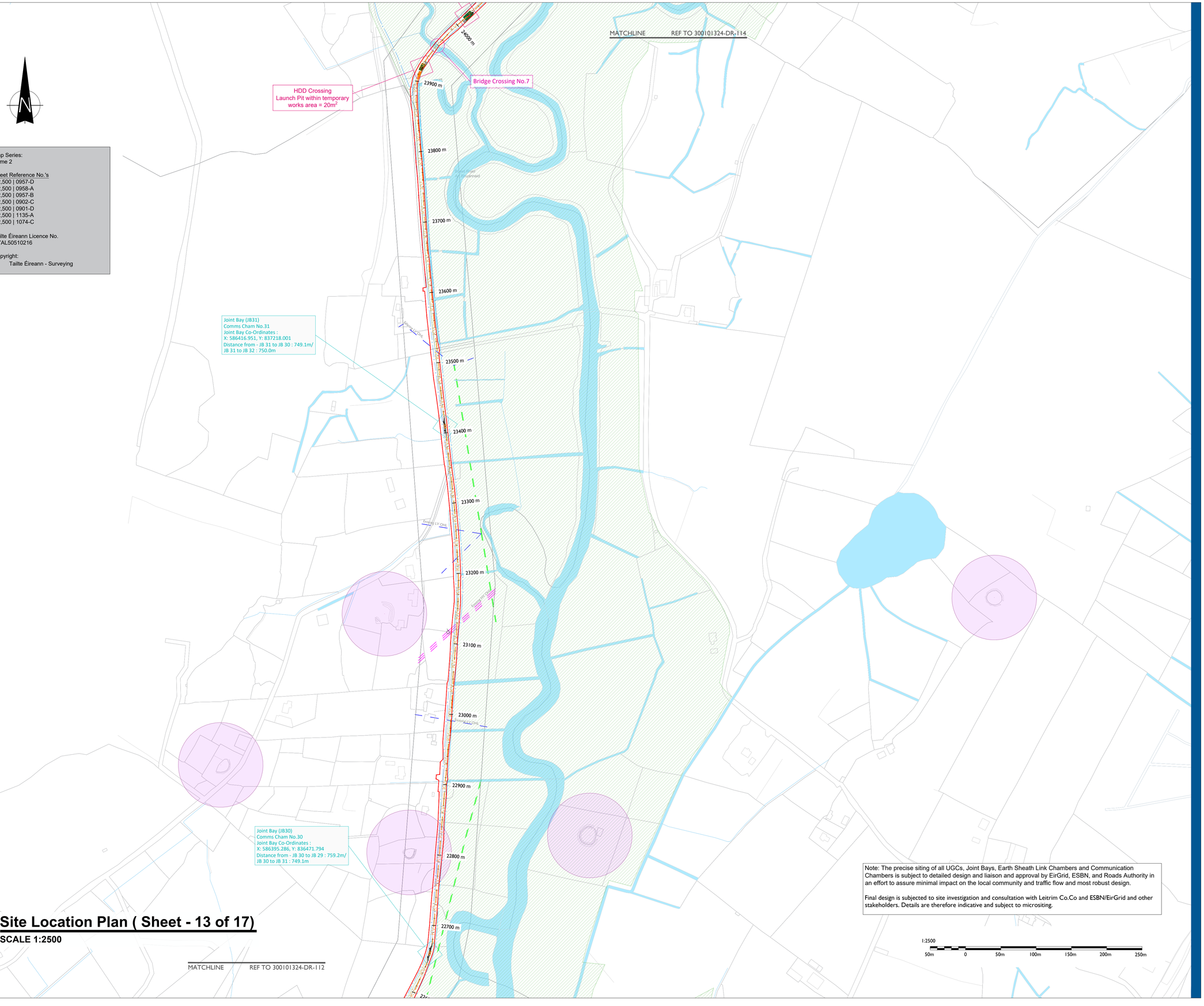
SHEET TITLE

Site Layout Plan
Sheet 12 of 17

SHEET NUMBER

05773-DR-112

ISO A1 594mm x 841mm



Map Series:
Prime 2

Sheet Reference No.'s
1:2,500 | 0957-D
1:2,500 | 0958-A
1:2,500 | 0957-B
1:2,500 | 0902-C
1:2,500 | 0901-D
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Site Location Plan (Sheet - 13 of 17)

SCALE 1:2500

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1:2500
50m 0 50m 100m 150m 200m 250m

Project Management Initials: Designer: AD Checked: DB Approved: RG

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PROJECT

Lissinagroagh Wind Farm 110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN CONSULTING ENGINEERS

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LEGEND: -

- Proposed UGC Grid Route shown thus (32.0Km)
- Red Line Planning Boundary shown thus
- Existing Lake, River Network shown thus
- Existing Stream Network shown thus
- Existing ESB LV/MV Networks shown thus
- Existing ESB HV OHL Networks shown thus
- Existing Irish Water Services shown thus
- Notification Zone for Heritage Monument shown thus
- Special Areas of Conservation (SAC)

ISSUED FOR PLANNING
21.04.2026

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P02	20.04.26	Issued for Planning
P01	30.01.26	Issued for Planning

PROJECT NUMBER

05-773

SHEET TITLE

Site Layout Plan
Sheet 13 of 17

SHEET NUMBER

05773-DR-113

Project Management Initials: Designer: AD Checked: DB Approved: RG

Map Series:
Prime 2

Sheet Reference No.'s
1:2,500 | 0957-D
1:2,500 | 0958-A
1:2,500 | 0957-B
1:2,500 | 0902-C
1:2,500 | 0901-D
1:2,500 | 1135-A
1:2,500 | 1074-C

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MATCHLINE REF TO 300101324-DR-115

Irish Water Crossing
Under crossing - S 45/46
Ref. Dr. 05773-DR-128

Irish Water Crossing
Under crossing - S 43/44
Ref. Dr. 05773-DR-128

Irish Water Crossing
Under crossing - S 41/42
Ref. Dr. 05773-DR-128

Irish Water Crossing
Under crossing - S 39/40
Ref. Dr. 05773-DR-128

Irish Water Crossing
Under crossing - S 38
Ref. Dr. 05773-DR-128

Irish Water Crossing
Under crossing - S 37
Ref. Dr. 05773-DR-128

Irish Water Crossing
Under crossing - S 36
Ref. Dr. 05773-DR-128

Irish Water Crossing
Under crossing - S 35
Ref. Dr. 05773-DR-128

Culvert Over
Crossing Detail
Ref. Dr. 05773-DR-127

Joint Bay (JB34)
Comms Cham No.34
Joint Bay Co-Ordinates :
X: 586915.761, Y: 839018.546
Distance from - JB 34 to JB 33 : 755.7m/
JB 34 to JB 35 : 748.9m

Joint Bay (JB33)
Comms Cham No.33
Joint Bay Co-Ordinates :
X: 587025.119, Y: 838467.249
Distance from - JB 33 to JB 32 : 749.6m/
JB 33 to JB 34 : 755.7m

Joint Bay (JB32)
Comms Cham No.32
Joint Bay Co-Ordinates :
X: 586548.924, Y: 837896.891
Distance from - JB 32 to JB 31 : 750.0m/
JB 32 to JB 33 : 749.6m

HDD Crossing
Receptor Pit within
temporary works
area = 40m²

26300 m
26200 m
26100 m
26000 m
25900 m
25800 m
25700 m
25600 m
25500 m
25400 m
25300 m
25200 m
25100 m
25000 m
24900 m
24800 m
24700 m
24600 m
24500 m
24400 m
24300 m
24200 m
24100 m
24000 m

MATCHLINE REF TO 300101324-DR-113

1:2500
50m 0 50m 100m 150m 200m 250m

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Site Location Plan (Sheet - 14 of 17)

SCALE 1:2500

LEGEND: -

- Proposed UGC Grid Route shown thus (32.0Km)
- Red Line Planning Boundary shown thus
- Existing Lake, River Network shown thus
- Existing Stream Network shown thus
- Existing ESB LV/MV Networks shown thus
- Existing ESB HV OHL Networks shown thus
- Existing Irish Water Services shown thus
- Notification Zone for Heritage Monument shown thus
- Special Areas of Conservation (SAC)

ISSUED FOR PLANNING
21.04.2026

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PROJECT

Lissinagroagh
Wind Farm
110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN
CONSULTING ENGINEERS

ISSUE/REVISION

P03	21.04.26	Issued for Planning
P02	20.04.26	Issued for Planning
P01	30.01.26	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

SHEET TITLE

Site Layout Plan
Sheet 14 of 17

SHEET NUMBER

05773-DR-114

ISO A1 594mm x 841mm

ISO A1 594mm x 841mm

Map Series:
Prime 2

Sheet Reference No.'s
1:2,500 | 0957-D
1:2,500 | 0958-A
1:2,500 | 0957-B
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1:2,500 | 0901-D
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1:2,500 | 1074-C

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LM13453F
Mci (Mirror Controls International) Ireland Limited

LM21524F - Coillte Cuideachta Ghníomhaíochta Ainmnithe

HDD Crossing Launch Pit within temporary works area = 20m²

Bridge Crossing No.8

HDD Crossing Receptor Pit within temporary works area = 40m²

Irish Water Crossing Under crossing - S 52 Ref. Dr. 05773-DR-128

Irish Water Crossing Under crossing - S 49/50 Ref. Dr. 05773-DR-128

Irish Water Crossing Under crossing - S 51 Ref. Dr. 05773-DR-128

Joint Bay (JB36)
Comms Cham No.36
Joint Bay Co-Ordinates :
X: 587153.087, Y: 840347.190
Distance from - JB 36 to JB 35 : 749.7m/
JB 36 to JB 37 : 759.9m

Irish Water Crossing Under crossing - S 51 Ref. Dr. 05773-DR-128

Joint Bay (JB37)
Comms Cham No.37
Joint Bay Co-Ordinates :
X: 587797.696, Y: 840043.539
Distance from - JB 37 to JB 36 : 759.9m/
JB 37 to JB 38 : 797.1m

Irish Water Crossing Under crossing - S 54/55 Ref. Dr. 05773-DR-128

Joint Bay (JB35)
Comms Cham No.35
Joint Bay Co-Ordinates :
X: 586954.889, Y: 839735.819
Distance from - JB 35 to JB 34 : 748.9m/
JB 35 to JB 36 : 749.7m

Irish Water Crossing Under crossing - S 48 Ref. Dr. 05773-DR-128

Irish Water Crossing

MATCHLINE REF TO 300101324-DR-114

MATCHLINE REF TO 300101324-DR-116

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1:2500
50m 0 50m 100m 150m 200m 250m

Site Location Plan (Sheet - 15 of 17)

SCALE 1:2500

Project Management Initials: Designer: AD Checked: DR Approved: RG

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PROJECT

Lissinagroagh
Wind Farm
110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN CONSULTING ENGINEERS

NOTES: -

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- Existing road build up and reinstatement requirements to be confirmed with Leitrim Co.Co

LEGEND: -

- Proposed UGC Grid Route shown thus (32.0Km) — 10kV 10kV
- Red Line Planning Boundary shown thus
- Existing Lake, River Network shown thus
- Existing Stream Network shown thus
- Existing ESB LV/MV Networks shown thus
- Existing ESB HV OHL Networks shown thus
- Existing Irish Water Services shown thus
- Notification Zone for Heritage Monument shown thus
- Special Areas of Conservation (SAC)
- Landowners Boundary shown thus

ISSUED FOR PLANNING
21.04.2026

ISSUE/REVISION

P03	21.04.26	Issued for Planning
P02	20.04.26	Issued for Planning
P01	30.01.26	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

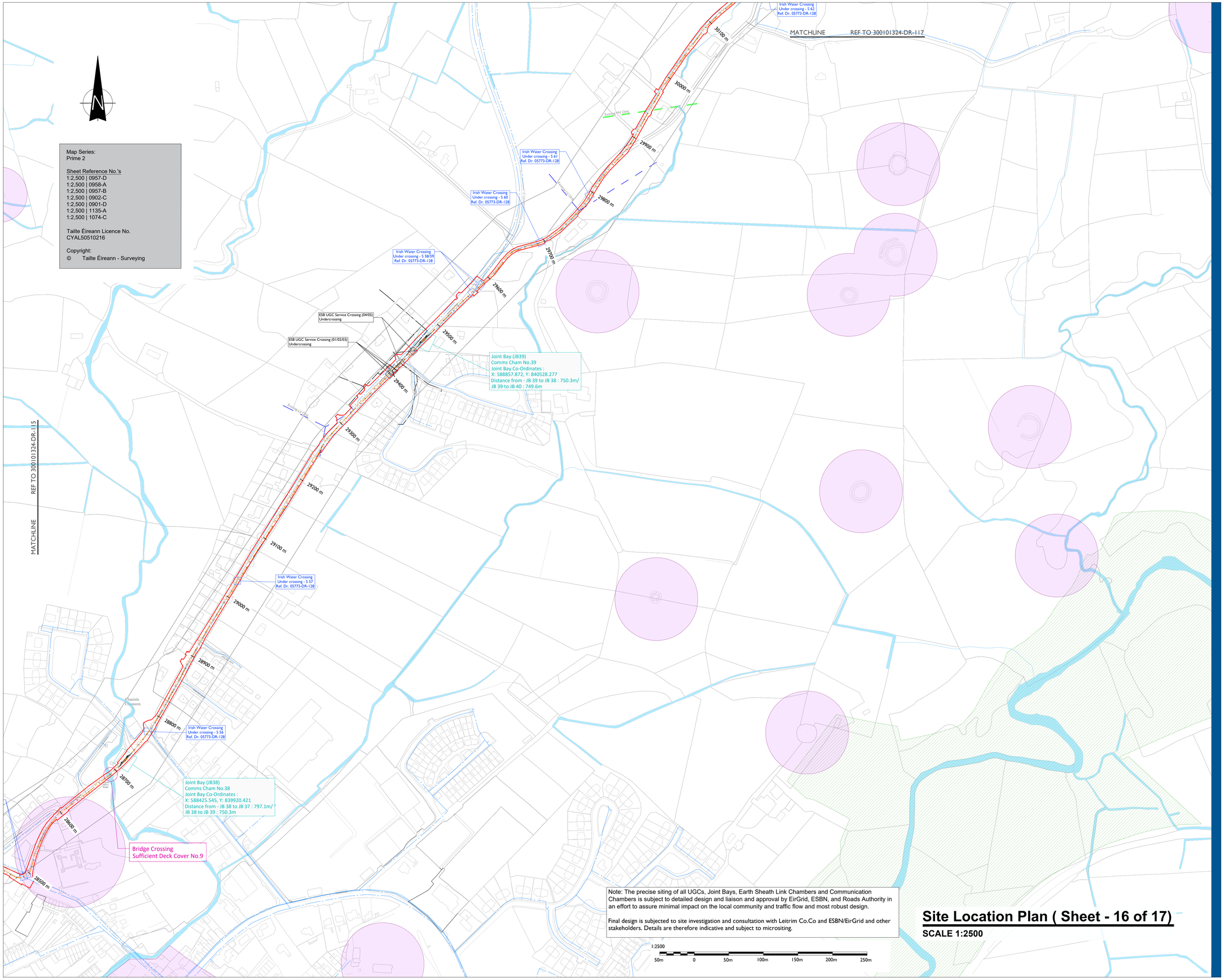
SHEET TITLE

Site Layout Plan
Sheet 15 of 17

SHEET NUMBER

05773-DR-115

ISO A1 594mm x 841mm



Site Location Plan (Sheet - 16 of 17)

SCALE 1:2500

Project Management Initials: Designer: AD Checked: DB Approved: RG

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PROJECT

Lissinagroagh Wind Farm 110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN CONSULTING ENGINEERS

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- Other services may be encountered along the route.
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LEGEND: -

- Proposed UGC Grid Route shown thus (32.0Km)
- Red Line Planning Boundary shown thus
- Existing Lake, River / Stream Network shown thus
- Existing ESB Underground MV cable shown thus
- Existing ESB LV/MV Networks shown thus
- Existing ESB HV OHL Networks shown thus
- Existing Irish Water Services shown thus
- Notification Zone for Heritage Monument shown thus
- Special Areas of Conservation (SAC)

ISSUED FOR PLANNING
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P03	21.04.26	Issued for Planning
P02	20.04.26	Issued for Planning
P01	30.01.26	Issued for Planning

PROJECT NUMBER

05-773

SHEET TITLE

Site Layout Plan
Sheet 16 of 17

SHEET NUMBER

05773-DR-116

ISO A1 594mm x 841mm

Map Series:
Prime 2

Sheet Reference No.'s
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1:2,500 | 0958-A
1:2,500 | 0957-B
1:2,500 | 0902-C
1:2,500 | 0901-D
1:2,500 | 1135-A
1:2,500 | 1074-C

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Proposed Lissinagroagh
Wind Farm 110kV Substation

317700 m
317600 m
317500 m
317400 m
317300 m
317200 m
317100 m
317000 m
309000 m
308000 m
307000 m
306000 m
305000 m
304000 m
303000 m
302000 m
301000 m

Culvert Under Crossing Detail Ref. Dr. 05773-DR-126

Joint Bay (JB41)
Comms Cham No.41
Joint Bay Co-Ordinates :
X: 589802.616, Y: 841665.913
Distance from - JB 41 to JB 40 : 748.1m/
JB 41 to Windfarm : 759.1m

Bridge Crossing No.11

HDD Crossing
Launch Pit within temporary works area = 20m²

Bridge Crossing No.10

HDD Crossing
Receptor Pit within temporary works area = 40m²

HDD Crossing
Launch Pit within temporary works area = 20m²

HDD Crossing
Launch Pit within temporary works area = 20m²

Joint Bay (JB40)
Comms Cham No.40
Joint Bay Co-Ordinates :
X: 589356.333, Y: 841070.694
Distance from - JB 40 to JB 39 : 749.6m/
JB 40 to JB 41 : 748.1m

Irish Water Crossing
Under crossing - S 62
Ref. Dr. 05773-DR-128

MATCHLINE REF TO 300101324-DR-116

1:2500
50m 0 50m 100m 150m 200m 250m

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Site Location Plan (Sheet - 17 of 17)

SCALE 1:2500

Project Management Initials: Designer: AO Checked: DB Approved: RG

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PROJECT

Lissinagroagh
Wind Farm
110kV Grid Connection

CLIENT

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CONSULTANTS

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- Other services may be encountered along the route.
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LEGEND: -

- Proposed UGC Grid Route shown thus (32.0Km)
- Red Line Planning Boundary shown thus
- EIAR Planning Boundary
- Permanent Paved Access Roads shown thus
- Existing Lake, River / Stream Network shown thus
- Existing ESB LV/MV Networks shown thus
- Existing ESB HV OHL Networks shown thus
- Existing Irish Water Services shown thus
- Notification Zone for Heritage Monument shown thus

ISSUED FOR PLANNING
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PROJECT NUMBER

05-773

SHEET TITLE

Site Layout Plan
Sheet 17 of 17

SHEET NUMBER

05773-DR-117

ISO A1 594mm x 841mm

Map Series:
Prime Data Vector

Discovery Tile Numbers:
OS1632, OS1832, OS1834

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Proposed Lissinagroagh 110kV Substation

Exist. Srananagh 220kV Substation

05773-DR-101
05773-DR-102
05773-DR-103
05773-DR-104
05773-DR-105
05773-DR-106
05773-DR-107
05773-DR-108
05773-DR-109
05773-DR-110
05773-DR-111
05773-DR-112
05773-DR-113
05773-DR-114
05773-DR-115
05773-DR-116
05773-DR-117

Joint Bay No.01
Joint Bay No.02
Joint Bay No.03
Joint Bay No.04
Joint Bay No.05
Joint Bay No.06
Joint Bay No.07
Joint Bay No.08
Joint Bay No.09
Joint Bay No.10
Joint Bay No.11
Joint Bay No.12
Joint Bay No.13
Joint Bay No.14
Joint Bay No.15
Joint Bay No.16
Joint Bay No.17
Joint Bay No.18
Joint Bay No.19
Joint Bay No.20
Joint Bay No.21
Joint Bay No.22
Joint Bay No.23
Joint Bay No.24
Joint Bay No.25
Joint Bay No.26
Joint Bay No.27
Joint Bay No.28
Joint Bay No.29
Joint Bay No.30
Joint Bay No.31
Joint Bay No.32
Joint Bay No.33
Joint Bay No.34
Joint Bay No.35
Joint Bay No.36
Joint Bay No.37
Joint Bay No.38
Joint Bay No.39
Joint Bay No.40
Joint Bay No.41

Site Map - Joint Bay Locations
SCALE 1:40000

Distance Between Joint Bays

Route Section	Distance (m)
Srananagh 220kV Sub to JB01	574
JB01 to JB02	804
JB02 to JB03	809
JB03 to JB04	798
JB04 to JB05	780
JB05 to JB06	744
JB06 to JB07	746
JB07 to JB08	755
JB08 to JB09	699
JB09 to JB10	795
JB10 to JB11	812
JB11 to JB12	788
JB12 to JB13	786
JB13 to JB14	785
JB14 to JB15	784
JB15 to JB16	700
JB16 to JB17	723
JB17 to JB18	799
JB18 to JB19	749
JB19 to JB20	749
JB20 to JB21	750

Distance Between Joint Bays

Route Section	Distance (m)
JB21 to JB22	750
JB22 to JB23	748
JB23 to JB24	751
JB24 to JB25	746
JB25 to JB26	738
JB26 to JB27	749
JB27 to JB28	750
JB28 to JB29	750
JB29 to JB30	749
JB30 to JB31	749
JB31 to JB32	750
JB32 to JB33	750
JB33 to JB34	756
JB34 to JB35	749
JB35 to JB36	750
JB36 to JB37	760
JB37 to JB38	797
JB38 to JB39	750
JB39 to JB40	750
JB40 to JB41	748
JB41 to Lissnagroargh110kV Substation	799

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PROJECT

Lissinagroagh (WF)
Wind Farm
110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN
CONSULTING ENGINEERS

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- Other services may be encountered along the route.
- Existing road build up and reinstatement requirements to be confirmed with Leitrim Co.Co

LEGEND: -

Proposed UGC Grid Route shown thus (32.0Km)
Red Line Planning Boundary shown thus
EIAR Planning Boundary
Permanent Paved Access Roads shown thus
Windfarm Development Area

ISSUED FOR PLANNING
21.04.2026

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PROJECT NUMBER

05-773

SHEET TITLE

Site Map - Joint Bay Locations

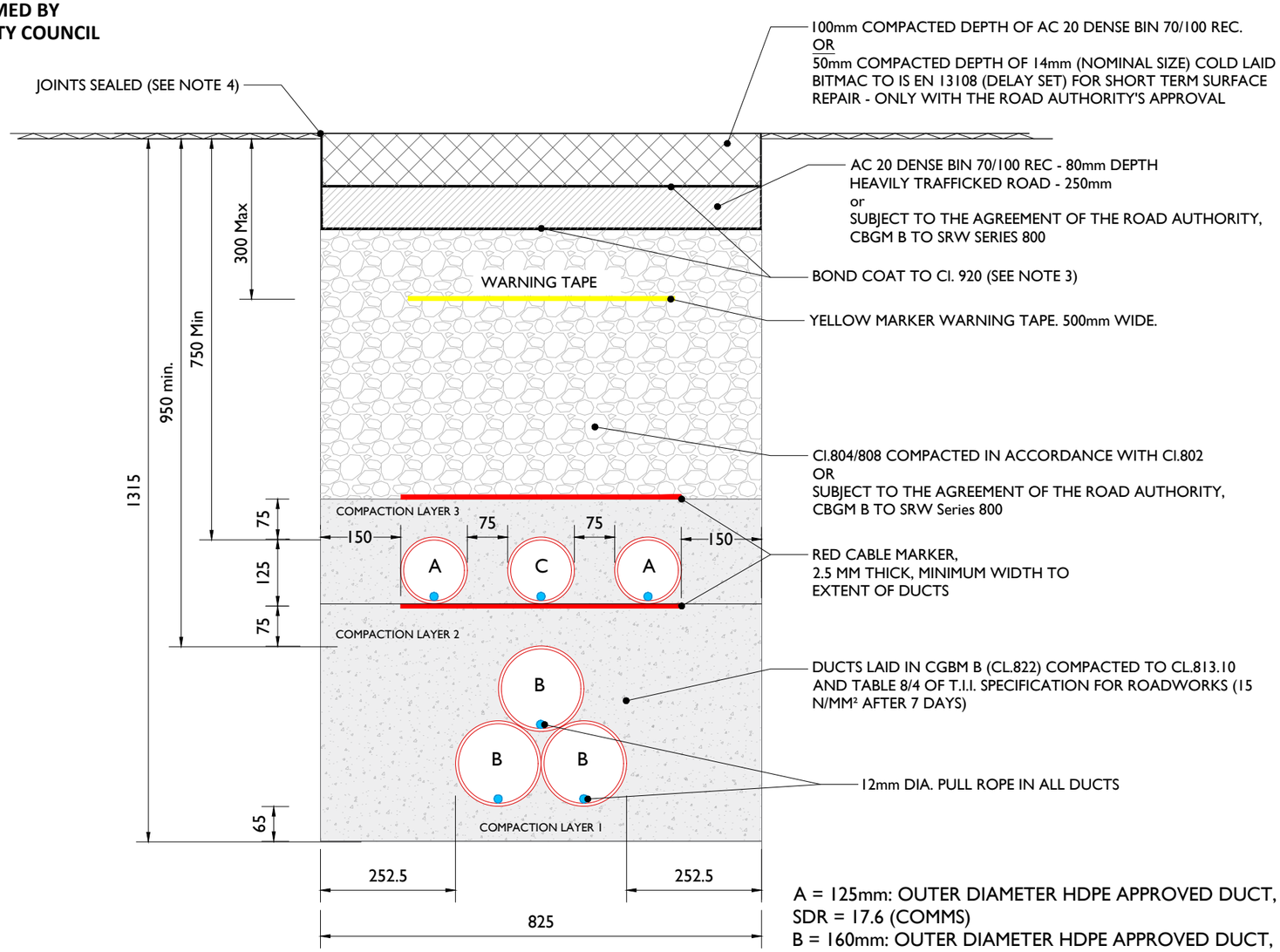
SHEET NUMBER

05773-DR-118

Project Management Initials:
Designer: AD
Checked: DR
Approved: RG

Reinstatement details based on Guidelines for Managing Openings in Public Roads - SD1

EXISTING ROAD BUILD-UP TO BE CONFIRMED BY LEITRIM COUNTY COUNCIL



A = 125mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 17.6 (COMMS)
B = 160mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 21.0 (POWER)
C = 125mm: ECC (EARTH CONTINUNITY CONDUCTOR) DUCT,

Typical Section Through Temporary Reinstatement of Longitudinal Opening in Dressed Rural Unbound Roadway

SCALE 1:10

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LOCAL AREA ENGINEERS REQUIREMENTS AND GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS

NOTES:

1. Refer to 'Guidelines for managing Openings in Public Roads (Purple Book - April 2017)', Chapter 6 'Specifications' for guidance on Duct type / colour and Marker Tape type / colour.
2. All bound edges shall be saw cut to expose the full vertical thickness of each layer prior to excavation. All edges shall be essentially straight, smooth and vertical.
3. Clause 808 surface to be sprayed per clause 920 prior to application of Asphalt Concrete Layer.
4. Joint sealer shall be a hot 40/60 pen bitumen binder or cold thixotropic bitumen 50-70 pen to be applied to all vertical cuts in accordance with B.S. 594987 prior to application of bituminous materials.
5. Licence holder must maintain temporary reinstatement to a safe and acceptable standard.
6. Any damaged area adjacent to the opening and resulting from the excavation operation shall be included within the area to be reinstated.
7. Temporary road Surface warning signs must be used in accordance with the Traffic Signs Manual (Chaper 8 - Temporary Traffic Measures and Signs for Roadworks) and RLS 8/2007.
8. Refer to detail Permanent Reinstatement of Road for advice on permanent reinstatement - all permanent reinstatement shall be carried out when adequate settlement has occurred as determined by the Road Authority.

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Abbeydorney,
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Tel: 00353 66 7135710

CLIENT
FuturEnergy Ireland

PROJECT
Lissinagroagh Wind Farm
110 kV Grid Connection

PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-119a

SHEET TITLE
Ducting through Local Roads
Temporary Reinstatement (SD1) with ECC

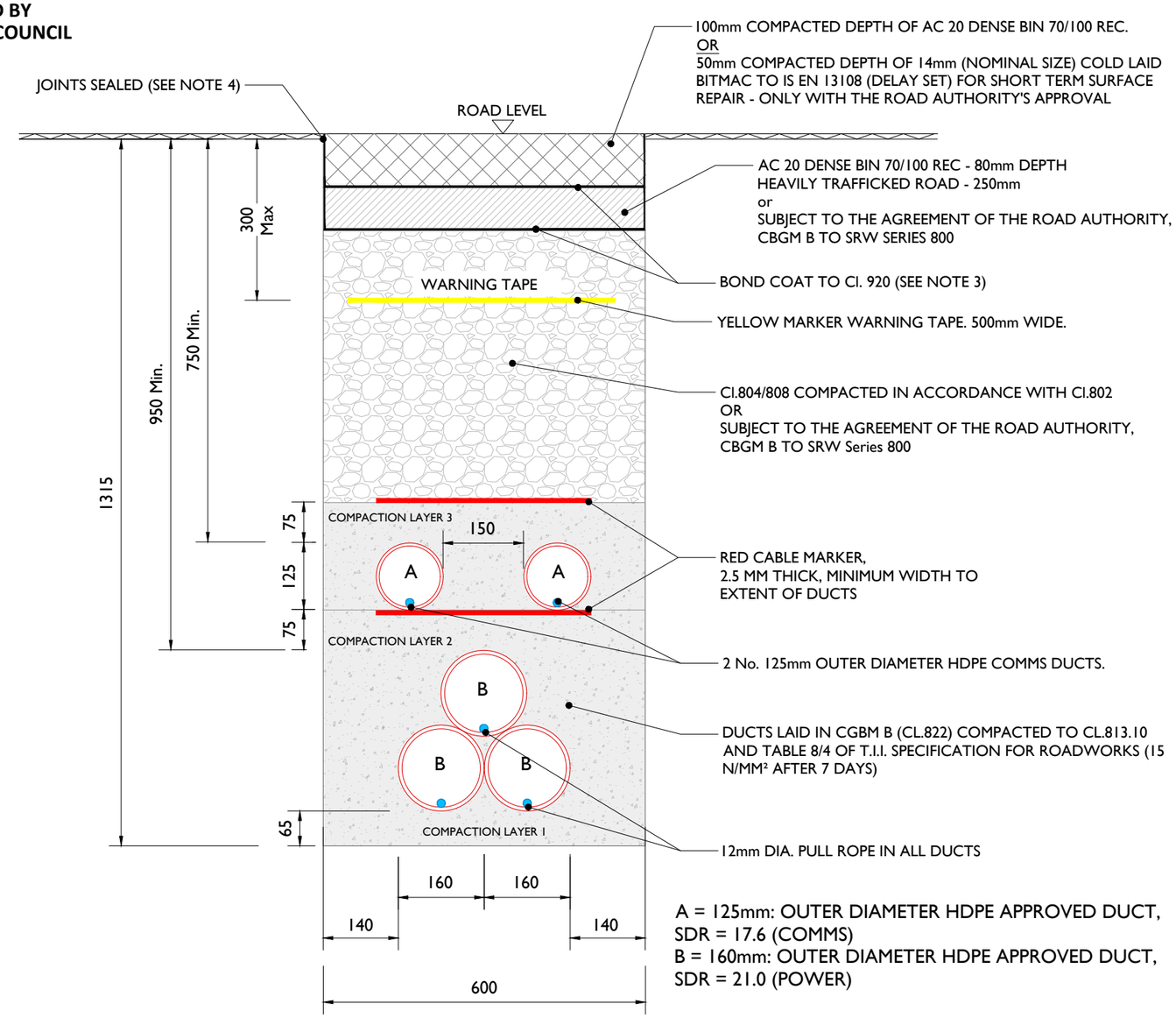
DRAWING STATUS
For Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.26	Issued for Planning
P00	12.01.26	Issued for Planning

Reinstatement details based on Guidelines for Managing Openings in Public Roads - SD1

EXISTING ROAD BUILD-UP TO BE CONFIRMED BY LEITRIM COUNTY COUNCIL



Typical Section Through Temporary Reinstatement of Longitudinal Opening in Dressed Rural Unbound Roadway

SCALE 1:10

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LOCAL AREA ENGINEERS REQUIREMENTS AND GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS

NOTES:

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FuturEnergy Ireland

PROJECT
Lissinagroagh Wind Farm
110 kV Grid Connection

PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-119b

SHEET TITLE
Ducting Through Local Roads
Temporary Reinstatement (SD1)

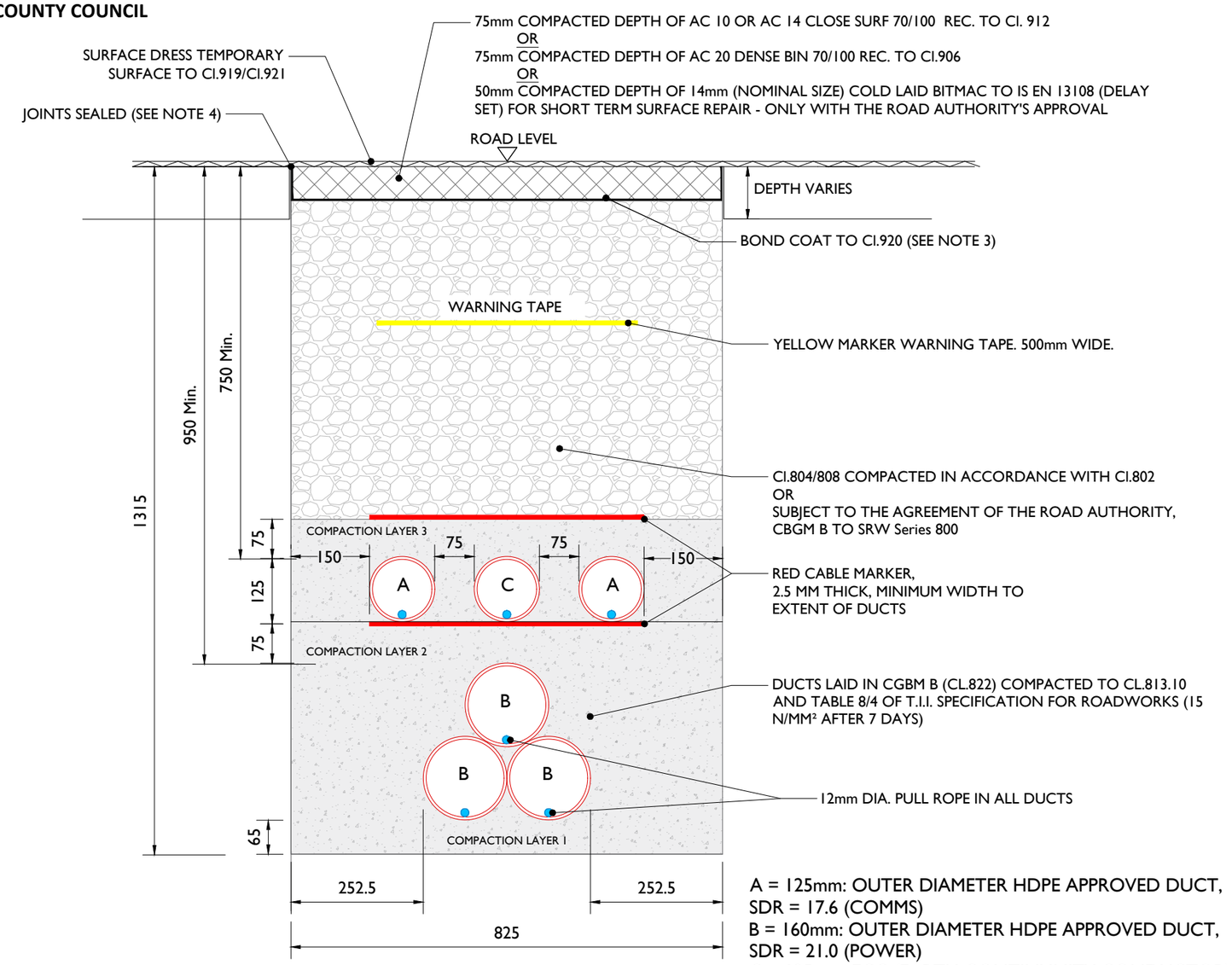
DRAWING STATUS
For Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.26	Issued for Planning
P00	12.01.26	Issued for Planning

EXISTING ROAD BUILD-UP TO BE CONFIRMED BY LEITRIM COUNTY COUNCIL

Reinstatement details based on Guidelines for Managing Openings in Public Roads - SD2



A = 125mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 17.6 (COMMS)
B = 160mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 21.0 (POWER)
C = 125mm: ECC (EARTH CONTINUNITY CONDUCTOR) DUCT,

Typical Section Through Temporary Reinstatement of Longitudinal Opening in Dressed Rural Unbound Roadway

SCALE 1:10

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LOCAL AREA ENGINEERS REQUIREMENTS AND GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS

NOTES:

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PROJECT
Lissinagroagh Wind Farm
110 kV Grid Connection

PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-119c

SHEET TITLE
Ducting Through Local Roads
Temporary Reinstatement (SD2) with ECC

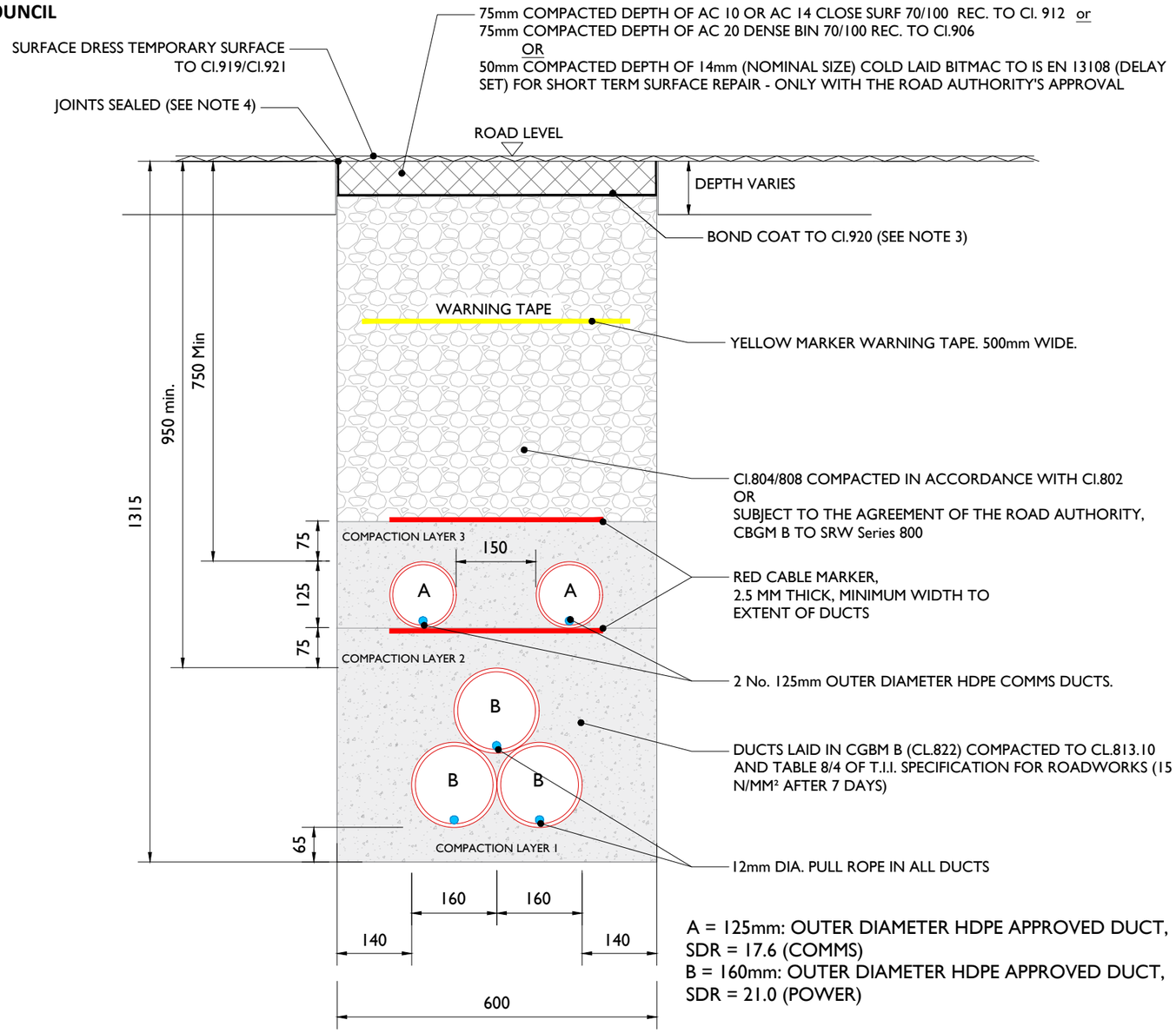
DRAWING STATUS
For Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.26	Issued for Planning
P00	12.01.26	Issued for Planning

EXISTING ROAD BUILD-UP TO BE CONFIRMED BY LEITRIM COUNTY COUNCIL

Reinstatement details based on Guidelines for Managing Openings in Public Roads - SD2



A = 125mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 17.6 (COMMS)
B = 160mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 21.0 (POWER)

Typical Section Through Temporary Reinstatement of Longitudinal Opening in Dressed Rural Unbound Roadway

SCALE 1:10

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LOCAL AREA ENGINEERS REQUIREMENTS AND GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS

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PROJECT
Lissinagroagh Wind Farm
110 kV Grid Connection

PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-119d

SHEET TITLE
Ducting Through Local Roads
Temporary Reinstatement (SD2)

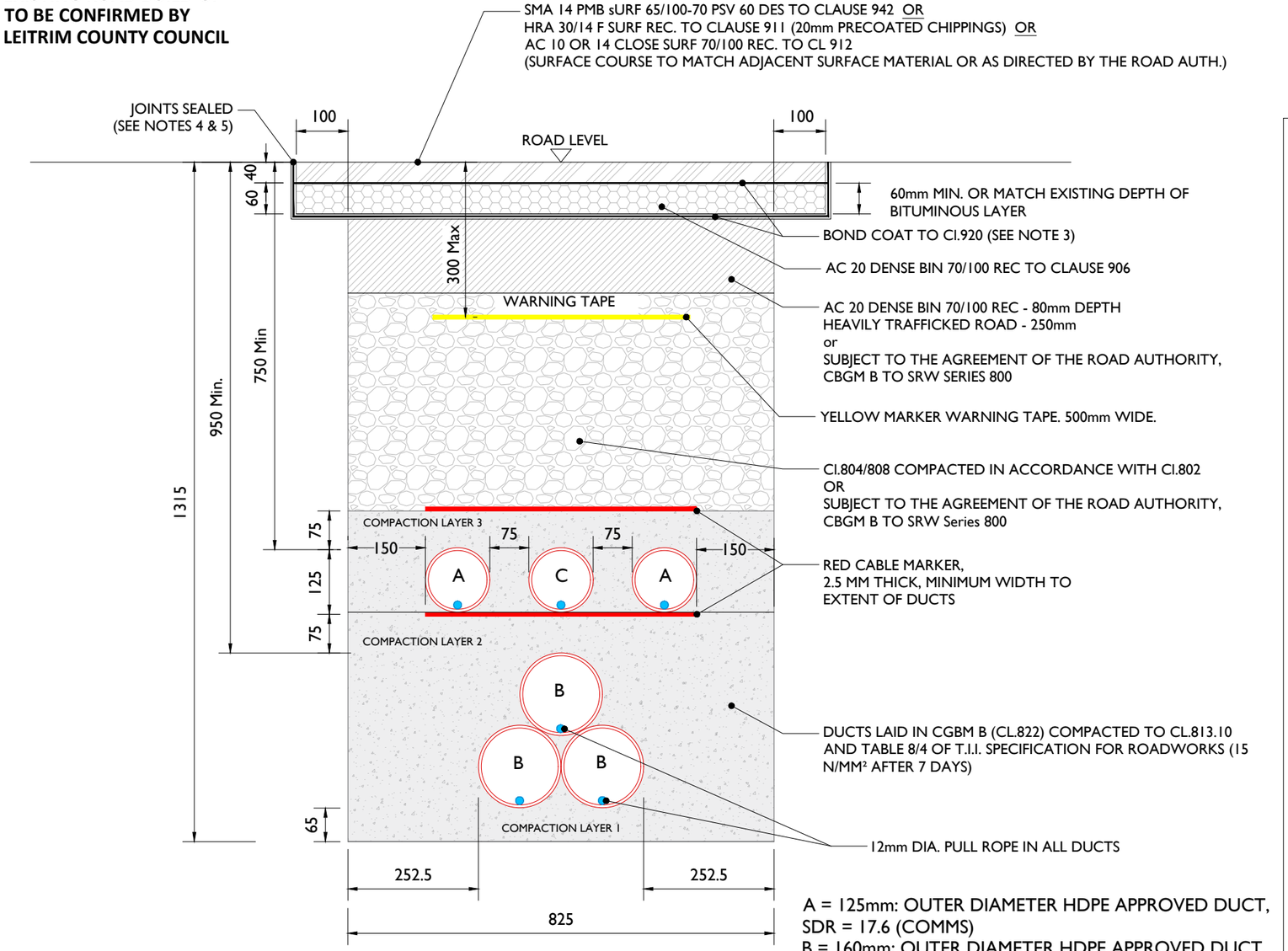
DRAWING STATUS
For Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.26	Issued for Planning
P00	12.01.26	Issued for Planning

Reinstatement details based on Guidelines for Managing Openings in Public Roads - SD4

EXISTING ROAD BUILD-UP TO BE CONFIRMED BY LEITRIM COUNTY COUNCIL



A = 125mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 17.6 (COMMS)
B = 160mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 21.0 (POWER)
C = 125mm: ECC (EARTH CONTINUNITY CONDUCTOR) DUCT,

Typical Section Through Permanent Reinstatement of Longitudinal Opening in Roadway

SCALE 1:10

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LOCAL AREA ENGINEERS REQUIREMENTS AND GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS

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5. Joints sealed with hot Bitumen and topped with fine sand/grit to get a minimum 55 skid resistance value as determined by the Portable Skid Resistance Pendulum & shall not exceed 3mm depth and 50mm width or other method approved by the Roads Authority
6. Licence holder must maintain temporary reinstatement to a safe and acceptable standard.
7. Any damaged area adjacent to the opening and resulting from the excavation operation shall be included within the area to be reinstated.
8. Temporary road Surface warning signs must be used in accordance with the Traffic Signs Manual (Chaper 8 - Temporary Traffic Measures and Signs for Roadworks) and RLS 8/2007.
9. For roads without asphalt concrete surface (e.g. may be Cl.804 with double surface dressing), the road authority may as its discretion permit the temporary reinstatement surface of asphalt concrete to be regulated in lieu of excavation and reinstatement; and subsequently surface dressed.
10. Surface course to match existing surfaces unless otherwise directed by road authority.
11. The coarse aggregate in the asphalt concrete surface course shall have a polished stone value of not less than 60.
12. Refer to detail Permanent Reinstatement of Road for advice on permanent reinstatement - all permanent reinstatement shall be carried out when adequate settlement has occurred as determined by the Road Authority.

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CLIENT
FuturEnergy Ireland

PROJECT
Lissinagroagh Wind Farm
110 kV Grid Connection

PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-120a

SHEET TITLE
Ducting Through Local Roads
Permanent Reinstatement (SD4) With ECC

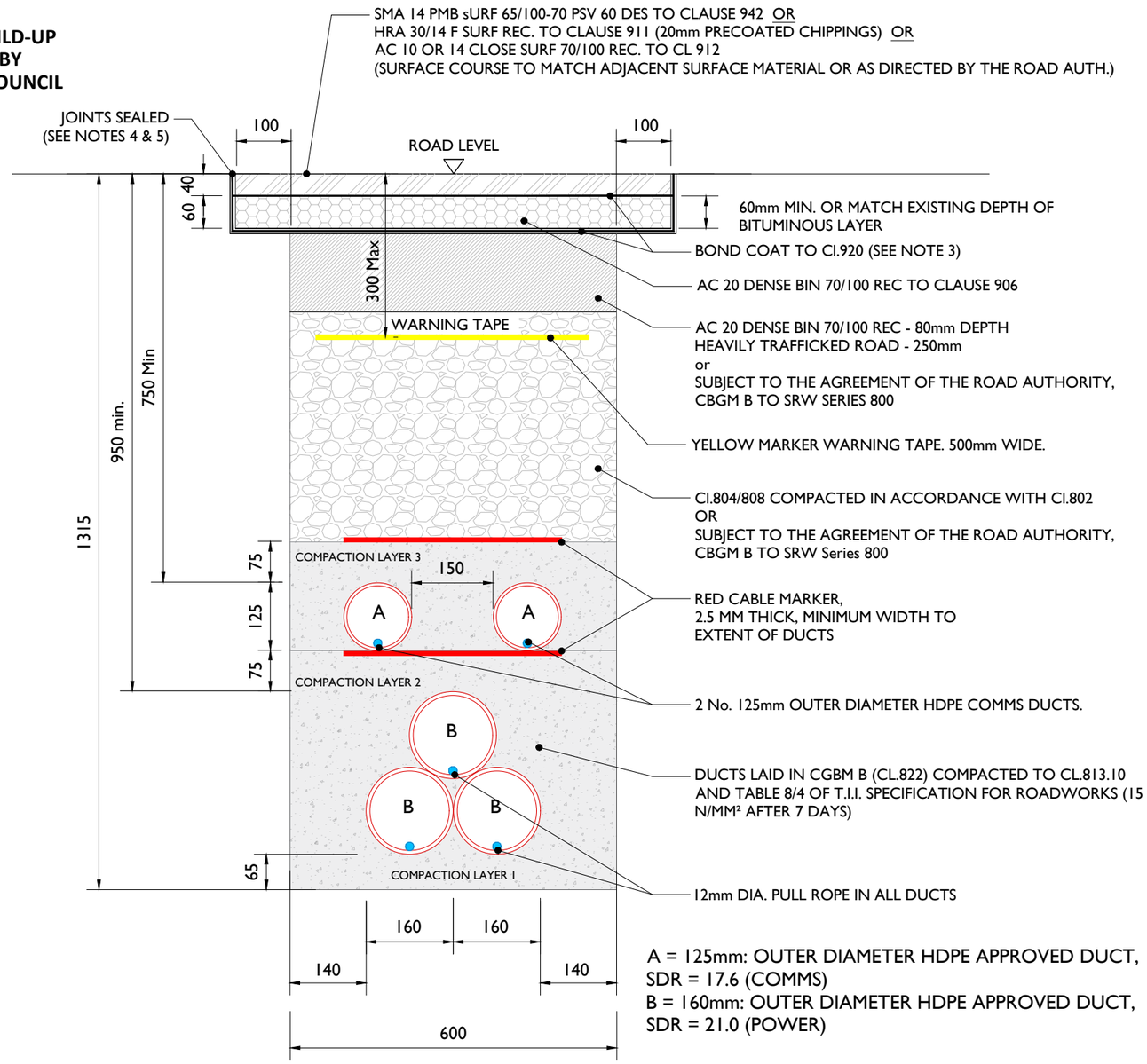
DRAWING STATUS
For Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.26	Issued for Planning
P00	12.01.26	Issued for Planning

Reinstatement details based on Guidelines for Managing Openings in Public Roads - SD4

EXISTING ROAD BUILD-UP TO BE CONFIRMED BY LEITRIM COUNTY COUNCIL



Typical Section Through Permanent Reinstatement of Longitudinal Opening in Roadway

SCALE 1:10

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LOCAL AREA ENGINEERS REQUIREMENTS AND GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS

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CLIENT
FuturEnergy Ireland

PROJECT
Lissinagroagh Wind Farm
110 kV Grid Connection

PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-120b

SHEET TITLE
Ducting Through Local Roads
Permanent Reinstatement (SD4)

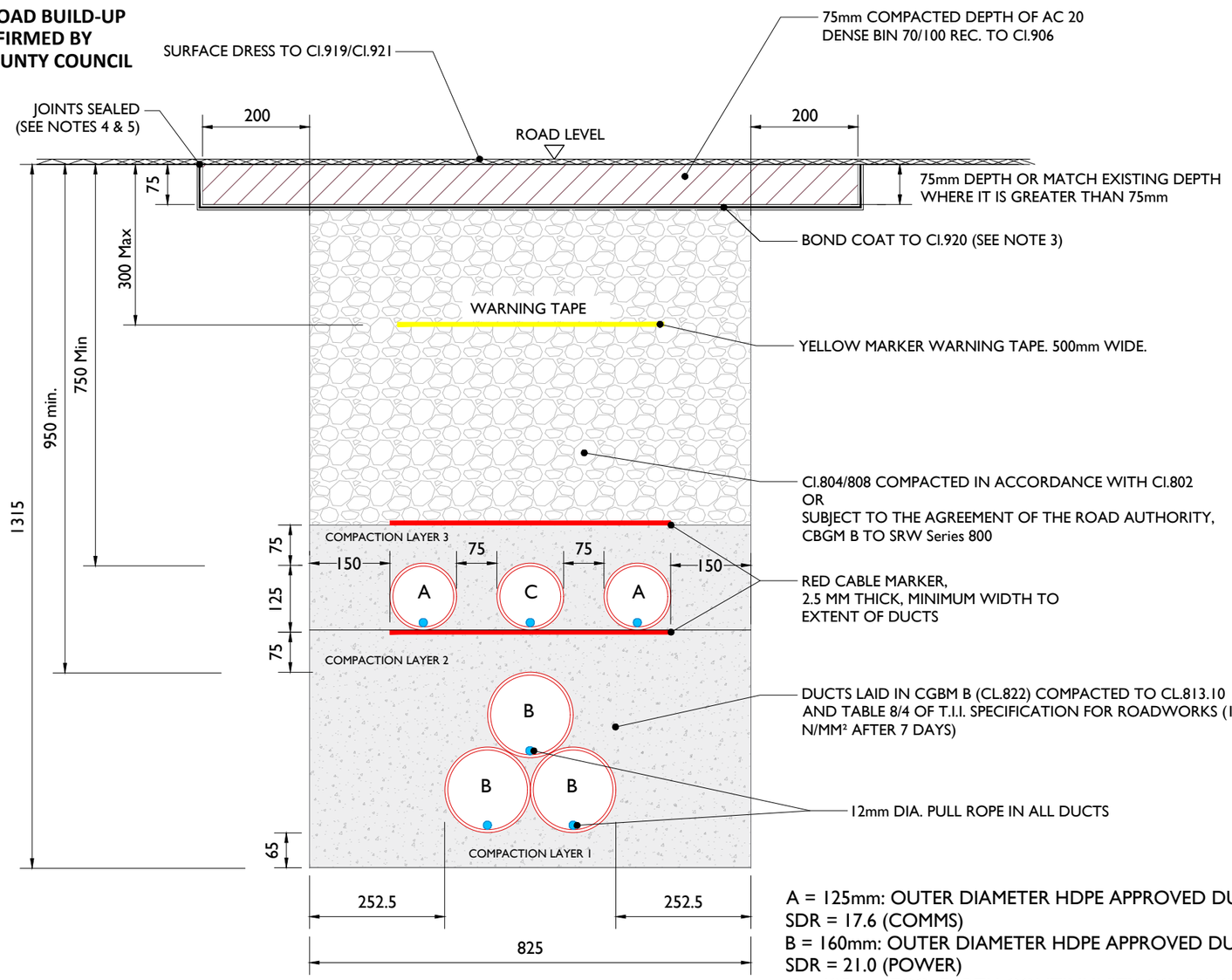
DRAWING STATUS
For Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.26	Issued for Planning
P00	12.01.26	Issued for Planning

Reinstatement details based on Guidelines for Managing Openings in Public Roads - SD5

EXISTING ROAD BUILD-UP TO BE CONFIRMED BY LEITRIM COUNTY COUNCIL



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B = 160mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 21.0 (POWER)
C = 125mm: ECC (EARTH CONTINUNITY CONDUCTOR) DUCT,

Typical Section Through Permanent Reinstatement of Longitudinal Opening in Roadway

SCALE 1:10

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CLIENT
Future Energy Ireland

PROJECT
Lissinagroagh Wind Farm
110 kV Grid Connection

PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-120c

SHEET TITLE
Ducting Through Local Roads
Permanent Reinstatement (SD5) With ECC

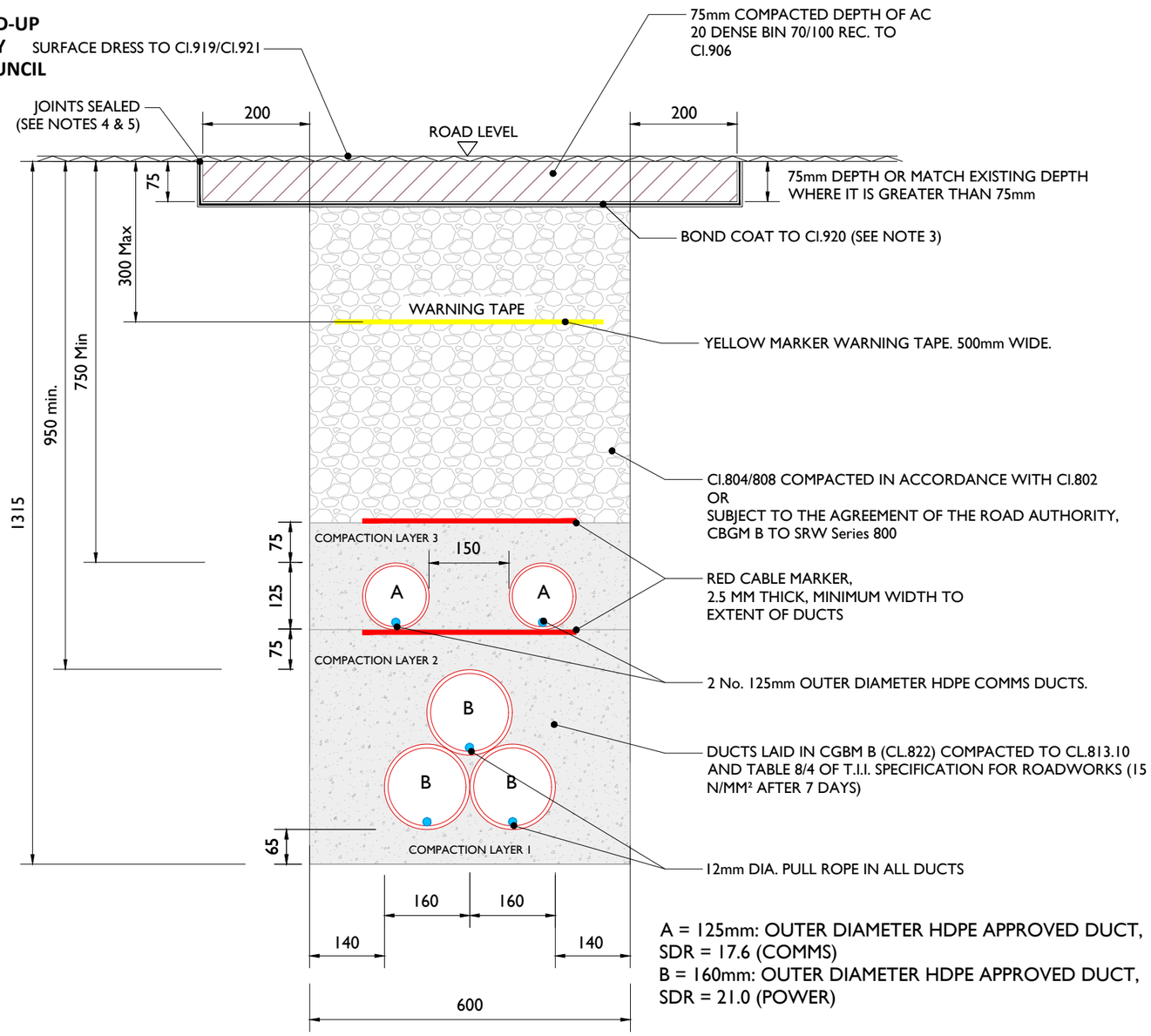
DRAWING STATUS
For Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.26	Issued for Planning
P00	12.01.26	Issued for Planning

Reinstatement details based on Guidelines for Managing Openings in Public Roads - SD5

EXISTING ROAD BUILD-UP TO BE CONFIRMED BY LEITRIM COUNTY COUNCIL



Typical Section Through Permanent Reinstatement of Longitudinal Opening in Roadway

SCALE 1:10

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CLIENT
FuturEnergy Ireland

PROJECT
Lissinagroagh Wind Farm
110 kV Grid Connection

PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-120d

SHEET TITLE
Ducting Through Local Roads
Permanent Reinstatement (SD5)

DRAWING STATUS
For Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.26	Issued for Planning
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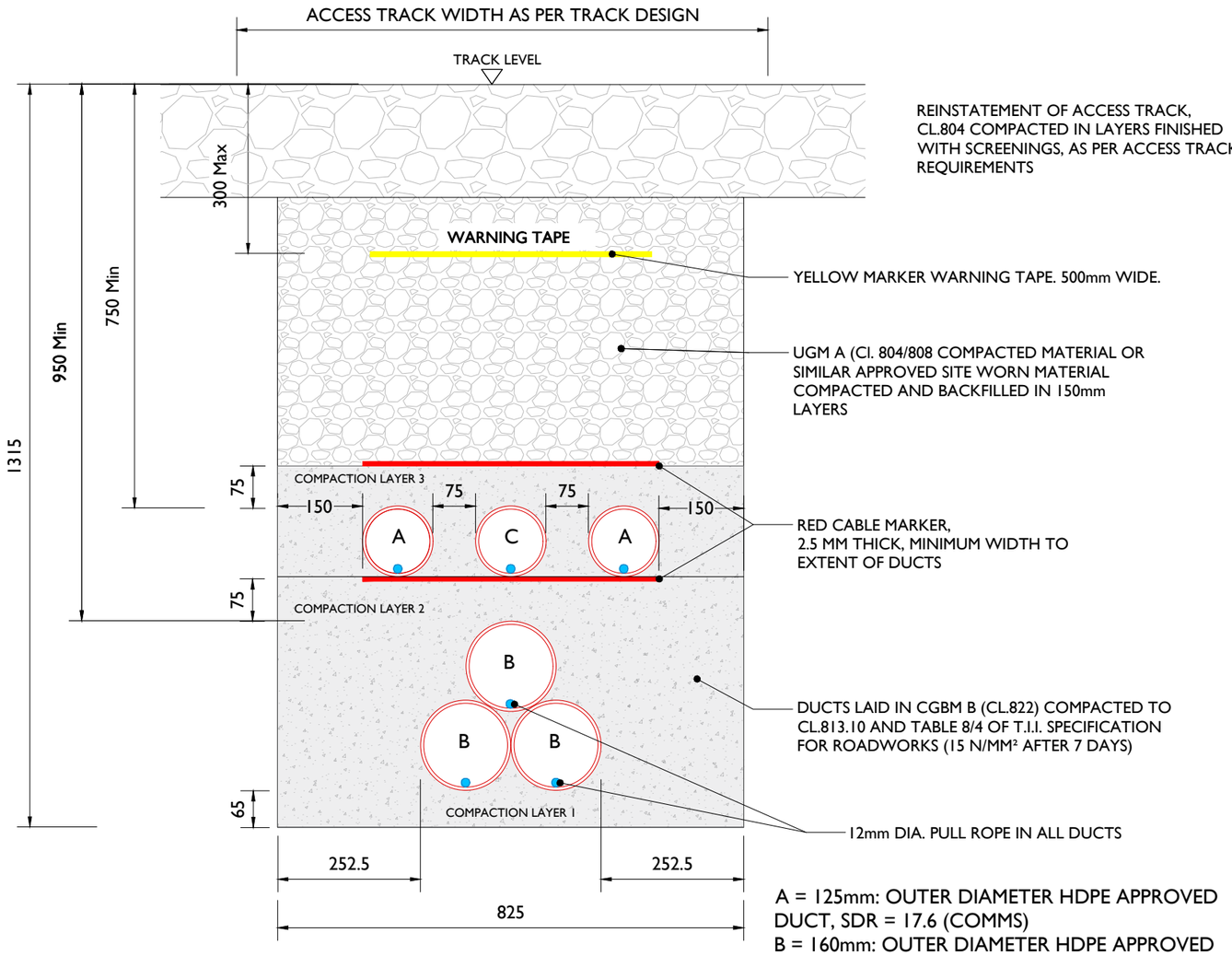
ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LOCAL LANDOWNER REQUIREMENTS



REINSTATEMENT OF ACCESS TRACK, CL.804 COMPACTED IN LAYERS FINISHED WITH SCREENINGS, AS PER ACCESS TRACK REQUIREMENTS

A = 125mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 17.6 (COMMS)
B = 160mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 21.0 (POWER)
C = 125mm: ECC (EARTH CONTINUITY CONDUCTOR) DUCT,

110kV Ducting in Access Track

SCALE 1:10

NOTES:

1. This design is subject to EirGrid & ESB approval and should be used for Planning purposes only.
2. The Customer shall submit all Planning Application designs and proposed cable routes in compliance with the specification requirements, for EirGrid to review and accept in advance of submitting to the local authority.
3. High Voltage cable installation across third party lands is to be avoided where possible.
4. High Voltage cable installation across peat lands is undesirable and only permitted in exceptional circumstances.
5. Service roads shall be installed along the cable route providing suitable and safe access for maintenance and cable pulling vehicles at all joint bay locations and along any section of the cable route that are not locate within the public road.
6. A deed of easement in respect of the cable route to ESB shall be provided. (min width 4 m for 110 kV circuits and 5 m for 220 kV and 400 kV circuits)
7. Direct burial of the cable is not permitted in any circumstance.
8. This drawing is to be read in conjunction with relevant drawings, specifications and reports
9. Dimensions are in millimeters, unless noted otherwise
10. Drawings are not to be scaled use figured dimensions only

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CLIENT
FuturEnergy Ireland

PROJECT
Lissinagroagh Wind Fram
110 kV Grid Connection

PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-121a

SHEET TITLE
Ducting Through Access Track With ECC Duct

DRAWING STATUS
For Planning

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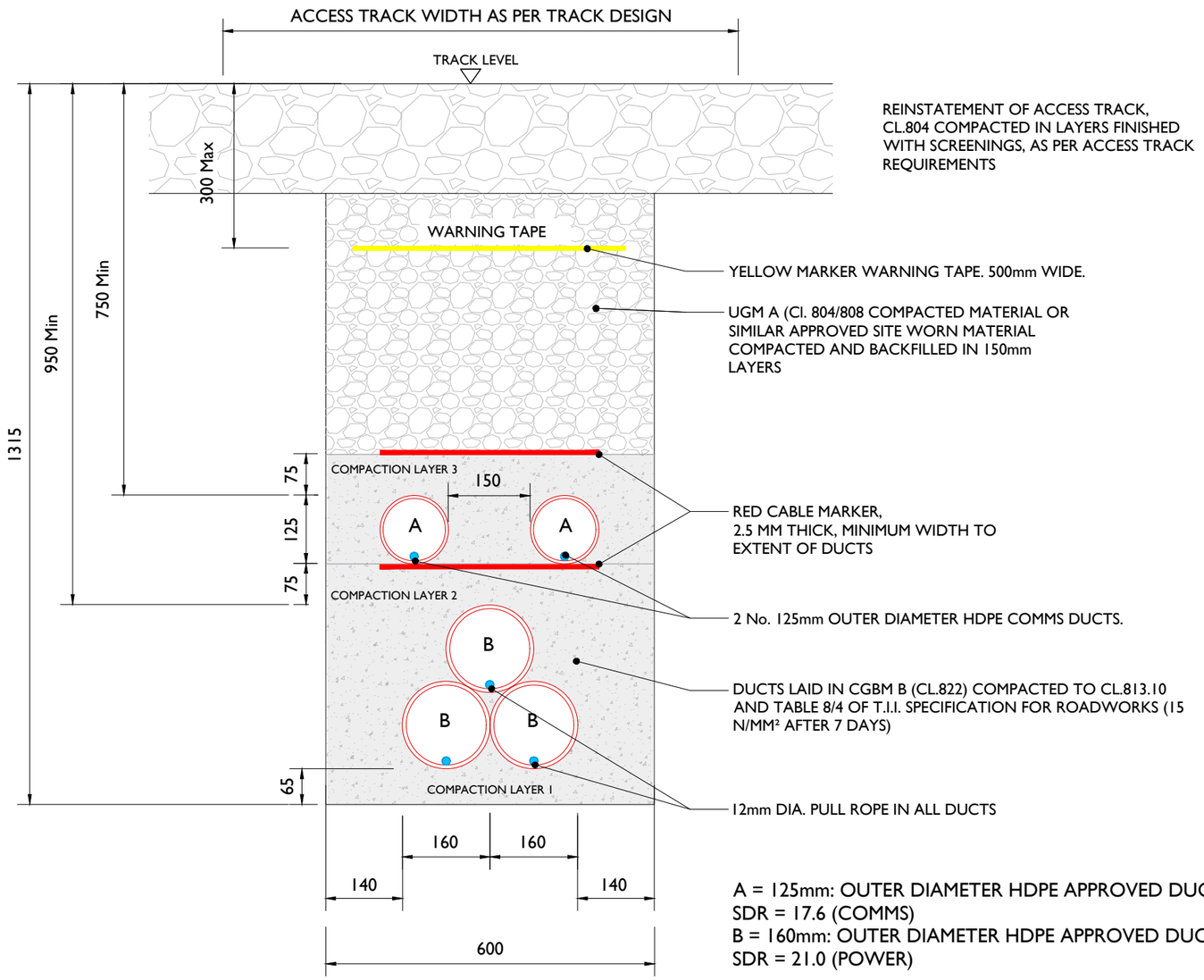
P01	21.04.26	Issued for Planning
P00	12.01.26	Issued for Planning

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LOCAL LANDOWNER REQUIREMENTS



110kV Ducting in Access Track

SCALE 1:10

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8. This drawing is to be read in conjunction with relevant drawings, specifications and reports
9. Dimensions are in millimeters, unless noted otherwise
10. Drawings are not to be scaled use figured dimensions only

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Tel: 00353 66 7135710

CLIENT: FuturEnergy Ireland

PROJECT: Lissinagroagh Wind Farm
110 kV Grid Connection

PROJECT NUMBER: 05-773

SHEET NUMBER: 05773-DR-121b

SHEET TITLE: Ducting Through Access Track

DRAWING STATUS: For Planning

ISSUE/REVISION

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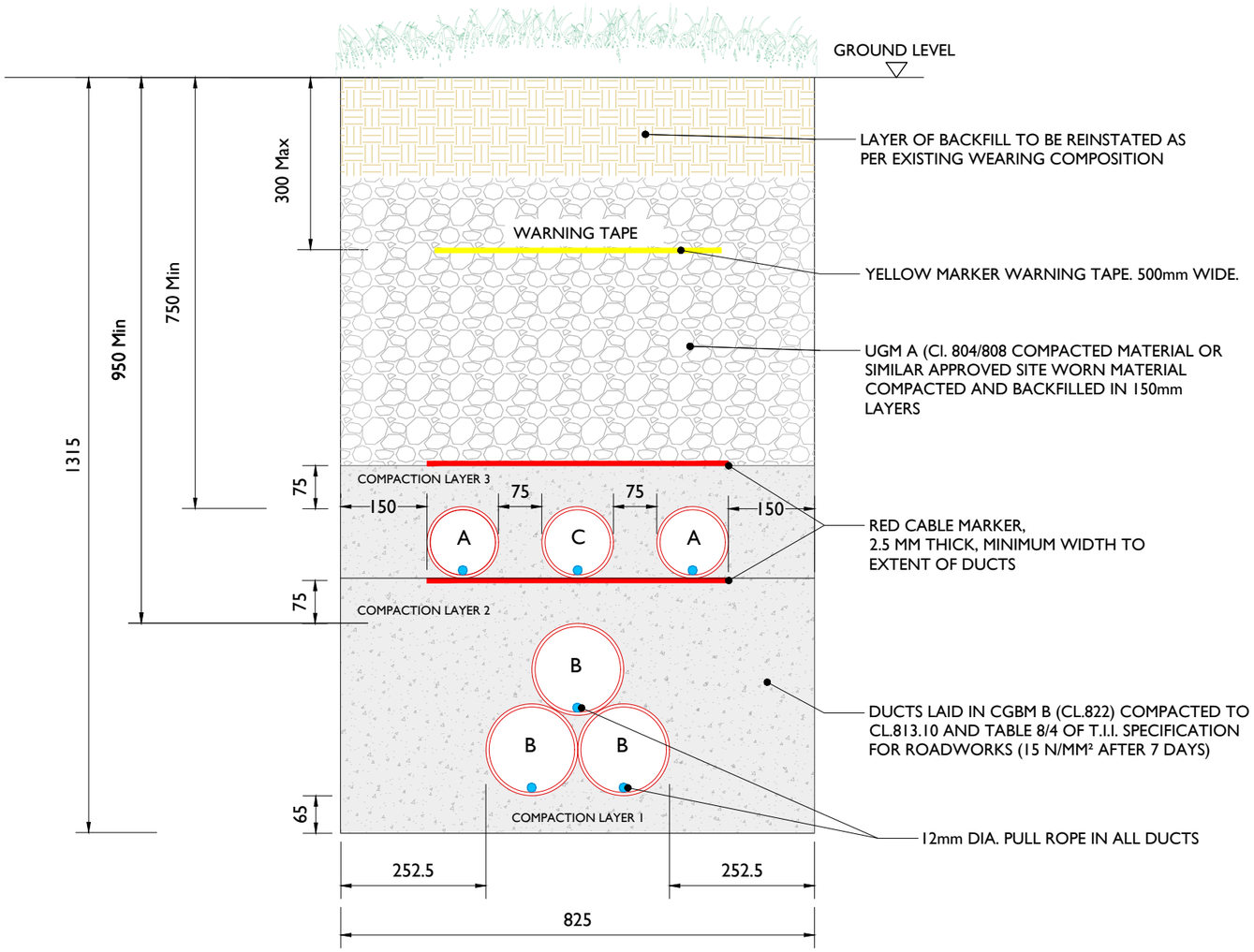
P01	21.04.26	Issued for Planning
P00	12.01.26	Issued for Planning



A = 125mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 17.6 (COMMS)
B = 160mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 21.0 (POWER)
C = 125mm: ECC (EARTH CONTINUNITY CONDUCTOR) DUCT,

110kV Ducting through Grassland

SCALE 1:10

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LOCAL LANDOWNER REQUIREMENTS

NOTES:

1. This design is subject to EirGrid & ESB approval and should be used for Planning purposes only.
2. The Customer shall submit all Planning Application designs and proposed cable routes in compliance with the specification requirements, for EirGrid to review and accept in advance of submitting to the local authority.
3. High Voltage cable installation across third party lands is to be avoided where possible.
4. High Voltage cable installation across peat lands is undesirable and only permitted in exceptional circumstances.
5. Service roads shall be installed along the cable route providing suitable and safe access for maintenance and cable pulling vehicles at all joint bay locations and along any section of the cable route that are not locate within the public road.
6. A deed of easement in respect of the cable route to ESB shall be provided. (min width 4 m for 110 kV circuits and 5 m for 220 kV and 400 kV circuits)
7. Direct burial of the cable is not permitted in any circumstance.
8. This drawing is to be read in conjunction with relevant drawings, specifications and reports
9. Dimensions are in millimeters, unless noted otherwise
10. Drawings are not to be scaled use figured dimensions only

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CLIENT
FuturEnergy Ireland

PROJECT
Lissinagroagh Wind Farm
110 kV Grid Connection

PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-122a

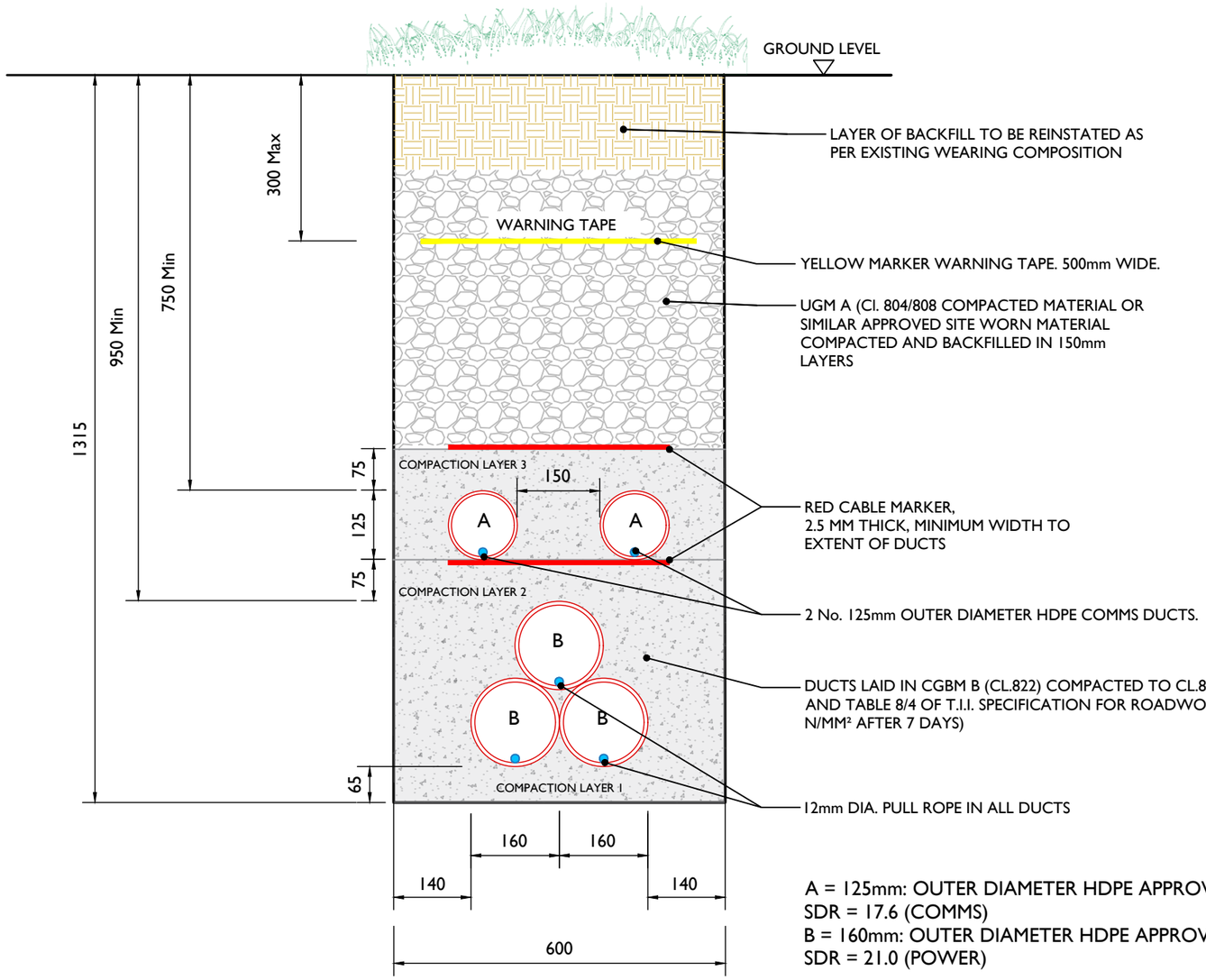
SHEET TITLE
Ducting Through Off Road / Grassland Section with ECC

DRAWING STATUS
For Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.26	Issued for Planning
P00	12.01.26	Issued for Planning

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LOCAL LANDOWNER REQUIREMENTS



A = 125mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 17.6 (COMMS)
B = 160mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 21.0 (POWER)

NOTES:

1. This design is subject to EirGrid & ESB approval and should be used for Planning purposes only.
2. The Customer shall submit all Planning Application designs and proposed cable routes in compliance with the specification requirements, for EirGrid to review and accept in advance of submitting to the local authority.
3. High Voltage cable installation across third party lands is to be avoided where possible.
4. High Voltage cable installation across peat lands is undesirable and only permitted in exceptional circumstances.
5. Service roads shall be installed along the cable route providing suitable and safe access for maintenance and cable pulling vehicles at all joint bay locations and along any section of the cable route that are not locate within the public road.
6. A deed of easement in respect of the cable route to ESB shall be provided. (min width 4 m for 110 kV circuits and 5 m for 220 kV and 400 kV circuits)
7. Direct burial of the cable is not permitted in any circumstance.
8. This drawing is to be read in conjunction with relevant drawings, specifications and reports
9. Dimensions are in millimeters, unless noted otherwise
10. Drawings are not to be scaled use figured dimensions only

110kV Ducting through Grassland, (with ECC duct)

SCALE 1:10

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PROJECT
Lissinagroagh Wind Farm
110 kV Grid Connection

PROJECT NUMBER
05-773

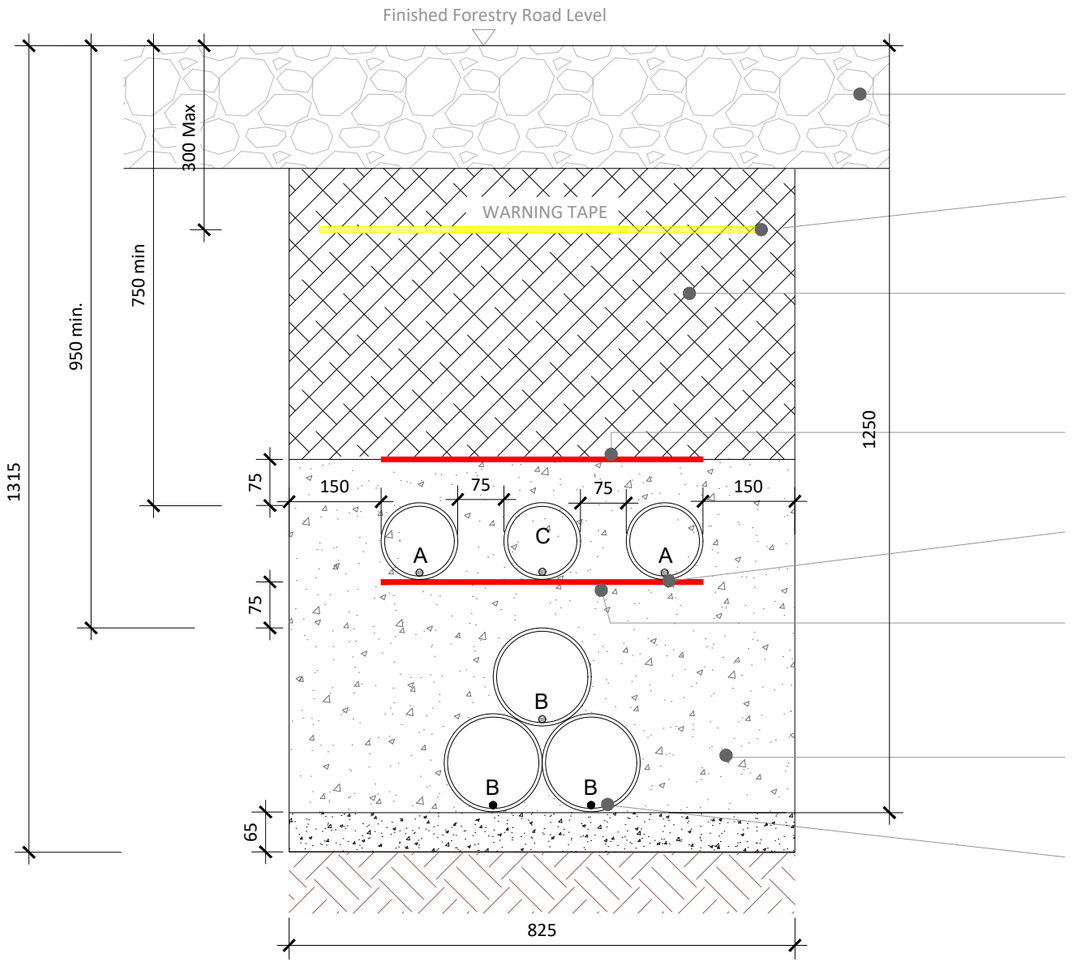
SHEET NUMBER
05773-DR-122b

SHEET TITLE
Ducting Through Off Road / Grassland Section

DRAWING STATUS
For Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.06	Issued for Planning
P00	12.01.26	Issued for Planning



A = 125mm: Outer Diameter HDPE ESB Approved Duct, SDR=17.6
B= 160mm : Outer Diameter HDPE ESB Approved Duct, SDR= 21
C = 125mm: ECC Earth Continuity Conductor

Section Through Forestry Road

SCALE 1:10

Note:
- This drawing is to be read in conjunction with relevant drawings, specifications and reports
- Dimensions are in millimeters, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LANDOWNERS REQUIREMENTS

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FuturEnergy Ireland

PROJECT
Lissinagroagh Wind Farm
110 kV Grid Connection

PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-123

SHEET TITLE
Ducting through Forestry Road

DRAWING STATUS
For Planning

ISSUE/REVISION

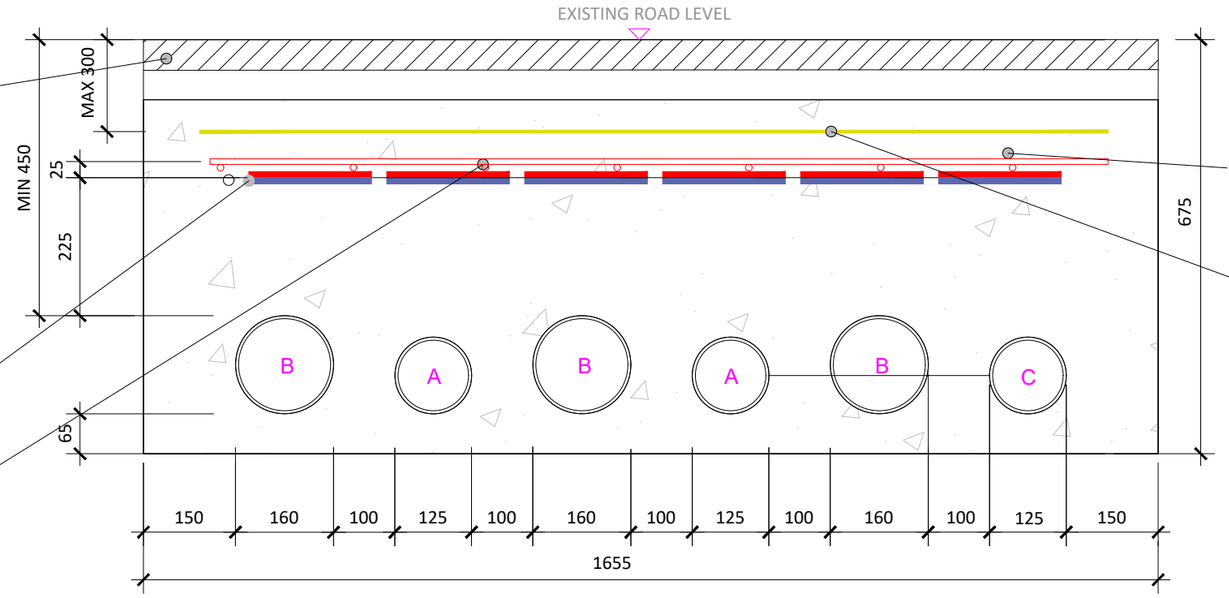
I/R	DATE	DESCRIPTION
P01	21.04.26	Issued for Planning
P00	12.01.26	Issued for Planning

Road reinstatement to be in accordance with *Guidelines for Managing Openings in Public Roads* (Purple Book - April 2017).

450mm is the minimum acceptable clearance dimension from the road surface to the top of the highest cable duct where the cable trench is in the carriageway

Heavy duty 6x200mm wide galvanized steel plates with red marker strips fixed to the top surface and to be installed until standard cover is achieved over hv ducts and communication ducts

A393 mesh to be installed until standard cover is achieved over hv ducts and communication ducts



C25/30 concrete to be in accordance with specification for road works 1000. 20mm max size of aggregate, with minimum duct spacing of 75mm. Min. cover to steel - 50mm.

4 X 400mm ESBN yellow warning tape across full width of trench

A = 125mm: Outer Diameter HDPE ESB Approved Duct, SDR=17.6

B= 160mm : Outer Diameter HDPE ESB Approved Duct, SDR=21

C = 125mm: ECC Earth Continuity Conductor

Section Through Ducting in Flat Formation

SCALE 1:10

Note:
- This drawing is to be read in conjunction with relevant drawings, specifications and reports
- Dimensions are in millimeters, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LOCAL AREA ENGINEERS LANDOWNERS REQUIREMENTS AND GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS

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PROJECT
Lissinagroagh Wind Farm
110 kV Grid Connection

PROJECT NUMBER
05-773

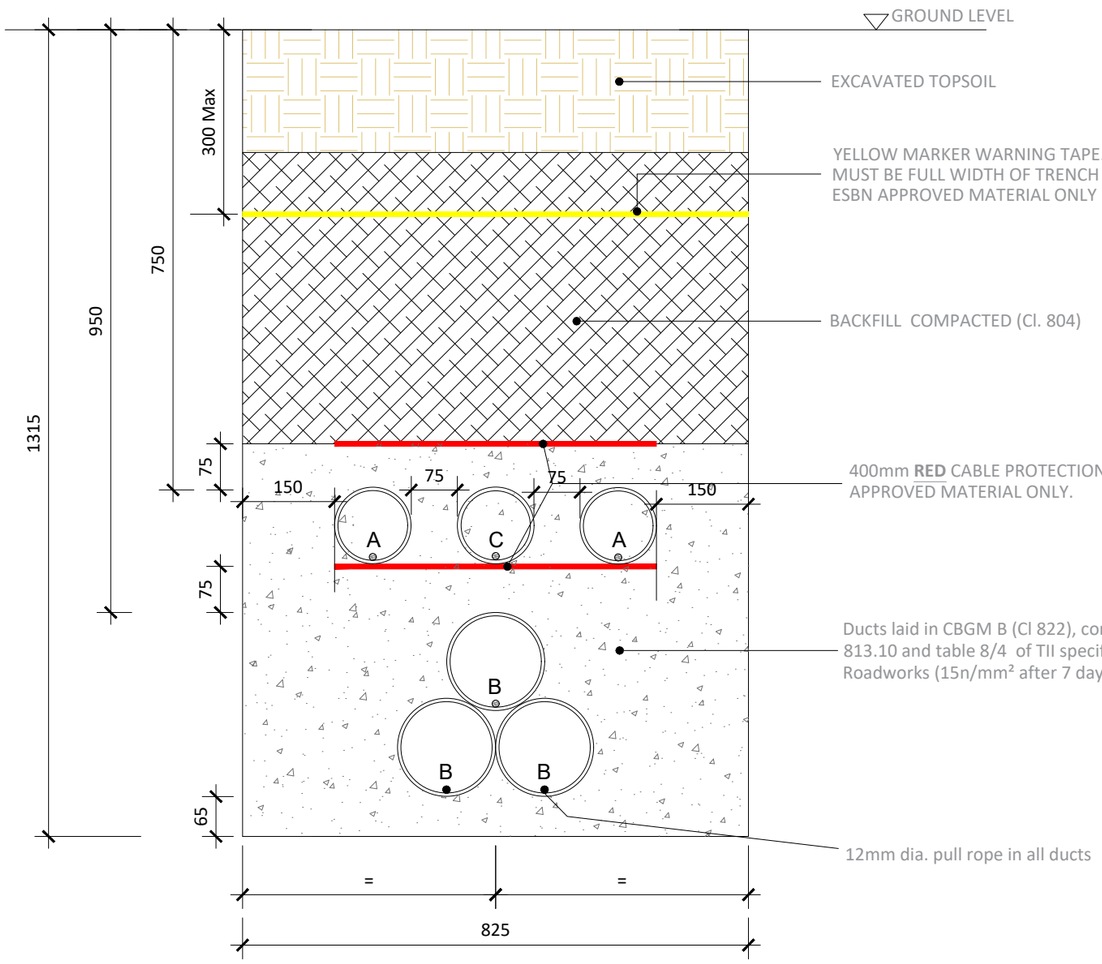
SHEET NUMBER
05773-DR-124

SHEET TITLE
Section Through Ducting in Flat Formation

DRAWING STATUS
For Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P02	21.04.26	Issued for Planning
P01	20.04.26	Issued for Planning
P00	12.01.26	Issued for Planning



A = 125mm: Outer Diameter HDPE ESB Approved Duct, SDR=17.6
B= 160mm : Outer Diameter HDPE ESB Approved Duct, SDR= 21
C = 125mm: ECC Earth Continuity Conductor

Section Through Off Road Sections

SCALE 1:10

Note:
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ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LANDOWNER REQUIREMENTS

Reinstatement details based on Guidelines for Managing Openings in Public Roads - SD14

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PROJECT
Lissinagroagh Wind Farm
110kV Grid Connection

PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-125

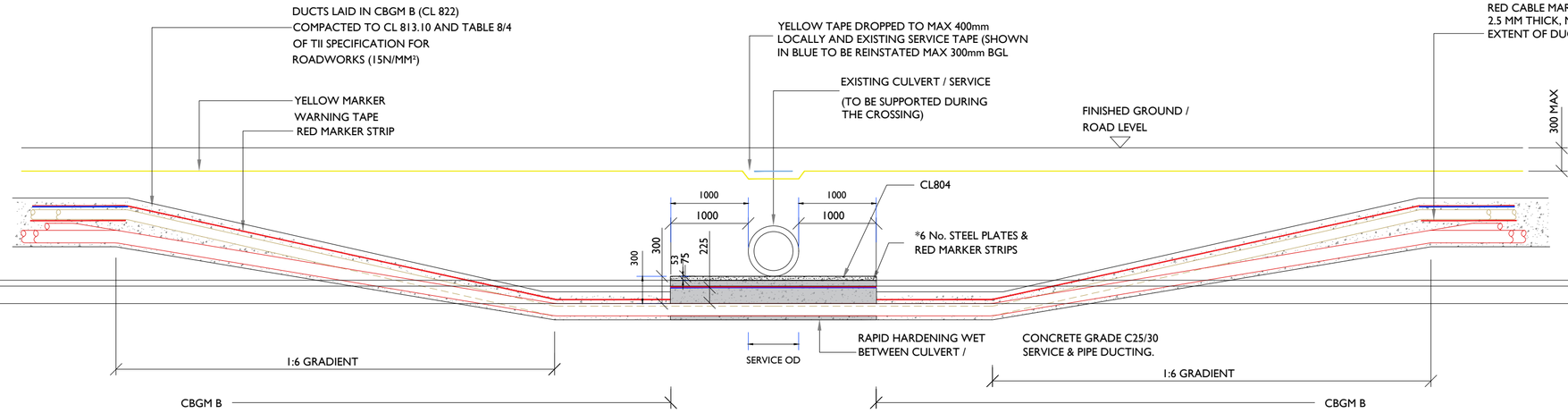
SHEET TITLE
Ducting through Off Road Sections

DRAWING STATUS
For Planning

ISSUE/REVISION

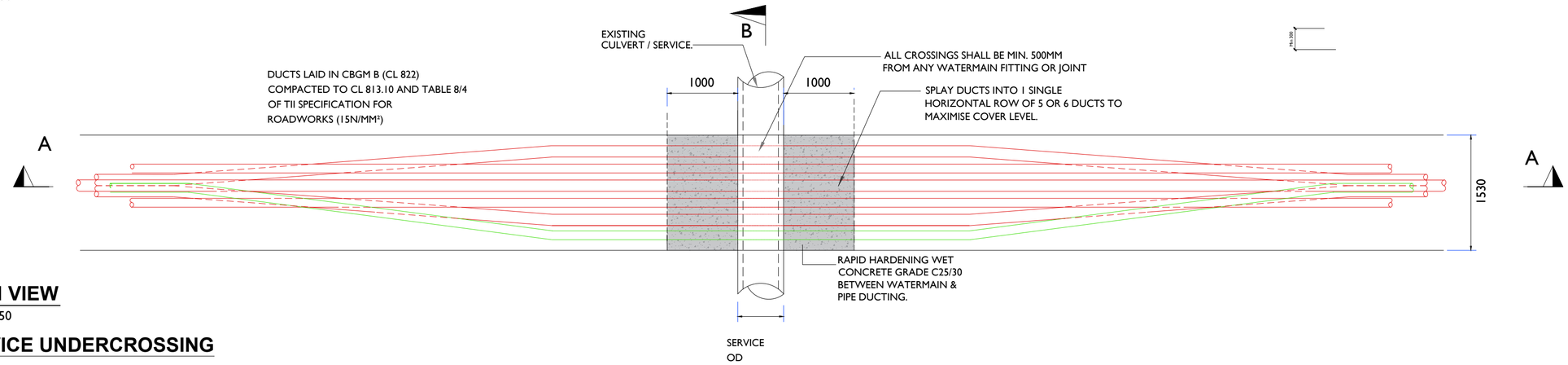
I/R	DATE	DESCRIPTION
P02	21.04.26	Issued for Planning
P01	20.04.26	Issued for Planning
P00	12.01.26	Issued for Planning

ISO A2 420mm x 594mm



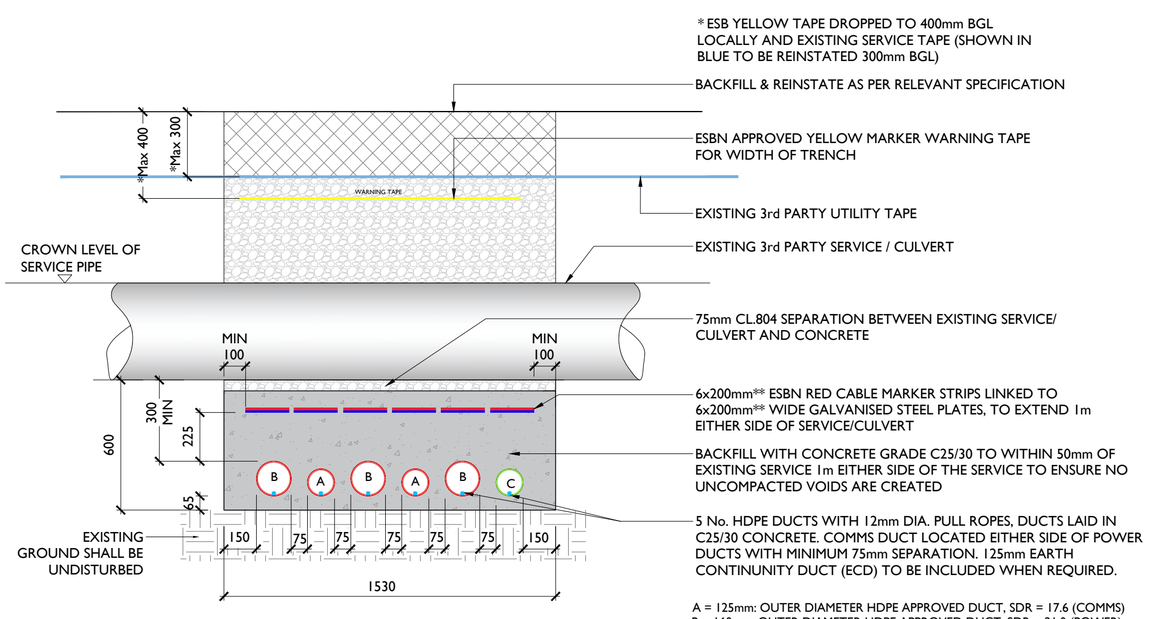
SECTION A-A
SCALE 1:50

* 5X200mm STEEL PLATE & RED MARKER WHERE ECC ISN'T REQUIRED
** MIN 1330mm WHERE ECC ISN'T REQUIRED
*** SEE GENERAL NOTES, NO. 19



PLAN VIEW
SCALE 1:50

SERVICE UNDERCROSSING



A = 125mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 17.6 (COMMS)
B = 160mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 21.0 (POWER)
C = 125mm: ECC (EARTH CONTINUNITY CONDUCTOR) DUCT,

** 5 x 200mm STEEL PLATES & RED MARKER WHERE ECC IS NOT REQUIRED
*** MIN 1330 WHERE ECC IS NOT REQUIRED
**** ALL EXISTING SERVICES WITH COVERS LESS THAN MIN. DIMENSIONS ABOVE SHALL BE CROSSED BY UNDERCROSSING METHOD

SECTION B-B
SCALE: 1:20

GENERAL NOTES

1. This drawing is subject to Design approval and is not to be used for construction.
2. This drawing is to be read in conjunction with all other relevant documentation.
3. Do not scale from this drawing use only printed dimensions
4. All dimensions are in millimetres, all chainages, levels and co-ordinates are in metres unless defined otherwise.
5. No excavation shall commence until the Contractor has consulted up to date services drawings and carried out an Electromagnetic Locator (EML) Scan.
6. Hand dig only within 500mm of existing services.
7. If compacting CBGM B could cause damage to the culvert / service below, use rapid hardening cement grade C25/30 following engineers prior approval.
8. For standard trench cross section drawings and minimum horizontal separation to existing services, see 05773-DR-119a (TREFOIL) and 05773-DR-124 (FLAT).
9. Where depths exceed 2500mm to the top of duct the Contractor shall consult the cable system design engineer for phase spacing requirements.
10. Backfill as per guidelines for the opening, backfilling and reinstatement of openings in public roads (2015).
11. **ESB's preference is to cross under existing services where possible.**
12. Backfill as per guidelines for the opening, backfilling and reinstatement of openings in public roads (2015)
13. The Contractor is responsible for the design and construction of all temporary works. The Contractor shall appoint a temporary works designer, and submit temporary works design to PSDP for review.
14. 225mm minimum concrete over ducts where they transition from standard cross section and where they are at less than standard cover to ground level.
15. Replace existing service marker tape over Yellow marker tape.
16. The owner of the existing utility being crossed must be consulted in advance of works commencing as per their guidelines.
17. The Contractor shall record detailed as-built information as per the specification. At all crossing locations these records shall include photographic evidence clearly demonstrating that minimum service clearances and duct separations have been achieved.

Project Management Initials: Designer: AD Checked: DB Approved: RG

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Tel: 00353 66 7135710

PROJECT

Lissinagroagh Wind Farm
110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN CONSULTING ENGINEERS

NOTES: -

LEGEND: -

- 160mm Ø HDPE POWER DUCT WITH 12mm DIAMTER PULL ROPE
- 125mm Ø HDPE COMMUNICATION DUCT WITH 12mm DIAMTER PULL ROPE
- 125mm Ø HDPE EARTH CONTINUITY CONDUCTOR WITH12mm DIAMTER PULL ROPE
- RED MARKER STRIP OR STEEL PLATES
- YELLOW MARKER WARNING TAPE
- 6mm GALVANISED STEEL PLATE
- EXISTING SERVICE TAPE

ISSUE/REVISION

P02	21.04.26	Issued for Planning
P01	20.04.26	Issued for Planning
P00	12.01.26	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

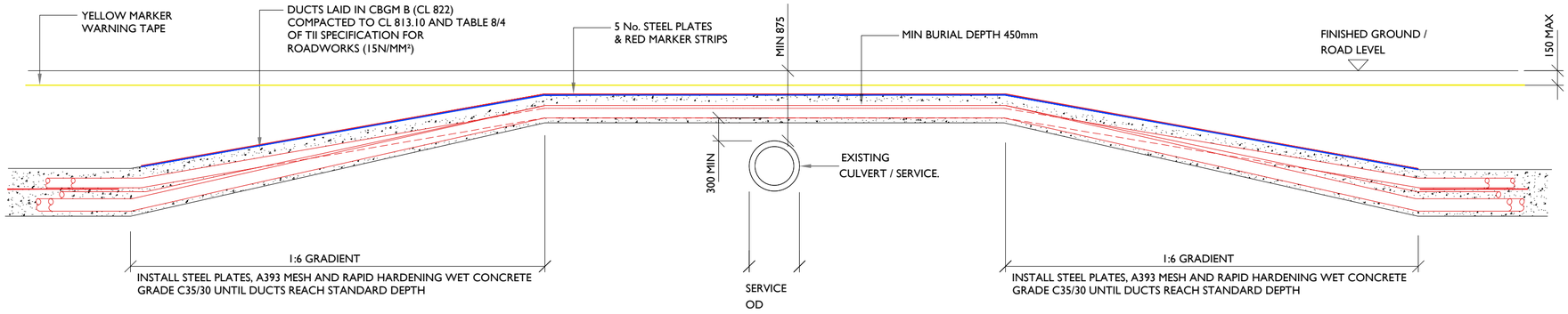
SHEET TITLE

Crossing through Existing Culverts/Services Undercrossing

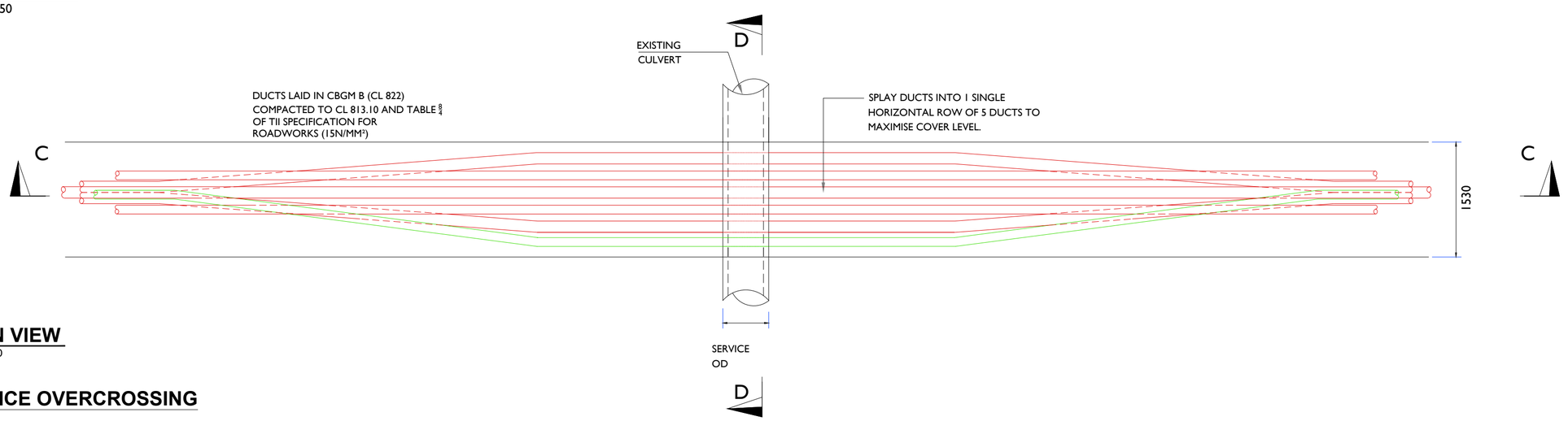
SHEET NUMBER

05773-DR-126

ISO A2 420mm x 594mm

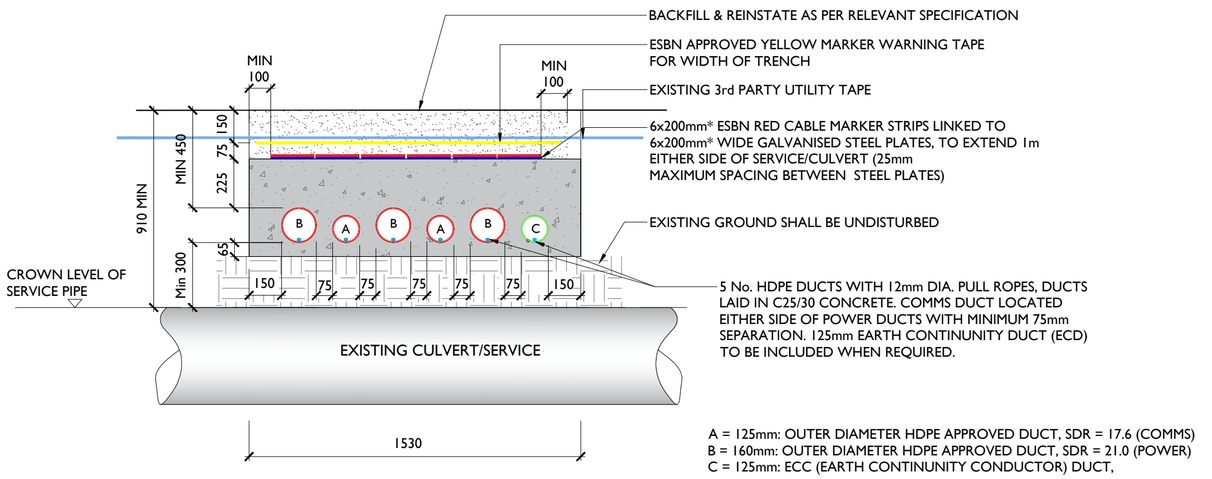


SECTION C-C
SCALE 1:50



PLAN VIEW
SCALE 1:50

SERVICE OVERCROSSING



A = 125mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 17.6 (COMMS)
B = 160mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 21.0 (POWER)
C = 125mm: ECC (EARTH CONTINUNITY CONDUCTOR) DUCT,

* 5 x 200mm STEEL PLATES & RED MARKER WHERE ECC IS NOT REQUIRED
** MIN 1330 WHERE ECC IS NOT REQUIRED
* ALL EXISTING SERVICES WITH COVERS LESS THAN MIN. DIMENSIONS ABOVE SHALL BE CROSSED BY UNDERCROSSING METHOD

SECTION D-D
SCALE: 1:20

GENERAL NOTES

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2. This drawing is to be read in conjunction with all other relevant documentation.
3. Do not scale from this drawing use only printed dimensions
4. All dimensions are in millimetres, all chainages, levels and co-ordinates are in metres unless defined otherwise.
5. No excavation shall commence until the Contractor has consulted up to date services drawings and carried out an Electromagnetic Locator (EML) Scan.
6. Hand dig only within 500mm of existing services.
7. If compacting CBGM B could cause damage to the culvert / service below, use rapid hardening cement grade C25/30 following engineers prior approval.
8. For standard trench cross section drawings and minimum horizontal separation to existing services, see 05773-DR-119a (TREFOIL) and 05773-DR-124 (FLAT).
9. Where depths exceed 2500mm to the top of duct the Contractor shall consult the cable system design engineer for phase spacing requirements.
10. Backfill as per guidelines for the opening, backfilling and reinstatement of openings in public roads (2015).
11. **ESB's preference is to cross under existing services where possible.**
12. Backfill as per guidelines for the opening, backfilling and reinstatement of openings in public roads (2015)
13. The Contractor is responsible for the design and construction of all temporary works. The Contractor shall appoint a temporary works designer, and submit temporary works design to PSDP for review.
14. 225mm minimum concrete over ducts where they transition from standard cross section and where they are at less than standard cover to ground level.
15. Replace existing service marker tape over Yellow marker tape.
16. The owner of the existing utility being crossed must be consulted in advance of works commencing as per their guidelines.
17. The Contractor shall record detailed as-built information as per the specification. At all crossing locations these records shall include photographic evidence clearly demonstrating that minimum service clearances and duct separations have been achieved.

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PROJECT

Lissinagroagh Wind Farm
110kV Grid Connection

CLIENT

FuturEnergy Ireland

CONSULTANTS

TOBIN CONSULTING ENGINEERS

NOTES: -

LEGEND: -

- 160mm Ø HDPE POWER DUCT WITH 12mm DIAMTER PULL ROPE
- 125mm Ø HDPE COMMUNICATION DUCT WITH 12mm DIAMTER PULL ROPE
- 125mm Ø HDPE EARTH CONTINUITY CONDUCTOR WITH12mm DIAMTER PULL ROPE
- RED MARKER STRIP OR STEEL PLATES
- YELLOW MARKER WARNING TAPE
- 6mm GALVANISED STEEL PLATE
- EXISTING SERVICE TAPE

ISSUE/REVISION

P02	21.04.26	Issued for Planning
P01	20.04.26	Issued for Planning
P00	12.01.26	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

SHEET TITLE

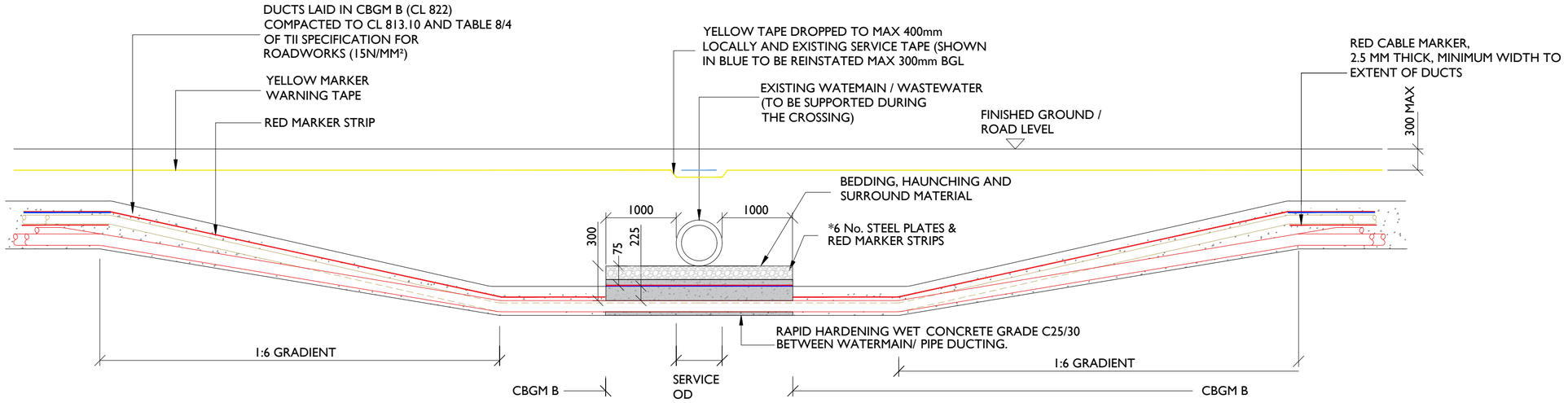
Trench Sections For Overcrossing Existing Culvert/Service

SHEET NUMBER

05773-DR-127

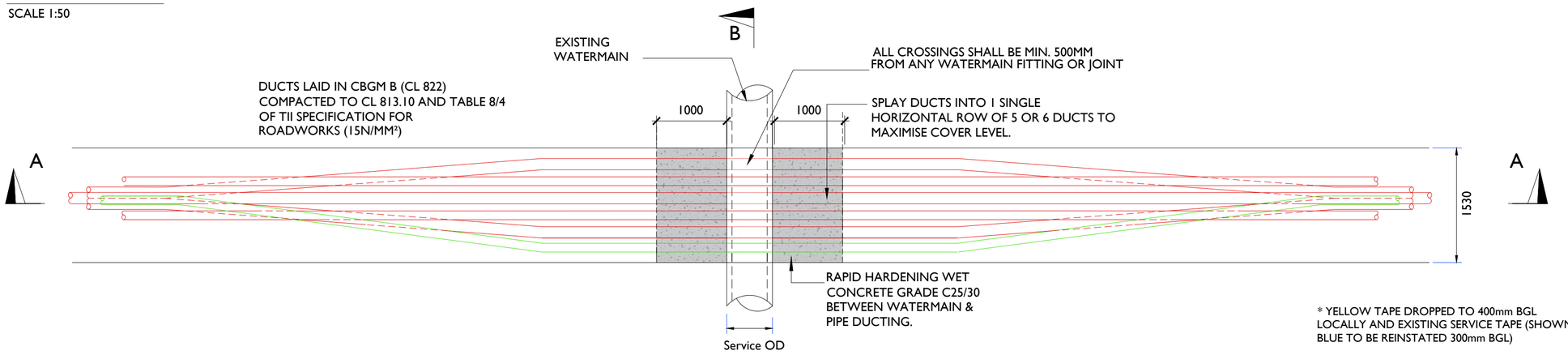
Project Management Initials: Designer: AD Checked: DB Approved: RG

ISO A2 420mm x 594mm



SECTION A-A

SCALE 1:50



PLAN VIEW

SCALE 1:50

GENERAL NOTES

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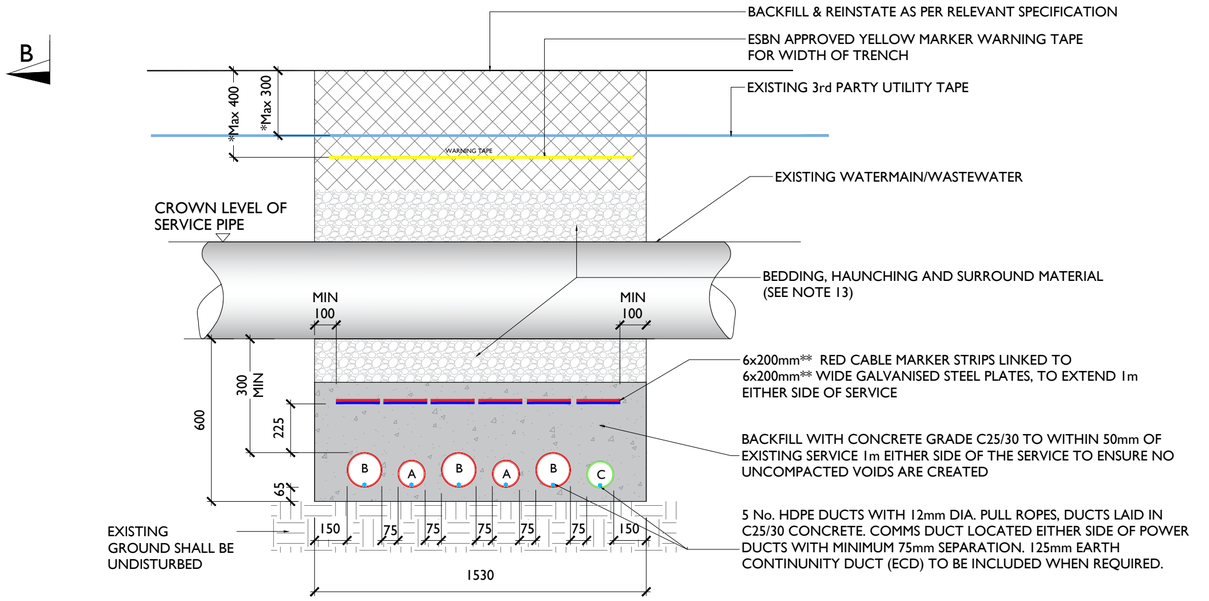
2. This drawing is to be read in conjunction with all other relevant documentation.
3. Do not scale from this drawing use only printed dimensions
4. All dimensions are in millimetres, all chainages, levels and co-ordinates are in metres unless defined otherwise.
5. No excavation shall commence until the Contractor has consulted up to date services drawings and carried out an Electromagnetic Locator (EML) Scan.
6. Hand dig only within 500mm of existing services.
7. If compacting CBGM B could cause damage to the culvert / service below, use rapid hardening cement grade C25/30 following engineers prior approval.
8. For standard trench cross section drawings and minimum horizontal separation to existing services, see 05773-DR-119a (TREFOIL) and 05773-DR-124 (FLAT).
9. Where depths exceed 2500mm to the top of duct the Contractor shall consult the cable system design engineer for phase spacing requirements.
10. Backfill as per guidelines for the opening, backfilling and reinstatement of openings in public roads (2015).
11. **ESB's preference is to cross under existing services where possible.**
12. Backfill as per guidelines for the opening, backfilling and reinstatement of openings in public roads (2015)
13. As per WIS 4-08-02 & IGN 4-08-01 granular material shall be 14mm to 5mm graded aggregate or 10mm single sized aggregate
14. If any Watermains are damaged during construction they will be replaced in full. camera scoping will be completed before and after the works.
15. The Contractor is responsible for the design and construction of all temporary works. The Contractor shall appoint a temporary works designer, and submit temporary works design to PSDP for review.
16. 225mm minimum concrete over ducts where they transition from standard cross section and where they are at less than standard cover to ground level.
17. Replace existing service marker tape over ESB yellow marker tape.
18. The owner of the existing utility being crossed must be consulted in advance of works commencing as per their guidelines.
19. The Contractor shall record detailed as-built information as per the specification. At all crossing locations these records shall include photographic evidence clearly demonstrating that minimum service clearances and duct separations have been achieved.



SECTION B-B

SCALE: 1:20

** 5 x 200mm STEEL PLATES & RED MARKER WHERE ECC IS NOT REQUIRED
*** MIN 1330 WHERE ECC IS NOT REQUIRED
**** ALL EXISTING SERVICES WITH COVERS LESS THAN MIN. DIMENSIONS ABOVE SHALL BE CROSSED BY UNDERCROSSING METHOD

A = 125mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 17.6 (COMMS)
B = 160mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 21.0 (POWER)
C = 125mm: ECC (EARTH CONTINUNITY CONDUCTOR) DUCT,

Project Management Initials: Designer: JC Checked: DB Approved: RG

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PROJECT

Lissinagroagh Wind Farm
110 kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN CONSULTING ENGINEERS

NOTES: -

LEGEND: -

- 160mm Ø HDPE POWER DUCT WITH 12mm DIAMTER PULL ROPE
- 125mm Ø HDPE COMMUNICATION DUCT WITH 12mm DIAMTER PULL ROPE
- 125mm Ø HDPE EARTH CONTINUITY CONDUCTOR WITH12mm DIAMTER PULL ROPE
- RED MARKER STRIP OR
- STEEL PLATES
- YELLOW MARKER WARNING TAPE
- 6mm GALVANISED STEEL PLATE
- EXISTING SERVICE TAPE

ISSUE/REVISION

P02	21.04.26	Issued for Planning
P01	20.04.26	Issued for Planning
P00	12.01.26	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

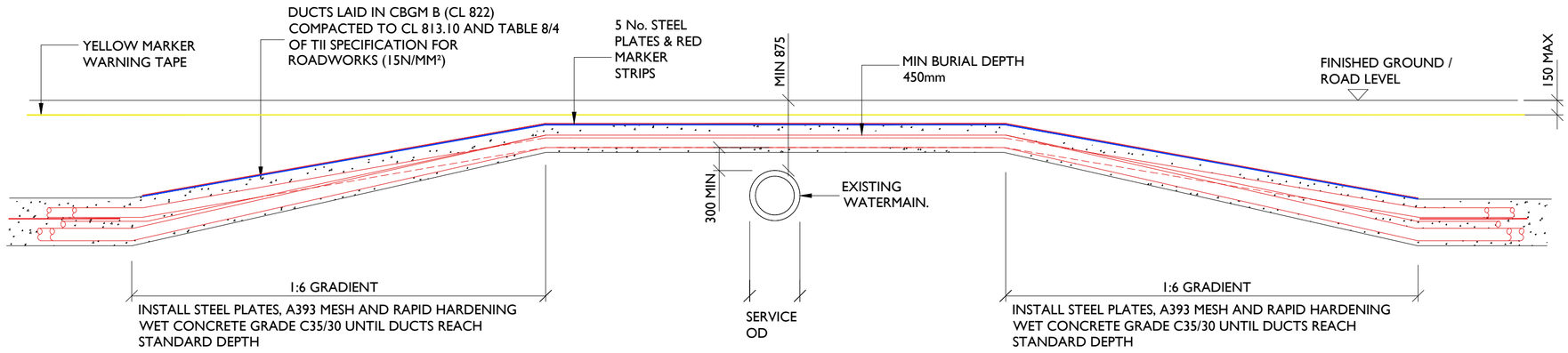
SHEET TITLE

Trench Sections For Undercrossing Existing Watermain/Wastewater

SHEET NUMBER

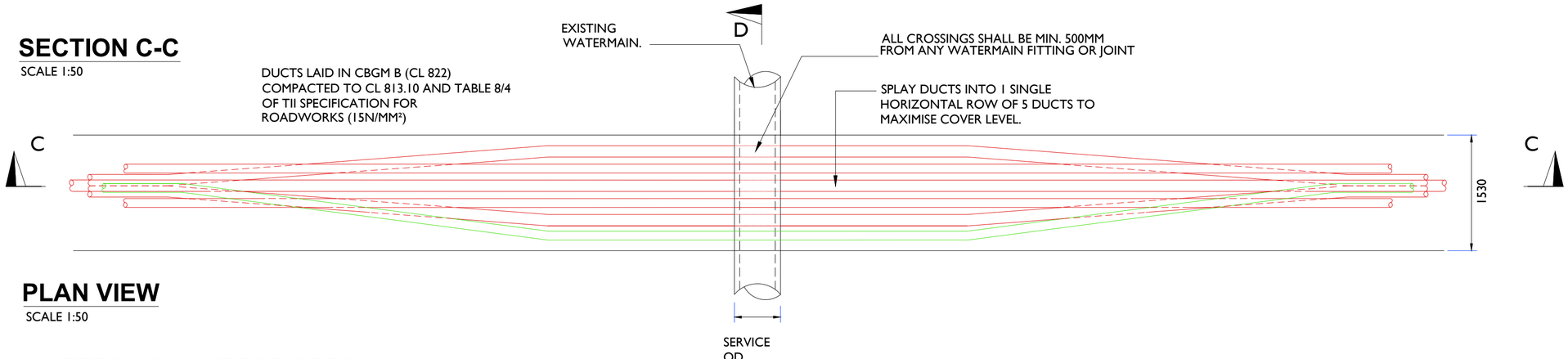
05773-DR-128

ISO A2 420mm x 594mm



SECTION C-C

SCALE 1:50



PLAN VIEW

SCALE 1:50

WATERMAIN OVERCROSSING

GENERAL NOTES

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2. This drawing is to be read in conjunction with all other relevant documentation.
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4. All dimensions are in millimetres, all chainages, levels and co-ordinates are in metres unless defined otherwise.
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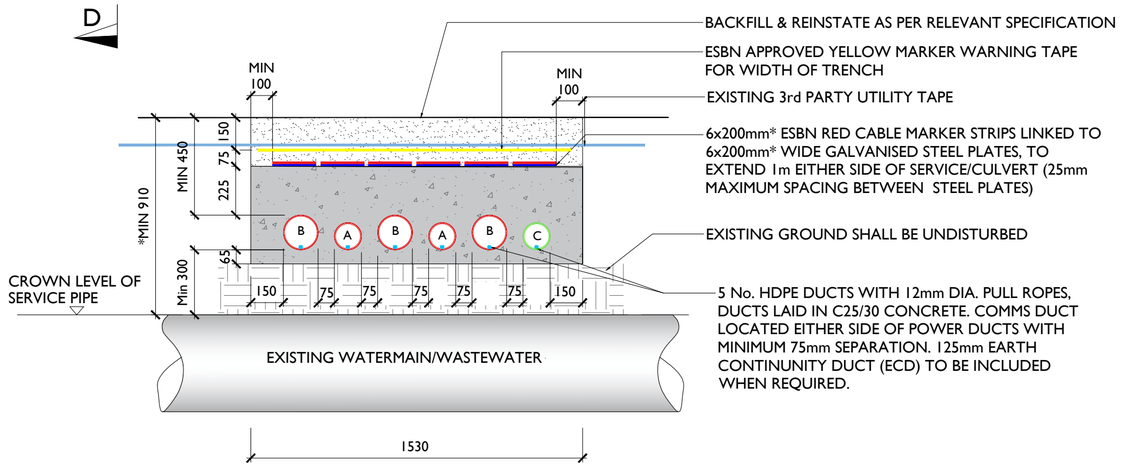
6. Hand dig only within 500mm of existing services.
7. If compacting CBGM B could cause damage to the culvert / service below, use rapid hardening cement grade C25/30 following engineers prior approval.
8. For standard trench cross section drawings and minimum horizontal separation to existing services, see 05773-DR-119a (TREFOIL) and 05773-DR-124 (FLAT).
9. Where depths exceed 2500mm to the top of duct the Contractor shall consult the cable system design engineer for phase spacing requirements.
10. Backfill as per guidelines for the opening, backfilling and reinstatement of openings in public roads (2015).
11. **ESB's preference is to cross under existing services where possible.**
12. Backfill as per guidelines for the opening, backfilling and reinstatement of openings in public roads (2015)
13. As per WIS 4-08-02 & IGN 4-08-01 granular material shall be 14mm to 5mm graded aggregate or 10mm single sized aggregate
14. If any Watermains are damaged during construction they will be replaced in full. camera scoping will be completed before and after the works.
15. The Contractor is responsible for the design and construction of all temporary works. The Contractor shall appoint a temporary works designer, and submit temporary works design to PSDP for review.
16. 225mm minimum concrete over ducts where they transition from standard cross section and where they are at less than standard cover to ground level.
17. Replace existing service marker tape over ESB yellow marker tape.
18. The owner of the existing utility being crossed must be consulted in advance of works commencing as per their guidelines.
19. The Contractor shall record detailed as-built information as per the specification. At all crossing locations these records shall include photographic evidence clearly demonstrating that minimum service clearances and duct separations have been achieved.



* 5 x 200mm STEEL PLATES & RED MARKER WHERE ECC IS NOT REQUIRED
** MIN 1330 WHERE ECC IS NOT REQUIRED
* ALL EXISTING SERVICES WITH COVERS LESS THAN MIN. DIMENSIONS ABOVE SHALL BE CROSSED BY UNDERCROSSING METHOD

A = 125mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 17.6 (COMMS)
B = 160mm: OUTER DIAMETER HDPE APPROVED DUCT, SDR = 21.0 (POWER)
C = 125mm: ECC (EARTH CONTINUITY CONDUCTOR) DUCT,

SECTION D-D

SCALE: 1:20

Project Management Initials: Designer: AD Checked: DB Approved: RG

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PROJECT

Lissinagroagh Wind Farm
110kVGrid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

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NOTES: -

LEGEND: -

- 160mm Ø HDPE POWER DUCT WITH 12mm DIAMTER PULL ROPE
- 125mm Ø HDPE COMMUNICATION DUCT WITH 12mm DIAMTER PULL ROPE
- 125mm Ø HDPE EARTH CONTINUITY CONDUCTOR WITH12mm DIAMTER PULL ROPE
- RED MARKER STRIP OR
- STEEL PLATES YELLOW MARKER WARNING TAPE
- 6mm GALVANISED STEEL PLATE
- EXISTING SERVICE TAPE

ISSUE/REVISION

P02	21.04.26	Issued for Planning
P01	20.04.26	Issued for Planning
P00	12.01.26	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

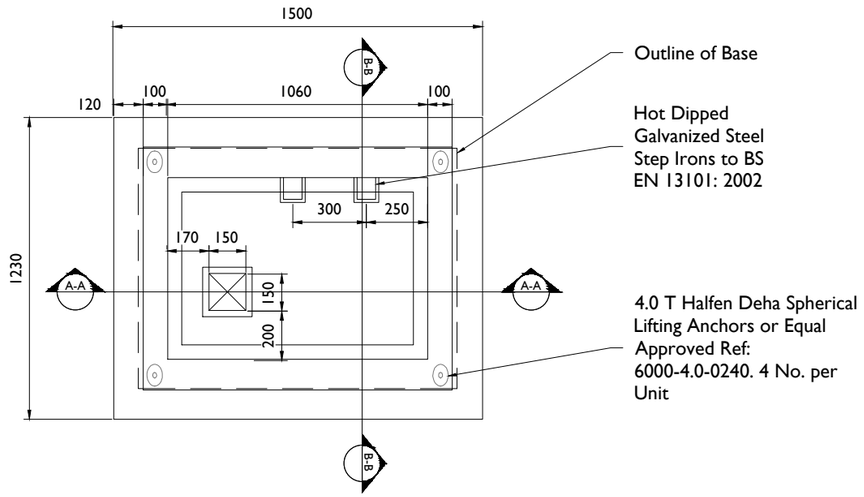
05-773

SHEET TITLE

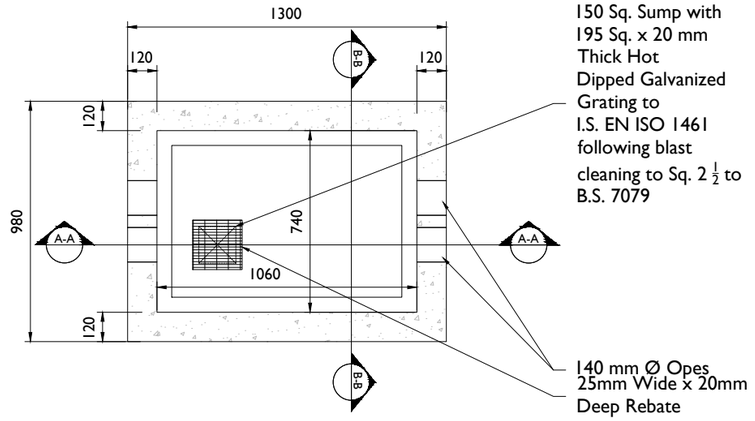
Trench Sections For Overcrossing Existing Watermain/Wastewater

SHEET NUMBER

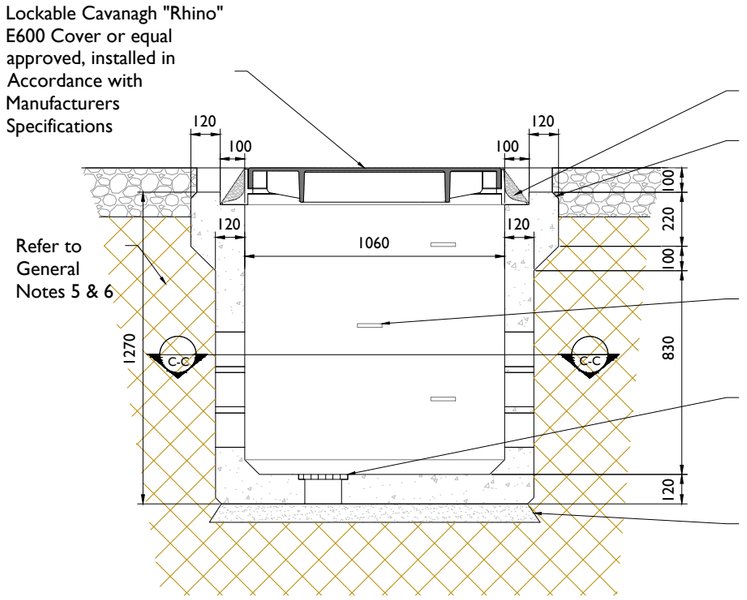
05773-DR-129



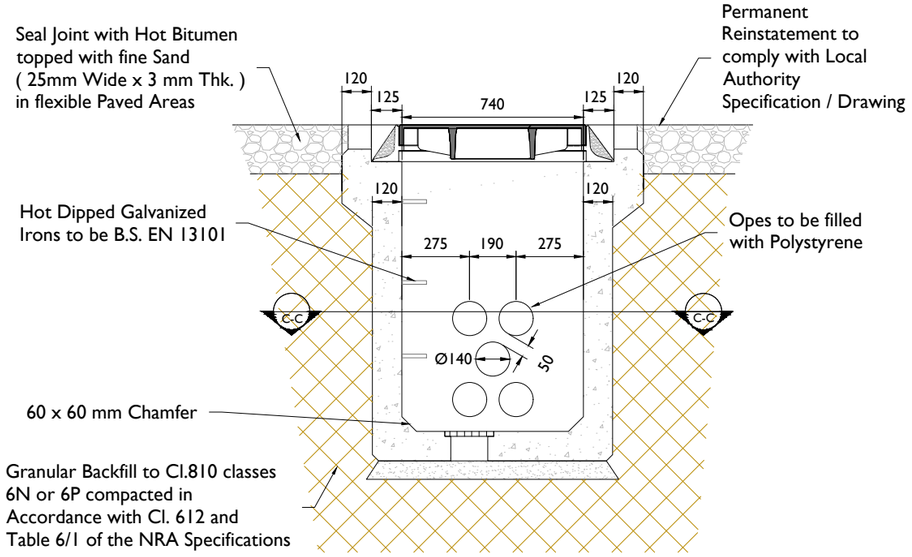
C2 Chamber - Typical Plan
Scale 1:25



C2 Chamber - Plan Section C-C
Scale 1:25



C2 Chamber - Section A-A
Scale 1:25



C2 Chamber - Section B-B
Scale 1:25

General Notes:

1. This drawing is to be read in conjunction with ESB drawing PE424-D7002-009-002-001 and all relevant drawings, specifications and reports.
2. Dimensions are in millimeters, unless noted otherwise.
3. Drawings are not to be scaled use figured dimensions only.
4. The contractor shall check all dimensions prior to construction, any discrepancies to be reported to the civil site supervisor immediately.
5. Temporary supports to the sides of the excavation may be required dependant on subsoil, method of work and site constraints, and are to be agreed with the ESB Engineer prior to commencement of excavation. side slopes of an unsupported excavation dependant upon subsoil and shall be agreed with ESB Engineer.
6. Main contractor to provide a method statement and risk assessment for the excavation works for the ESB Engineer to review.
7. The construction, as shown, is applicable only where the subsoil at formation level exceeds 100kN/m² Bearing capacity.
8. Suitability of the cover and chamber to be assessed by the project engineer in circumstances of high traffic loading in accordance with the recommendations of NRA Design manual for roads and bridges addendum to HA 104/09.
9. Cover and frame to B.S. EN 124.
10. Cover shall have approved badged marking incorporated to the approval of the ESB Engineer.
11. All materials and workmanship to be in accordance with the NRA Specification for roadworks.
12. Reinstatement to comply with requirements of the relevant local authority/asset owner.
13. Reinforced concrete to be a minimum grade C32/40, sulphate resisting cement to be used where aggressive soil conditions apply, Refer to table 6.1 of B.S. 8110.
14. Final Position of C2 Chambers shall be agreed with ESB.

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PROJECT
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110kV Grid Connection

SHEET TITLE
C2 Chamber Details

PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-142

DRAWING STATUS
For Planning

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P01	21.04.26	Issued for Planning
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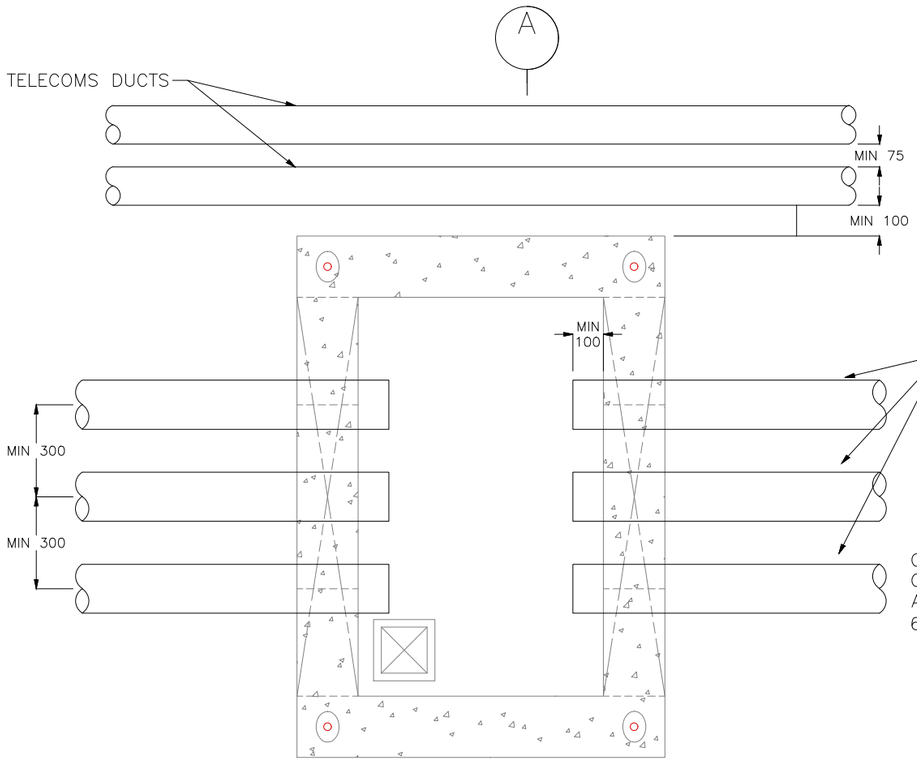
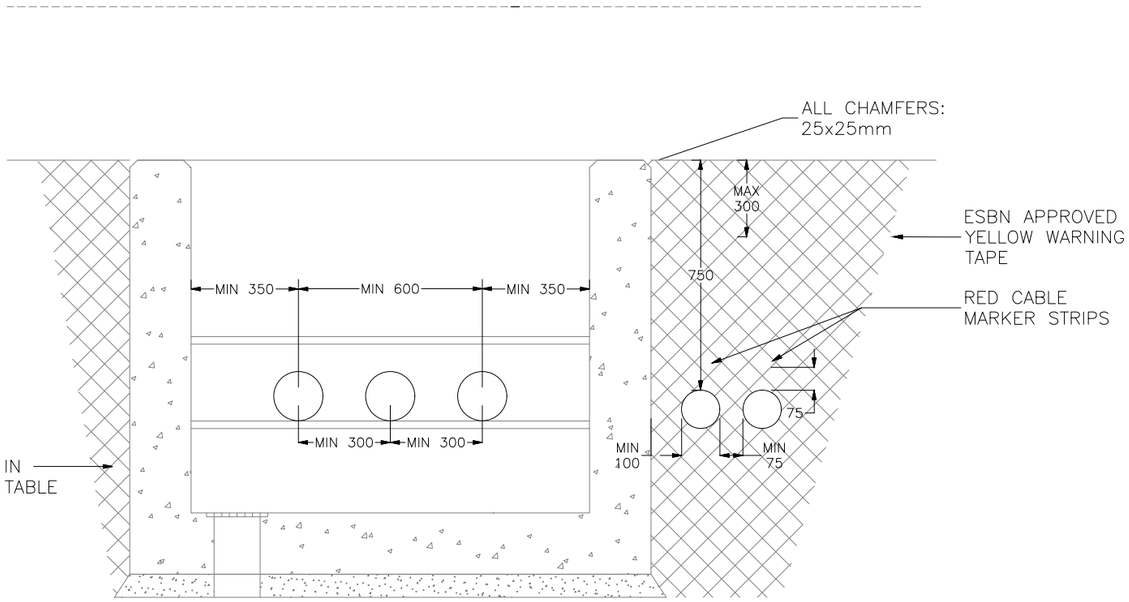
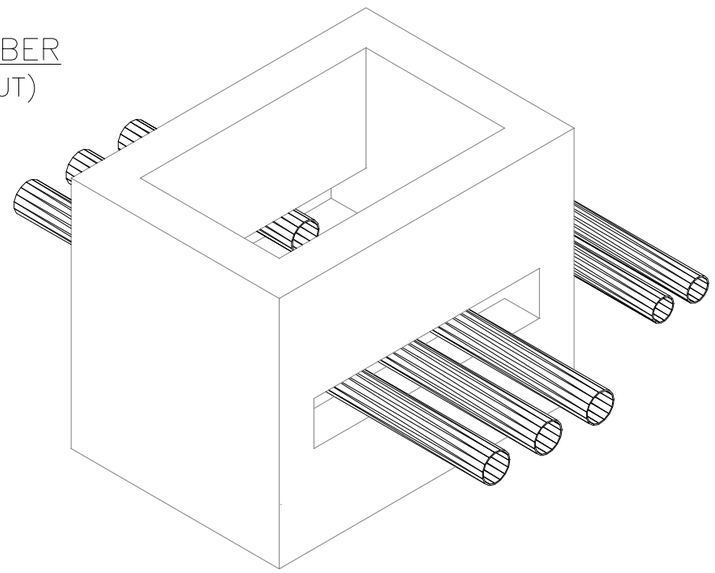


PLAN – TRANSITION CHAMBER
SCALE 1:20 (DUCT SETTING OUT)



SECTION A
SCALE 1:20



NOTES:

1. This drawing is to be read in conjunction with relevant drawings, specifications and reports.
2. Dimensions are in millimetres, unless noted otherwise.
3. Drawings are not to be scaled use figured dimensions only.
4. Telecomunication ducts not to be routed through Transition chamber
5. If Transition chamber is used to interface with a HDD section, Then the telecoms duct SDR 17.6 should be chamfered when coupled with SDR 11 ducts

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110kV Grid Connection

PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-143

SHEET TITLE
Transition Chamber Details

DRAWING STATUS
For Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.26	Issued for Planning
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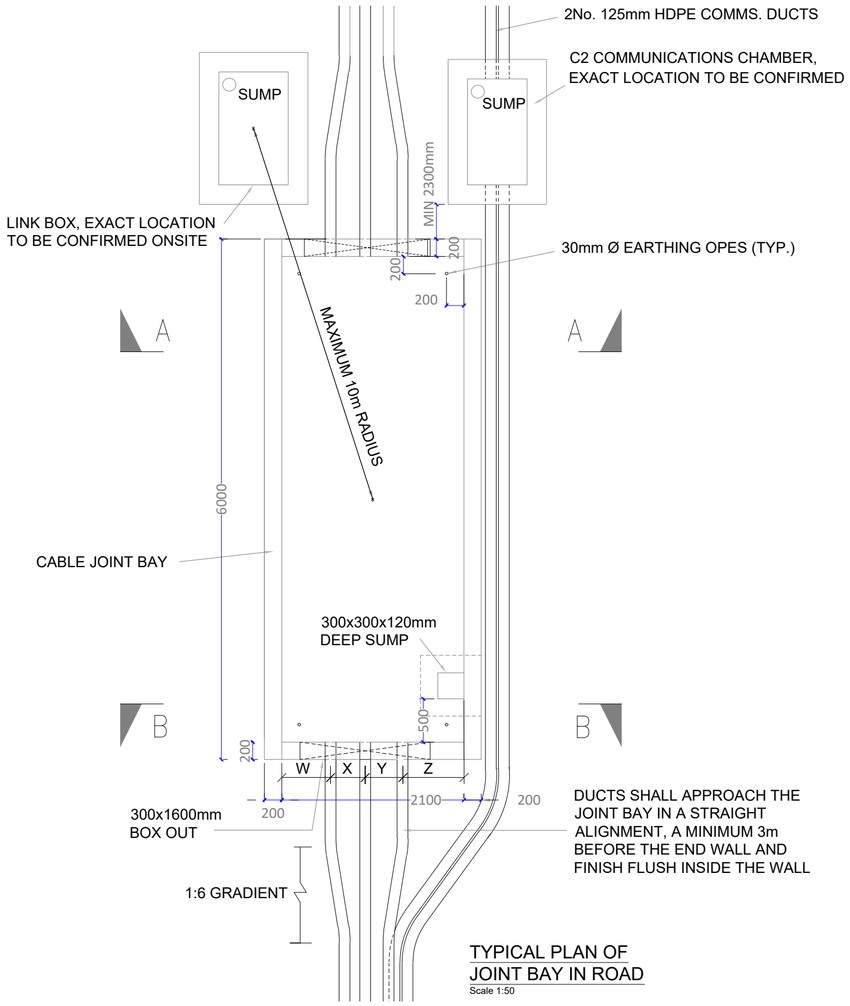
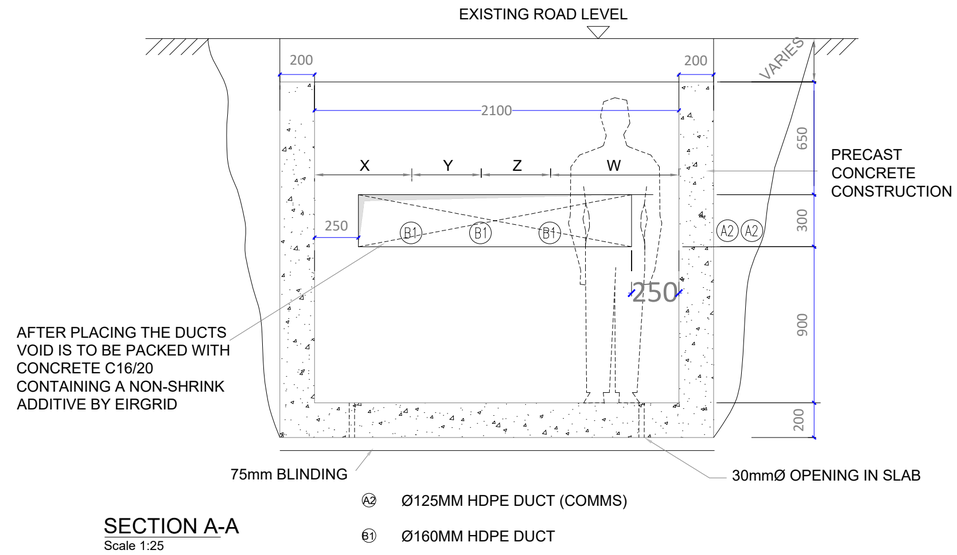
ISO A2 420mm x 594mm



TYPICAL PLAN OF JOINT BAY IN ROAD
Scale 1:50

GENERAL NOTES:

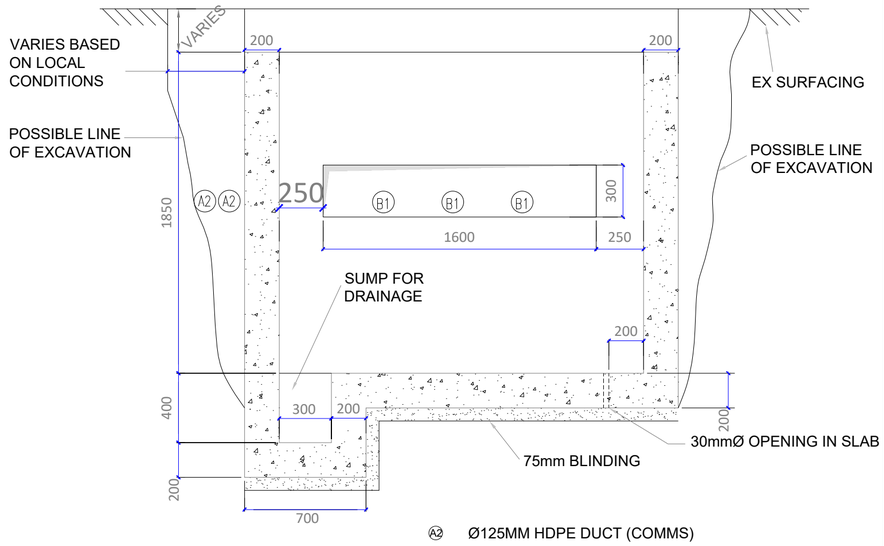
1. THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE AND IS SUBJECT TO AMENDMENT.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT INFORMATION
3. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS DEFINED OTHERWISE.
5. STANDARD FOUNDATIONS ARE BASED ON THE FORMATION AT THE BASE OF THE EXCAVATION SHOWN BEING SUITABLE FOR A MINIMUM BEARING PRESSURE OF 100kN/m2. SUITABILITY OF STANDARD JOINT BAY FOUNDATIONS CAN ONLY BE CONFIRMED FOLLOWING GROUND INVESTIGATION. HAND VANE TESTS SHALL BE REQUIRED AS PER GI SPECIFICATION. WHERE SPECIFIED MINIMUM BEARING PRESSURE IS NOT ACHIEVABLE, AND WHERE PEAT IS ENCOUNTERED, THE CONTRACTOR SHALL REFER TO THE ENGINEER FOR GUIDANCE.
6. THE LENGTH OF BONDING LEAD LENGTH SHALL IN NO CASE EXCEED 10M. NO JOINTS IN BONDING CABLE ARE PERMITTED.
7. ALL EARTHING SHALL BE IN ACCORDANCE WITH ENA ER C55 AND EIRGRID/ESBN FUNCTIONAL SPECIFICATION
8. THE DEPTH FROM GROUND/ROAD LEVELTO THE TOP OF THE CONCRETE WALL SHALL BE
   A. 500MM - IN CULTIVATED FIELDS & GRASS LAND
   B. 300MM - IN PAVED ROADS AND GRASS VERGES
   C. 350MM - IN PAVED CITY ROADS AND GRASS VERGES
9. LINK BOX CHAMBERS TO BE POSITIONED AT THE EDGE OR OFF ROAD
10. LINK BOX CHAMBERS AND C2 COMM CHAMBERS FINAL POSITIONING TO BE AGREED WITH EIRGRID PRIOR TO INSTALLATION



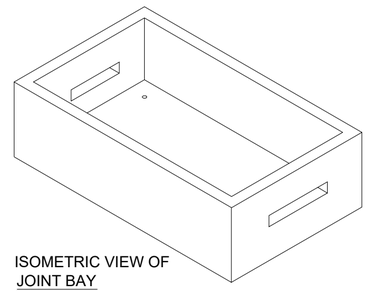
SECTION A-A
Scale 1:25

TABLE 1 - DUCT SEPERATION

	X	Y	Z	W
110kV	560	400	400	760
220kV	375	675	675	375



SECTION B-B
Scale 1:25



ISOMETRIC VIEW OF JOINT BAY
N.T.S.

Project Management Initials: Designer: AD Checked: DB Approved: RG

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PROJECT

Lissinagroagh Wind Farm 110kV Grid Connection

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NOTES: -

LEGEND: -

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.26	Issued for Planning
P00	12.01.26	Issued for Planning

PROJECT NUMBER

05-773

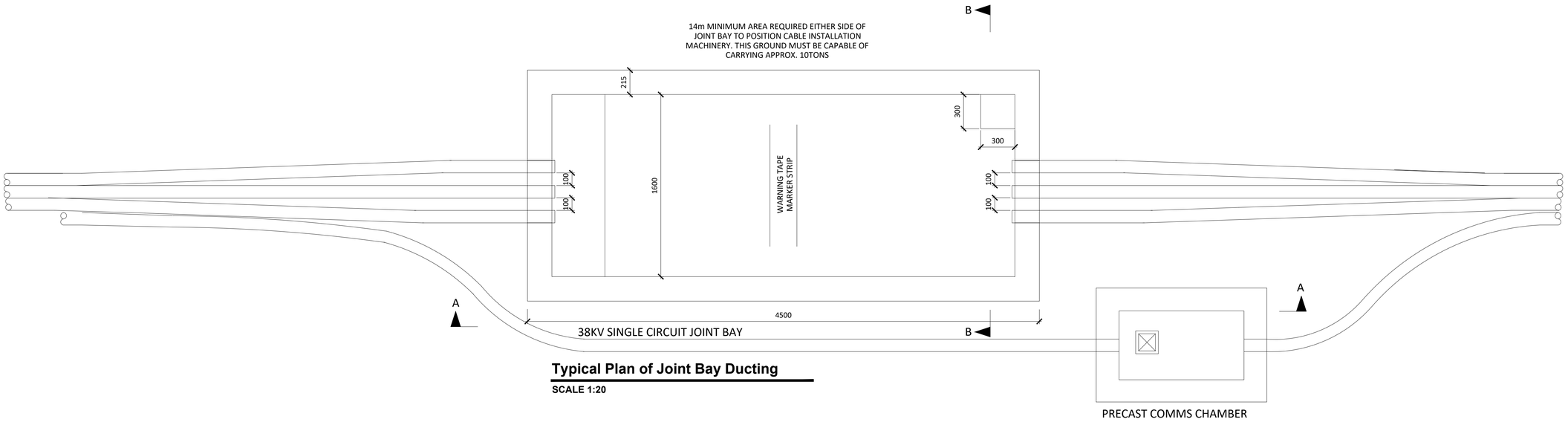
SHEET TITLE

110kV Joint Bay Section Detail

SHEET NUMBER

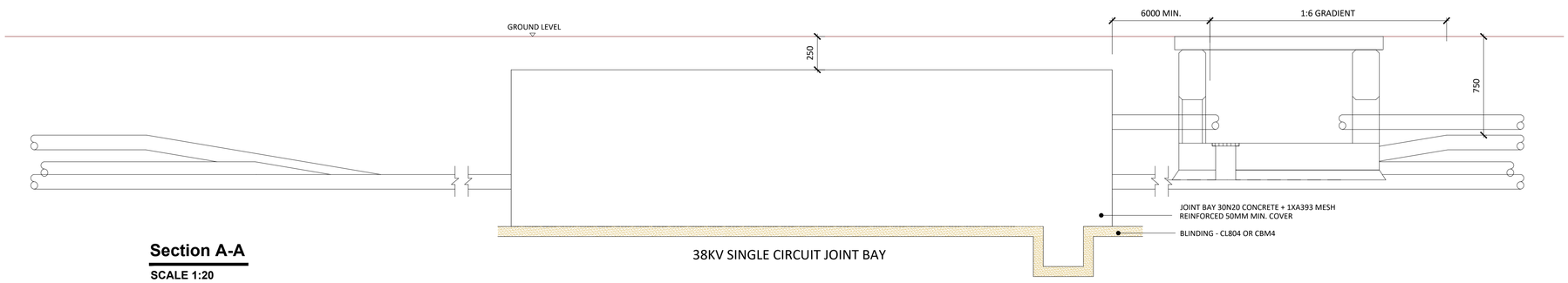
05773-DR-144

ISO A1 594mm x 841mm



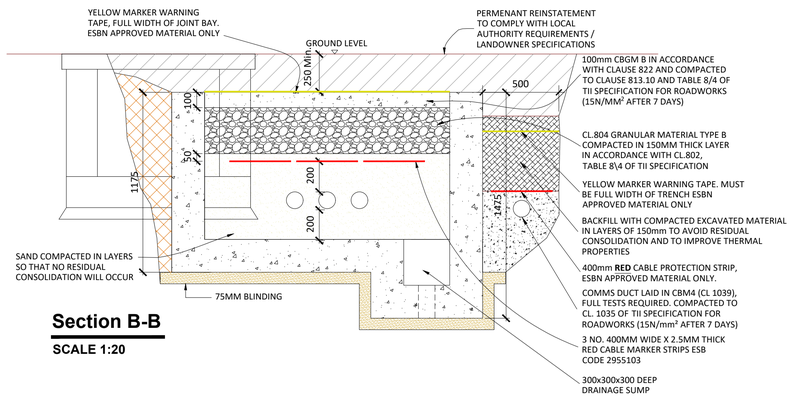
Typical Plan of Joint Bay Ducting

SCALE 1:20



Section A-A

SCALE 1:20



Section B-B

SCALE 1:20

NOTES:
- This drawing is subject to ESB approval and should be used for planning purposes only.
- This drawing is to be read in conjunction with relevant drawings, specifications and reports
- Dimensions are in millimeters, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only
- Suitability of standard joint bay foundations can only be confirmed following ground investigation. Standard foundations are based on the formation at the base of the excavation shown being suitable for a minimum bearing pressure of 100N/m2. Where this is not achievable and where peat is encountered , the contractor shall refer to the Engineer for guidance.

Project Management Initials: Designer: AD Checked: DB Approved: RG

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PROJECT

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NOTES: -
- See notes in drawing window

LEGEND: -

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I/R	DATE	DESCRIPTION
P01	21.04.26	Issued for Planning
P00	12.01.26	Issued for Planning

PROJECT NUMBER

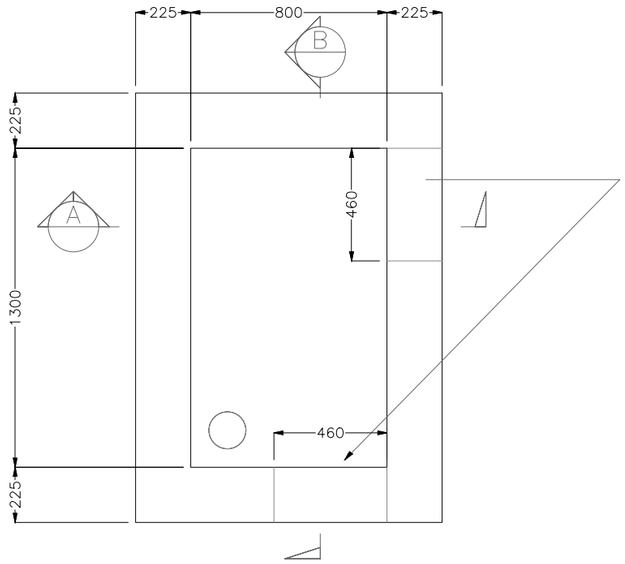
05-773

SHEET TITLE

110kV Joint Bay General Arrangement

SHEET NUMBER

05773-DR-145



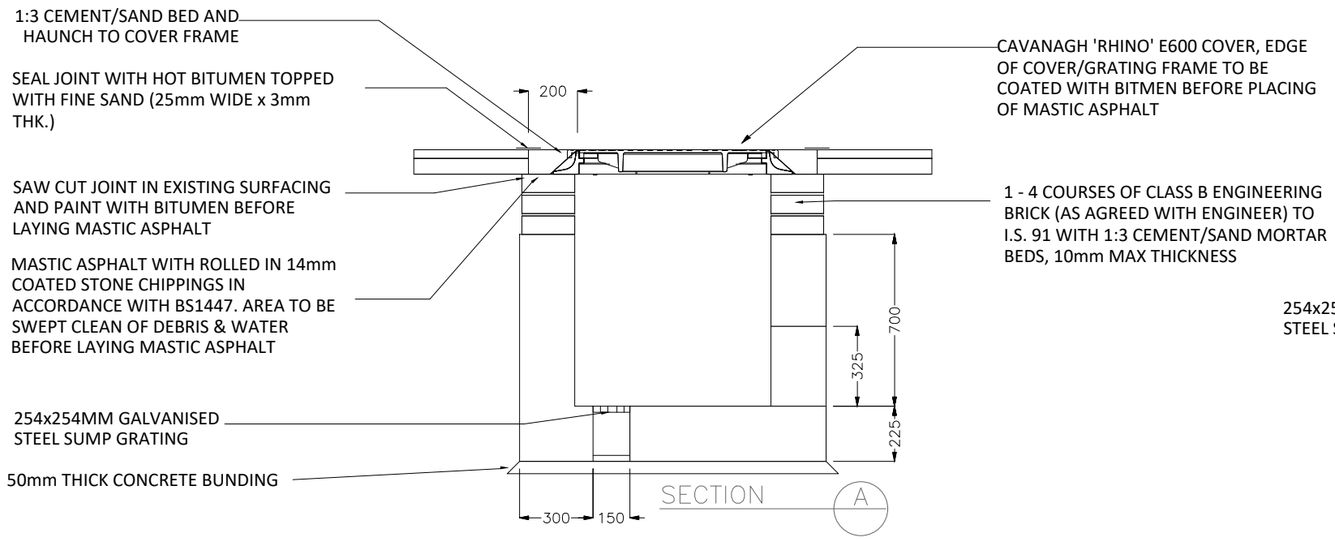
WALL OPENING 460x325 MAX. ACTUAL SIZE TO BE FORMED TO SUIT DUCT ENTRIES. VOIDS TO BE SEALED AND SURFACES MADE GOOD WITH CLASS 1 MORTAR.

Link Box Chamber Detail - Plan

SCALE 1:20

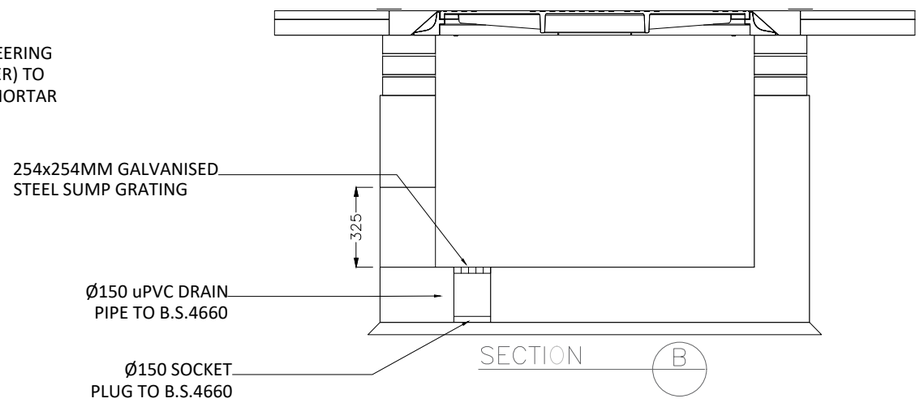
NOTES:

1. This drawing is to be read in conjunction with relevant drawings, specifications and reports.
2. Dimensions are in millimeters, unless noted otherwise.
3. Drawings are not to be scaled use figured dimensions only.
4. All material and workmanship to be in accordance with the NRA./TII specification for Roadworks, May 2005 and subsequent revisions
5. Reinforced concrete to be a minimum grade C32/40, Sulphate resisting cement to be used where aggressive soil conditions apply.
6. Carriageway covers and frames to be to B.S. 124.
7. All covers to have ESB logo incorporated in them to the approval of Eirgrid
8. Brickwork to be class B Engineering, beds and Joints to be class 1 mortar
9. Final position of Link Box to be agreed with Eirgrid prior to installation



Link Box Chamber Detail - Section A-A

SCALE 1:20



Link Box Chamber Detail - Section B-B

SCALE 1:20

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PROJECT

Lissinagroagh Wind Farm
110kV Grid Connection

PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-146

SHEET TITLE
Link Box Chamber Details

DRAWING STATUS
For Planning

ISSUE/REVISION

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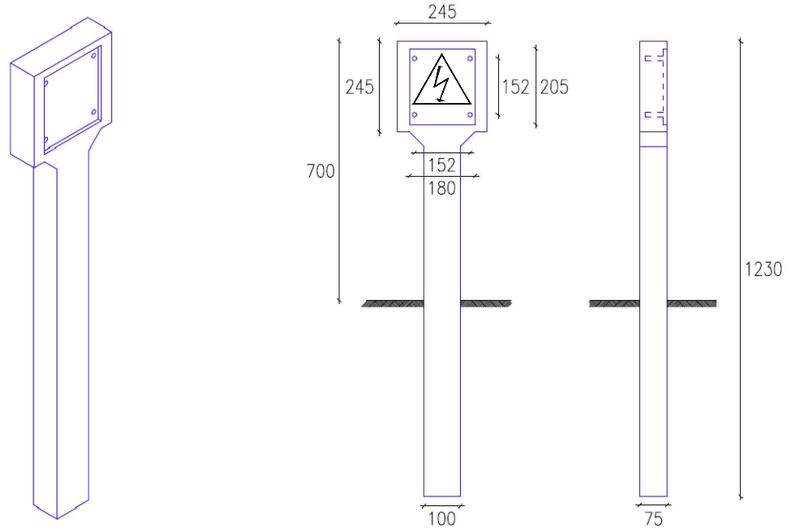
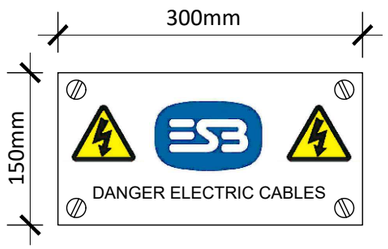
Note:
Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions.
Corrosion proof aluminium triangular danger sign, with 700mm base, and with centred lightning symbol, on engineering grade fluorescent yellow background shall be installed in adequately sized concrete foundations. Marker posts shall also be placed in the event that burial depth is not to standard.



Typical ESB Marker Post Detail

Not to Scale



Note:
Metallic plate; 300mm x150mm; 4 screw-holes. Surface Marker Plates to be placed on footpaths/fences, bridges, walkways etc., where cable depth is unavoidably shallow.



Typical Surface Marker Plate

Typical ESB Marker Plate Detail

Not to Scale

Note:

- This drawing is to be read in conjunction with relevant drawings, specifications and reports.
- Dimensions are in millimeters, unless noted otherwise.
- Drawings are not to be scaled use figured dimensions only.

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PROJECT
Lissinagroagh Wind Farm
110kV Grid Connection

PROJECT NUMBER
05-775

SHEET NUMBER
05775-DR-148

SHEET TITLE
Typical 110kV UGC -
ESB Marker Posts / Plates

DRAWING STATUS
For Planning

ISSUE/REVISION

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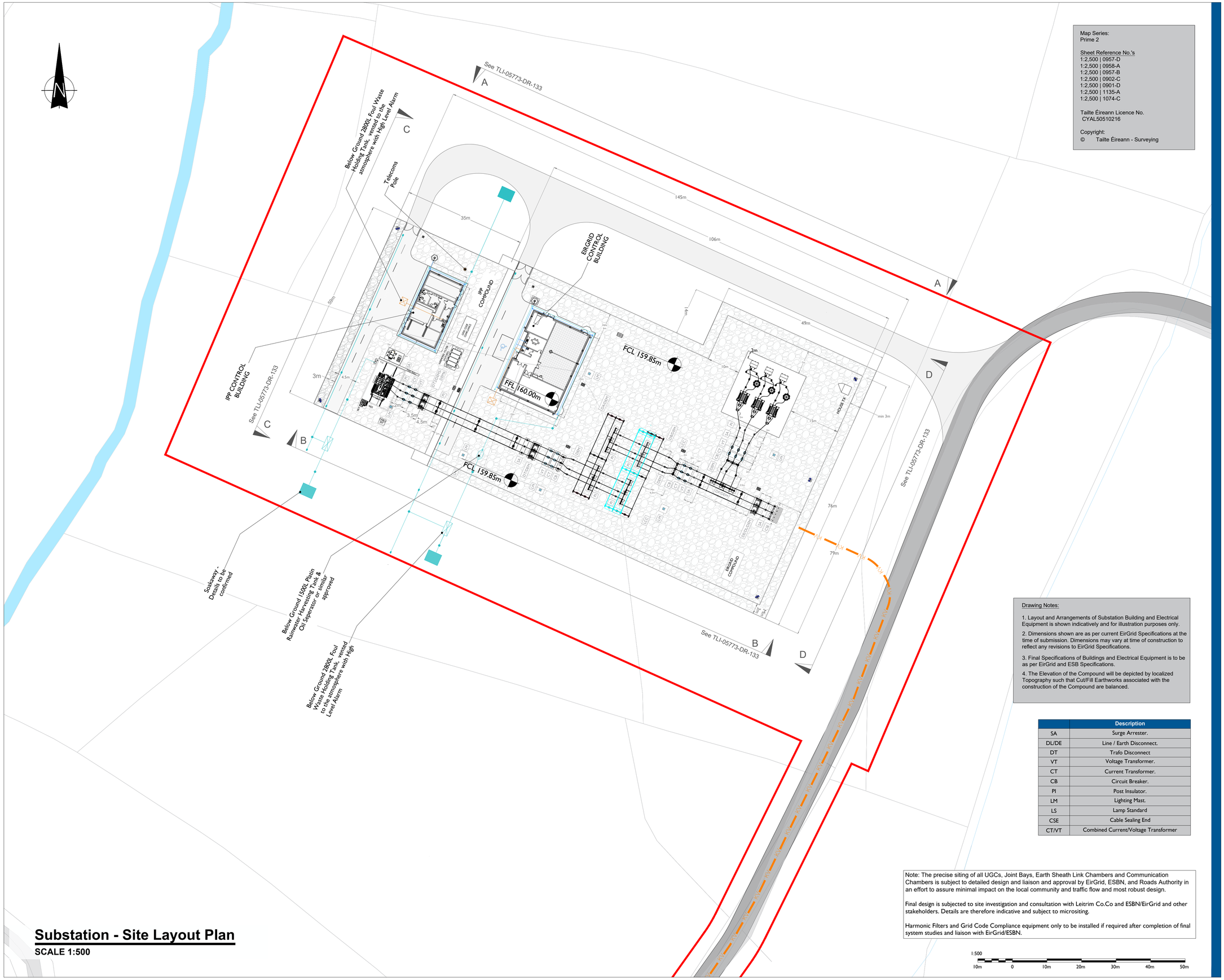
ISO A1 594mm x 841mm



Map Series:
Prime 2

Sheet Reference No.'s
1:2,500 | 0957-D
1:2,500 | 0958-A
1:2,500 | 0957-B
1:2,500 | 0902-C
1:2,500 | 0901-D
1:2,500 | 1135-A
1:2,500 | 1074-C

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Drawing Notes:

1. Layout and Arrangements of Substation Building and Electrical Equipment is shown indicatively and for illustration purposes only.
2. Dimensions shown are as per current EirGrid Specifications at the time of submission. Dimensions may vary at time of construction to reflect any revisions to EirGrid Specifications.
3. Final Specifications of Buildings and Electrical Equipment is to be as per EirGrid and ESB Specifications.
4. The Elevation of the Compound will be depicted by localized Topography such that Cut/Fill Earthworks associated with the construction of the Compound are balanced.

	Description
SA	Surge Arrester.
DL/DE	Line / Earth Disconnect.
DT	Trafo Disconnect
VT	Voltage Transformer.
CT	Current Transformer.
CB	Circuit Breaker.
PI	Post Insulator.
LM	Lighting Mast.
LS	Lamp Standard
CSE	Cable Sealing End
CT/VT	Combined Current/Voltage Transformer

Note: The precise siting of all UGCs, Joint Bays, Earth Sheath Link Chambers and Communication Chambers is subject to detailed design and liaison and approval by EirGrid, ESBN, and Roads Authority in an effort to assure minimal impact on the local community and traffic flow and most robust design.

Final design is subjected to site investigation and consultation with Leitrim Co.Co and ESBN/EirGrid and other stakeholders. Details are therefore indicative and subject to micrositing.

Harmonic Filters and Grid Code Compliance equipment only to be installed if required after completion of final system studies and liaison with EirGrid/ESBN.

1:500
10m 0 10m 20m 30m 40m 50m

Substation - Site Layout Plan

SCALE 1:500

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110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN
CONSULTING ENGINEERS

NOTES: -

- Configuration of substation equipment and infrastructure is subject to detailed design and EirGrid design approval.
- The proposed substation layout should be used for planning purposes only.
- This drawing is to be read in conjunction with relevant drawings, specifications and reports.
- Dimensions are in millimeters, unless noted otherwise.
- Drawings are not to be scaled use figured dimensions only.
- Preliminary design has only taken place, more detail design is required for all individual electrical components.

LEGEND: -

- Proposed UGC Grid Route (31.767km)
- Red Line Planning Boundary shown thus
- Proposed Levels shown thus (160.00m)
- Proposed 110kV EirGrid Substation two bay arrangement
- Existing Access track shown thus
- Proposed Wind Farm track shown thus
- Contours shown thus (138.5)
- Existing River Network shown thus
- Future extension to 4 Bays shown thus
- Future extension to 8 Bays shown thus
- Spare shown thus

ISSUE/REVISION

I/R	DATE	DESCRIPTION
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P2	20.04.26	Issued for Planning
P1	19.12.25	Issued for Planning

PROJECT NUMBER

05-773

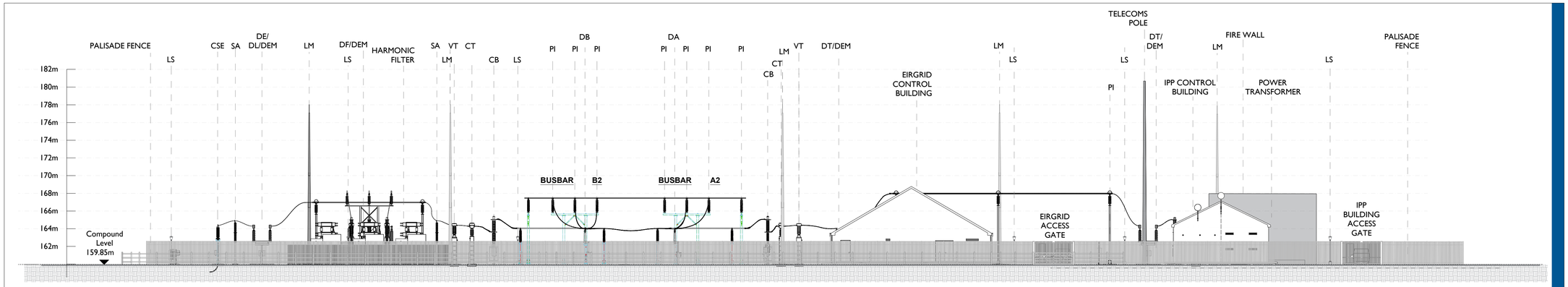
SHEET TITLE

Substation Layout Plan

SHEET NUMBER

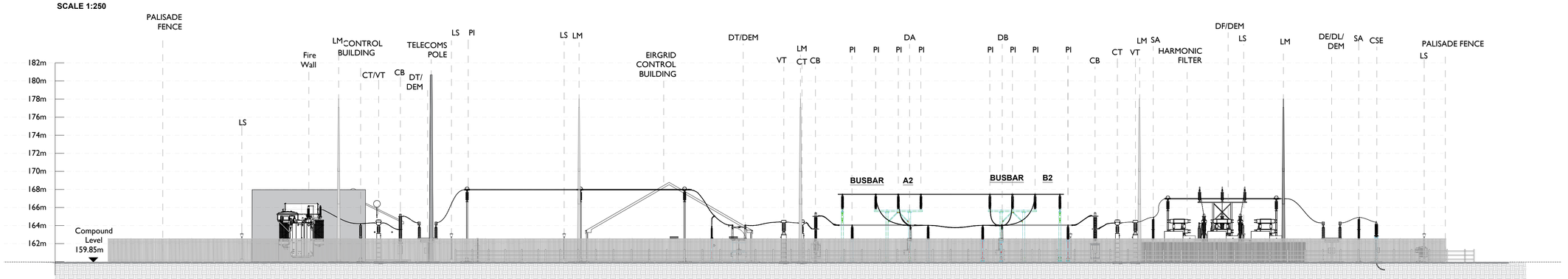
05773-DR-130

ISO A1 594mm x 841mm



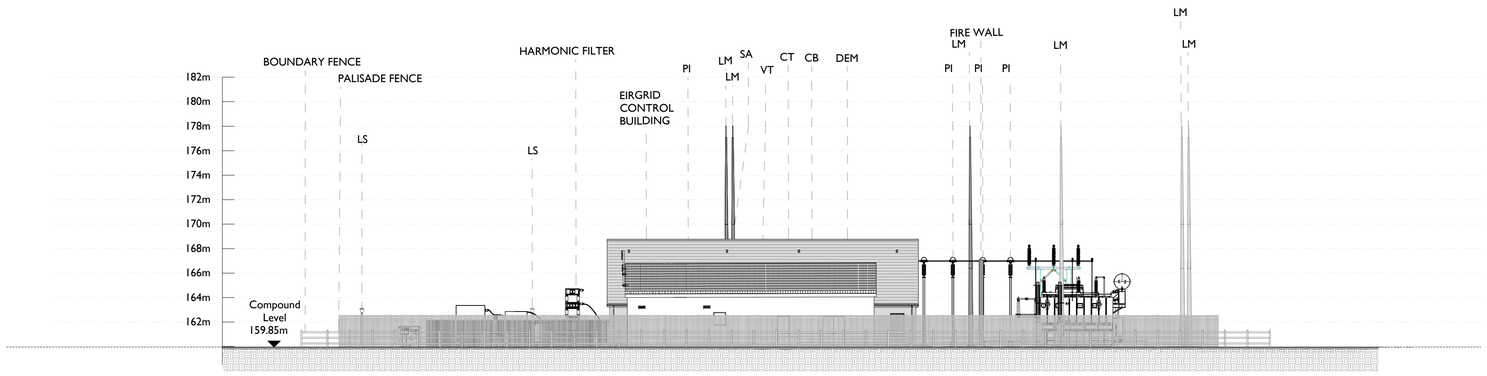
Section A-A Elevation

SCALE 1:250



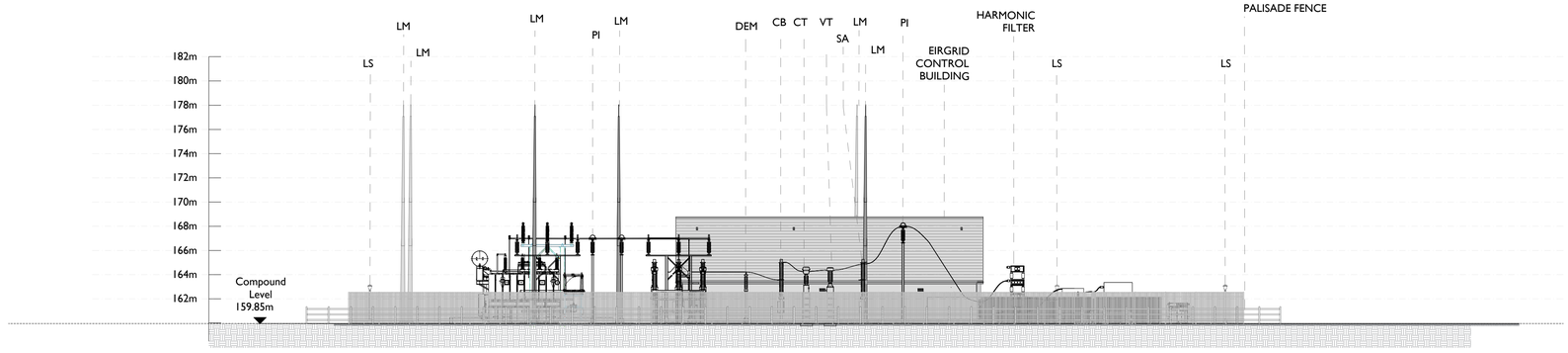
Section B-B Elevation

SCALE 1:250



Section C-C Elevation

SCALE 1:250



Section D-D Elevation

SCALE 1:250

1:250

5m 0 5m 10m 15m 20m 25m

Project Management Initials:
Designer: NS
Checked: DB
Approved: DB

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PROJECT

Lissinagroagh Wind Farm 110kV Grid Connection

CLIENT

FuturEnergy Ireland

CONSULTANTS

TOBIN CONSULTING ENGINEERS

NOTES: -

- Configuration of substation equipment and infrastructure is subject to detailed design and EirGrid design approval.
- The proposed substation layout should be used for planning purposes only.
- This drawing is to be read in conjunction with relevant drawings, specifications and reports.
- Dimensions are in millimeters, unless noted otherwise.
- Drawings are not to be scaled use figured dimensions only.
- Preliminary design has only taken place, more detail design is required for all individual electrical components.

LEGEND: -

	Description
CSE	CABLE SEALING END
SA	SURGE ARRESTER
DL/DE	LINE DISCONNECT
DT/DEM	TRANSFORMER/EARTH DISCONNECT
DEM	EARTH SWITCH
DB/DEB	BUSBAR DISCONNECT
VT	VOLTAGE TRANSFORMER
CT	CURRENT TRANSFORMER
CB	CIRCUIT BREAKER
PI	POST INSULATOR
LM	LIGHTING MAST
LP	LAMP POST
IK	INTERFACE KIOSK
HX	HOUSE TRANSFORMER
LCC	LOCAL CONTROL CABINET
NER	NEUTRAL EARTHING RESISTOR

ISSUE/REVISION

P3	21.04.26	Issued for Planning
P2	20.04.26	Issued for Planning
P1	19.12.25	Issued for Planning
N1	25.11.25	Issued for Information
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

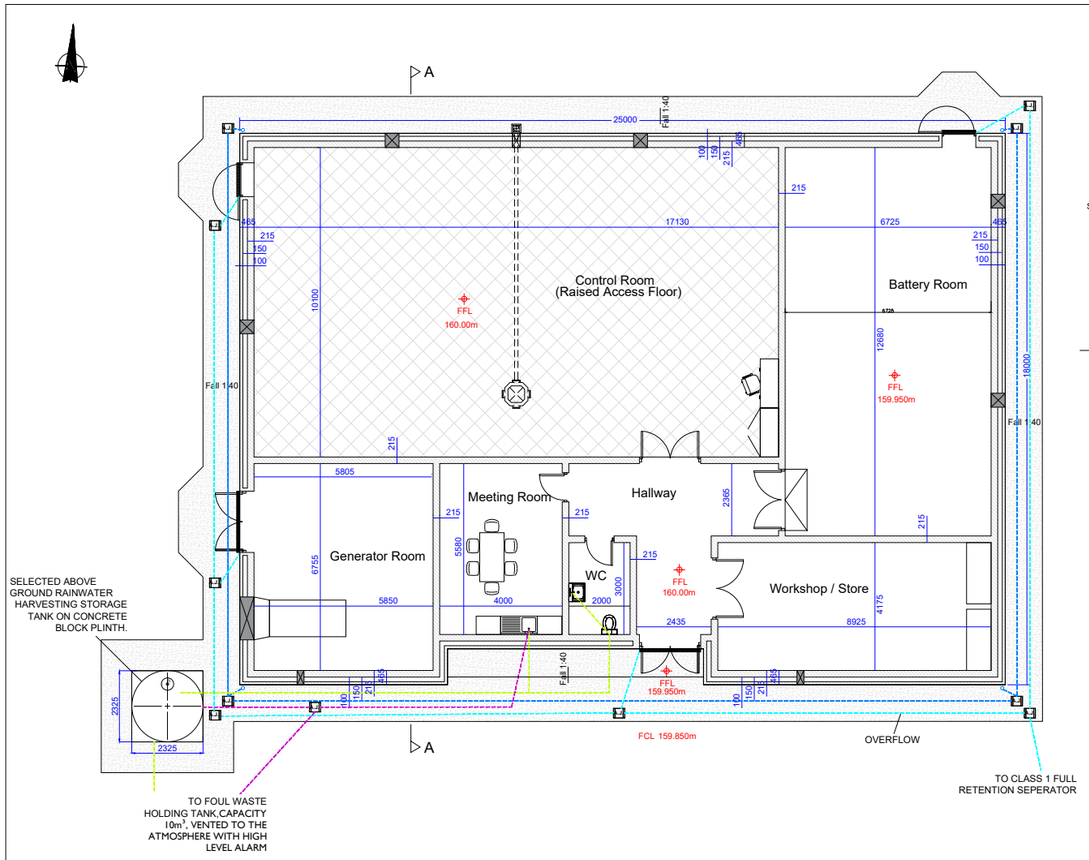
SHEET TITLE

Substation Compound Elevations

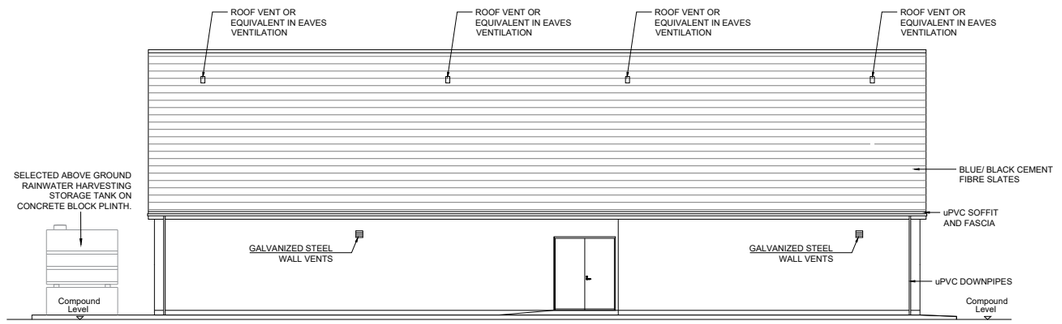
SHEET NUMBER

05773-DR-133

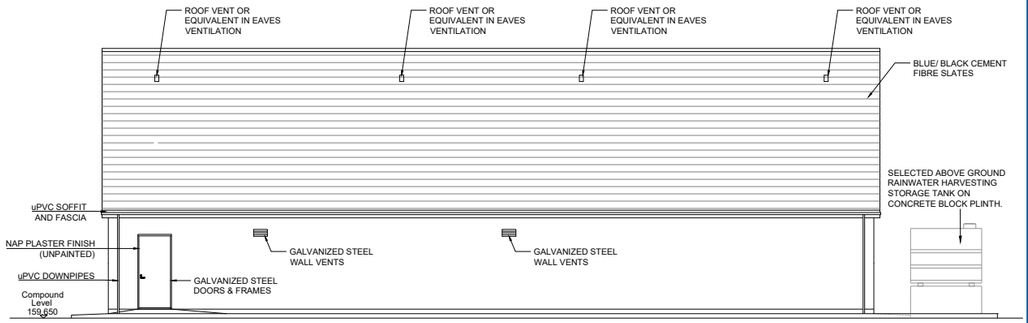
ISO A1 594mm x 841mm



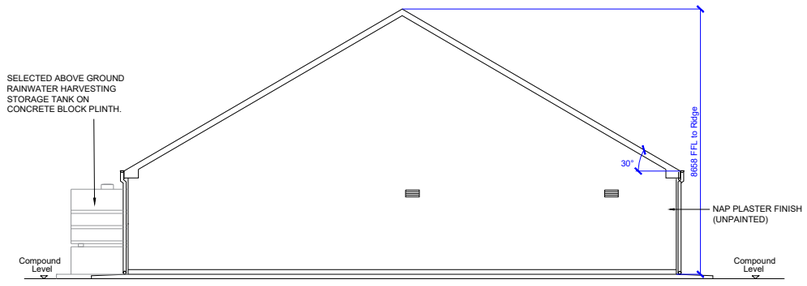
PLAN - CONTROL BUILDING
Scale : 1:100



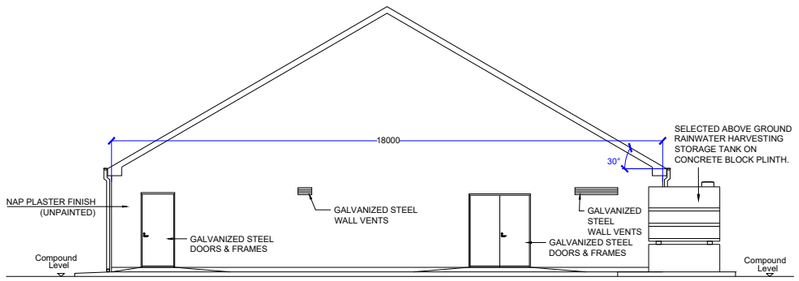
NORTH WEST ELEVATION
Scale : 1:100



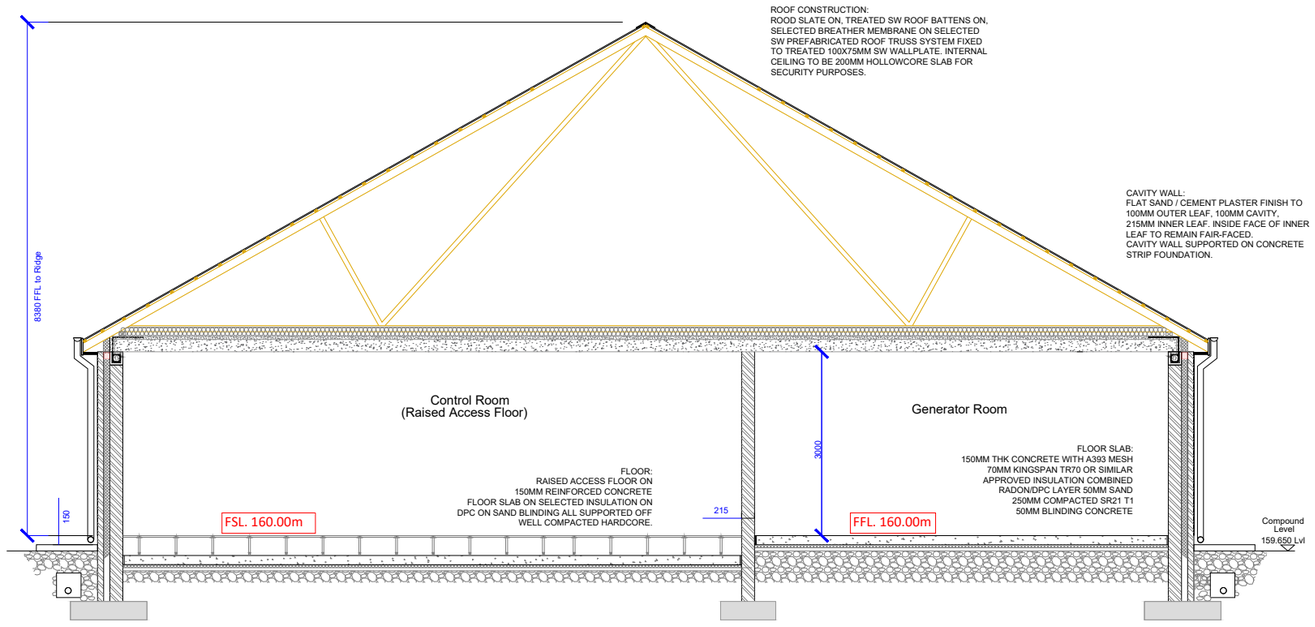
SOUTH EAST ELEVATION
Scale : 1:100



SOUTH WEST ELEVATION
Scale : 1:100



NORTH EAST ELEVATION
Scale : 1:100



SECTION A-A
Scale : 1:50

Project Management Initials: Designer: JC Checked: DB Approved: RG

tli GROUP

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Tel: 00 44 1256406664

PROJECT

Lissinagroagh
Wind Farm
110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN CONSULTING ENGINEERS

NOTES: -

1. Layout and Arrangements of Substation Building and Electrical Equipment is shown indicatively and for illustration purposes only.
2. Dimensions shown are as per current EirGrid Specifications at the time of submission. Dimensions may vary at time of construction to reflect any revisions to EirGrid Specifications.
3. Final Specifications of Buildings and Electrical Equipment is to be as per Eirgrid and ESB Specifications.
4. The Elevation of the Compound will be depicted by localized Topography such that Cut/Fill Earthworks associated with the construction of the Compound are balanced.

LEGEND: -

Levels shown thus 140.864m
Concrete Footpath shown thus
Foul Sewer shown thus
Clean Storm Water shown thus
Dirty Storm Water shown thus
Water supply from Harvesting Tank shown thus

ISSUE/REVISION

P03	21.04.26	Issued for Planning
P02	20.04.26	Issued for Planning
P01	19.12.25	Issued for Planning
P00	29.04.22	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

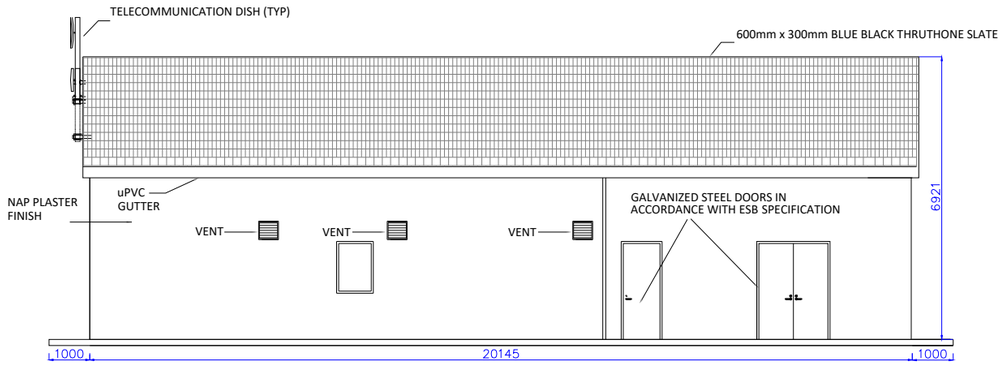
SHEET TITLE

Eir Grid Control Building
Plan,Elevations & Section

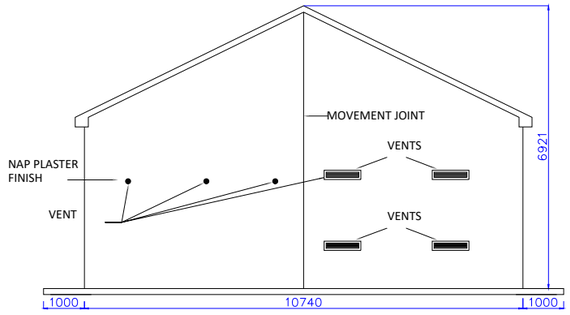
SHEET NUMBER

05773-DR-134

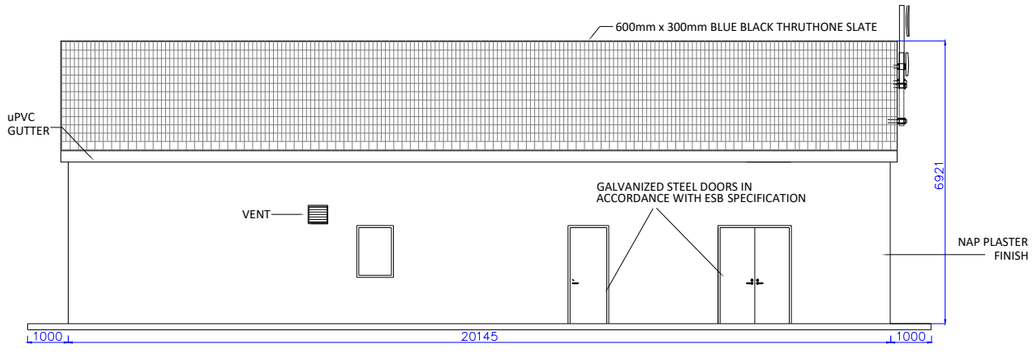
ISO A1 594mm x 841mm



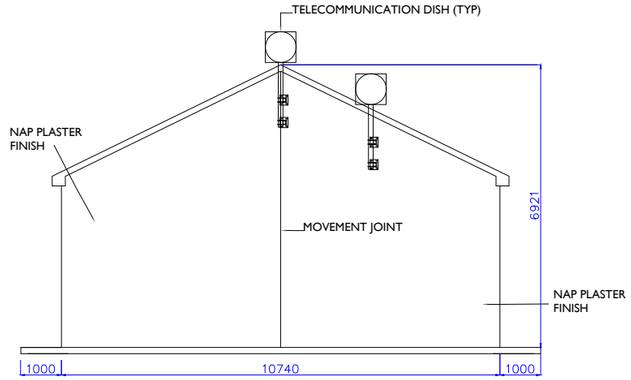
NORTH WEST ELEVATION
Scale : 1:75



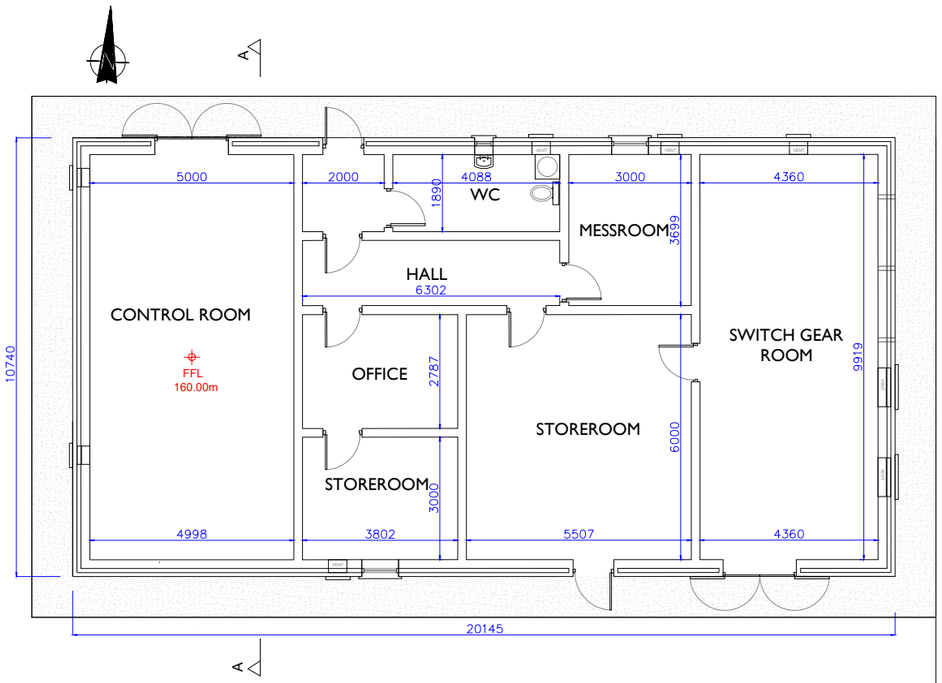
NORTH EAST ELEVATION
Scale : 1:75



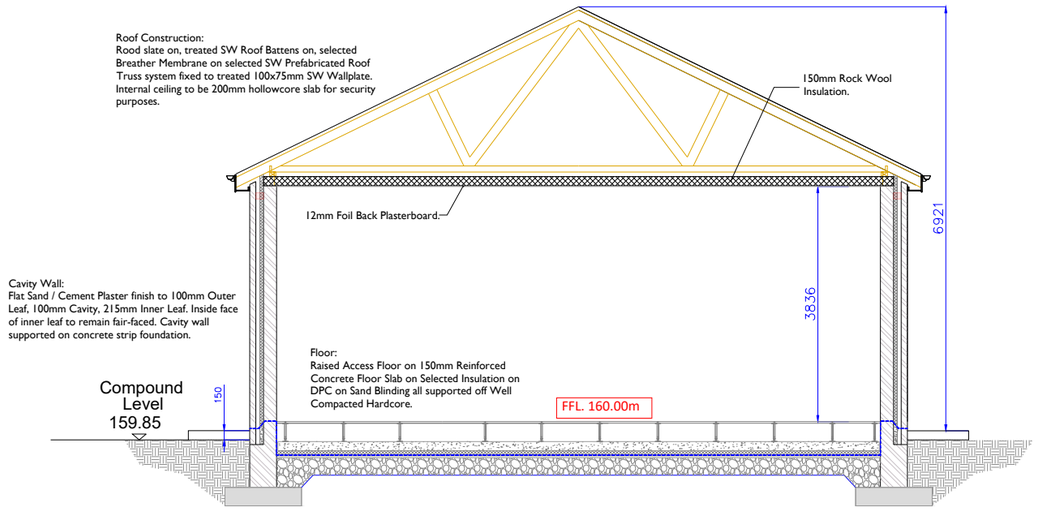
SOUTH EAST ELEVATION
Scale : 1:75



SOUTH WEST ELEVATION
Scale : 1:75



PLAN - IPP BUILDING
Scale : 1:100



SECTION A-A
Scale : 1:50

Project Management Initials: Designer: JC Checked: DB Approved: RG

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RG24 8UP, UK
Tel: 00 44 1256406664

PROJECT

Lissinagroagh
Wind Farm
110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN CONSULTING ENGINEERS

NOTES: -

1. Layout and Arrangements of Substation Building and Electrical Equipment is shown indicatively and for illustration purposes only.
2. Dimensions shown are as per current EirGrid Specifications at the time of submission. Dimensions may vary at time of construction to reflect any revisions to EirGrid Specifications.
3. Final Specifications of Buildings and Electrical Equipment is to be as per Eirgrid and ESB Specifications.
4. The Elevation of the Compound will be depicted by localized Topography such that Cut/Fill Earthworks associated with the construction of the Compound are balanced.

LEGEND: -

Levels shown thus 159.90m

Concrete Footpath shown thus

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P03	21.04.26	Issued for Planning
P02	20.04.26	Issued for Planning
P01	19.12.25	Issued for Planning
P00	29.04.22	Issued for Planning

PROJECT NUMBER

05-773

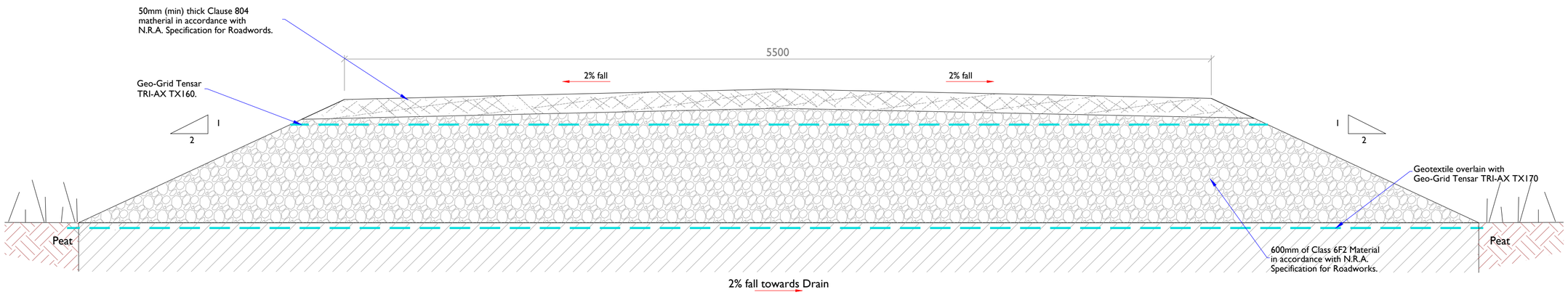
SHEET TITLE

IPP Building - Plan & Elevations & Section

SHEET NUMBER

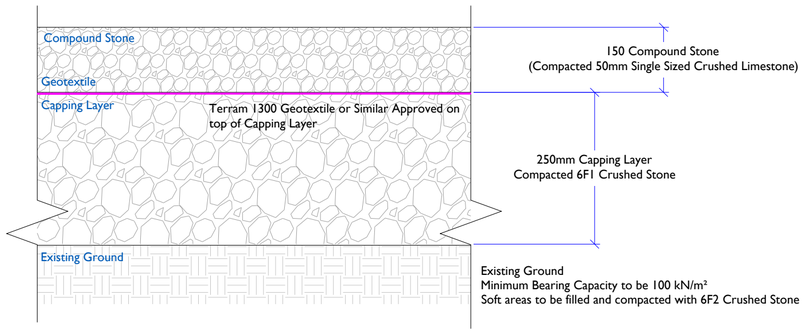
05773-DR-135

ISO A2 420mm x 594mm



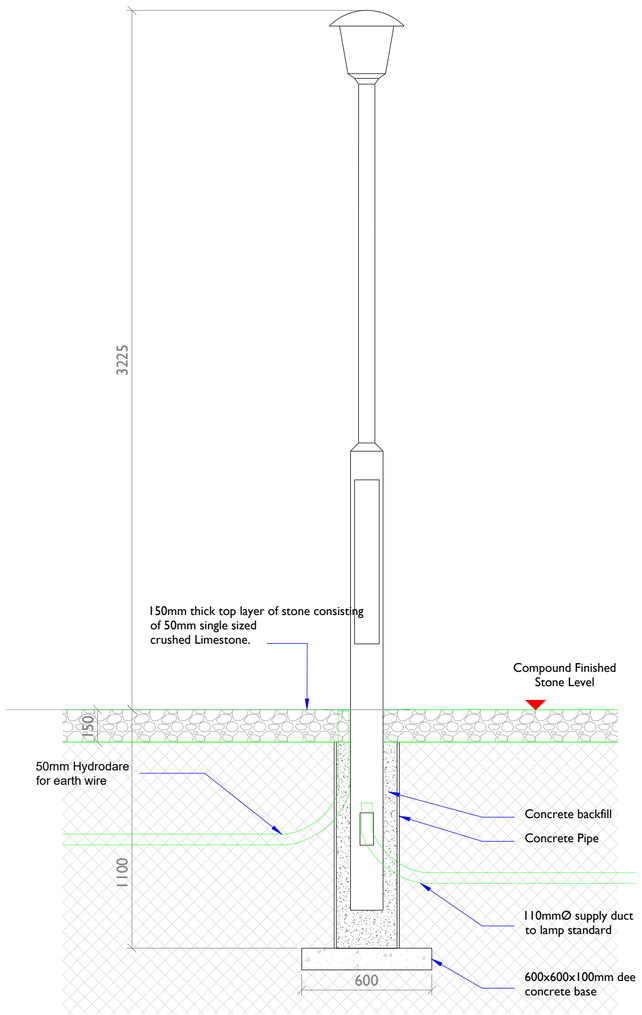
Typical Section Thru Access Road (Floating Road Detail)

SCALE 1:20



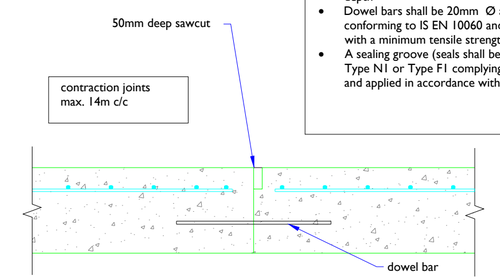
Typical Compound Detail

SCALE 1:10



Lighting Column & Surround Detail

SCALE 1:20

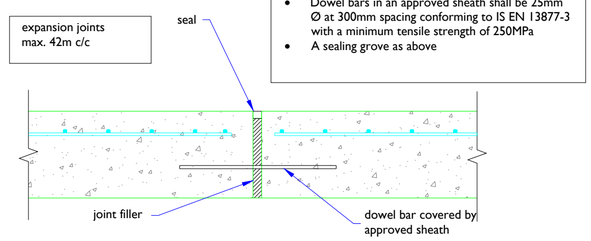


Contraction joints should comprise of the following:

- A sawn groove joint 10mm wide at least $\frac{1}{4}$ the slab depth
- Dowel bars shall be 20mm Ø at 300mm spacing conforming to IS EN 10060 and IS EN 13877-3 with a minimum tensile strength of 250 MPa
- A sealing groove (seals shall be hot applied sealants Type N1 or Type F1 complying with IS EN 14188-1 and applied in accordance with BS 2499-2)

Concrete Access Road Contraction Joint

SCALE 1:10

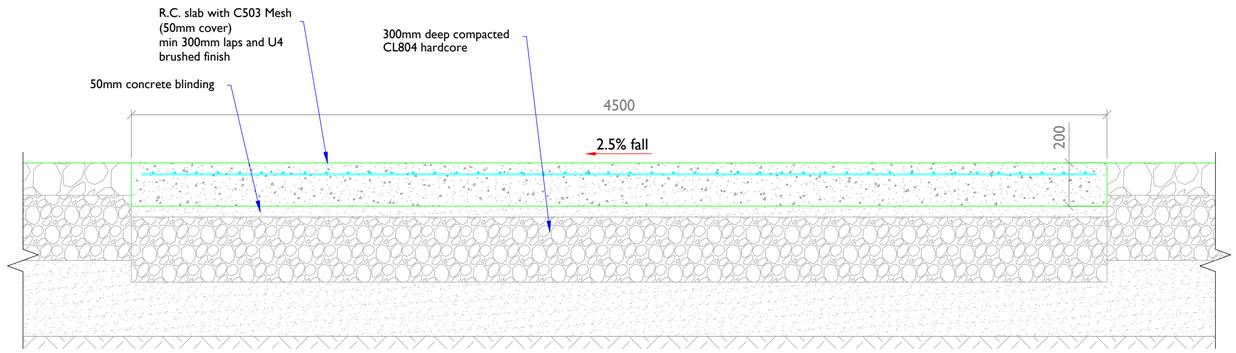


Expansion joints should comprise of the following:

- A joint filler board 25mm thick self expanding cork seal or from another approved compressible material
- Dowel bars in an approved sheath shall be 25mm Ø at 300mm spacing conforming to IS EN 13877-3 with a minimum tensile strength of 250MPa
- A sealing grove as above

Concrete Access Road Expansion Joint

SCALE 1:10



Typical Section - Concrete Access Road

SCALE 1:20

Project Management Initials: Designer: JC Checked: DB Approved: RG

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PROJECT

LissinagroaghWind Farm
110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN CONSULTING ENGINEERS

NOTES: -

- This drawing is to be read in conjunction with relevant engineering drawings, specifications and reports
- Dimensions are in millimeters, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only

LEGEND: -

ISSUE/REVISION

P01	21.04.26	Issued for Planning
P00	19.12.25	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

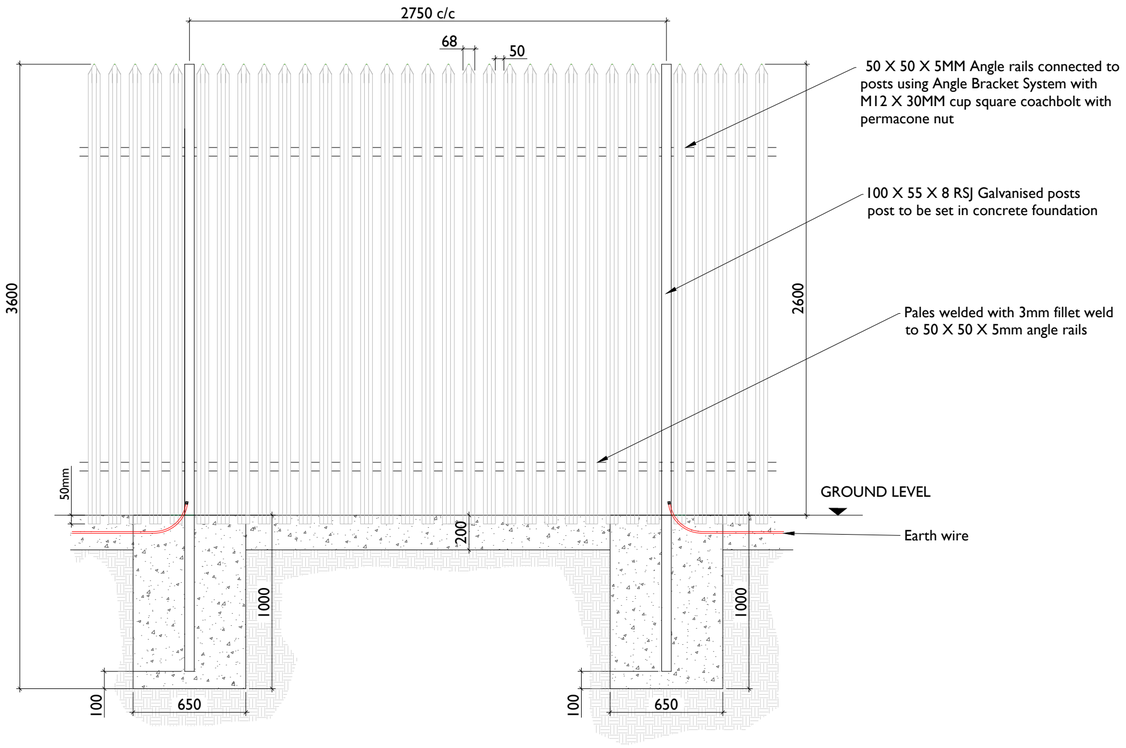
SHEET TITLE

Site Compound Details
& Access Road Details.

SHEET NUMBER

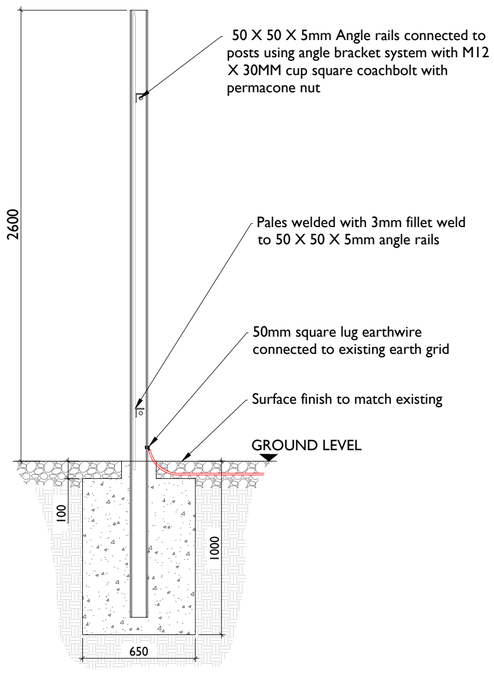
05773-DR-136

ISO A2 420mm x 594mm



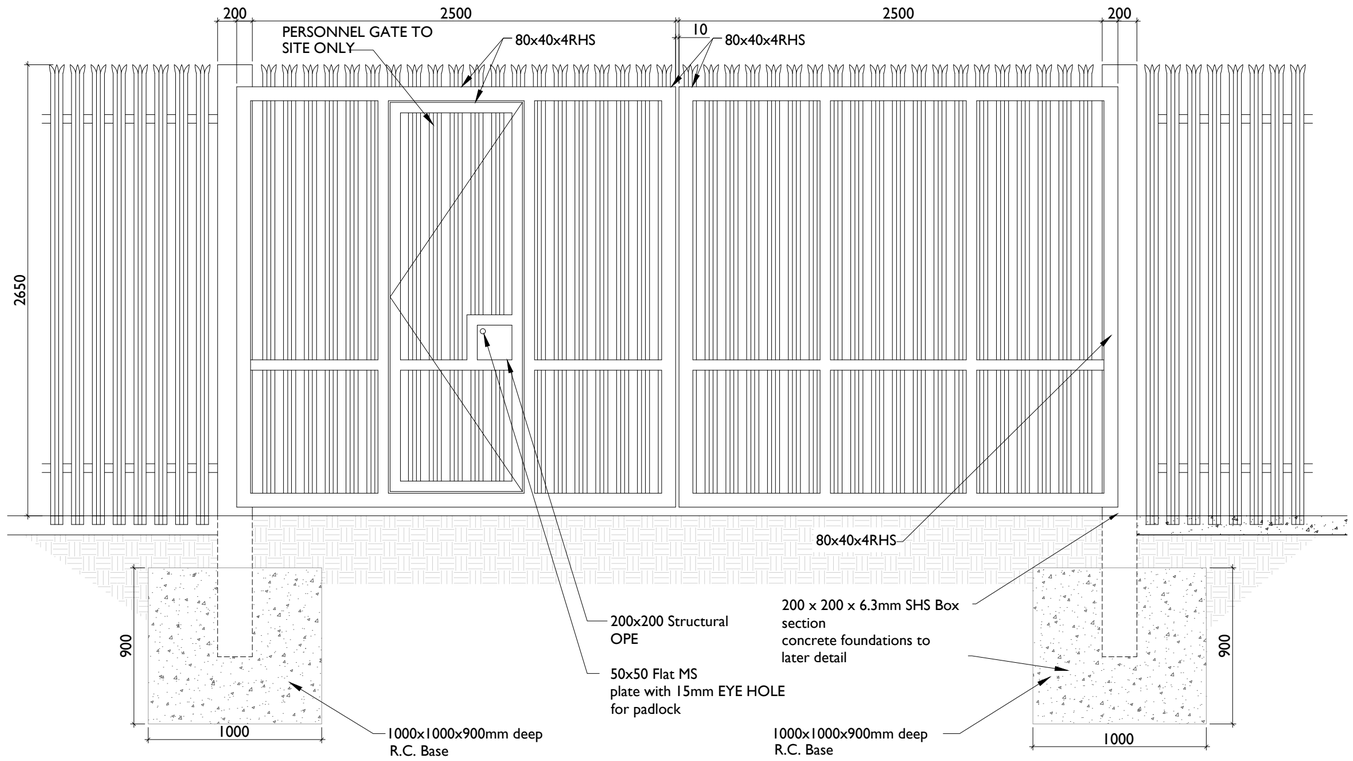
Palisade Fencing Details - Elevation

SCALE 1:25



Palisade Fencing Details - Section

SCALE 1:25



Typical Gate Elevation

SCALE 1:25

tli GROUP
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PROJECT

Lissinagroagh Wind Farm
110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN CONSULTING ENGINEERS

NOTES: -

LEGEND: -

- This drawing is to be read in conjuction with relevant drawings, specifications and reports
- Dimensions are in millimetres, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only

ISSUE/REVISION

P2	21.04.26	Issued for Planning
P1	19.12.25	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

SHEET TITLE

Gate & Fence Details

SHEET NUMBER

05773-DR-137

Project Management Initials: Designer: AD Checked: DB Approved: RG

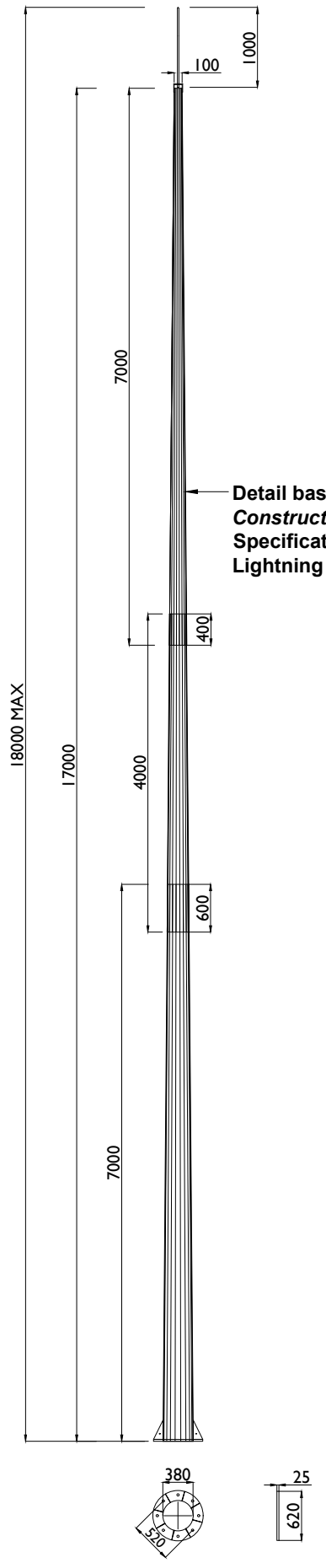
ISO A3 297mm x 420mm

GENERAL NOTES:

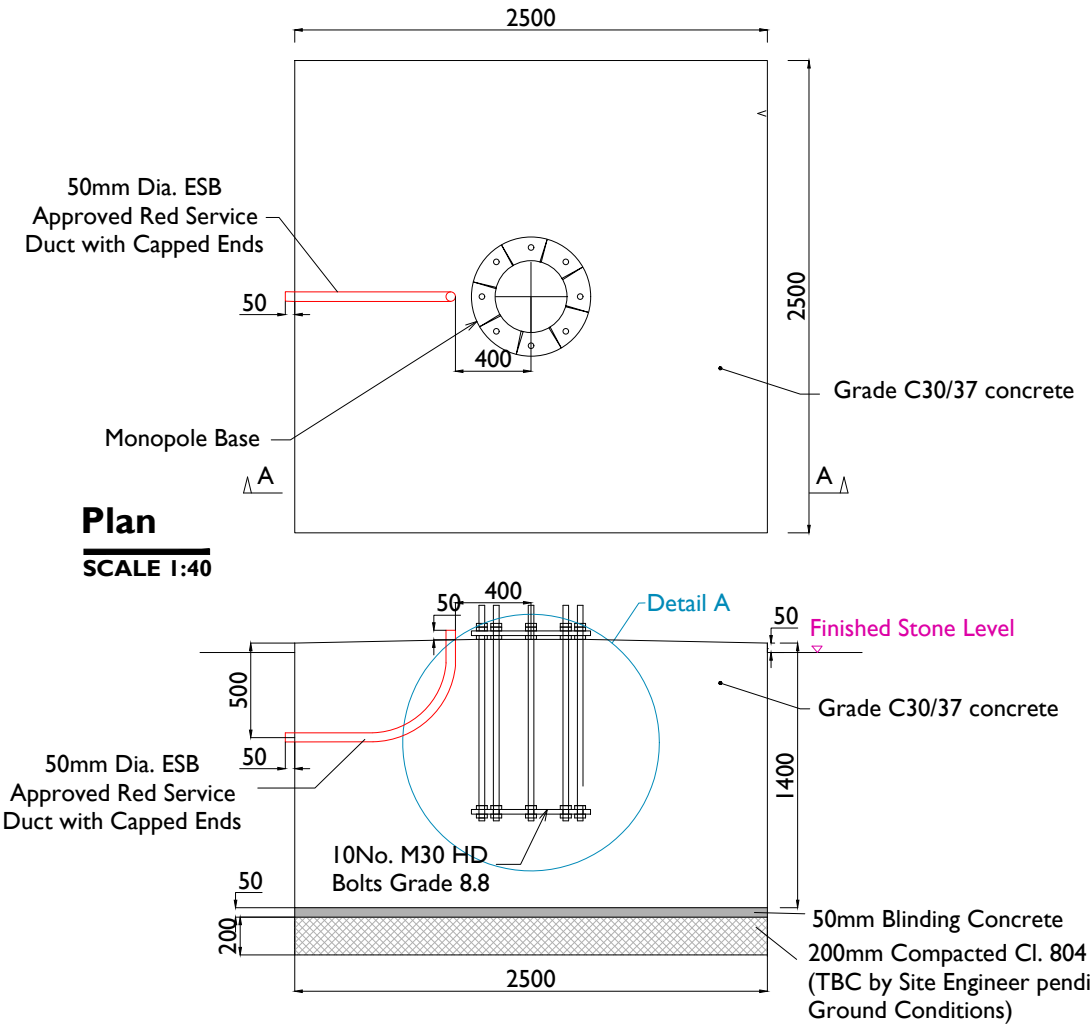
1. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH THE SPECIFICATION AND ALL ENGINEERS AND ARCHITECTS DRAWINGS
2. ALL CONCRETE TO BE IN ACCORDANCE WITH I.S. EN 206-1:2002 WITH THE MIX DESIGNS SHOWN IN TABLE 1
3. CONCRETE FINISHES TO BE IN ACCORDANCE WITH TABLE 6.1 OF THE ESBI SPECIFICATION CS17-SO1-005.
4. ALL REINFORCEMENT SHALL BE IN ACCORDANCE WITH BS4449 AND SCHEDULED IN ACCORDANCE WITH BS.8666. 300MM LAPS FOR A142 MESH 600MM MIN LAPS FOR A393 MESH.
5. REFER ALWAYS TO RELEVANT EARTH GRID DRAWING PRIOR TO EXCAVATIONS & CONCRETE POURS
6. GEOMETRICAL TOLERANCES TO BE IN ACCORDANCE WITH TABLE 6.2 OF ESBI SPECIFICATION CS17-S01-005

FOUNDATION NOTES:

7. GROUND TO HAVE A MINIMUM BEARING CAPACITY OF 100 kN/M².
8. FORMATION LEVEL AND FOUNDATIONS TO BE INSPECTED AND APPROVED BY THE ENGINEER PRIOR TO ANY CONCRETE BEING POURED.
9. ALL FOUNDATIONS ARE TO BE BLINDED IMMEDIATELY AFTER EXCAVATION WITH 50MM OF C16/20 CONCRETE BLINDING.
10. REFER ALWAYS TO THE RELEVANT EARTH WORK DRAWINGS PRIOR TO EXCAVATIONS & CONCRETE POURS.

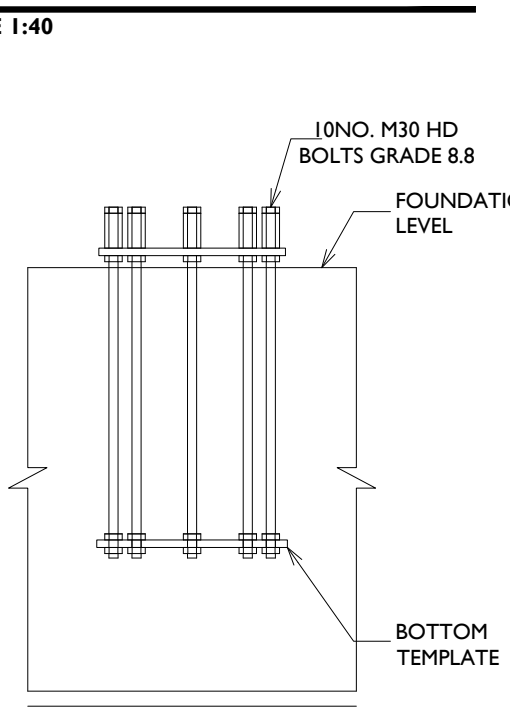


Monopole Details
SCALE 1:75

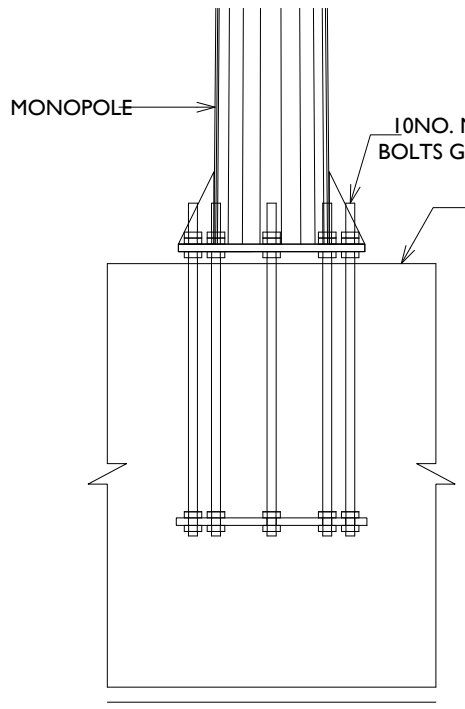


Plan
SCALE 1:40

Section A-A: Foundation detail
SCALE 1:40



Detail A
Scale : 1:25



Monopole Base Plate to HDB Connection
Scale : 1:25

Head Office
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Tralee, Co. Kerry
Ireland
Tel: 00353 66 7135710

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P2	21.04.26	Issued for Planning
P1	19.12.25	Issued for Planning

CLIENT
FuturEnergy Ireland

PROJECT
Lissinagroagh Wind Farm
110kV Grid Connection

SHEET TITLE
Lightning Monopole
Foundation Details 18m Mast

DRAWING STATUS
For Planning

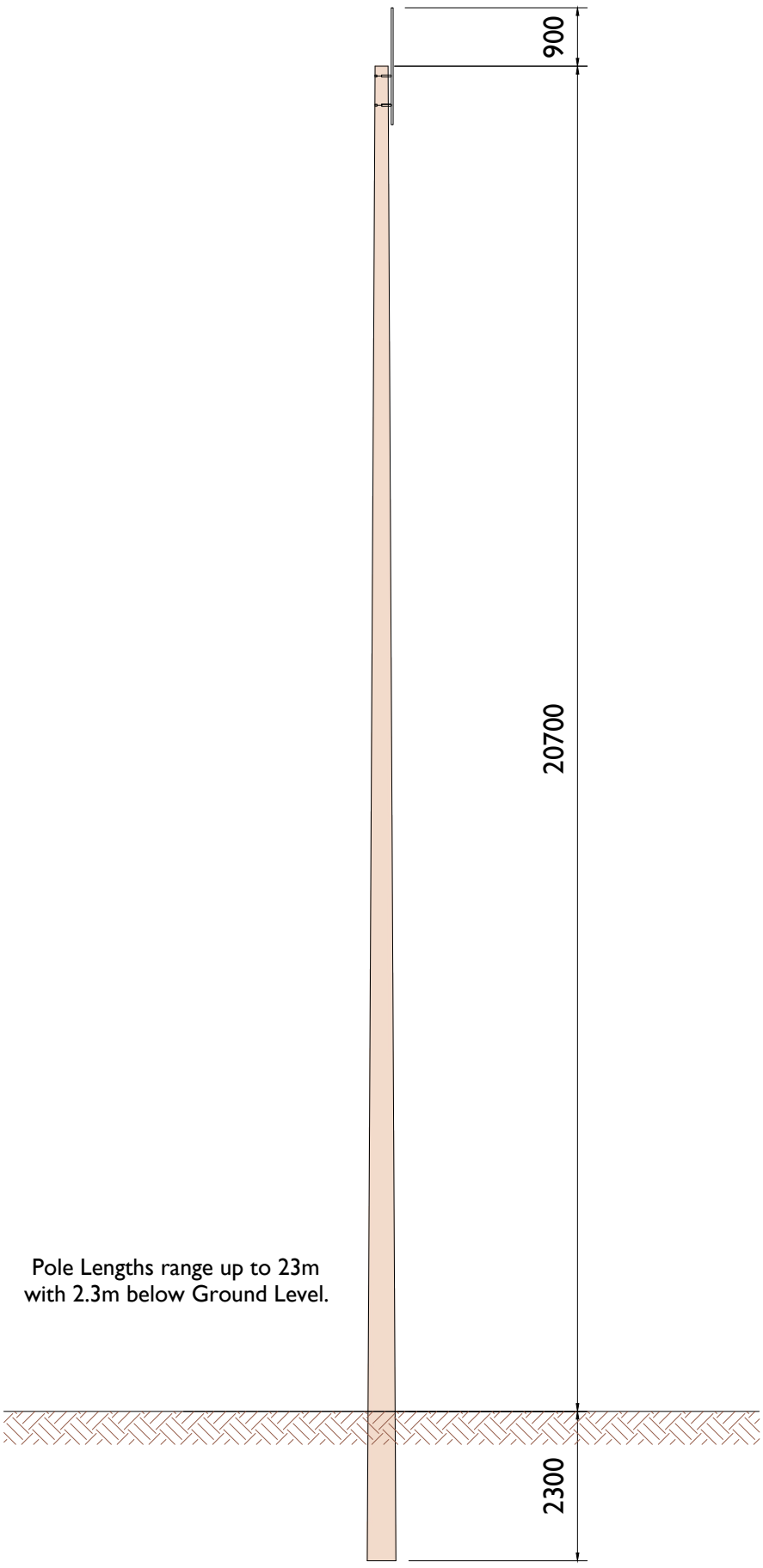
PROJECT NUMBER
05-773

SHEET NUMBER
05773-DR-138

LEGEND/NOTES: -

- This drawing is to be read in conjuction with relevant drawings, specifications and reports
- Dimensions are in millimetres, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only

ISO A3 297mm x 420mm



Pole Lengths range up to 23m
with 2.3m below Ground Level.

FRONT ELEVATION

Scale 1:100

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ISSUE/REVISION

I/R	DATE	DESCRIPTION
P2	21.04.26	Issued for Planning
P1	19.12.25	Issued for Planning

CLIENT

Ireland FuturEnergy

PROJECT

Lissinagroagh Wind Farm
110kV Grid Connection

SHEET TITLE

Telecoms Pole Elevation View

DRAWING STATUS

For Planning

PROJECT NUMBER

05-773

SHEET NUMBER

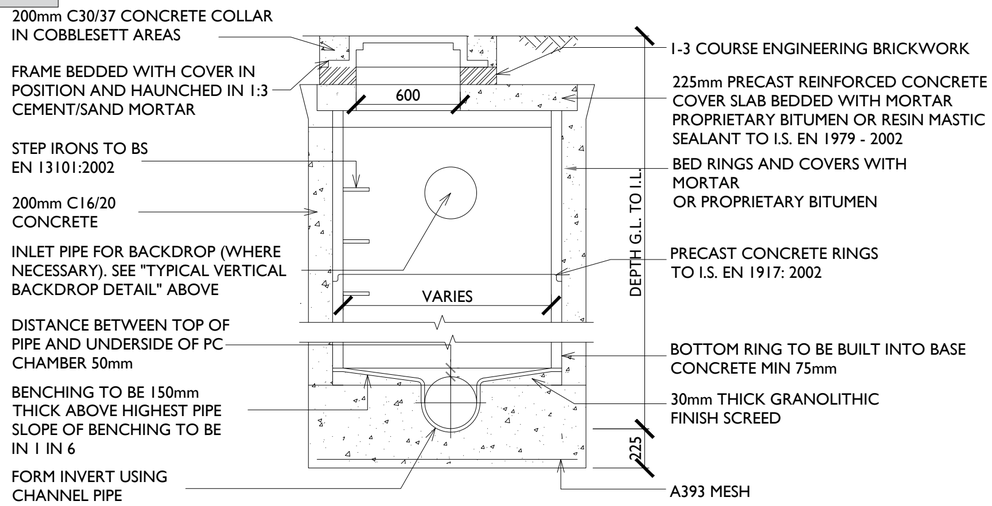
05773-DR-139

LEGEND/NOTES: -

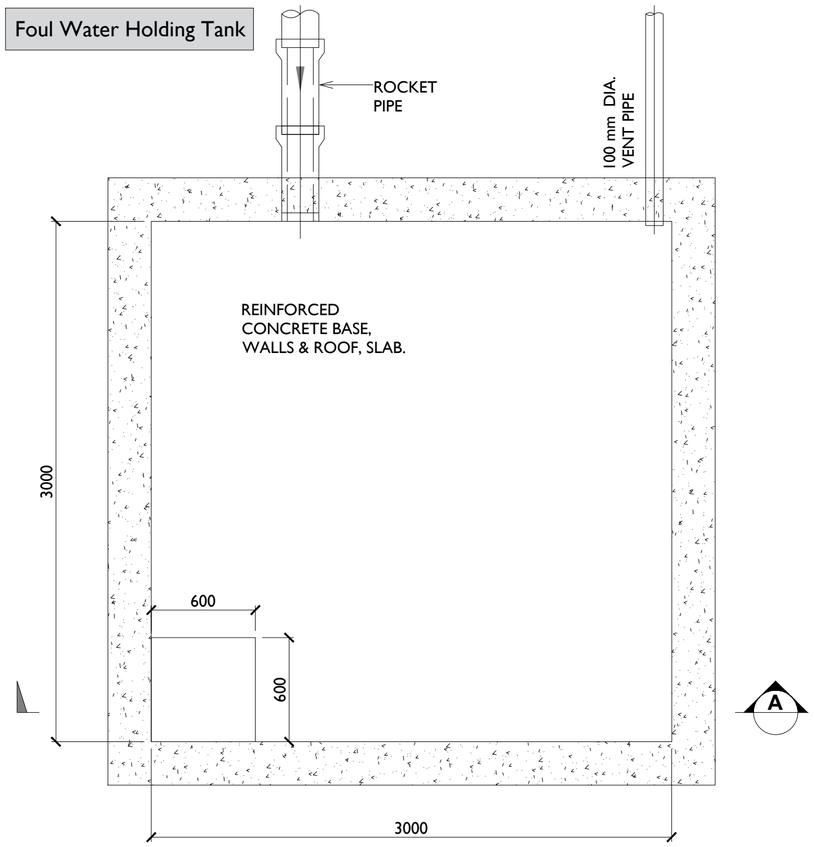
All dimensions in mm unless noted otherwise

ISO A2 420mm x 594mm

Manhole

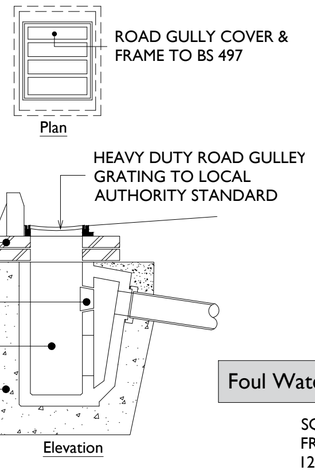


Foul Water Holding Tank

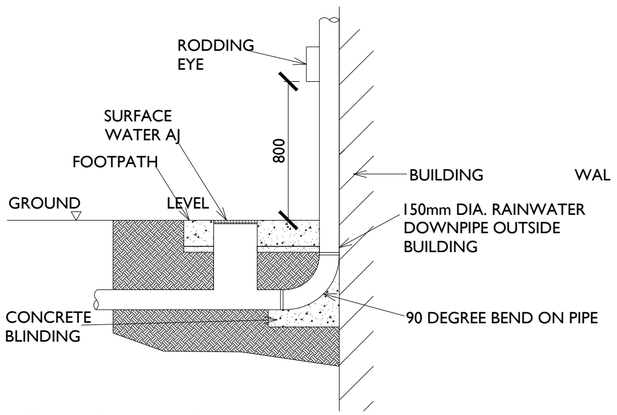


Typical Foul Water Holding Tank - Plan
Scale : 1:25

Road Gully

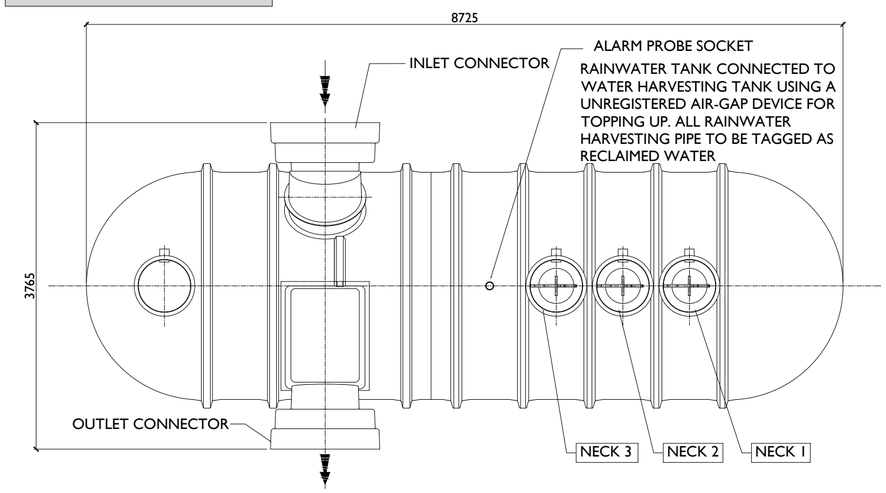


Typical Road Gully Detail
Scale : 1:25



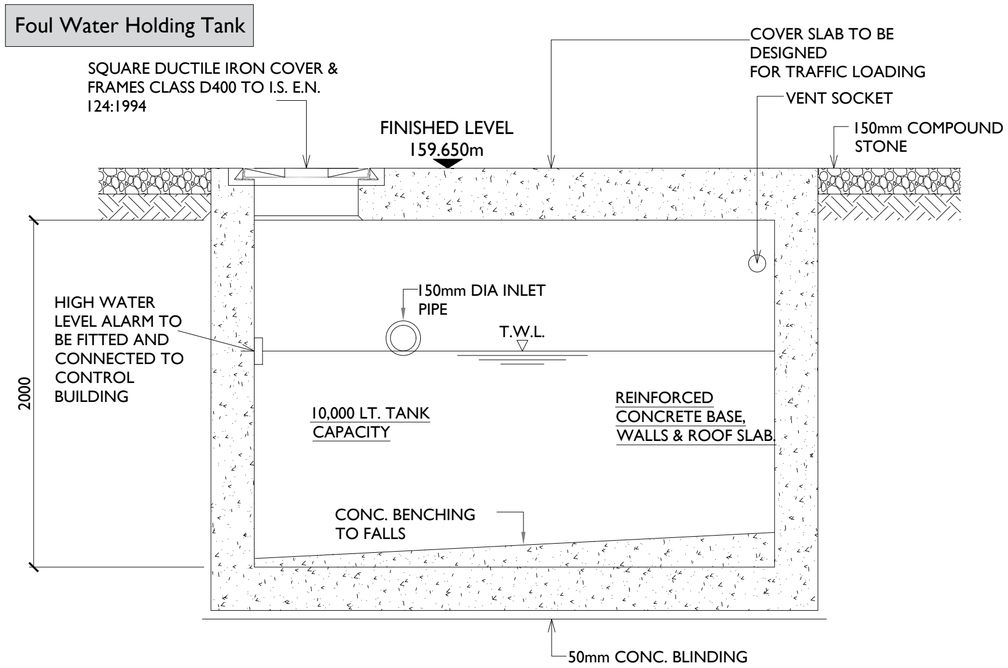
Typical Rainwater Downpipe Detail - Elevation
Scale : 1:25

Retention Seperator Tank



Typical Retention Separator Tank - Plan
Scale : 1:50

Foul Water Holding Tank



Typical Foul Water Holding Tank - Section 'A'
Scale : 1:25

Project Management Initials: Designer: JC Checked: LR Approved: DB

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PROJECT

Lissinagroagh Wind Farm
110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN CONSULTING ENGINEERS

NOTES: -

- This drawing is to be read in conjunction with relevant engineering drawings, specifications and reports
- Dimensions are in millimeters, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only

LEGEND: -

ISSUE/REVISION

P2	21.04.26	Issued for Planning
P1	19.12.25	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

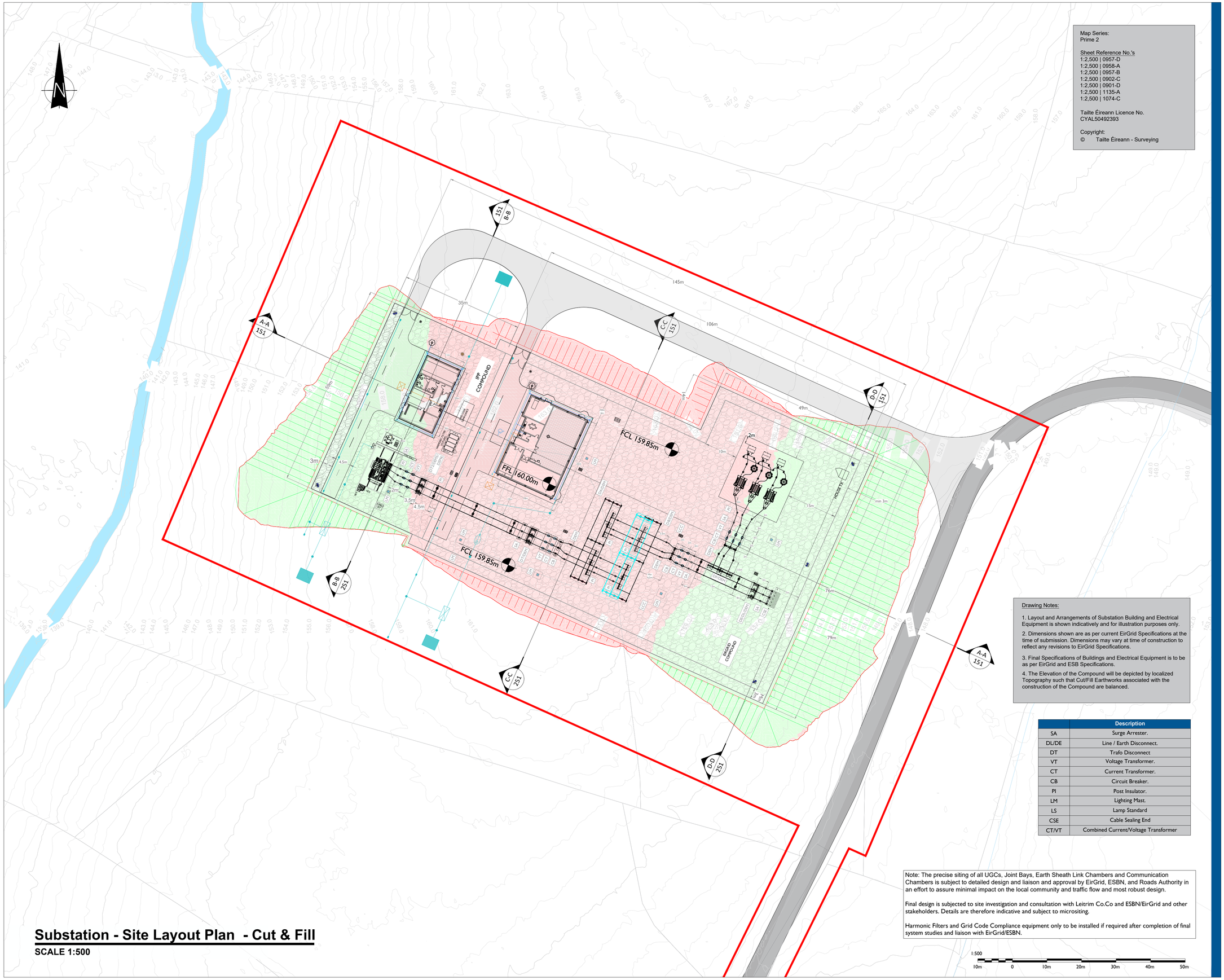
SHEET TITLE

Substation Compound drainage, Rentention seperator tank, Foul water holding tank details

SHEET NUMBER

05773-DR-141

ISO A1 594mm x 841mm



Map Series:
Prime 2

Sheet Reference No.'s
1:2,500 | 0957-D
1:2,500 | 0958-A
1:2,500 | 0957-B
1:2,500 | 0902-C
1:2,500 | 0901-D
1:2,500 | 1135-A
1:2,500 | 1074-C

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Drawing Notes:

1. Layout and Arrangements of Substation Building and Electrical Equipment is shown indicatively and for illustration purposes only.
2. Dimensions shown are as per current EirGrid Specifications at the time of submission. Dimensions may vary at time of construction to reflect any revisions to EirGrid Specifications.
3. Final Specifications of Buildings and Electrical Equipment is to be as per EirGrid and ESB Specifications.
4. The Elevation of the Compound will be depicted by localized Topography such that Cut/Fill Earthworks associated with the construction of the Compound are balanced.

	Description
SA	Surge Arrester.
DL/DE	Line / Earth Disconnect.
DT	Trafo Disconnect
VT	Voltage Transformer.
CT	Current Transformer.
CB	Circuit Breaker.
PI	Post Insulator.
LM	Lighting Mast.
LS	Lamp Standard
CSE	Cable Sealing End
CT/VT	Combined Current/Voltage Transformer

Note: The precise siting of all UGCs, Joint Bays, Earth Sheath Link Chambers and Communication Chambers is subject to detailed design and liaison and approval by EirGrid, ESBN, and Roads Authority in an effort to assure minimal impact on the local community and traffic flow and most robust design.

Final design is subjected to site investigation and consultation with Leitrim Co.Co and ESBN/EirGrid and other stakeholders. Details are therefore indicative and subject to micrositing.

Harmonic Filters and Grid Code Compliance equipment only to be installed if required after completion of final system studies and liaison with EirGrid/ESBN.

1:500
10m 0 10m 20m 30m 40m 50m

Substation - Site Layout Plan - Cut & Fill

SCALE 1:500

tli GROUP

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PROJECT

Lissinagroagh
Wind Farm
110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN CONSULTING ENGINEERS

NOTES: -

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LEGEND: -

Proposed Cut Volume 14231m³ shown thus
Proposed Fill Volume 13591m³ shown thus
Red Line Planning Boundary shown thus
Contours 14.0
Proposed Levels shown thus 160.00m
Permanent Paved Access Roads shown thus

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P02	21.04.26	Issued for Planning
P01	20.04.26	Issued for Planning
P00	19.12.25	Issued for Planning
N1	10.12.25	Issued for Information

PROJECT NUMBER

05-773

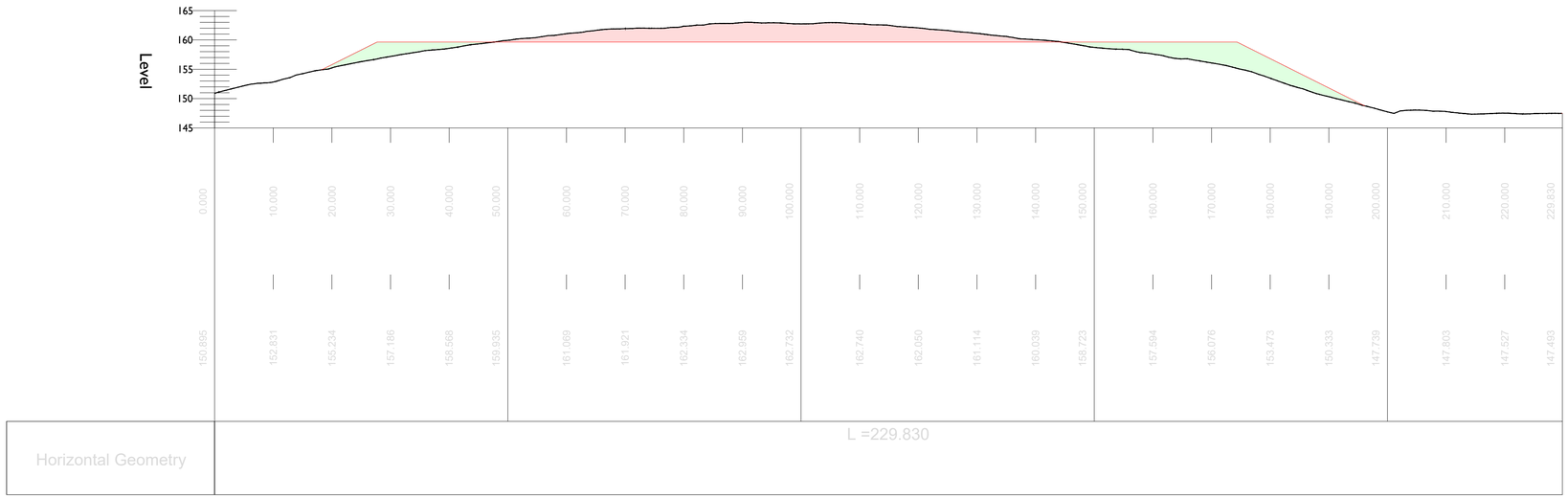
SHEET TITLE

Substation Layout Plan - Cut & Fill

SHEET NUMBER

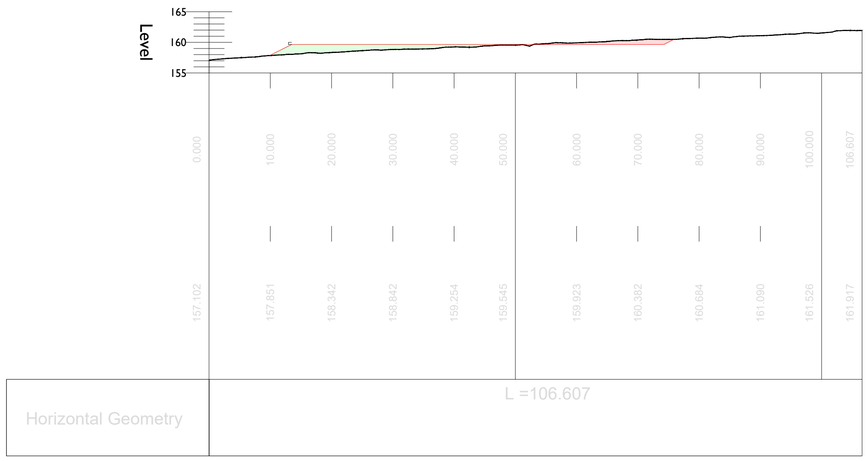
05773-DR-150

ISO A1 594mm x 841mm



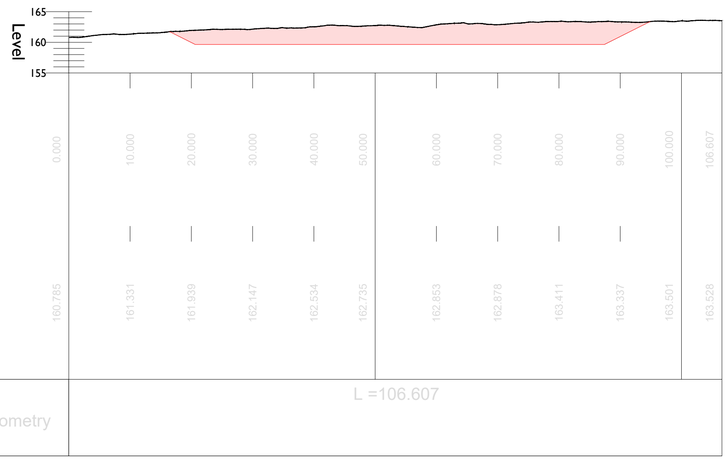
Section A-A

SCALE 1:500



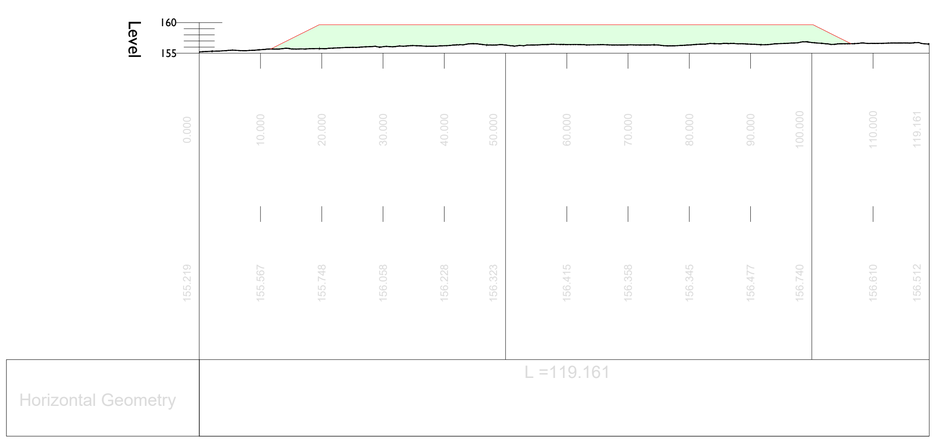
Section B-B

SCALE 1:500



Section C-C

SCALE 1:500



Section D-D

SCALE 1:500

1:500

10m 0 10m 20m 30m 40m 50m

tli GROUP

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PROJECT

Lissinagroagh Wind Farm 110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

TOBIN CONSULTING ENGINEERS

NOTES: -

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LEGEND: -

Proposed Cut Volume 13824m³ shown thus

Proposed Fill Volume shown thus

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.26	Issued for Planning
P00	19.12.25	Issued for Planning

PROJECT NUMBER

05-773

SHEET TITLE

Cut & Fill Sections

SHEET NUMBER

05773-DR-151

ISO A1 594mm x 841mm

Map Series:
Prime Data Vector

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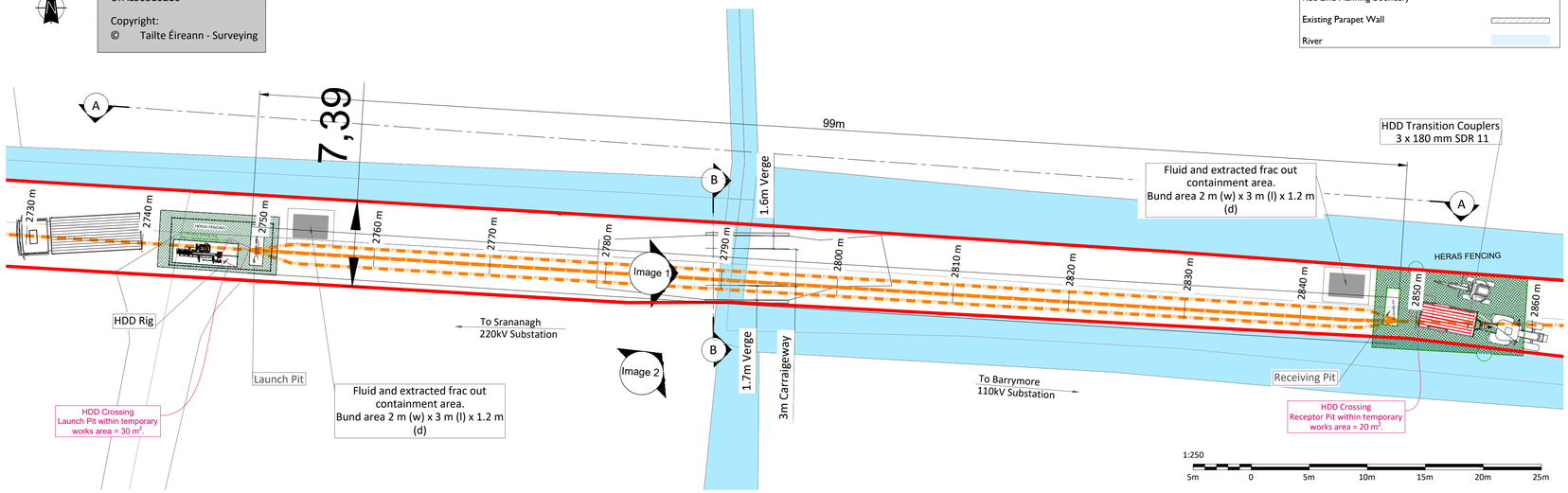
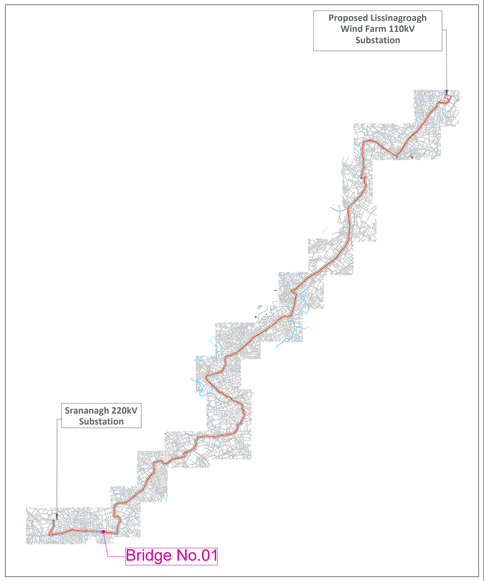
LEGEND:
- Proposed 110kV Grid Connection Underground Cable Route (13.86km)
- Red Line Planning Boundary
- Existing Parapet Wall
- River

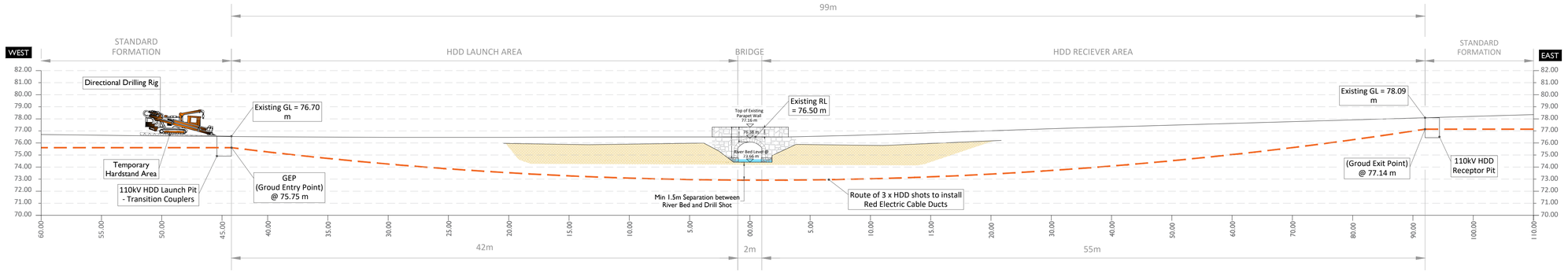




Bridge 01- Layout Plan

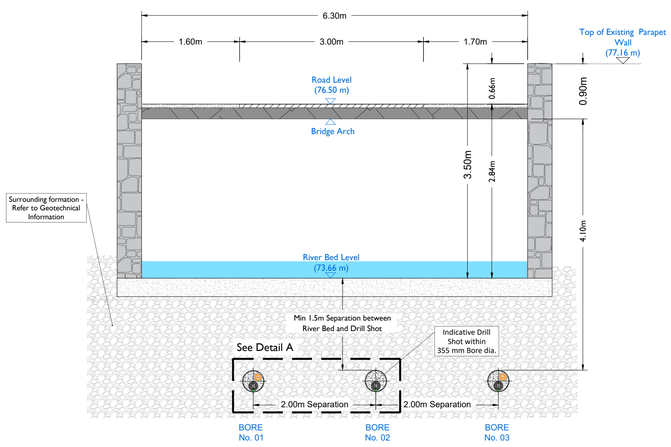
Scale : 1:250

Key Plan



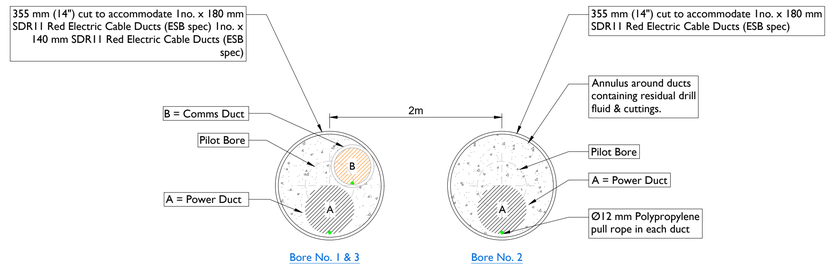
Section A-A (Longitudinal Cross Section)

Scale : 1:500



Section B-B

Scale : 1:200



Detail - A

Scale : 1:10

HDD Schedule	
110kV	Circuit: 3 x 180 SDR 11 Red Electric Ducts; 2 x 140 mm SDR 11 Red Electric Ducts
Entry (GEP) Co-Ordinates	X = 576746.0466 Y = 825037.4060
Exit (GXP) Co-Ordinates	X = 576842.7349 Y = 825032.6410
HDD Length	• Horizontal Distance - 99.00 m • Curve Distance - 99.30 m
All HDD ducts to comply with ESB Specification	



Image - 1



Image - 2

Project Management Initials: Designer: AD Checked: DB Approved: RG

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PROJECT

Lissinagroagh Wind Farm

110kV Grid Connection

CLIENT

FuturEnergy Ireland

CONSULTANTS

NOTES: -

- The proposals are subject to detailed design approval.
- Position of HDD launch/reception points will be selected following site investigations and detailed design.
- Dimensions are in metres, & coordinate system is ITM, unless noted otherwise.
- Drawings are not to be scaled use figured dimensions only.

LEGEND: -

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.2026	Issued for Planning
P00	20.04.2026	Issued for Planning

PROJECT NUMBER

05-773

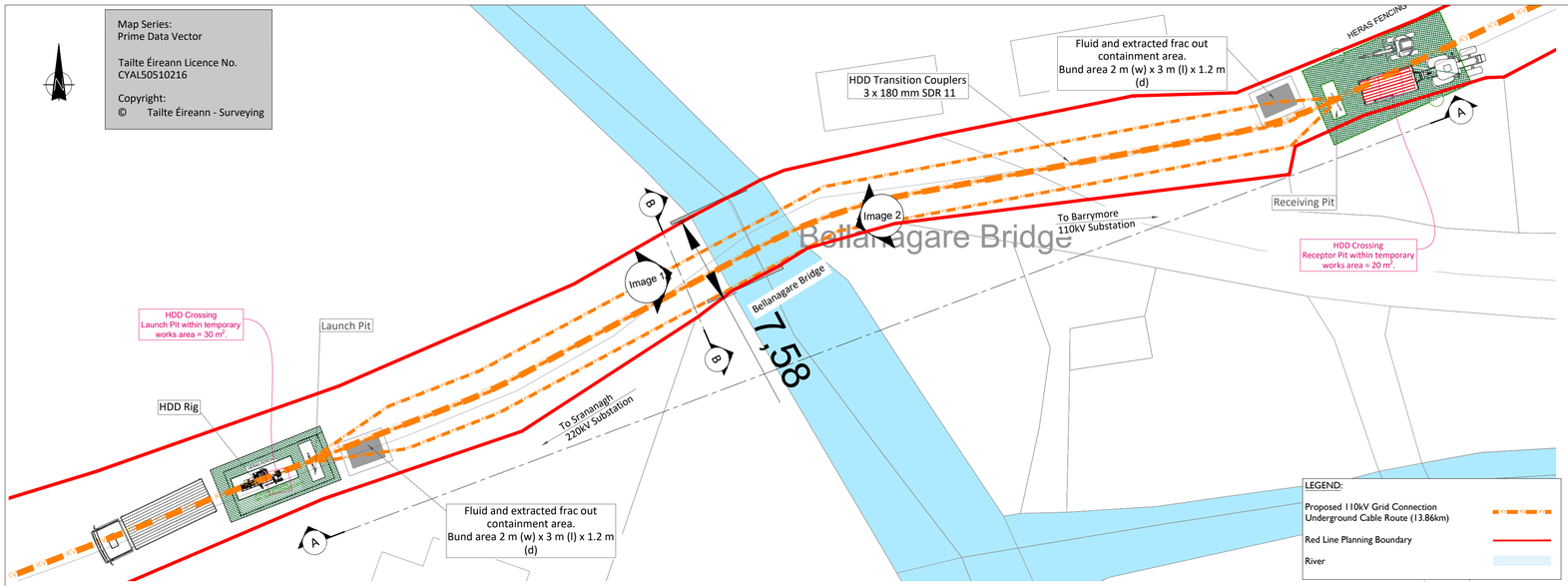
SHEET TITLE

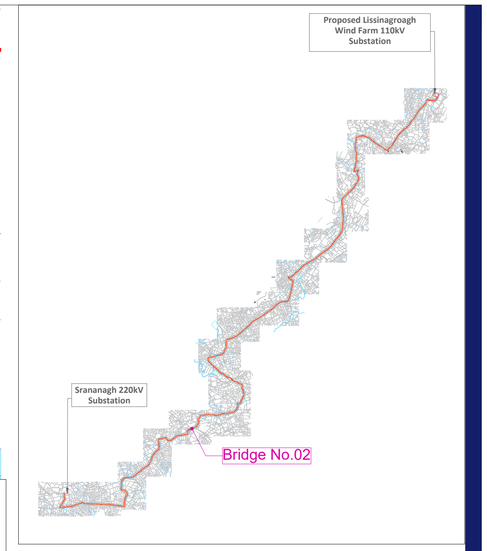
Bridge 01 - HDD Crossing Details
L 5204

SHEET NUMBER

05773-DR-152

ISO A1 594mm x 841mm





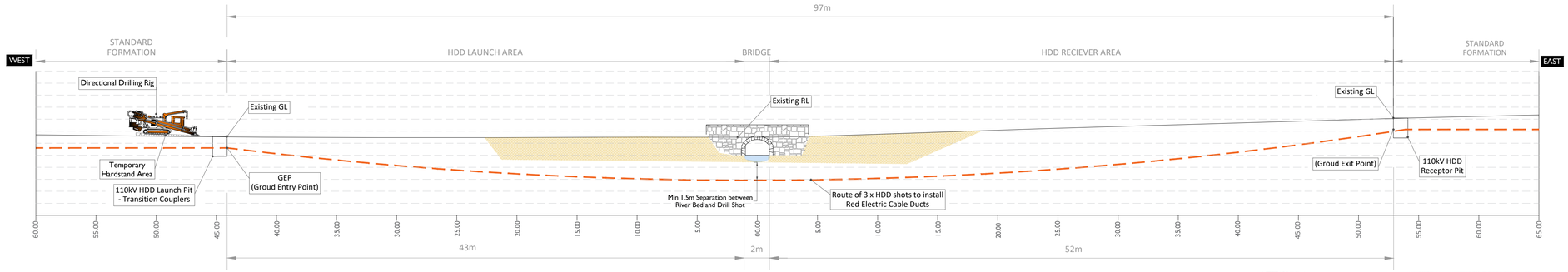
Key Plan

Bridge 02- Layout Plan

Scale : 1:250

1:250

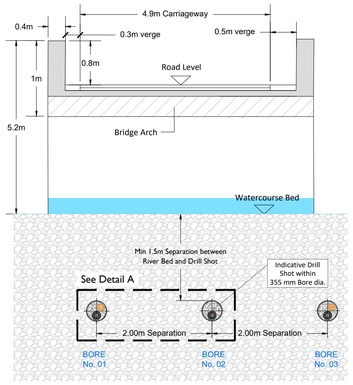
5m 0 5m 10m 15m 20m 25m



Section A-A (Longitudinal Cross Section)

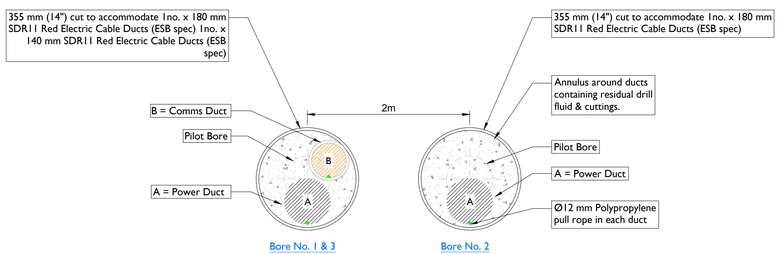
Scale : 1:500

HDD Schedule	
110kV	Circuit 3 x 180 SDR 11 Red Electric Ducts 2 x 140 mm SDR 11 Red Electric Ducts
Entry (GEP) Co-Ordinates	X = 580104.2836, Y = 828183.6384
Exit (GXP) Co-Ordinates	X = 580191.8689 Y = 828214.417
HDD Length	• Horizontal Distance - 99.00 m • Curve Distance - 99.30 m
All HDD ducts to comply with ESB Specification	



Section B-B

Scale : 1:200



Detail - A

Scale : 1:10



Image - 1



Image - 2

Project Management Initials: Designer: AD Checked: DB Approved: RG

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PROJECT

Lissinagroagh Wind Farm

110kV Grid Connection

CLIENT

FuturEnergy Ireland

CONSULTANTS

NOTES: -

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LEGEND: -

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.2026	Issued for Planning
P00	20.04.2026	Issued for Planning

PROJECT NUMBER

05-773

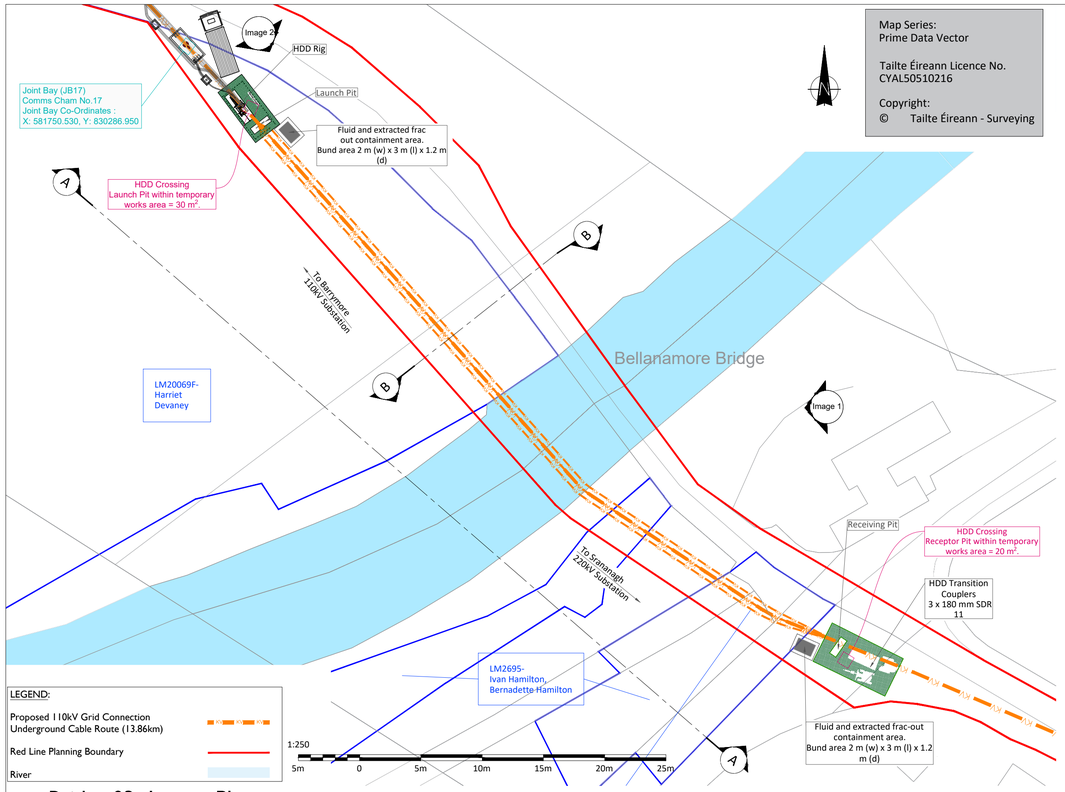
SHEET TITLE

Bridge 02 - HDD Crossing Details
L 4263/ L 82561

SHEET NUMBER

05773-DR-153

ISO A1 594mm x 841mm



Bridge 03- Layout Plan

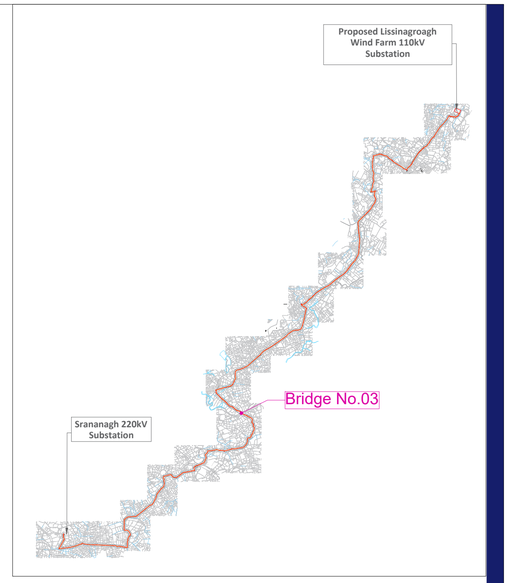
Scale : 1:250



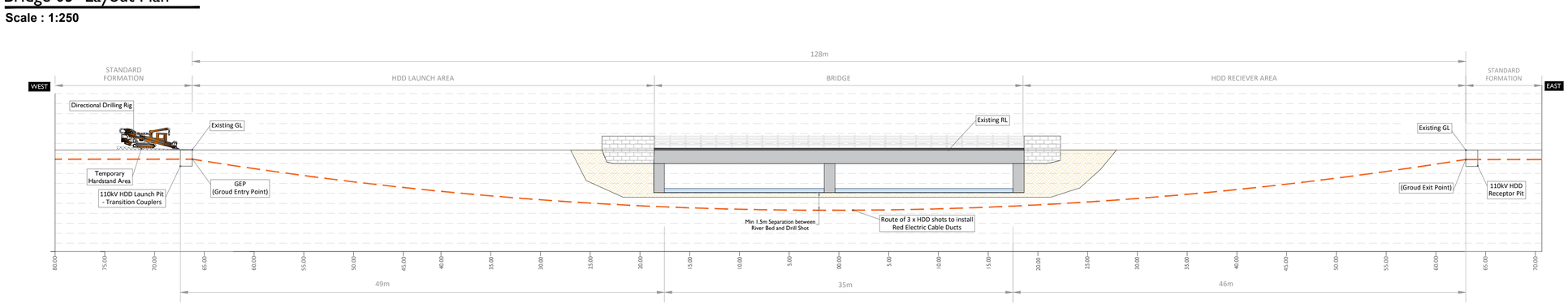
Image - 1



Image - 2

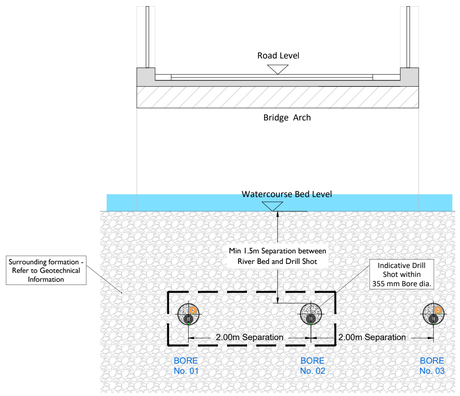


Key Plan



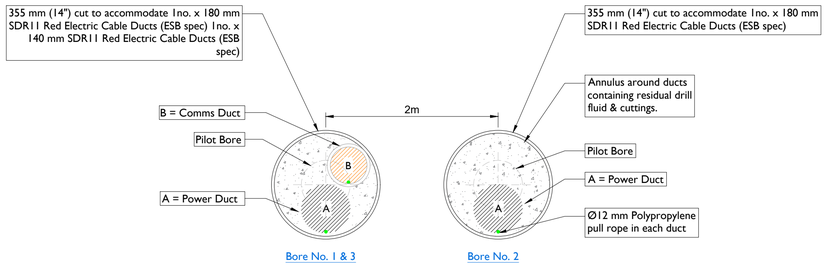
Section A-A (Longitudinal Cross Section)

Scale : 1:500



Section B-B

Scale : 1:200



Detail - A

Scale : 1:10

HDD Schedule	
110kV	Circuit: 3 x 180 SDR 11 Red Electric Ducts; 2 x 140 mm SDR 11 Red Electric Ducts
Entry (GEP) Co-Ordinates	X = 581762.8525 Y = 830273.6023
Exit (GXP) Co-Ordinates	X = 581856.2444 Y = 830189.1720
HDD Length	• Horizontal Distance - 128.0 m • Curve Distance - 128.53 m
All HDD ducts to comply with ESB Specification	

tli GROUP

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PROJECT

Lissinagroagh Wind Farm

110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

NOTES: -

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LEGEND: -

ISSUE/REVISION

P01	21.04.2026	Issued for Planning
P00	20.04.2026	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

SHEET TITLE

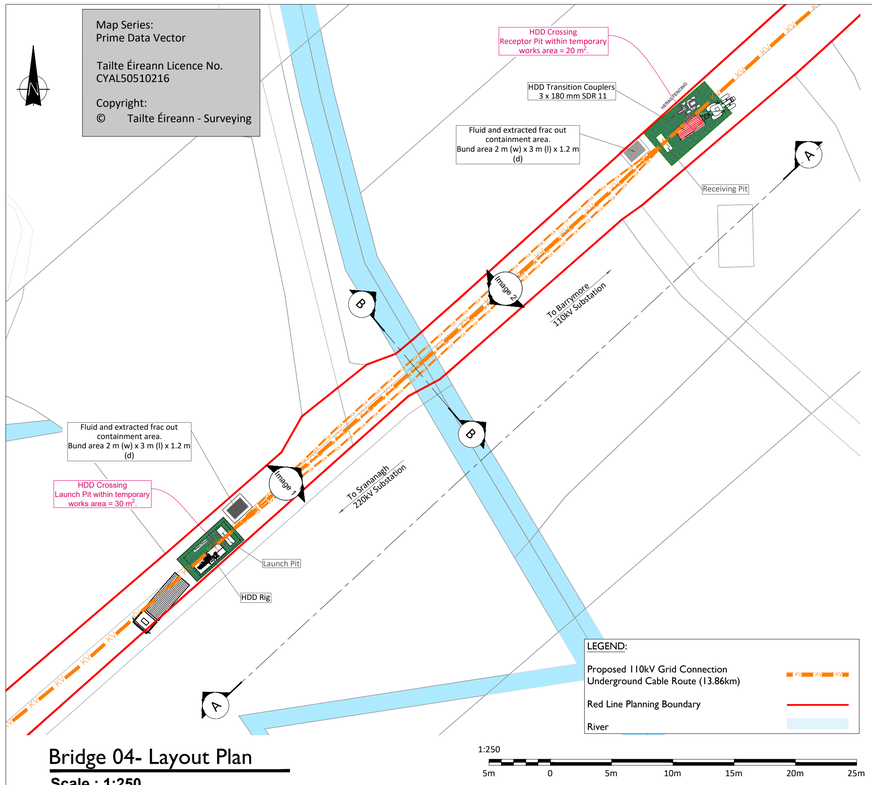
Bridge 03- HDD Crossing Details
R 289/ R287 / LM20069F

SHEET NUMBER

05773-DR-154

Project Management Initials: Designer: AD Checked: DB Approved: RG

ISO A1 594mm x 841mm



Bridge 04- Layout Plan

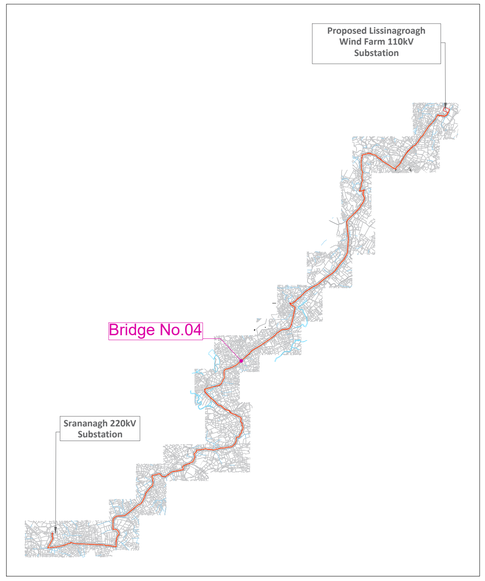
Scale : 1:250



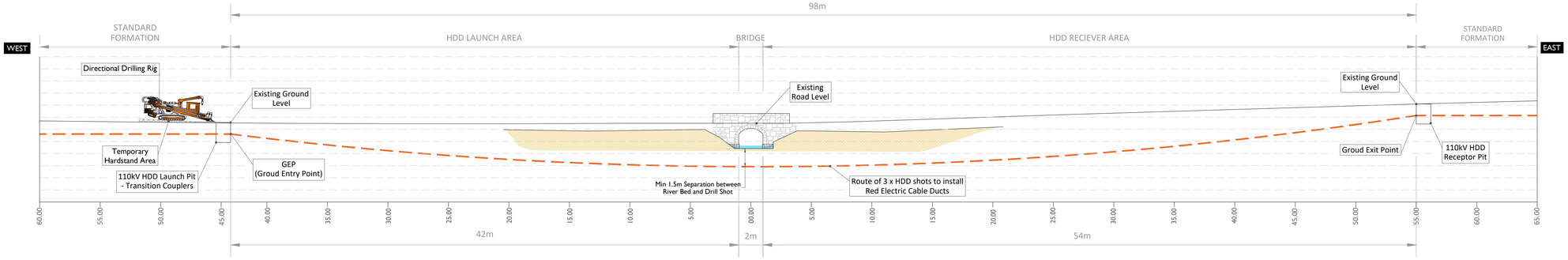
Image - 1



Image - 2

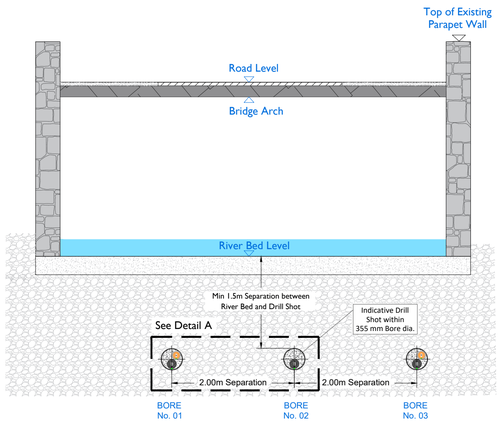


Key Plan



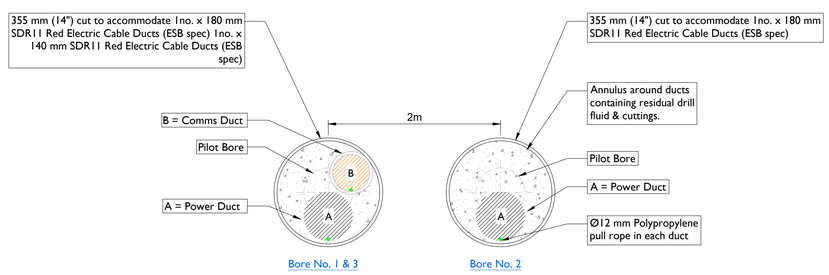
Section A-A

Scale : 1:500



Section B-B

Scale : 1:200



Detail - A

Scale : 1:10

HDD Schedule	
110kV	Circuit
	3 x 180 SDR 11 Red Electric Ducts 2 x 140 mm SDR 11 Red Electric Ducts
Entry (GEP) Co-Ordinates	X = 582207.8199 Y = 832214.2730
Exit (GXP) Co-Ordinates	X = 582278.4462 Y = 832277.7238
HDD Length	• Horizontal Distance - 99.00 m • Curve Distance - 99.30 m
All HDD ducts to comply with ESB Specification	

tli GROUP

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Tralee, Co. Kerry
Ireland
Tel: 00353 66 7135710

PROJECT

Lissinagroagh Wind Farm

110kV Grid Connection

CLIENT

FuturEnergy Ireland

CONSULTANTS

NOTES: -

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LEGEND: -

ISSUE/REVISION

P01	21.04.2026	Issued for Planning
P00	20.04.2026	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

SHEET TITLE

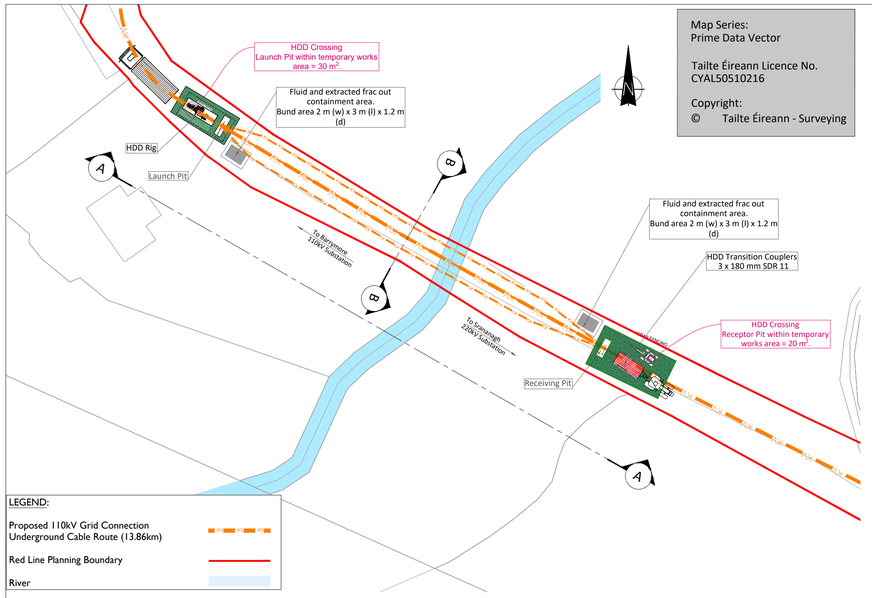
Bridge 04 - HDD Crossing Details
L 4166

SHEET NUMBER

05773-DR-155

Project Management Initials: Designer: AD Checked: DB Approved: RG

ISO A1 594mm x 841mm

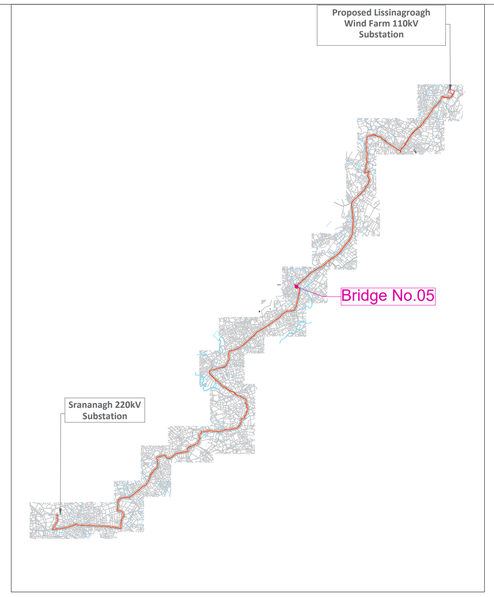


Bridge 05- Layout Plan

Scale : 1:250

1:250

5m 0 5m 10m 15m 20m 25m



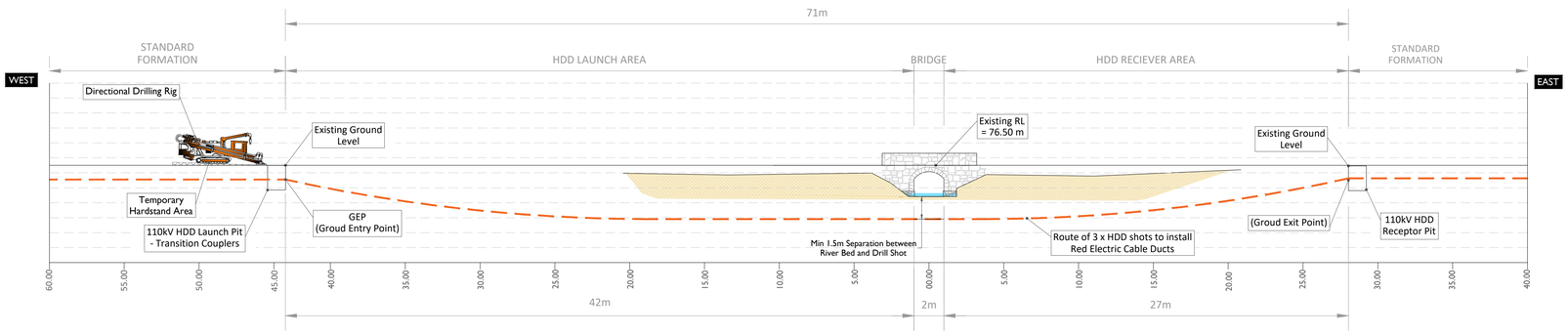
Key Plan



Image - 1

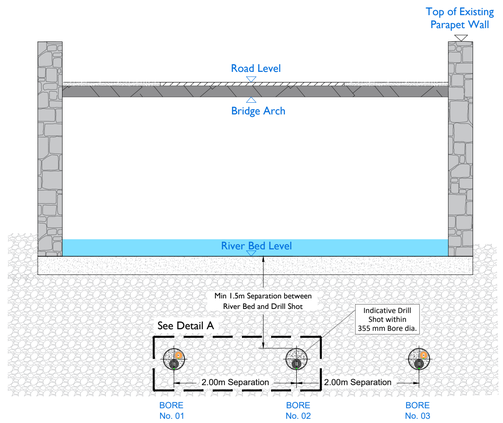


Image - 2



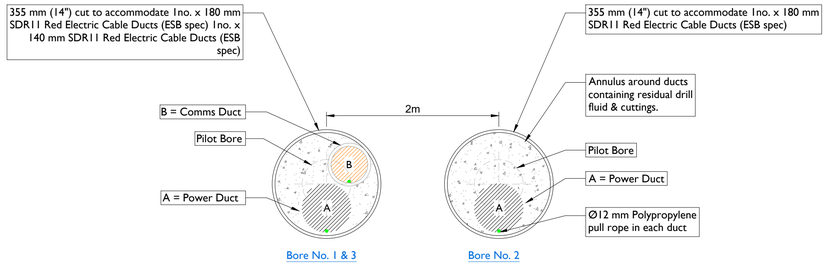
Section A-A

Scale : 1:500



Section B-B

Scale : 1:200



Detail - A

Scale : 1:10

HDD Schedule	
110kV	Circuit
	3 x 180 SDR 11 Red Electric Ducts 2 x 140 mm SDR 11 Red Electric Ducts
Entry (GEP) Co-Ordinates	X = 584181.9915 Y = 834440.2383
Exit (GXP) Co-Ordinates	X = 584243.2297 Y = 834404.6224
HDD Length	• Horizontal Distance - 71.00 m • Curve Distance - 71.40 m
All HDD ducts to comply with ESB Specification	

tli GROUP

Head Office
Beenreigh,
Abbeydorney,
Tralee, Co. Kerry
Ireland
Tel: 00353 66 7135710

PROJECT

Lissinagroagh Wind Farm

110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

NOTES: -

- The proposals are subject to detailed design approval.
- Position of HDD launch/reception points will be selected following site investigations and detailed design.
- Dimensions are in metres, & coordinate system is ITM, unless noted otherwise.
- Drawings are not to be scaled use figured dimensions only.

LEGEND: -

ISSUE/REVISION

P01	21.04.2026	Issued for Planning
P00	20.04.2026	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

SHEET TITLE

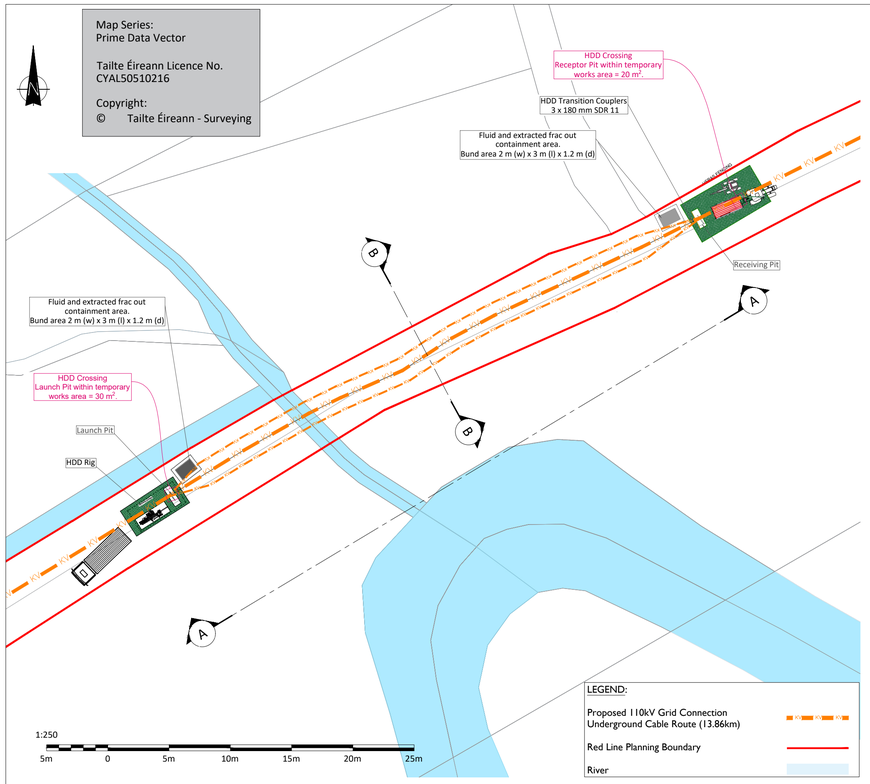
Bridge 05 - HDD Crossing Details
L 4166

SHEET NUMBER

05773-DR-156

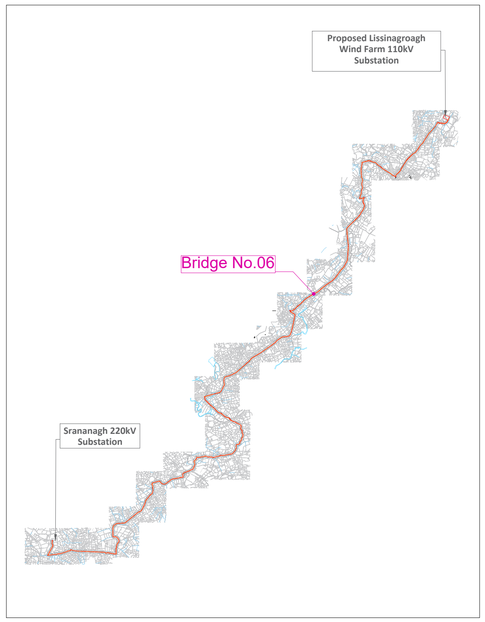
Project Management Initials: Designer: AD Checked: DB Approved: RG

ISO A1 594mm x 841mm



Bridge 06- Layout Plan

Scale : 1:250



Key Plan

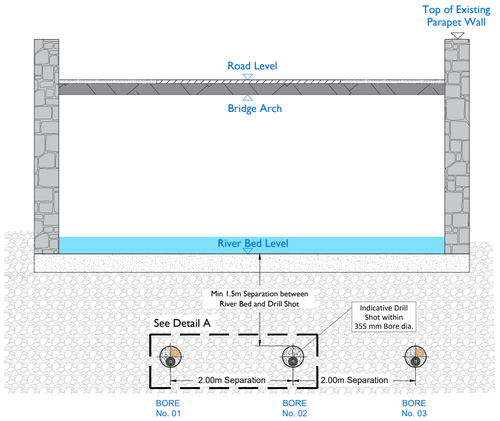


Image - 1

Section A-A (Longitudinal Cross Section)

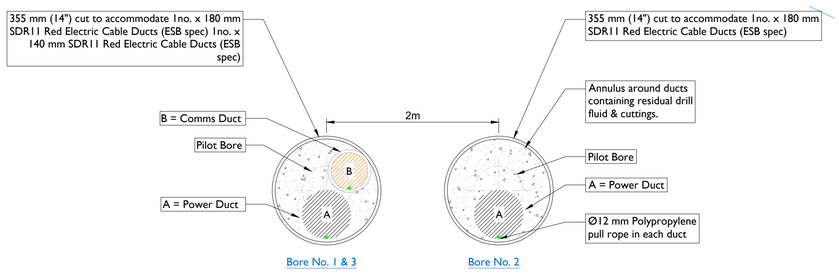
Scale : 1:500

HDD Schedule	
110kV	Circuit
	3 x 180 SDR 11 Red Electric Ducts 2 x 140 mm SDR 11 Red Electric Ducts
Entry (GEP) Co-Ordinates	X = 586386.0773 Y = 837729.9947
Exit (GXP) Co-Ordinates	X = 586445.4520 Y = 837795.5899
HDD Length	• Horizontal Distance - 96 m • Curve Distance - 96.3 m
All HDD ducts to comply with ESB Specification	



Section B-B

Scale : 1:200



Detail - A

Scale : 1:10

Project Management Initials: Designer: AD Checked: DB Approved: RG

tli GROUP

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Beenreigh,
Abbeydorney,
Tralee, Co. Kerry
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Tel: 00353 66 7135710

PROJECT

Lissinagroagh Wind Farm

110kV Grid Connection

CLIENT

FuturEnergy Ireland

CONSULTANTS

NOTES: -

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- Drawings are not to be scaled use figured dimensions only.

LEGEND: -

ISSUE/REVISION

P01	21.04.2026	Issued for Planning
P00	20.04.2026	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

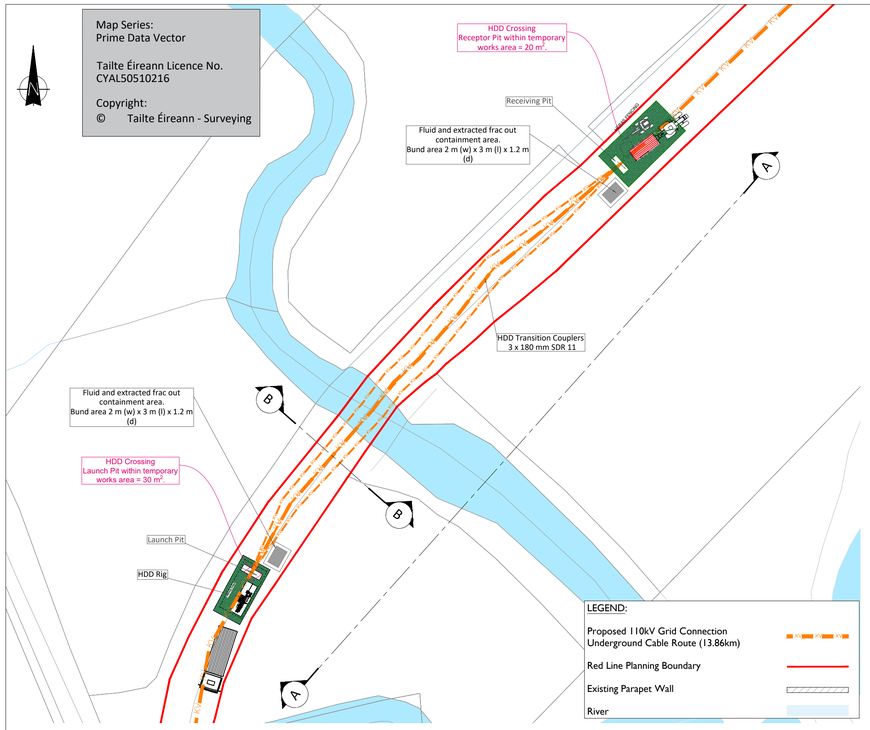
SHEET TITLE

Bridge 06 - HDD Crossing Details
L 5204

SHEET NUMBER

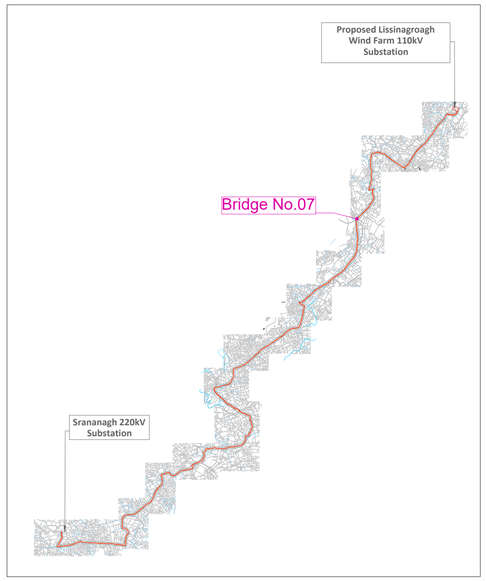
05773-DR-157

ISO A1 594mm x 841mm



Bridge 07- Layout Plan

Scale : 1:250



Key Plan



Image - 1

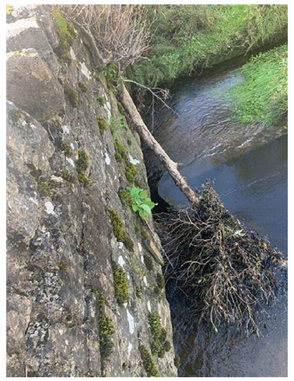
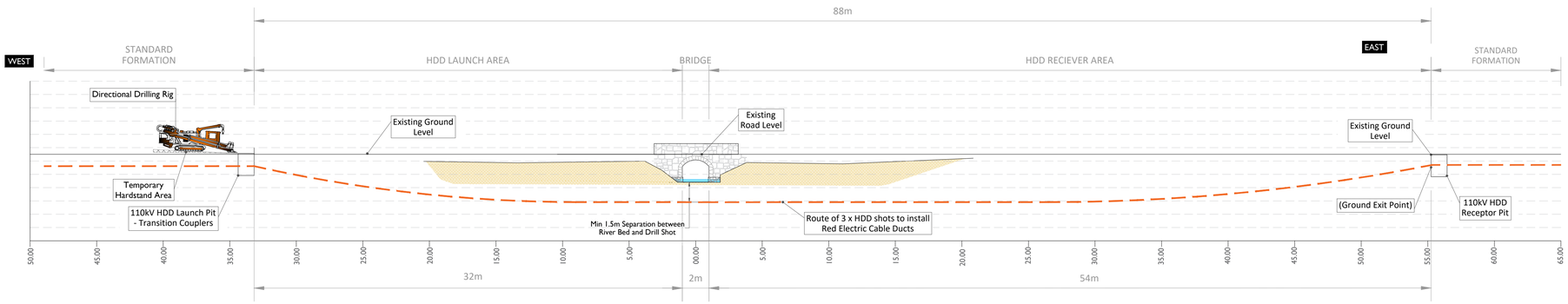


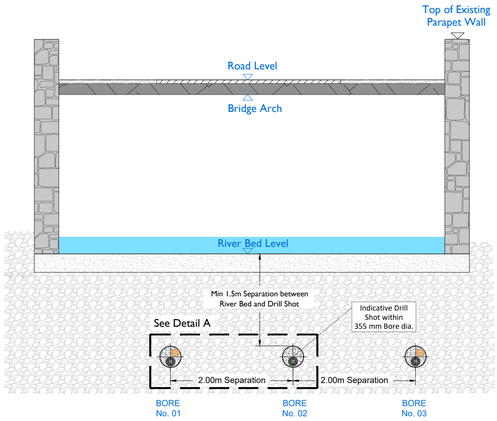
Image - 2



Section A-A (Longitudinal Cross Section)

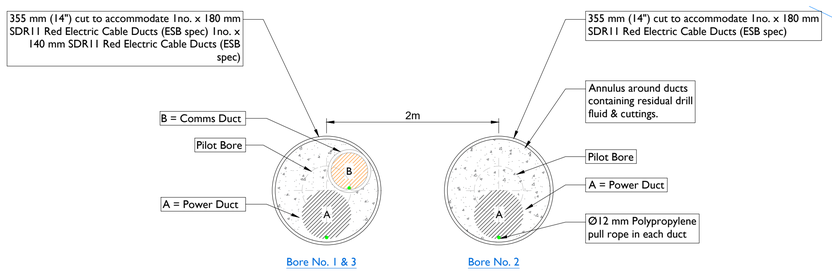
Scale : 1:500

HDD Schedule	
110kV	Circuit
	3 x 180 SDR 11 Red Electric Ducts 2 x 140 mm SDR 11 Red Electric Ducts
Entry (GEP) Co-Ordinates	X = 586386.0773 Y = 837729.9947
Exit (GXP) Co-Ordinates	X = 586445.4520 Y = 837795.5899
HDD Length	• Horizontal Distance - 96 m • Curve Distance - 96.3 m
All HDD ducts to comply with ESB Specification	



Section B-B

Scale : 1:200



Detail - A

Scale : 1:10

Project Management Initials: Designer: AD Checked: DB Approved: RG

tli GROUP

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Abbeydorney,
Tralee, Co. Kerry
Ireland
Tel: 00353 66 7135710

PROJECT

Lissinagroagh Wind Farm

110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

NOTES: -

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LEGEND: -

ISSUE/REVISION

P01	21.04.2026	Issued for Planning
P00	20.04.2026	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-773

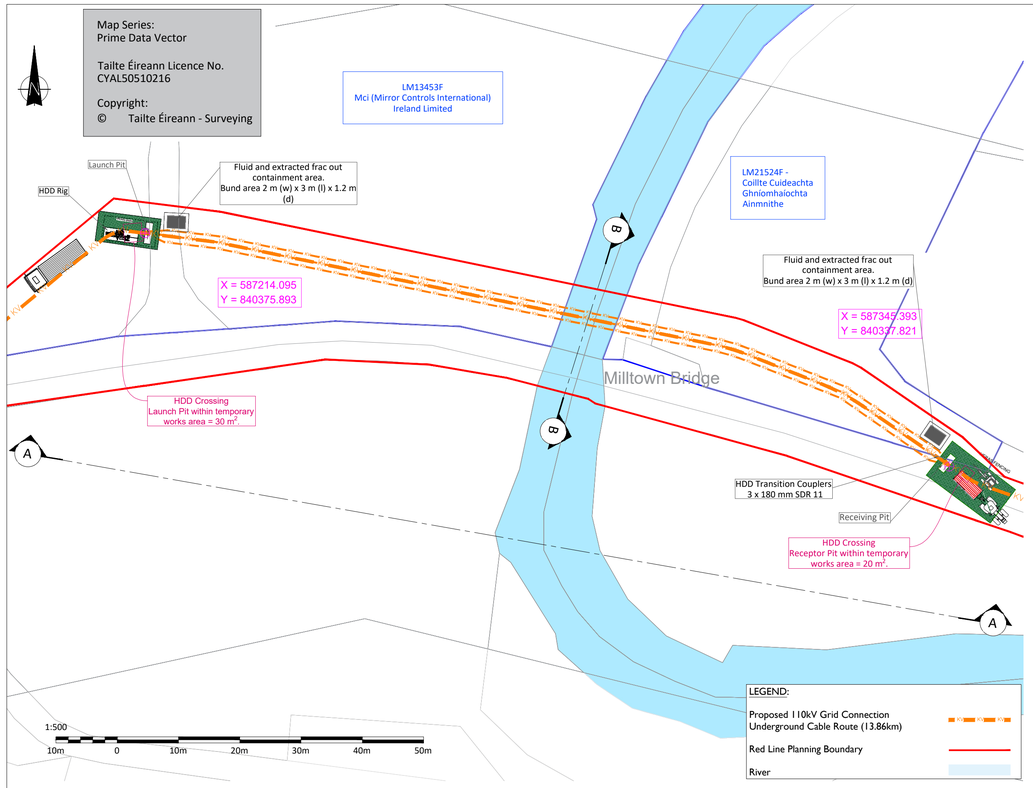
SHEET TITLE

Bridge 07 - HDD Crossing Details
L 5204

SHEET NUMBER

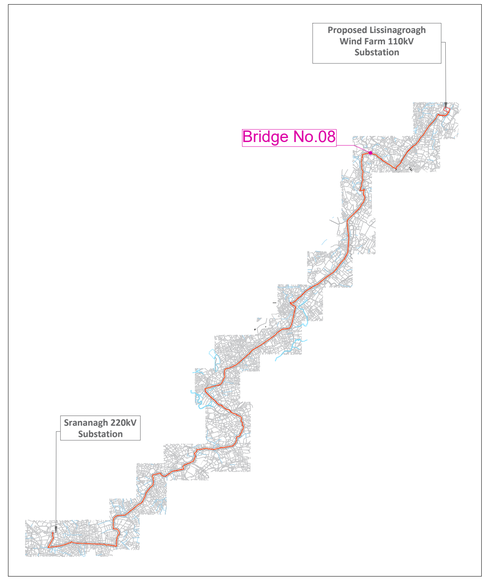
05773-DR-158

ISO A1 594mm x 841mm



Bridge 08- Layout Plan

Scale : 1:500



Key Plan



Image - 1

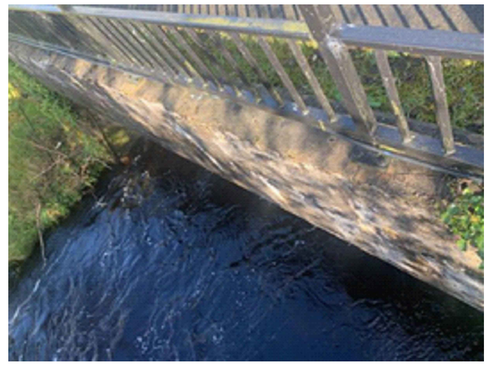
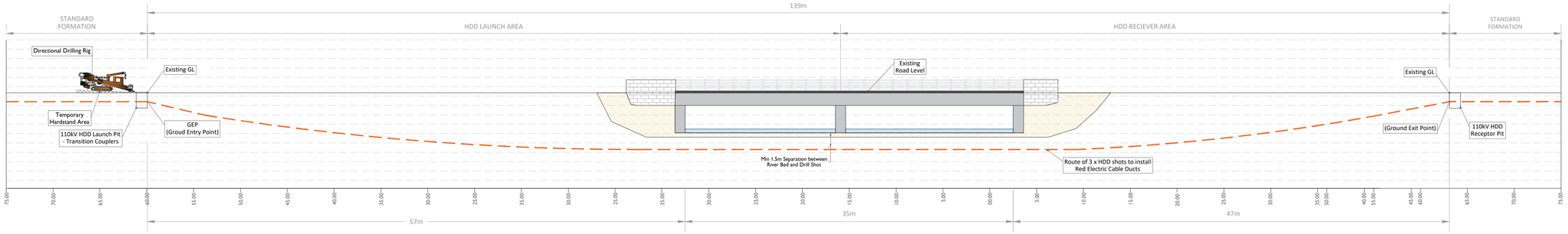
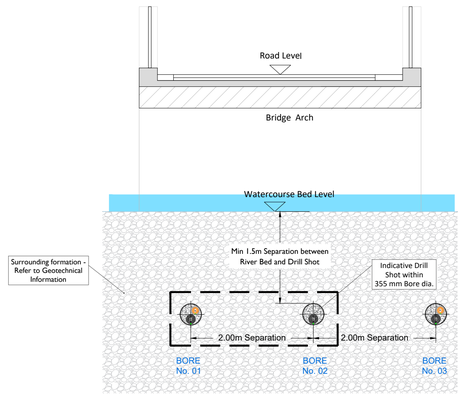


Image - 2



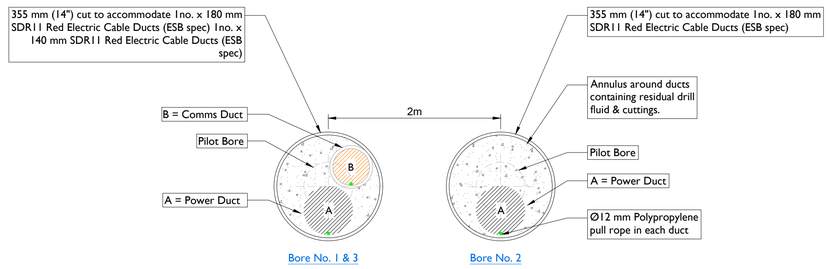
Section A-A

Scale : 1:250



Section B-B

Scale : 1:200



Detail - A

Scale : 1:10

HDD Schedule	
110kV	Circuit
	3 x 180 SDR 11 Red Electric Ducts 2 x 140 mm SDR 11 Red Electric Ducts
Entry (GEP) Co-Ordinates	X = 587215.2388 Y = 840375.7501
Exit (GXP) Co-Ordinates	X = 587344.4927 Y = 840338.6559
HDD Length	• Horizontal Distance - 139 m • Curve Distance - 139.72 m
All HDD ducts to comply with ESB Specification	

Project Management Initials: Designer: AD Checked: DB Approved: RG

tli GROUP

Head Office
Beenreigh,
Abbeydorney,
Tralee, Co. Kerry
Ireland
Tel: 00353 66 7135710

PROJECT

Lissinagroagh Wind Farm

110kV Grid Connection

CLIENT

FuturEnergy Ireland

CONSULTANTS

NOTES: -

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LEGEND: -

ISSUE/REVISION

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P00	20.04.2026	Issued for Planning
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PROJECT NUMBER

05-773

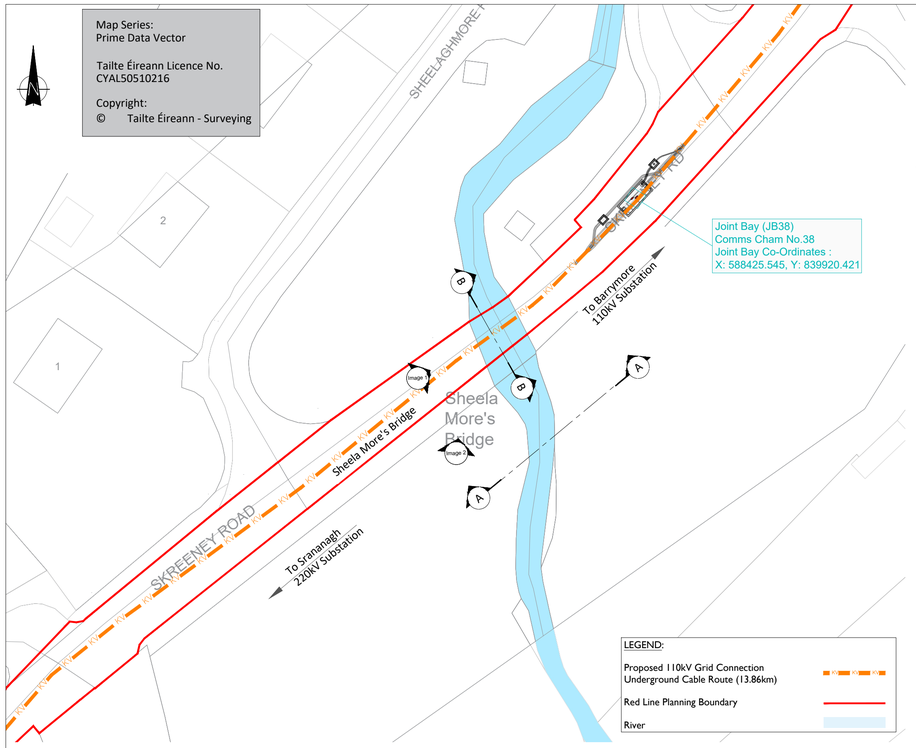
SHEET TITLE

Bridge 08 - HDD Crossing Details
L 2136

SHEET NUMBER

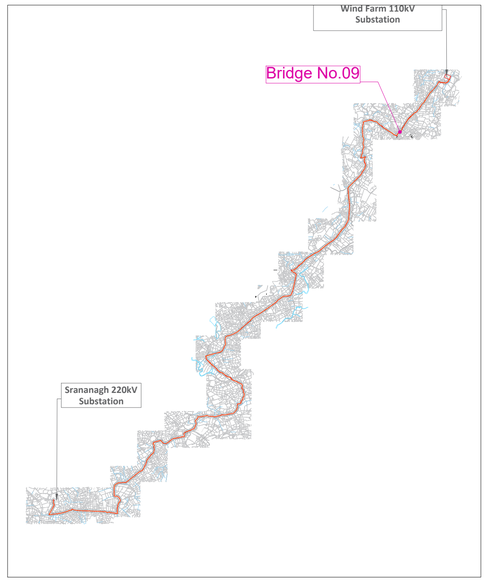
05773-DR-159

ISO A1 594mm x 841mm



Bridge 09- Layout Plan

Scale : 1:500



Key Plan



Image - 1

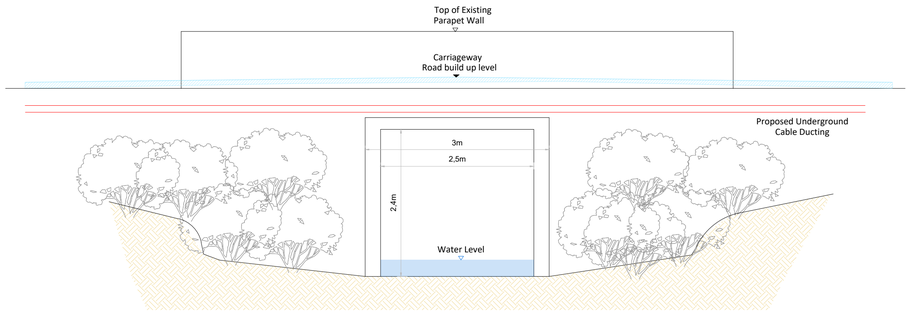


Image - 2

PARAPET WALL BUILD UP
To match existing parapet construction
(Subject to Kilkenny CoCo approval)

Section A-A

Scale : 1:250



Section B-B

Scale : 1:250



Detail - A

Scale : 1:10

Project Management Initials: Designer: AD Checked: DB Approved: RG

tli GROUP

Head Office
Beenreigh,
Abbeydorney,
Tralee, Co. Kerry
Ireland
Tel: 00353 66 7135710

PROJECT

Lissinagroagh Wind Farm

110kV Grid Connection

CLIENT

FuturEnergy Ireland

CONSULTANTS

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LEGEND: -

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.2026	Issued for Planning
P00	20.04.2026	Issued for Planning

PROJECT NUMBER

05-773

SHEET TITLE

Bridge 09 - Crossing Details
R 282

SHEET NUMBER

05773-DR-160

ISO A1 594mm x 841mm

Map Series:
Prime Data Vector

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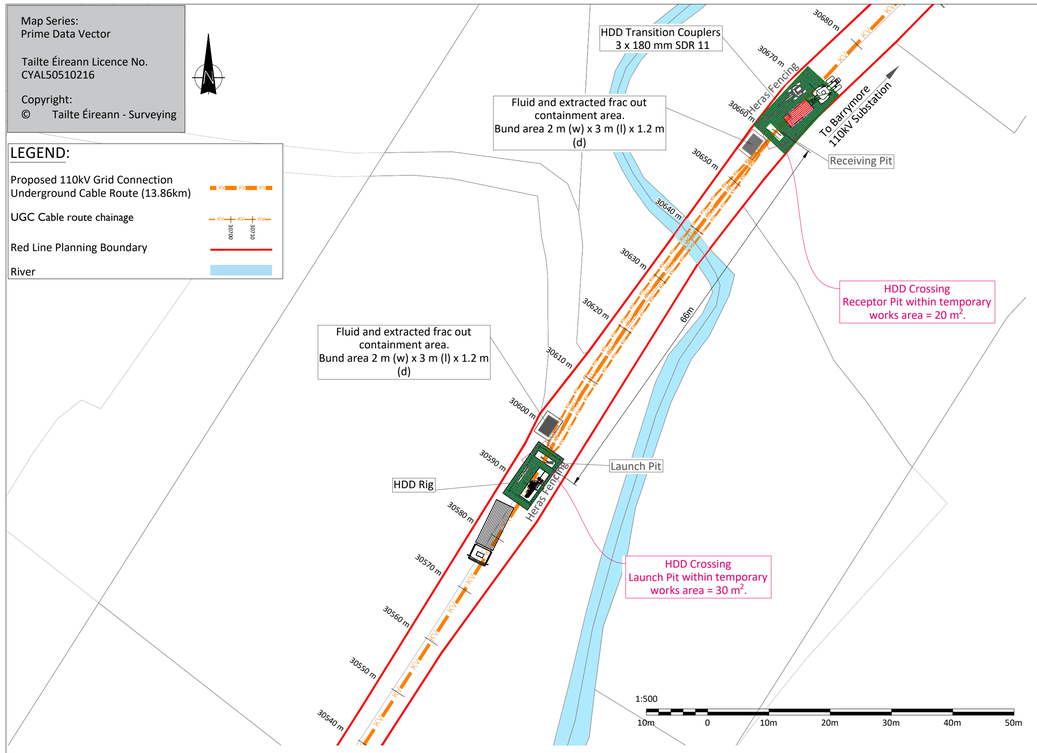
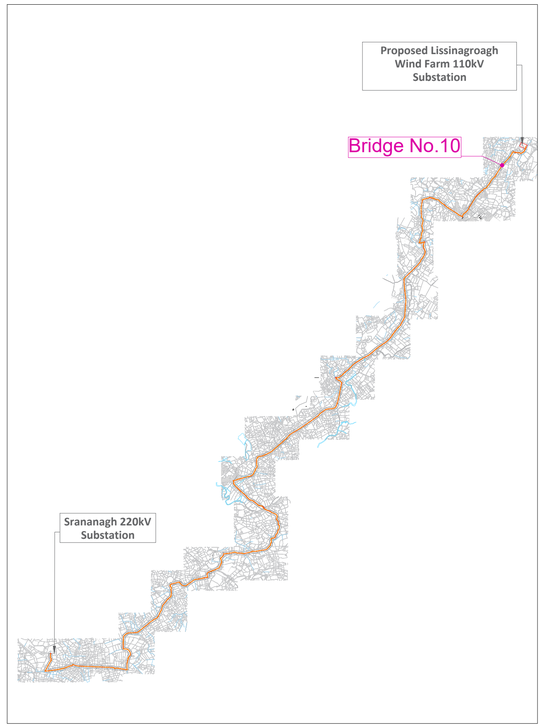
LEGEND:

- Proposed 110kV Grid Connection Underground Cable Route (13.86km)
- UGC Cable route chainage
- Red Line Planning Boundary
- River



Bridge 10- Layout Plan

Scale : 1:500



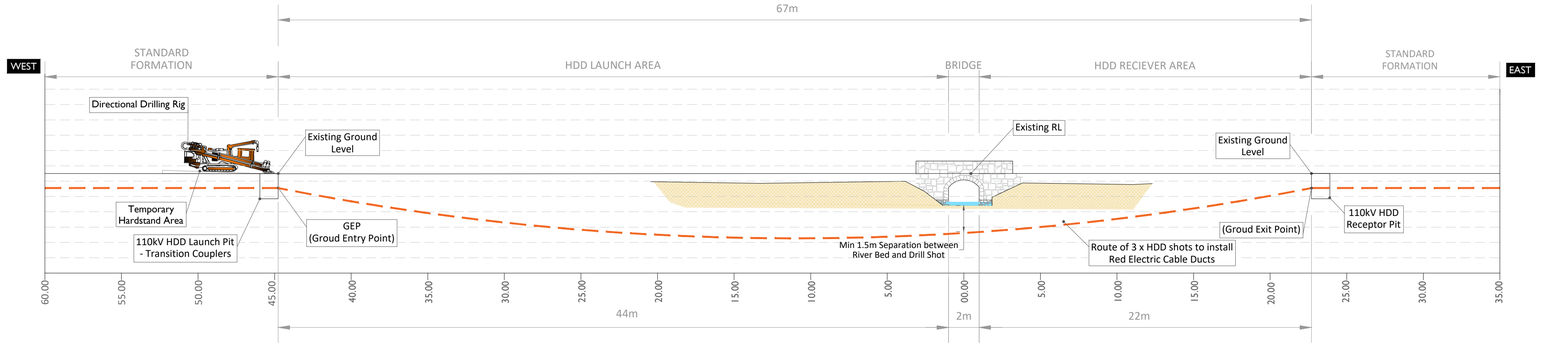
Key Plan



Image - 1



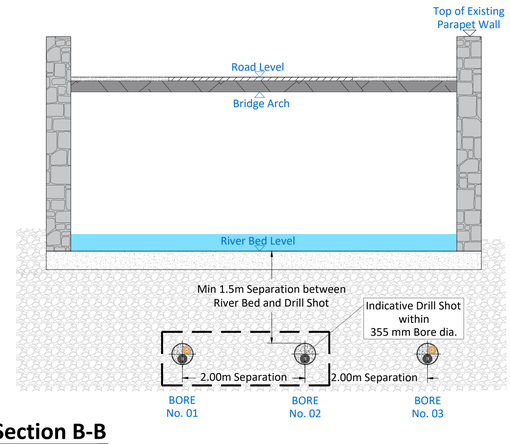
Image - 2



Section A-A (Longitudinal Cross Section)

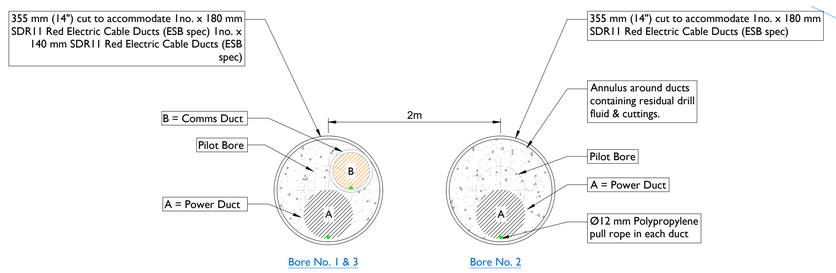
Scale : 1:500

HDD Schedule	
	Circuit
110kV	3 x 180 SDR 11 Red Electric Ducts 2 x 140 mm SDR 11 Red Electric Ducts
Entry (GEP) Co-Ordinates	X = 589555.3235 Y = 841387.3884
Exit (GXP) Co-Ordinates	X = 589593.5549 Y = 841441.7086
HDD Length	• Horizontal Distance - 67.00 m • Curve Distance - 67.88 m
All HDD ducts to comply with ESB Specification	



Section B-B

Scale : 1:200



Detail - A

Scale : 1:10

Head Office
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Tel: 00353 66 7135710

PROJECT

Lissinagroagh Wind Farm
110kV Grid Connection

CLIENT

Ireland FuturEnergy

CONSULTANTS

NOTES: -

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LEGEND: -

- Proposed 110kV Grid Connection Underground Cable Route (13.86km)
- Red Line Planning Boundary
- River

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.2026	Issued for Planning
P00	20.04.2026	Issued for Planning

PROJECT NUMBER

05-773

SHEET TITLE

Bridge 10 - HDD Crossing Details
L 6180

SHEET NUMBER

05773-DR-161

Project Management Initials: Designer: NS Checked: GS Approved: DB

ISO A1 594mm x 841mm

Map Series:
Prime Data Vector

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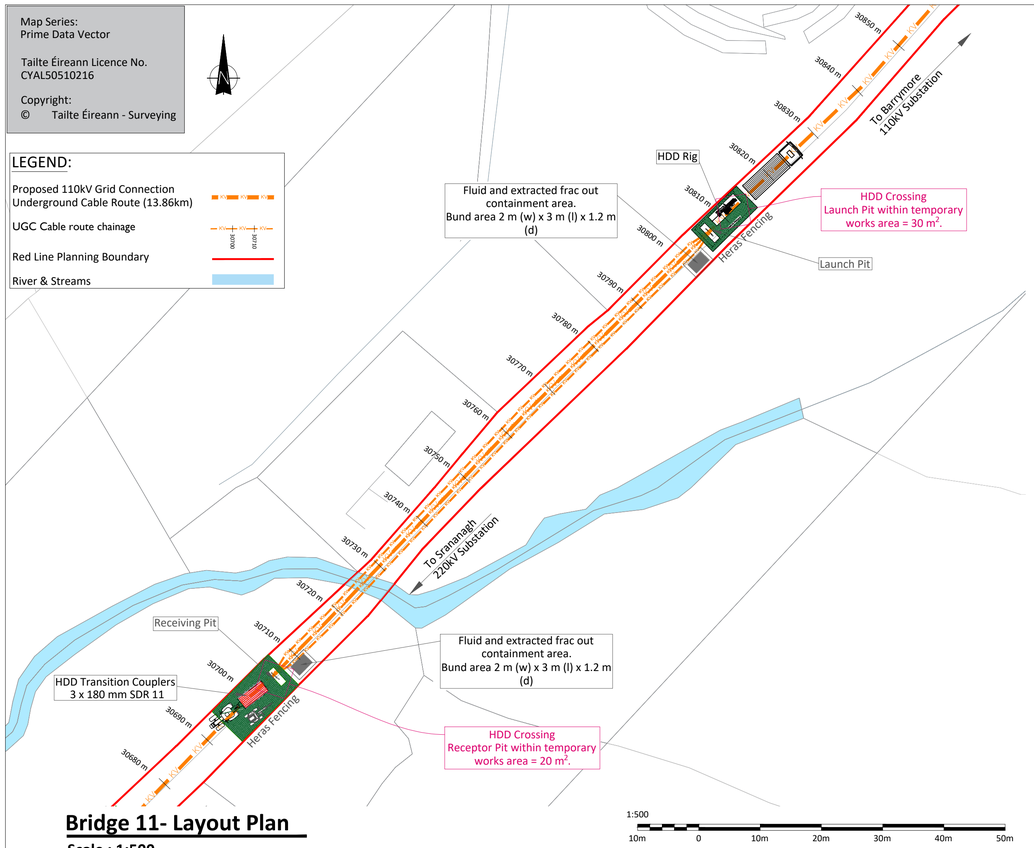
LEGEND:

Proposed 110kV Grid Connection Underground Cable Route (13.86km)

UGC Cable route chainage

Red Line Planning Boundary

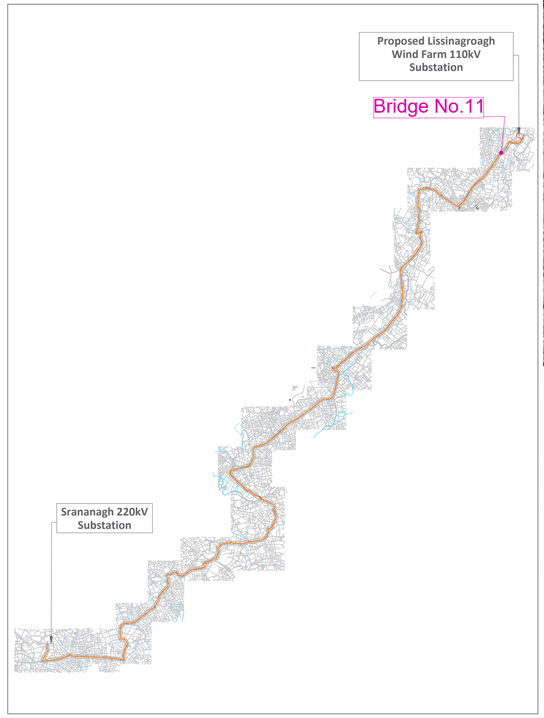
River & Streams



Bridge 11- Layout Plan

Scale : 1:500

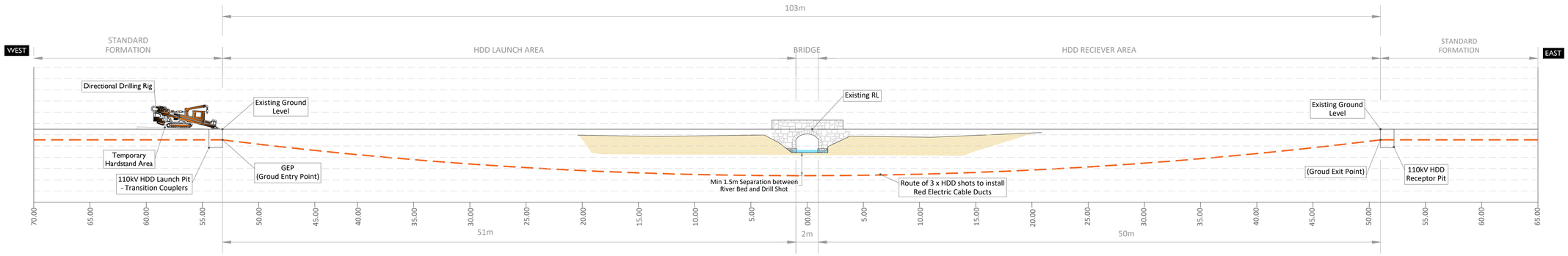
1:500
10m 0 10m 20m 30m 40m 50m



Key Plan



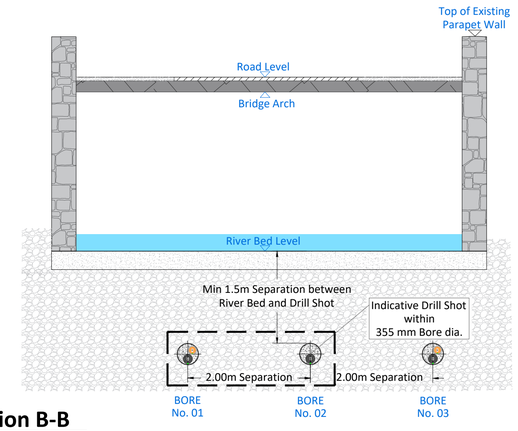




Section A-A (Longitudinal Cross Section)

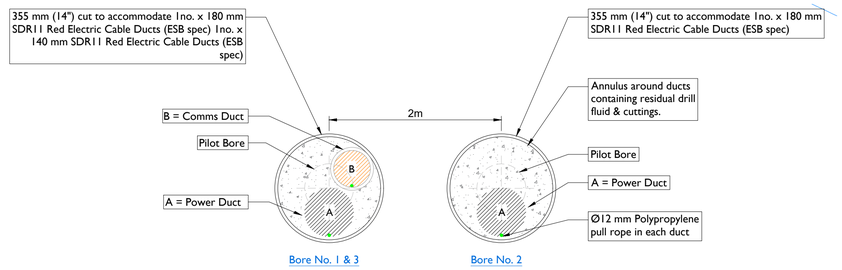
Scale : 1:500

HDD Schedule	
	Circuit
110kV	3 x 180 SDR 11 Red Electric Ducts 2 x 140 mm SDR 11 Red Electric Ducts
Entry (GEP) Co-Ordinates	X = 589695.7560 Y = 841546.0484
Exit (GXP) Co-Ordinates	X = 589624.4280 Y = 841472.7055
HDD Length	• Horizontal Distance - 103.00 m • Curve Distance - 103.26 m
All HDD ducts to comply with ESB Specification	



Section B-B

Scale : 1:200



Detail - A

Scale : 1:10

Project Management Initials: Designer: NS Checked: GS Approved: DB

tli GROUP

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Beenreigh,
Abbeydorney,
Tralee, Co. Kerry
Ireland
Tel: 00353 66 7135710

PROJECT

Lissinagroagh Wind Farm
110kV Grid Connection

CLIENT

FuturEnergy Ireland

CONSULTANTS

NOTES: -

- The proposals are subject to detailed design approval.
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- Drawings are not to be scaled use figured dimensions only.

LEGEND: -

Proposed 110kV Grid Connection Underground Cable Route (13.86km)

Red Line Planning Boundary

River & Streams

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	21.04.2026	Issued for Planning
P00	20.04.2026	Issued for Planning

PROJECT NUMBER

05-773

SHEET TITLE

Bridge 11 - HDD Crossing Details
L 6180

SHEET NUMBER

05773-DR-162

Appendix 2-3

Substation & Grid Connection Construction Methodology

CONSTRUCTION METHODOLOGY

Lissinagroagh Wind Farm - 110kV Substation & Grid Connection

Document No: 05773-R01-03

Client: FuturEnergy Ireland (FEI) C/o Tobin Consulting

Revision:	Author:	Checked:	Date:	Notes:
00	POS	DB	28.04.22	*Issued for Client Review*
01	GS	DB	16.01.26	*Issued for Client Review*
02	JM	DB	09.02.26	*Issued for Planning*
03	GS	DB	20.04.26	*Issued for Planning*

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1.0 Introduction

The purpose of this document is to outline and explain the construction techniques and methodologies which will be implemented during construction of the proposed Lissinagroagh Wind Farm 110kV substation and grid connection to the existing Srananagh 220kV substation. The grid connection will consist entirely of underground cabling (UGC) with the majority of the UGC to be installed within the public road network.

The proposed 110kV substation and grid connection will be subject to a Strategic Infrastructure Development (SID) application to An Coimisiún Pleanála under Section 182A of the Planning and Development Act 2000 (as amended).

This document outlines the methodologies and techniques to be employed during the construction of the substation and grid connection and should be read in conjunction with the Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) which accompany the planning application.

2.0 110kV Substation

The proposed 110kV substation will be designed and constructed to meet all the required EirGrid standards and specifications. The substation will be constructed in the southwest of the site near the L61801 site entrance within an area that is currently part of the commercial forestry plantation. The trees will be cleared and the required area will be levelled and built to the required level with stone fill material, capped by high quality compacted stone.

The IPP and EirGrid control buildings will be constructed using traditional techniques for constructing small buildings (i.e. concrete block walls, timber and slate tile roof). Foundations will be built for all the proposed electrical infrastructure. All the electrical equipment will be installed to EirGrid requirements. Perimeter fencing will be constructed around the substation compound for security and safety purposes.

The Substation will comprise 1 No. Control building, 1 No. Independent Power Producer (IPP) Medium Voltage (MV) Switch room, Transformer compound and Busbar compound.

The control building works will consist of foundation works, block work, roofing, low voltage electrical fit out, cladding and building finishing works. The transformer, gantry and structural steelwork will be installed in the transformer compound. Two cable sealing ends will be installed to incorporate the radial underground circuits in and out of the station. The busbar compound structural steelwork will be erected with lightning masts also installed. Substation electrical equipment will be installed once the control building and compound is complete. Fencing will be erected around the compound for security/protection. Permanent access tracks will also be installed to allow trafficking in and out of the proposed substation compound, access road to loop in interface mast structures and internal access track for compound use.

The expected duration of works is to be approximately 12 months.

The following section outlines the methodology to be followed during construction:

1. This new substation will be in a compound of circa 145m x 80m (9.854 m^2) plan area secured by a 2.6m high palisade fence.
2. The substation compound and drainage will be marked out by a qualified engineer.
3. A drainage system will be excavated and installed around the compound area.
4. Topsoil and subsoil will be removed from the footprint of the compound using an excavator. The excavated material will be temporarily stored in adjacent berms for later use during reinstatement works.

5. A layer of geotextile material will be laid over the footprint of the compound.
6. Using an excavator, a base layer of Clause 804 material will be laid followed by a 6F2 capping layer which will provide the finished surface.
7. Each layer will be compacted using a vibrating roller.
8. Earthing cable will be laid underground around the substation for connection to the various electrical components during the electrical fit out phase.
9. The construction of a 9,854m² substation compound comprising of approximately 450m² single story 110kV substation control building and associated outdoor electrical equipment, including 1 no. 33/110kV transformer, associated internal access road, including 2.6m high station perimeter fencing will be built.
10. Permanent access roads will be constructed to allow site vehicular activity in and out of construction area.
11. Adequate lighting will be installed around the compound on the lighting masts within the compound.
12. 110kV cable sealing ends and associated accessories will be required to incorporate the Lissinagroagh UGC to Srananagh 220kV substation. The support structures will be located outdoors.
13. Transformers will be installed in bunded enclosures within the substation compound.

The electrical installation is expected to take 20 weeks, within the overall 12-month construction programme, and includes the following:

- Delivery and installation of 33/110kV transformer. These are unusually large, and the deliveries will be managed in accordance with regulations governing the movement of large loads.
- Delivery and installation of all other HV equipment.
- Wiring and cabling of HV/LV equipment, protection and control cabinets.
- Commissioning of all newly installed equipment.

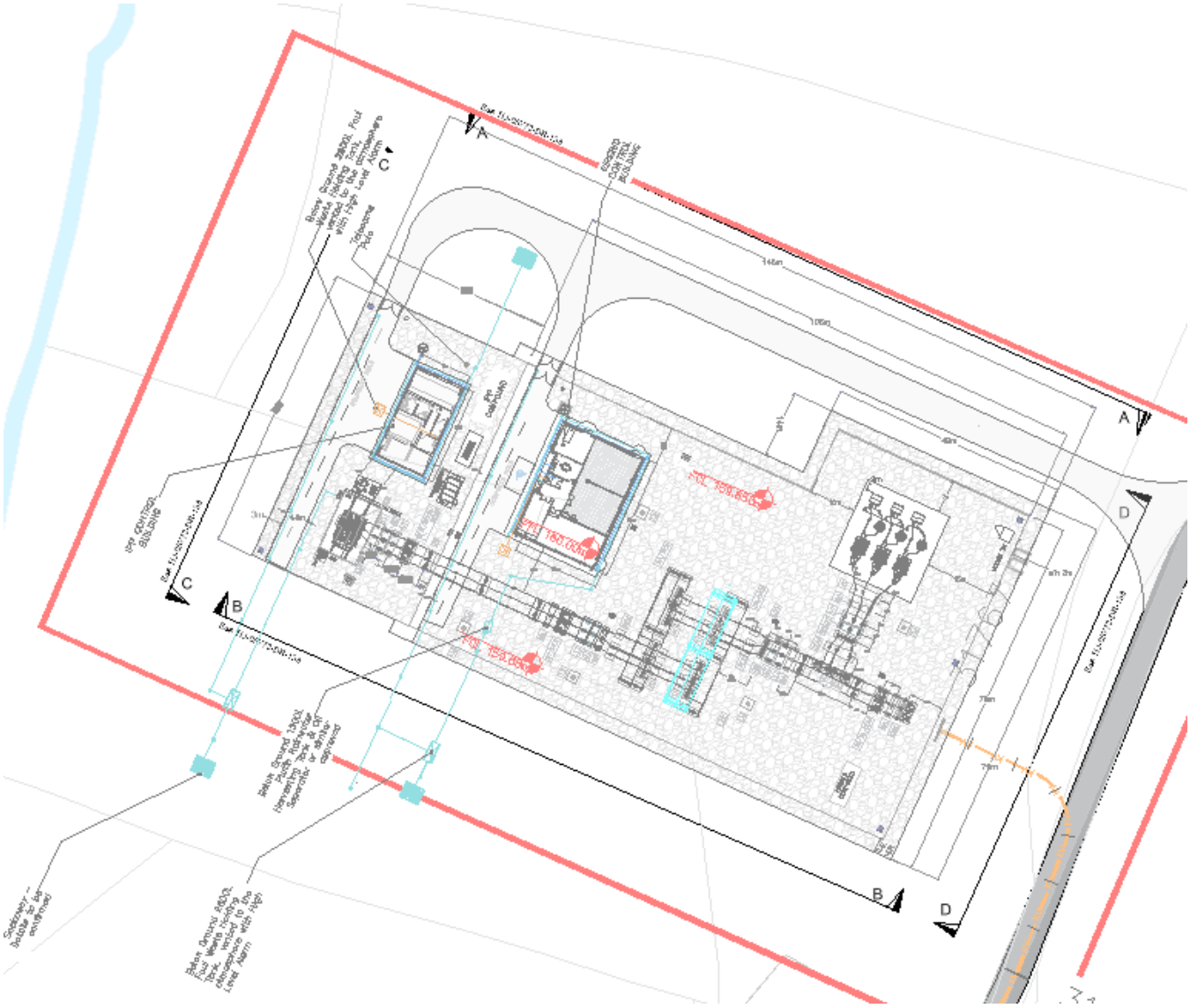

Figure 1 Proposed Lissinagroagh 110kV Substation Infrastructure Layout Plan (Drawing 05773-DR-130)

3.0 110kV Underground Cable Route

The UGC route is approximately 32km in length and runs in a predominantly northward directionfrom the existing Srananagh 220kV substation to the Lissinagroagh Wind Farm substation location utilising public local roads, and existing forestry access tracks and sections of private lands.

The exact location of the UGC within the curtilage of the public local road network and sections of private lands may be subject to minor modification following confirmatory site investigations, to be undertaken prior to construction of the proposed wind farm, to confirm the conditions predicted in the EIAR. The cable location will take into consideration the requirements of Leitrim County Council, Sligo County Council, and all other relevant stakeholders. Installation of the cable will be carried out in line with the methodologies outlined in this document and all relevant mitigation and environmental protection measures contained within the EIAR, as implemented through the Construction Environmental Management Plan (CEMP).

Figure 2 outlines the UGC route, with the total length of each road type detailed in Table 1.

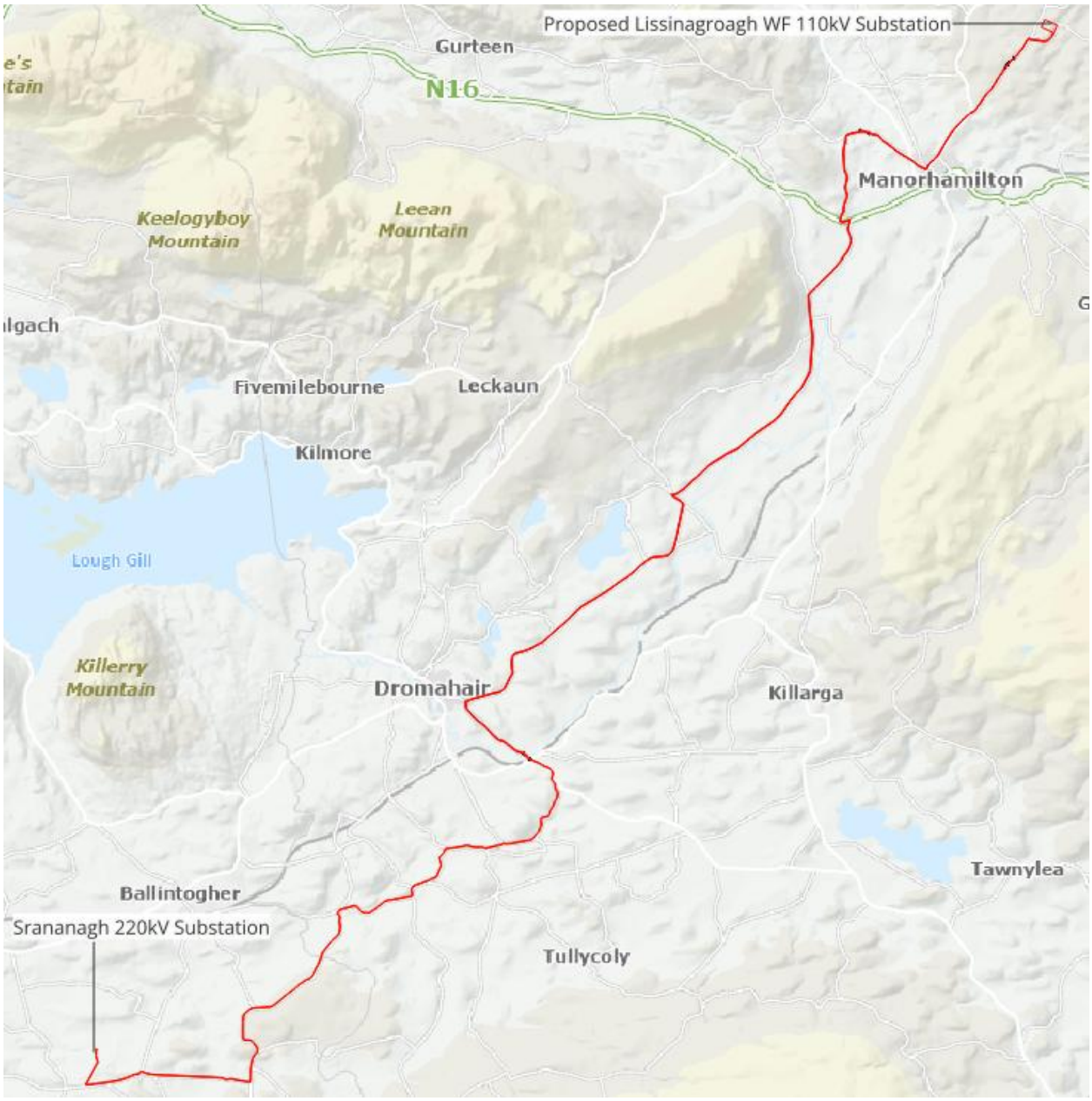

Figure 2 - Grid Connection Route Layout Plan

Table 1 – Approximate UGC Route Location of Preliminary Design:			
Srananagh Substation Access Rd	**Public Roads**	**Wind Farm Site/Forestry Roads**	**Sections of Private Lands**
230m	30,634m	557m	345.5m

Table 1: Lissinagroagh Wind Farm to Srananagh 220kV Substation – UGC Route Location Summary

Table 2 separates the UGC route into a number of sections and describes the specific construction requirements of each individual section along with assessment of access routes to the work areas.

Table 2 - Summary of Grid Connection Design Route	
Section	**Description**
Section 1 UGC 6,276.8 m	**UGC from Srananagh 220kV Substation to Leitrim County Boundary** The initial section of the route is fully located within County Sligo for approx. 6.3km. The underground cable route (UGC) begins at the Srananagh 220 kV Substation and proceeds south along an access track. It then follows the L-52043 for approximately 0.4 km, where it reaches the junction with the L-5204 and turns east. From this point, the cable continues along the L-5204 for approximately 2.73 km. Within this section, the route encounters an existing bridge structure where insufficient clearance is available to install the cable using an open-cut methodology. Consequently, the crossing will be completed using Horizontal Directional Drilling (HDD), installed inline with the existing road carriageway. Refer to Section 1 details below. The UGC then arrives at the junction with the L-1201 and turns north. It continues along this road for approximately 1.46 km. Several areas within this section lack passing bays, overhead lines are within the vicinity of joint bay 05, with appropriate H.S.A safety precaution measures to be applied. The cable route then proceeds northeast along the L-12011 for approximately 0.26 km, where it crosses a culvert which signifies the Leitrim – Sligo County Boundary. <u>Features</u> Section 1 contains 8 no. joint bays and 1 No. bridge crossing. <u>Joint Bays</u> Joint bays, described in Section 6.6 below, will be located below ground, within the curtilage of the existing road and finished/reinstated to the required roads specification. All joint bays will have associated communication chambers and mentioned joint bays will also include earth link boxes which will have a surface access hatch which will match existing ground levels. • Joint Bay 01 (JB01) will be located within the (L-52043) roadway, approximately 576m south of Srananagh 220kV Sub. An earth link box will also be located at this joint bay location. • Joint Bay 02 (JB02) will be located within the (L-5204) roadway, approximately 810m east of JB01. An earth link box will also be located at this joint bay location. • Joint Bay 03 (JB03) will be located within the (L-5204) roadway, approximately 800m east of JB02. An earth link box will also be located at this joint bay location. • Joint Bay 04 (JB04) will be located within the (L-5204) roadway, approximately 780m east of JB03. An earth link box will also be located at this joint bay location. • Joint Bay 05 (JB05) will be located within the (L-1201) roadway, approximately 745m northeast of JB04. An earth link box will also be located at this joint bay location. • Joint Bay 06 (JB06) will be located within the (L-1201) roadway, approximately 747m northwest of JB05. An earth link box will also be located at this joint bay location. • Joint Bay 07 (JB07) will be located within the (L-12011) roadway, approximately 756m northeast of JB06. An earth link box will also be located at this joint bay location. • Joint Bay 08 (JB08) will be located within the (L-12011) roadway, approximately 756m northeast of JB07. An earth link box will also be located at this joint bay location.

	Bridge Crossing: • Bridge 1 crosses over the Rathgeean River. Located within the L-5204 approximately 610m east of JB03. Insufficient clearance exists within the bridge structure and will cross this bridge utilising the HDD method. The HDD alignment will be positioned within the road corridor, maintaining a straight section of approximately 50 m on either side of the bridge.
Section 2 UGC 7,926.6 m	**UGC from Leitrim County Boundary to L-4165** After crossing the Leitrim County boundary, the UGC crosses a stone clapper culvert with insufficient cover and continues northeast along the L-12011 for approximately 2.37 km. The route then proceeds onto the L-42621, passing an area where light water flow runs along the roadside. The UGC continues onto the L-4262 for approximately 1.43km, encountering two culvert locations, one of which is a shallow culvert with low flow. Along this section of road, space for passing places is limited or narrow. The route then turns east onto the L-4263, where Bridge 2 requires HDD due to insufficient clearance beneath the structure. The HDD crossing will be carried out inline within the road corridor. From here, the cable proceeds northeast along the L-82561, then east along the L-8256, continuing via the L-4260 and L-8260 to an additional joint bay location situated in an area without passing places. The UGC then follows the L-8269 northeast for approximately 1.04 km, where a culvert crossing is identified shortly before another joint bay location, before proceeding to join the R-289. Along this regional road, a joint bay is proposed on a sweeping bend where a passing place is available. Further along, the route reaches Bridge 03 over the Bonet River, which requires off-road HDD due to insufficient clearance beneath the structure. The launch pit and JB12 will be located on private land under Folio LM20069F.The section concludes at the junction with the L-4165 after exiting the private land. <u>Features</u> Section 2 contains 9 no. joint bays, 2 No. bridge crossings and 5 No. Culvert Crossings. <u>Joint Bays:</u> Joint bays, described in Section 6.6 below, will be located below ground, within the curtilage of the existing road and finished/reinstated to the required roads specification. All joint bays will have associated communication chambers and mentioned joint bays will also include earth link boxes which will have a surface access hatch which will match existing ground levels. • Joint Bay 09 (JB09) will be located within the (L- 42621) roadway, approximately 699m northeast of JB08. An earth link box will also be located at this joint bay location. • Joint Bay 10 (JB10) will be located within the (L- 4262) roadway, approximately 797m northeast of JB09. An earth link box will also be located at this joint bay location. • Joint Bay 11 (JB11) will be located within the (L- 4262) roadway, approximately 813m east of JB10. An earth link box will also be located at this joint bay location. • Joint Bay 12 (JB12) will be located within the (L- 82561) roadway, approximately 788m northeast of JB11. An earth link box will also be located at this joint bay location. • Joint Bay 13 (JB13) will be located within the (L- 8256) roadway, approximately 787m northeast of JB12. An earth link box will also be located at this joint bay location.

	• Joint Bay 14 (JB14) will be located within the (L- 8260) roadway, approximately 784m east of JB13. An earth link box will also be located at this joint bay location. • Joint Bay 15 (JB15) will be located within the (L- 8269) roadway, approximately 789m northeast of JB14. An earth link box will also be located at this joint bay location. • Joint Bay 16 (JB16) will be located within the (R-289) roadway, approximately 705m north of JB15. An earth link box will also be located at this joint bay location. • Joint Bay 17 (JB17) will be located within the private land LM20069F-Harriet Devaney (immediately after the HDD receptor area for Bridge 03), approximately 723m northwest of JB16. An earth link box will also be located at this joint bay location. Bridge Crossings: • Bridge 2 crosses the Killanummery River and is located on the L-4263, approximately 530 m northeast of JB11. Due to insufficient clearance beneath the structure, this crossing will be completed using the HDD method. The HDD alignment will follow the road corridor, maintaining a straight section of approximately 50 m on either side of the bridge. • Bridge 3 crosses the Bonet River, where zero cover is available and an off-road HDD installation is therefore required. The launch pit will be located on private land under Folio LM20069F (Harriet Devaney), where a joint bay is also proposed immediately adjacent to the launch area. The receptor pit will be located on the R-289. <u>Culvert Crossings</u> Section 2 has 5 No. Culvert Crossings. A standard culvert crossing method is described in drawing no. 05773-DR-126.
Section 3 UGC 11,372.2 m	**UGC from L-4165 to N16** From the junction with the L-4165, the UGC continues along this roadway for approximately 0.80 km before reaching the location of JB18. The route then proceeds to the junction with the L-4166 and continues along this road for approximately 5.35 km, where a sequence of joint bays is proposed in areas generally constrained by narrow road widths and limited opportunities for passing places. Along the L-4166, the route encounters two bridges, Bridge 4 and 5, where insufficient clearance beneath the structures requires the use of HDD. After approximately 0.94km from the bridge 5 crossing, the UGC continues northeast along the L-4166 until it reaches the junction with the L-2169. The route continues along the L-2169 for approximately 5.86 km. This section contains several culvert crossings and two additional bridge crossings (Bridge 6 and Bridge 7), both of which require HDD installation due to insufficient cover. The UGC continues northeast along the L-2169, passing further culvert locations, before reaching the N16. <u>Features</u> Section 3 contains 13 no. joint bays, 4 No. bridge crossings and 2 No. culvert crossings. <u>Joint Bays:</u> Joint bays, described in Section 6.6 below, will be located below ground, within the curtilage of the existing road and finished/reinstated to the required roads specification. All joint bays will have

	associated communication chambers and mentioned joint bays will also include earth link boxes which will have a surface access hatch which will match existing ground levels. • Joint Bay 18 (JB18) will be located within the (L- 4165) roadway, approximately 799m northwest of JB17. An earth link box will also be located at this joint bay location. • Joint Bay 19 (JB19) will be located within the (L- 4166) roadway, approximately 750m northeast of JB18. An earth link box will also be located at this joint bay location. • Joint Bay 20 (JB20) will be located within the (L- 4166) roadway, approximately 750m northeast of JB19. An earth link box will also be located at this joint bay location. • Joint Bay 21 (JB21) will be located within the (L- 4166) roadway, approximately 750m northeast of JB20. An earth link box will also be located at this joint bay location. • Joint Bay 22 (JB22) will be located within the (L- 4166) roadway, approximately 750m northeast of JB21. An earth link box will also be located at this joint bay location. • Joint Bay 23 (JB23) will be located within the (L- 4166) roadway, approximately 750m northeast of JB22. An earth link box will also be located at this joint bay location. • Joint Bay 24 (JB24) will be located within the (L- 4166) roadway, approximately 750m northeast of JB23. An earth link box will also be located at this joint bay location. • Joint Bay 25 (JB25) will be located within the (L- 4166) roadway, approximately 750m northeast of JB24. An earth link box will also be located at this joint bay location. • Joint Bay 26 (JB26) will be located within the (L- 2169) roadway, approximately 750m north of JB25. An earth link box will also be located at this joint bay location. • Joint Bay 27 (JB27) will be located within the (L-2169) roadway, approximately 750m northeast of JB26. An earth link box will also be located at this joint bay location. • Joint Bay 28 (JB28) will be located within the (L-2169) roadway, approximately 750m northeast of JB27. An earth link box will also be located at this joint bay location. • Joint Bay 29 (JB29) will be located within the (L-2169) roadway, approximately 750m northeast of JB28. An earth link box will also be located at this joint bay location. • Joint Bay 30 (JB30) will be located within the (L-2169) roadway, approximately 750m northeast of JB29. An earth link box will also be located at this joint bay location. • Joint Bay 31 (JB31) will be located within the (L-2169) roadway, approximately 750m north of JB30. An earth link box will also be located at this joint bay location. • Joint Bay 32 (JB32) will be located within the (L-2169) roadway, approximately 750m northeast of JB31. An earth link box will also be located at this joint bay location. • Joint Bay 33 (JB33) will be located within the (L-2169) roadway, approximately 750m northeast of JB32. An earth link box will also be located at this joint bay location. <u>Bridge Crossings:</u> • Bridge 4 crosses the Rubbal River and is located on the L-4166, approximately 278 m northeast of JB21. Due to insufficient clearance beneath the structure, the crossing will be carried out using the HDD method. The HDD alignment will follow the road corridor, maintaining a straight section of approximately 50 m on either side of the bridge. • Bridge 5 crosses the Lough Carrigeencor River and is located on the L-4166, approximately 609 m northwest of JB25. Due to insufficient clearance beneath the structure, this crossing will be carried out using the HDD method. The HDD alignment will follow the road corridor, maintaining a straight section of approximately 50 m on either side of the bridge.

	• Bridge 6 crosses the BOIHY River and is located on the L-2169, approximately 327 m northeast of JB27. As insufficient clearance exists beneath the structure, the crossing will be completed using the HDD method. The HDD alignment will follow the road corridor, maintaining a straight section of approximately 50 m on either side of the bridge. • Bridge 7 crosses the Shanvaus 35 River and is located on the L-2169, approximately 549 m northeast of JB31. Due to inadequate clearance beneath the structure, this crossing will be installed using the HDD method. The HDD alignment will follow the road corridor, maintaining a straight section of approximately 50 m on either side of the bridge. Culvert Crossings: Section 3 has 2 No. Culvert Crossings. A standard culvert crossing method is described in drawing no. 05773-DR-127
Section 4 UGC 6,179.9 m	**UGC from N16 to Lissinagroagh WF Substation** From the entrance on the N16, the UGC proceeds west along the national road, where the verge is generally suitable for construction purposes. The route continues for approximately 0.16 km before reaching the entrance to the L-21361 (north direction). From this junction, the UGC follows the L-21361 for approximately 0.12 km, where the first joint bay in this section, JB34, is proposed. Continuing along the L-21361, the cable route progresses for approximately 1.31 km to reach the junction with the L-2136, where it continues east for approximately 0.03 km before entering private land under Folio Number LM13453F. At this location a HDD undercrossing of the bridge is required. This location will accommodate the launch pit for Bridge 8, with the receptor pit situated on the L-2136. After the bridge crossing, the route continues along the L-2136 for approximately 0.81 km before reaching the R-280. The UGC proceeds to cross the R 280, continuing southeast toward the junctions with the L 2643 and L 2128. The route then exits to the northeast, joining the R 282, along which it continues for approximately 1.1 km. Along this section, Bridge 9 is encountered on the R-282, where measurements indicate 2200 mm from the top of the slab to the top of the parapet and 1200 mm from the parapet top to road level, confirming sufficient cover for a standard crossing method. The UGC then transitions south onto the L-6180. This section includes two bridge crossings: Bridge 10 and Bridge 11. Both crossings require HDD due to insufficient clearance beneath their structures. For each bridge, launch and receptor pits are located on the L-6180 immediately adjacent to the structures. Continuing north along the L-6180 for approximately 0.40 km after Bridge 11, the cable route proceeds west toward the Wind Farm access road, where a culvert crossing is required before finally reaching the Lissinagroagh Wind Farm Substation. <u>Features</u> Section 3 contains 8 no. joint bays, 4 no. bridge crossings and 1 no. culvert crossing. <u>Joint Bays:</u> Joint bays, described in Section 6.6 below, will be located below ground, within the curtilage of the existing road and finished/reinstated to the required roads specification. All joint bays will have associated communication chambers and mentioned joint bays will also include earth link boxes which will have a surface access hatch which will match existing ground levels.

	• Joint Bay 34 (JB34) will be located within the (L- 21361) roadway, approximately 750m north of JB33. An earth link box will also be located at this joint bay location. • Joint Bay 35 (JB35) will be located within the (L- 21361) roadway, approximately 750m north of JB34. An earth link box will also be located at this joint bay location. • Joint Bay 36 (JB36) will be located within the (L- 2136) roadway, approximately 750m northeast of JB35. An earth link box will also be located at this joint bay location. • Joint Bay 37 (JB37) will be located within the (L- 2136) roadway, approximately 762m southeast of JB36. An earth link box will also be located at this joint bay location. • Joint Bay 38 (JB38) will be located within the (R-282) roadway, approximately 750m east of JB37. An earth link box will also be located at this joint bay location. • Joint Bay 39 (JB39) will be located within the (R-282) roadway, approximately 750m northeast of JB38. An earth link box will also be located at this joint bay location. • Joint Bay 40 (JB40) will be located within the (L- 6180) roadway, approximately 750m northeast of JB39. An earth link box will also be located at this joint bay location. • Joint Bay 41 (JB40) will be located within the (L- 6180) roadway, approximately 800m northeast of JB39. An earth link box will also be located at this joint bay location. Bridge Crossings: • Bridge 8 crosses the Bonet River and is located on the L-2136 road, approximately 139m east of JB36. Due to insufficient clearance beneath the structure, this crossing will be carried out using the HDD method. The launch pit will be located on private land under Folio LM13453F (Mirror Controls International Ireland Limited), and the receptor pit will be located on the L-2136. • Bridge 9 crosses the Brackary River and is located on the R-282 road, approximately 718 m east of JB37. There is sufficient cover beneath the structure for a standard crossing method. • Bridge 10 crosses the CurraghforeRiver and is located on the L-6180, approximately 376 m northeast of JB40. Due to insufficient clearance beneath the structure, this crossing will be carried out using the HDD method. The HDD alignment will follow the road corridor. • Bridge 11 crosses the Curraghfore River and is located on the L-6180, approximately 110 m northeast of Bridge 10. As insufficient clearance exists beneath the structure, this crossing will be completed using the inline HDD method. The HDD alignment will follow the road corridor. Culvert Crossings: Section 4 has 1 No. Culvert Crossing, located on the Wind Farm access road. A standard culvert crossing method is described in drawing no. 05773-DR-127
Note: The precise location of the UGC route within the curtilage of the existing access tracks, public roads and forestry tracks may be subject to minor modifications following confirmatory site investigations prior to the construction phase of the proposed wind farm development.	

4.0 Access Routes to Work Area

The majority of the proposed underground cable will be installed within the public road network and therefore will be accessed via the existing road network. The contractor(s) will be required to utilise the local public road network in the vicinity of the work area and from there utilise existing forestry/farm access tracks, where appropriate.

In the event planning permission is granted for the proposed development, the Traffic Management Plan included with the EIAR will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned. Some work areas will require a road closure where it is not possible to safely implement a Stop/Go system. Where road closures are necessary, a suitable diversion will be implemented using appropriate signage, following consultation with Leitrim County Council and Sligo County Council.

Careful and considered local consultation will be carried out, to minimise the amount of disturbance caused during works. All plant and equipment employed during the proposed works (e.g. diggers, tracked machines, footwear etc.) will be inspected prior to arrival on site and on leaving site and cleaned where necessary to prevent the spread of dust and/or invasive aquatic / riparian species.

5.0 Traffic Management

Traffic management and road signage will be in accordance with the Department of Transport: Traffic Signs Manual - Chapter 8: Temporary Traffic Measures and Signs for Road Works, the project Traffic Management Plan and in agreement with Leitrim County Council and Sligo County Council. All work on public roads will be subject to the approval of a road opening license application by Leitrim County Council and Sligo County Council. The contractor will prepare a detailed traffic management plan for inclusion as part of the road opening applications. Where road widths allow, the UGC installation works will allow for one side of the road to be open to traffic at all times by means of a 'Stop/Go' type traffic management system, where a minimum 2.5m roadway will be maintained at all times.

Where it is not possible to implement a 'Stop/Go' system a full road closure will be required. Temporary traffic signals will be implemented to allow road users safely pass through the works area by channelling them onto the open side of the road. Typically, the UGC will be installed in 150m sections, and no more than 100m will be excavated without the majority of the previous section being reinstated. Where the construction requires the crossing of a road, works on one carriageway will be completed before the second carriageway is opened, to maintain traffic flows.

All construction vehicles will be parked appropriately within the works area so as not to cause additional obstruction or inconvenience to road users or local residents. The traffic signals will be in place prior to the works commencing and will remain in place until after the works are completed. The public road will be checked regularly and maintained free of mud and debris. Road sweeping will be carried out as appropriate to ensure construction traffic does not adversely affect the local road condition.

In the event of emergency; steel plates, which will be available on site, can be put in place across the excavation to allow traffic to flow on both sides of the road. Access for local residents can be accommodated, although traffic flows during works may have to minimised.

All traffic management measures will comply with those outlined in Section 14.1 of the EIAR and the Project Traffic Management Plan (TMP), which is being submitted as part of the EIAR for planning. These measures will be implemented in consultation with Leitrim County Council and Sligo County Council prior to and during the commencement of UGC construction.

6.0 Road Opening Licence

The grid connection works, along the public road network, will require a road opening licence under Section 254 of the Planning and Development Act 2000-2015 from Leitrim County Council and Sligo County Council. A Traffic Management Plan (TMP) has been prepared for the project and will be agreed with Leitrim County Council & Sligo County Council prior to the commencement of the development. The TMP will outline the location of traffic management signage, together with the location of any necessary road closures and the routing of appropriate diversions. Where diversions are required, these will be agreed with Leitrim County Council and Sligo County Council in advance of the preparation of the detailed TMP.

7.0 UGC Construction Methodology

The UGC will consist of 3 No. 160mm diameter HDPE power cable ducts, 2 No. 125mm diameter HDPE communications ducts and 1 No. 125mm earth continuity conductor duct to be installed in an excavated trench, typically 825mm wide by 1,315mm deep, with variations on this design to adapt to bridge crossings, service crossings and watercourse crossings, etc. The power cable ducts will accommodate 1 No. power cables per duct. One of the communications ducts will accommodate a fibre cable to allow communications between the Lissinagroagh Wind Farm substation and Srananagh 220kV substation. The inclusion 1 No. 125mm earth continuity conductor duct will also be required. The ducts will be installed, the trench reinstated in accordance with landowner or Leitrim County Council & Sligo County Council specification, and then the electrical cabling/fibre cable is pulled through the installed ducts in approximately 700 to 850m section lengths. Construction methodologies to be implemented and materials to be used will ensure that the UGC is installed in accordance with the requirements and specifications of ESBN and EirGrid standards.

7.1 Trenching Methodology

The following section outlines the methodology to be followed during trenching works:-

- The Contractor, and their appointed Site Manager, will prepare a targeted Method Statement concisely outlining the construction methodology and incorporating all mitigation and control measures included within the EIAR and as required by planning conditions where relevant;
- All existing underground services along the UGC route shall be confirmed prior to the commencement of construction works;
- At watercourse crossings, the contractor will be required to adhere to the environmental control measures outlined within the EIAR, the Construction Environmental Management Plan (CEMP) and best practice construction methodologies;
- Where the cable route intersects with culverts, the culvert will remain in place (where possible) and the ducting will be installed either above or below the culvert to provide minimum separation distances in accordance with ESB and Irish Water specifications;
- Traffic management measures will be implemented in accordance with those included in Section 14.1 of the EIAR, and the Traffic Management Plan submitted with the EIAR for planning,and will be agreed with Leitrim County Council & Sligo County Council;
- Excavated material will be temporarily stockpiled onsite for re-use during reinstatement. Stockpiles will be restricted to less than 2m in height. Stockpiles will be located a minimum of 50m from surface water features and all stockpiling locations will be subject to approval by the Site Manager and Project Ecological Clerk of Works (ECoW);
- Excavated material shall be employed to backfill the trench where appropriate and any surplus material will be transported to the proposed on-site borrow pits;
- Any earthen (sod) banks to be excavated will be carefully opened with the surface sods being stored separately and maintained for use during reinstatement;

- The excavated trench will be dewatered if required, from a sump installed within the low section of the opened trench. Where dewatering is required, dirty water will be fully and appropriately attenuated, through silt bags, before being appropriately discharged to vegetation or surface water drainage feature (please refer to Chapter 8-Appendix 2.7 of the EIAR);
- Where required, grass will be reinstated by either seeding or by replacing with grass turves;
- No more than a 100m section of trench will be opened at any one time. The second 100m will only be excavated once the majority of reinstatement has been completed on the first;
- The excavation, installation and reinstatement process will take on average of 1 no. week to complete a 250m section;
- Where the cable is being installed in a roadway, temporary reinstatement may be provided to allow larger sections of road to be permanently reinstated together;
- Following the installation of ducting, pulling the cable will take approximately 1 no. day between each joint bay, with the jointing of cables taking approximately 1 week per joint bay location.



Figure 3 - Typical 110kV Underground Duct Installation

7.2 Ducting Installation Methodology

For the trenching and ducting works the following step by step methodology will apply:

1. Grade, smooth and trim trench floor when the required 1315mm depth and 825mm width have been obtained.
2. Place bedding layer of Thermal Sand material in accordance with the specification and compact it so that the compacted thickness is as per the drawings.
3. Lay the bottom row of ducts in trefoil formation as detailed on the design drawings. Use spacers as appropriate to establish horizontal duct spacing. Fit a secure cap / bung to the end of each duct run to prevent the ingress of dirt or water.
4. Carefully surround and cover ducts with Thermal Sand in accordance with the design drawings and specifications and thoroughly compact without damaging ducts.
5. Place cable protection strips on compacted Thermal Sand directly over the ducts.
6. Lay the top row of ducts onto the freshly compacted Thermal Sand including the cable protection strips above the bottom row of ducts. Place a secure cap at the end of each duct to prevent the ingress of dirt or water.

7. Carefully surround and cover ducts with Thermal Sand material in accordance with the drawings and thoroughly compact without damaging ducts.
8. Place red cable protection strip on top of compacted Thermal Sand over each set of ducts as shown on the drawings.
9. Place and thoroughly compact Thermal Sand material or Clause 804 backfill or soil backfill as specified and place warning tape at the depth shown on the drawings.
10. For concrete and asphalt/bitmac road sections, carry out immediate permanent reinstatement in accordance with the specification and to the approval of the local authority and/or landowners, unless otherwise agreed with local authorities *(Figure 3).*
11. For unsurfaced/grass sections, backfill with suitable excavated material to ground level leaving at least 100 mm topsoil or match existing level at the top to allow for seeding or replace turves as per the specification of the local authority or landowner *(Figure 4).*
12. Clean and test the ducts in accordance with the specification by pulling through a brush and mandrel. Install 12 mm polypropylene draw rope in each duct and seal all ducts using robust duct end seals fitted with rope attachment eyes in preparation for cable installation at a later date. All the works should be witnessed by ESBN Clerk of Works (CoW) as required.

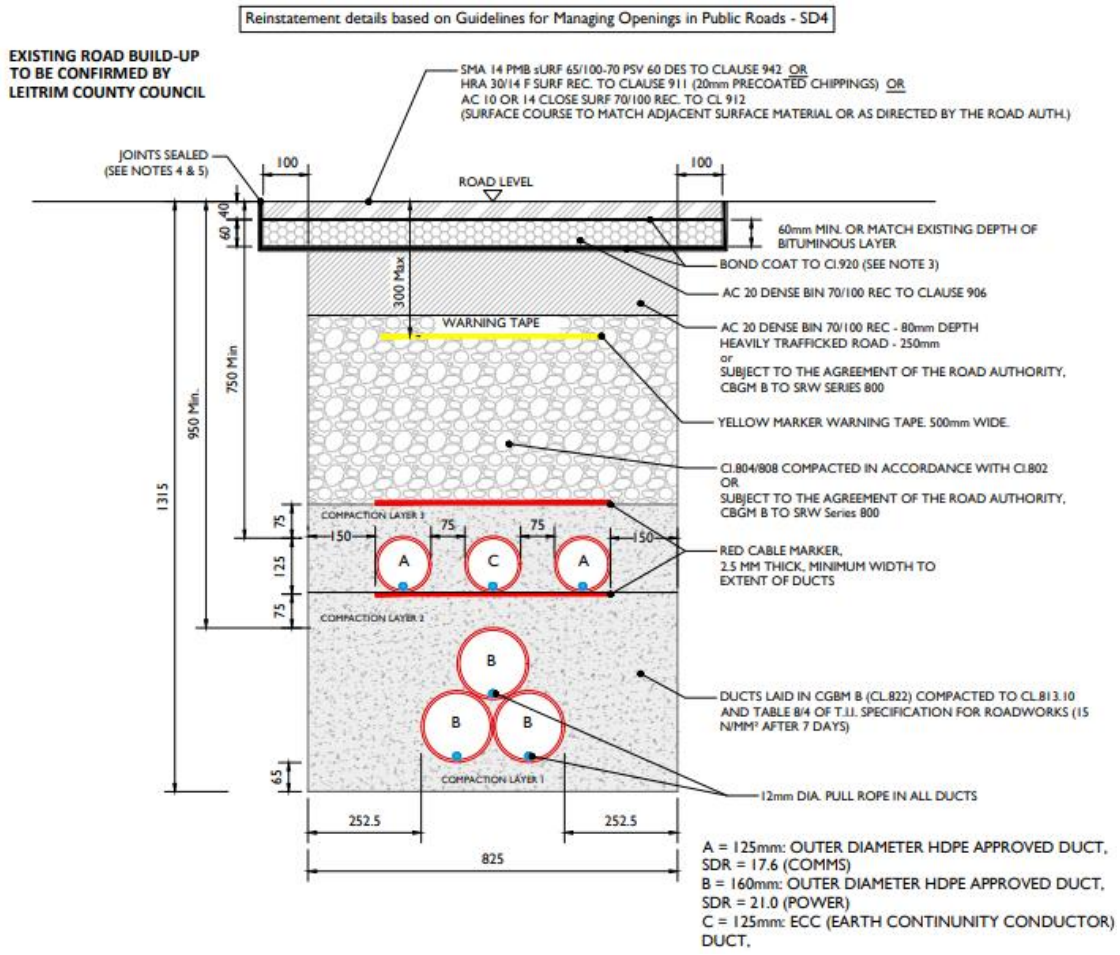

Figure 4 – Typical 110kV Section Through Permanent Reinstatement of Longitudinal Opening in Roadway

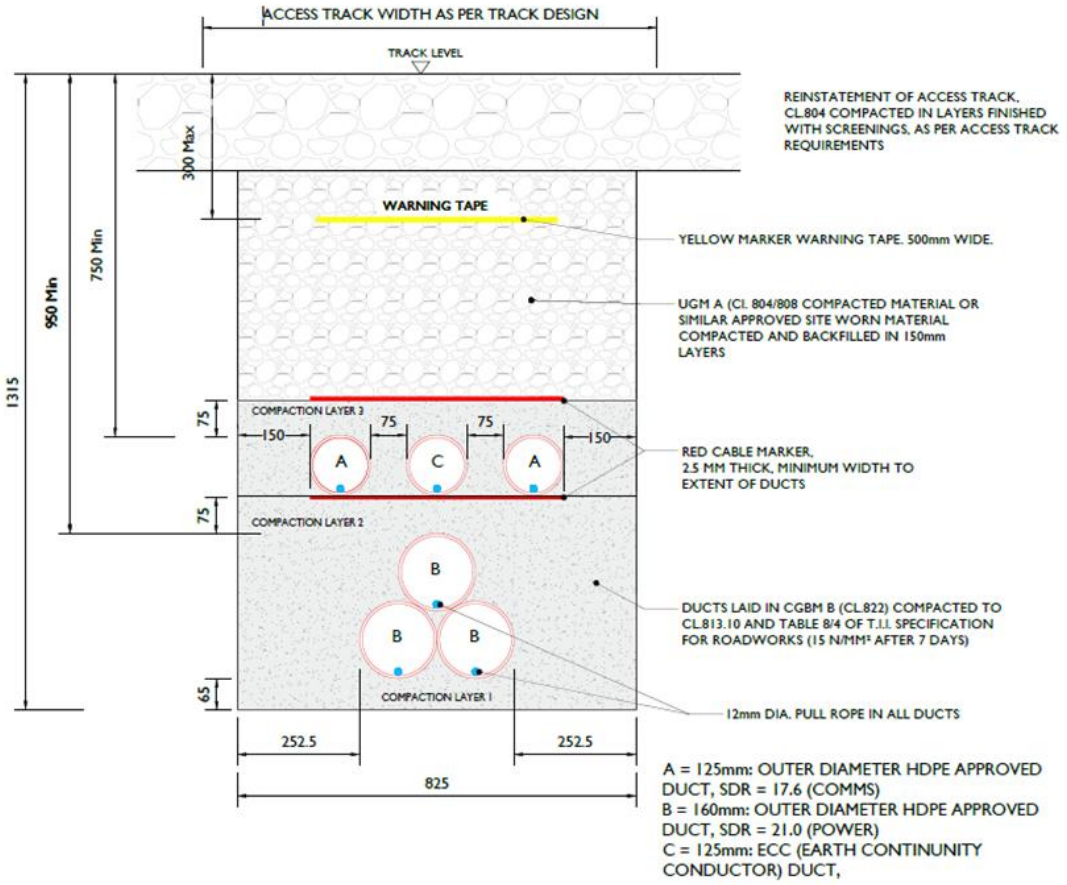

Figure 5 - Typical 110kV Section Through Off Road Sections

Equipment and Personnel:

- 1 no. tracked excavator (only rubber tracked machines will be allowed on public roads);
- 1 no. dumper or tractor and trailer;
- 2-3 General Operatives;
- 1 Excavator Operator.
-

Materials:

- Sand for pipe bedding;
- Ready-mix Concrete where necessary (delivered to site);
- Trench backfilling material (excavated material and aggregates) to relevant specifications;
- 160mm diameter HDPE ducting;
- 125mm diameter HDPE ducting;
- 63mm diameter HDPE duct;
- Temporary Surface Reinstatement Materials

7.2.1 UGC Installation on Public Road

The majority of the 110kV UGC route is located within public road carriages and where applicable the trench will be installed in the non-trafficked strip between the wheel marks on the road. The cable will be micro-sited based on the presence of exiting utilities and the nature of the road and the adjoining terrain. It is preferable to excavate a trench within the middle of the lane, or the middle of the roadway to reduce load on the cable.

7.2.2 UGC Installation on Private Assess Tracks

Where the cable is installed in private tracks the location where the cable is laid will depend on several factors such as; width of track, bends along the track and crossings. Where the track needs to be widened, stone will be brought in to build up the area to the same level of the track. The excess material from the track will be used elsewhere on reinstatement works.

7.3 Marker posts

Surface cable markers will be placed along the route where cable depth is unavoidably shallow, due to constraints such as existing services, to indicate the precise location of the UGC. These markers will be metallic plates in accordance with ESBN and EirGrid standards.

Marker posts will be used on non-roadway routes to delineate the cable route and joint bay positions. Corrosion proof aluminium triangular danger sign, with 700mm base, and with centred lightning symbol, on engineering grade fluorescent yellow background shall be installed in adequately sized concrete foundations. Marker post shall also be placed in the event that burial depth is not to standard *(Figure 5)*.

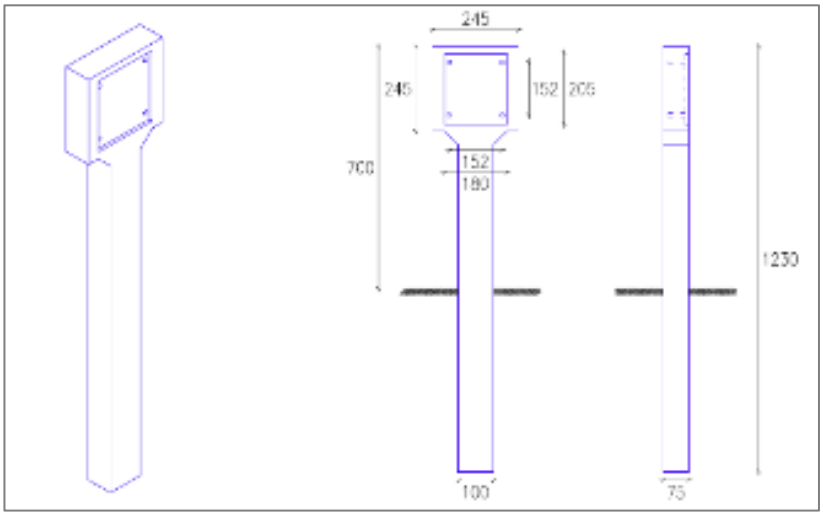

Figure 6 - Typical ESB Marker Posts Example

7.4 Managing Excess Material from Trench

All excavated material will be temporarily stored adjacent to the trench prior to re-use in the trench reinstatement (where applicable). Stockpiles will be restricted to less than 2m in height. Where excess peat and spoil material exists, it may be used in the reinstatement of borrow pits within Lissinagroagh Wind Farm. Excavated tar from the public road network will be transported off site by an appropriately authorised waste collector and disposed of at an appropriately licenced waste facility.

7.5 Storage of Plant and Machinery

All plant, machinery and equipment will be stored on site within the UGC works area or within the temporary construction compounds to be located within the Lissinagroagh Wind Farm. Oils and fuels will be stored in an appropriately bunded area within the temporary construction compounds.

7.6 Joint Bays and Associated Chambers

Joints Bays are to be installed approximately every 700m to 850m lengths along the UGC route to facilitate the jointing of 2 No. lengths of UGC. Joint Bays are typically 2.6m x 6m x 1.75m pre-cast concrete structures installed below finished ground level. Joint Bays will be located in the non-wheel bearing strip of roadways, however given the narrow profile of local roads this may not always be possible.

In association with Joint Bays, Communication Chambers are required at every joint bay location to facilitate communication links between the Lissinagroagh Wind Farm substation and the existing 220kV substation at Srananagh. Earth Sheath Link Chambers are also required at every joint bay along the cable route where the cables are to be Single Point Bonded. These locations have been detailed in Section 2 Table 2 (Summary of Grid Connection Design Route). Earth Sheath Links are used for earthing and bonding cable sheaths of underground power cables, so that the circulating currents and induced voltages are eliminated or reduced. Earth Sheath Link Chambers and Communication Chambers are located in close proximity to Joint Bays as seen in Figure 6. Earth Sheath Link Chambers and Communication Chambers will typically be pre-cast concrete structures with an access cover at finished surface level.

The precise siting of all Joint Bays, Earth Sheath Link Chambers and Communication Chambers, within the curtilage of the public road, is subject to approval by EirGrid.

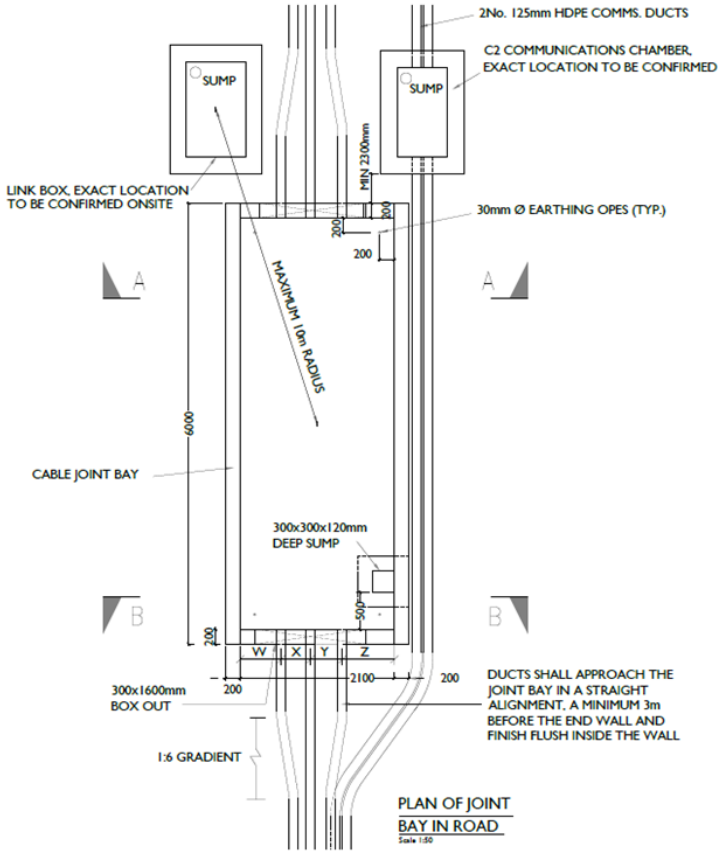

Figure 7 - 110kV Joint Bay Plan Layout

7.7 Joint Bay Construction and Cable Installation

In advance of commencing construction, the area around the edge of the joint bay which will be used by heavy vehicles will be surfaced with a terram cover (if required) and stone aggregate to minimise ground damage. Any roadside drains within the temporary works area will be culverted and check dams made from stone or sandbags covered with terram will be inserted upstream and downstream of these culverts to intercept any solids generated

during the insertion or which wash out during the works. If the ground slopes from the working area toward a watercourse or if there is evidence of solids washing off the works area toward nearby watercourses or drains, a silt fence with straw bales, will be interposed between the works area and the watercourse.

All excavated material will be stored near the excavations and reused for reinstatement works. Any soil required for reinstatement that will be temporarily stockpiled on site will be placed at least 15m away from the nearest watercourse on level ground and will be ringed at the base by silt fencing and be regularly monitored by a designated competent person for signs of solids escape. In which case an additional line of silt fencing with straw bales will be added in line with the relevant environmental control measures.

If the joint bay needs to be dewatered, this will be pumped to a percolation area if the soil is not saturated, otherwise a settlement tank will be used to remove any solids from the dewatering process to comply with the environmental control measures.

The risk of concrete reaching surface waters is considered very low given that all concrete will be poured into the pit excavated for the joint bay so that spills will be contained. The basic requirement therefore is that all pouring operations be constantly supervised to prevent accidental spillages occurring outside the pit.

Temporary storage of cement bound sand (if required) will be on hardstand areas only where there is no direct drainage to surface waters and where the area has been bunded e.g. using sand-bags and geotextile sheeting or silt fencing to contain any solids in run-off.

The following steps outline the methodology for joint bay construction and reinstatement:

1. The contractor will excavate a pit for joint bay construction, including for a sump in one corner.
2. Grade and smooth floor; then lay a 75 mm depth of blinding concrete (for in situ construction) or 50 mm thick sand (for pre-cast concrete construction) on 200 mm thick Clause 804 granular material.
3. In situ construction. Construct 200 mm thick reinforced concrete floor slab with sump and starter bars placed for walls as detailed on the drawings.
4. In situ construction. Construct 200 mm thick reinforced concrete sidewalls as detailed on the drawings. *(Figure 8)*



Figure 8- Typical joint bay under construction (in-situ)

5. In situ construction. Remove formwork and backfill with suitable backfill material in grassed areas or Clause 804 material once ducting has been placed in the bay. Backfill externally with granular material to Co. Council/TII Specification for Roadworks. *(Figure 9)*



Figure 9 - Completed joint bay prior to cable installation (in-situ)

6. Pre-cast concrete construction. Place pre-cast concrete sections on sand bedding. *(Figure 10)*



Figure 10 - Typical joint bay under construction (pre-cast)

7. Where joint bays are located under the road surface the joint bay will be backfilled with compacted layers of Clause 804 and the road surface temporarily reinstated as specified by the local authority.
8. Precast concrete covers may be used as temporary reinstatement of joint bays at off road locations. These covers are placed over the constructed joint bay and are then removed at the cable installation stage of the project.
9. At a later date to facilitate cable installation and jointing, reinstate traffic management signage, secure individual sites, re-excavate three consecutive joint bays and store excavated material for reuse.
10. The cable is supplied in pre-ordered lengths on large cable drums *(Figure 10).* Installing "one section" of cable normally involves pulling three individual conductors into three separate ducts. The cable pulling winch must be set at a predetermined cut off pulling tension as specified by the designer. The cable will be connected to the winch rope using approved suitably sized and rated cable pulling stocking and swivel or the pulling head fitted by the cable manufacturer**.** A sponge may also be secured to the winch rope to disperse lubricant through the duct. Lubrication is also applied to the cable in the joint bay before it enters the duct.
11. Once the "two sections" of cable (total of 6 conductors) are pulled into the joint bay, a jointing container is positioned over the joint bay and the cable jointing procedure is carried out in this controlled environment.



Figure 11 - HV cable pulling procedure (Typical drum set-up)



Figure 12 - HV cable jointing container

Following the completion of jointing and duct sealing works in the joint bay, place and thoroughly compact cement-bound sand in approximately 200 mm layers to the level of the cable joint base to provide vertical support. Install additional layers of cement-bound sand and compact each layer until the cement-bound sand is level with the top of the joint. Install an additional 100 mm cement-bound sand layer. Install cable protection strip. Backfill with cement-bound sand to a depth of 250 mm below surface and carry out permanent reinstatement including placement of warning tape at 400 mm depth below finished surface.

Equipment and Personnel:

- 360˚ tracked excavator (13 ton normally, 22 ton for rock breaker)
- 1 no. tracked dumper or tractor and trailer
- 2-3 General Operatives
- 1 Excavator Operator
-

Materials:

- Sand for pipe bedding
- Blinding Concrete where necessary
- Clause 804 Material
- 160mm diameter HDPE ducting;
- 125mm diameter HDPE ducting;
- Precast Chamber Units / Relevant construction materials for chambers
- Link Box

8.0 Relocation of Existing Services

To facilitate the installation of the proposed UGC, it may be necessary to relocate existing underground services such as water mains, telecoms, or existing cables. In advance of any construction activity, the contractor will undertake additional surveys of the proposed route to confirm the presence or otherwise of any services. If found to be present, the relevant service provider will be consulted to determine the requirement for specific excavation or relocation methods and to schedule a suitable time to carry out works.

8.1 Underground Cables

If existing underground cables are found to be present, a trench will be excavated, and new ducting and cabling will be installed along the new alignment and connected to the network on either end. The trench will be backfilled with suitable material to the required specification. Warning strip and marking tape will be laid at various depths over the cables as required. Marker posts and plates will be installed at surface level to identify the new alignment of the underground cable, and the underground cables will then be re-energised.

8.2 Water Mains

Uisce Eireann will be consulted and advised on details of the project proposals in the form of a completed Building-over or Near an Irish Water Asset Application Form and associated technical information largely comprising drawings and schedules with details of proposed crossings etc with as much available information as possible. Uisce Eireann will be involved in the early engagement on projects that may involve any infrastructure which may be located near their assets with the intention of identifying as early as possible, if bespoke design measures or diversions are necessary.

The water supply will be turned off by the utility provider so work can commence on diverting or crossing the service. The section of the existing pipe will be removed and will be replaced with a new pipe along the new alignment of the service. The works will be carried out in accordance with the utility standards.

9.0 Major Watercourse Crossings

The cable route will involve 11 No. bridge crossings including 10 No. HDD crossings. Where the cable route intersects with existing watercourses, a detailed construction method statement will be prepared by the Contractor prior to the commencement of construction and is to be approved by the Local Authority and relevant environmental agencies. The preferred cable installation location is within the bridge deck where there is sufficient depth and width available on the bridge, however from onsite surveys 9? of the 11 bridges detailed below (Section 8.1 to 8.11) have insufficient depth and width available therefore horizontal directional drilling (HDD) will be employed as an alternative.

Existing culverts will be crossed using open trenching with either an undercrossing or an overcrossing, depending on the depth of the culvert. A confirmatory site survey of all culverts will be completed as part of the next phase of the project prior to construction to confirm the findings of the design phase surveys. The proposed culvert crossing methods are detailed in *Figures 12* and *13* and can be found in drawing *05773-DR-126 and 05773-DR-127, respectively.*

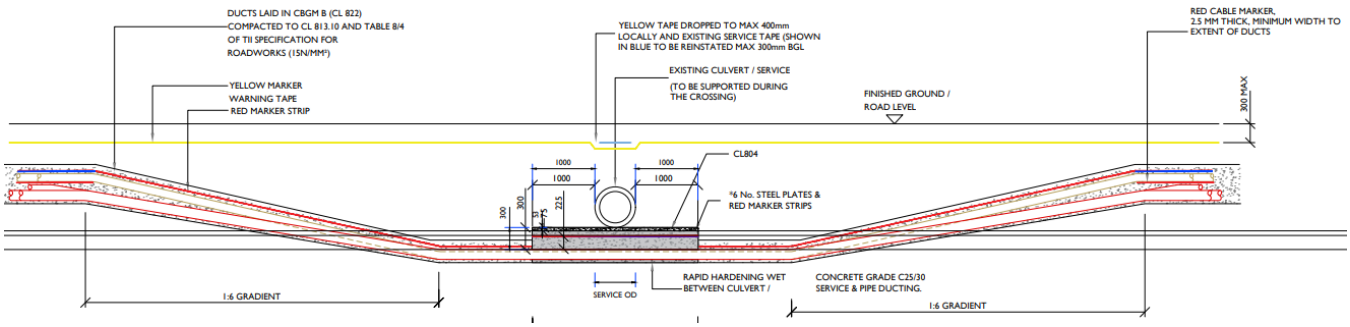

Figure 13 - 110kV UGC Culvert Undercrossing

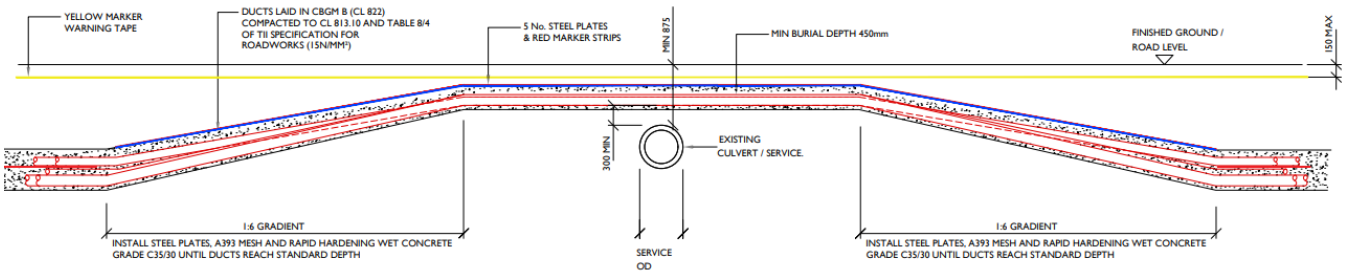

Figure 14 - 110kV UGC Culvert Overcrossing

Inland Fisheries Ireland (IFI) have published guidelines relating to construction works along water bodies entitled 'Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites", and these guidelines will be adhered to during the construction of the development.

The bridge and culvert crossing locations are shown on the drawings included in Appendix 2-2 of the EIAR.

10.0 Horizontal Directional Drilling (HDD)

Horizontal Directional Drilling (HDD) is a method of drilling under obstacles such as bridges, railways, water courses, etc. in order to install cable ducts under the obstacle. This method is employed where installing the ducts using standard installation methods is not possible. There are a number of bridges on this UGC route which will require HDD due to there being insufficient cover and depth in the bridge to cross within the bridge deck. The drilling methodology is as follows: -

1. A works area of circa. 40m^2 will be fenced on both sides of the river crossing,
2. The drilling rig and fluid handling units will be located on one side of the bridge and will be stored on double bunded 0.5mm PVC bunds which will contain any fluid spills and storm water run-off.
3. Entry and exit pits (1m x 1m x 2m) will be excavated using an excavator, the excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility.
4. A 1m x 1m x 2m steel box will be placed in each pit. This box will contain any drilling fluid returns from the borehole.
5. The drill bit will be set up by a surveyor, and the driller will push the drill string into the ground and will steer the bore path under the watercourse.
6. A surveyor will monitor drilling works to ensure that the modelled stresses and collapse pressures are not exceeded.
7. The drilled cuttings will be flushed back by drilling fluid to the steel box in the entry pit.
8. Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit pit and will pull a drill pipe back through the bore to the entry side.
9. Once all bore holes have been completed, a towing assembly will be set up on the drill and this will pull the ducting into the bore.
10. The steel boxes will be removed, with the drilling fluid disposed of to a licensed facility.

11. The ducts will be cleaned and proven, and their installed location surveyed.
12. The entry and exit pits will be reinstated to the specification of ESBN, EirGrid and Leitrim County Council & Sligo County Council.
13. A reducing coupler will be installed at either side of the bridge/ following the horizontal directional drilling as per EirGrid requirements, this will join the HDD ducts to the standard ducts.

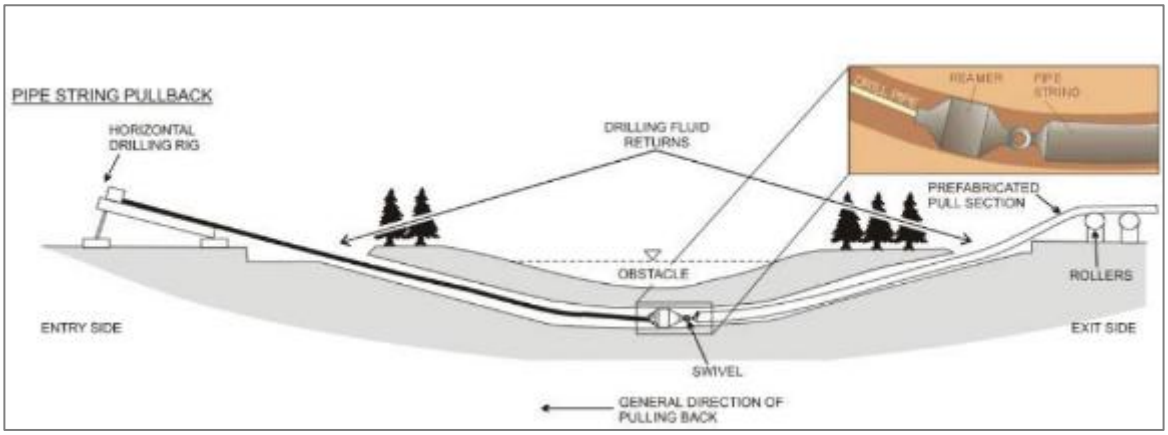

Figure 15 - Typical HDD Installation

10.1 Bridge 1 - Horizontal Directional Drilling

ITM Coordinates: 576811.49, 825036.44

Bridge 1 is located on the L-5204 approx. 610m east of JB03 crossing over the Rathgeean River. The Bridge has insufficient room to install the cable to ESBN and EirGrid specifications (450mm cover to top of ducts) and the suitability of the bridge is inadequate to accommodate the works. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway**.** The methodology for HDD is outlined in Section 9 below.



Figure 16 - Bridge 1 within L-5204

10.2 Bridge 2 - Horizontal Directional Drilling

ITM Coordinates: 580131.58, 828212.11

Bridge 2 is located on the L-4263 approx. 530m northeast of JB11 crossing over the Killanummery River. The Bridge has insufficient room to install the cable to ESBN and EirGrid specifications (450mm cover to top of ducts) and the

suitability of the bridge is inadequate to accommodate the scope of works. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway**.**



Figure 17 - Bridge 2 within L-4263

10.3 Bridge 3 - Horizontal Directional Drilling

ITM Coordinates: 581781.21, 830238.62

Bridge 3 is located on the L-4165 approx. 648m northwest of JB16 crossing over the Bonet River. Bridge 3 has insufficient room to install the cable to ESBN and EirGrid specifications (450mm cover to top of ducts) and the suitability of the bridge is inadequate to accommodate the proposed works. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. The launch pit for this HDD crossing will be located on private land under Folio LM20069F (Harriet Devaney), and the receptor pit will be situated on the R-289.



Figure 18 - Bridge 3 within L-4165

10.4 Bridge 4 - Horizontal Directional Drilling

ITM Coordinates: 582215.02, 832248.48

Bridge 4 is located on the L-4166 approx. 278m northeast of JB21 crossing over the Rubbal River. Bridge 4 has insufficient room to install the cable to ESBN and EirGrid specifications (450mm cover to top of ducts) and the suitability of the bridge is inadequate to accommodate the proposed works. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway**.**



Figure 19 - Bridge 4 within L-4166

9.5 Bridge 5 - Horizontal Directional Drilling

ITM Coordinates: 584209.01, 834422.74

Bridge 5 is located on the L-4166 approx. 609m northwest of JB25 crossing over the Lough Carrigeencor River. Bridge 5 has insufficient room to install the cable to ESBN and EirGrid specifications (450mm cover to top of ducts) and the suitability of the bridge is inadequate to accommodate the proposed works. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway**.**



Figure 20 - Bridge 5 within L-4166

10.6 Bridge 6 - Horizontal Directional Drilling

ITM Coordinates: 585075.11, 835148.49

Bridge 6 is located on the L-2169 approx. 327m northeast of JB27 crossing over the BOIHY River. Bridge 6 has insufficient room to install the cable to ESBN and EirGrid specifications (450mm cover to top of ducts) and the suitability of the bridge is inadequate to accommodate the proposed works. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway**.**



Figure 21 - Bridge 6 within L-2169

10.7 Bridge 7 - Horizontal Directional Drilling

ITM Coordinates: 586403.94, 837764.09

Bridge 7 is located on the L-2169 approx. 549m northeast of JB31 crossing over the Shanvaus 35 River. Bridge 7 has insufficient room to install the cable to ESBN and EirGrid specifications (450mm cover to top of ducts) and the suitability of the bridge is inadequate to accommodate the proposed works. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway**.**



Figure 22 - Bridge 7 within L-2169

10.8 Bridge 8 - Horizontal Directional Drilling

ITM Coordinates: 587242.82, 840345.5

Bridge 8 is located on the L-2136 approx. 139m east of JB36 crossing over the Bonet River. This bridge has insufficient room to install the cable to ESBN and EirGrid specifications (450mm cover to top of ducts) and the suitability of the bridge is inadequate to accommodate the proposed works. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. The launch pit will be located on private land under Folio LM13453F and the receptor pit will be located on the L-2136.



Figure 23 - Bridge 8 within L-22136

10.9 Bridge 9 - Horizontal Directional Drilling

ITM Coordinates: 588395.62, 839917.27

Bridge 9 is located on the R-282, approximately 718 m east of JB37, crossing over a tributary of the Brackary River. Bridge 9 provides sufficient clearance to achieve the required 450 mm cover to the top of ducts in accordance with ESBN and EirGrid specifications and is therefore suitable to accommodate the proposed UGC installation. Site measurements record 2200 mm from the top of the slab to the parapet top, and 1200 mm from the parapet top to road level, confirming adequate cover for a standard crossing method.



Figure 24 - Bridge 9 within R-282

10.10 Bridge 10 - Horizontal Directional Drilling

ITM Coordinates: 589554.12, 841421.74

Bridge 10 is located on the L-6180 approx. 376m northeast of JB40 crossing over the Curraghfore River. This bridge has insufficient room to install the cable to ESBN and EirGrid specifications (450mm cover to top of ducts) and the suitability of the bridge is inadequate to accommodate the proposed works. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway**.**



Figure 25 - Bridge 10 within L-6180

10.11 Bridge 11 - Horizontal Directional Drilling

ITM Coordinates: 589530.20, 841497.35

Bridge 11 is located on the L-6180 approx. 110m northeast of Bridge 10 crossing over the Curraghfore River. This bridge has insufficient room to install the cable to ESBN and EirGrid specifications (450mm cover to top of ducts) and the suitability of the bridge is inadequate to accommodate the proposed works. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway**.**



Figure 26 - Bridge 11 within L-6180

11.0 Construction Hours

Standard working hours for construction will be 8.00am to 8.00pm Monday to Friday and 8.00am to 6.00pm on Saturday (if required), with no works on Sundays or Bank Holidays except in exceptional circumstances or in the event of an emergency. All site personnel will be required to wear project notification labelling on high visibility vests and head protection so that they can be easily identified by all workers on-site.

12.0 Reinstatement of Private Land

Once all construction works are complete, the work areas will be reinstated with excavated soil and either seeded out with native species, allowed to vegetate naturally or reinstated with excavated grass turves and will be restored to their original condition. This work will be carried out in in consultation with the landowner and in line with any relevant measures outlined in the planning application, CEMP and planning conditions.

13.0 Best Practice Design and Construction & Environmental Management Methodology

Prior to commencement of construction works the contractor will draw up detailed Method Statements which will be informed by this Construction Methodology, environmental protection measures included within the EIAR, measures within the CEMP, and the guidance documents and best practice measures listed below. This method statement will be adhered to by the contractors and will be overseen by the Project Manager, Environmental Manager and ECoW where relevant.

The following documents will contribute to the preparation of the method statements in addition to those measures below: -

- Inland Fisheries Ireland (2016) *Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters*. Inland Fisheries Ireland*, Dublin,*
- *National Roads Authority (2008) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*. National Roads Authority, Dublin;
- E. Murnane, A. Heap and A. Swain. (2006) *Control of water pollution from linear construction projects.* Technical guidance (C648). CIRIA;
- E. Murnane et al., (2006) *Control of water pollution from linear construction projects*. Site guide (C649). CIRIA.
- Murphy, D. (2004) Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites. Eastern Regional Fisheries Board, Dublin;
- H. Masters-Williams et al (2001) *Control of water pollution from construction sites. Guidance for consultants and contractors* (C532);
- Enterprise Ireland (unknown). *Best Practice Guide (BPGCS005) Oil storage guidelines;*
- Law, C. and D'Aleo, S. (2016) *Environmental good practice on site pocket book*. (C762) 4th edition. CIRIA;
- CIRIA *Environmental Good Practice on Site (fourth edition) (C741) 2015*.

The works will be carried out by employing accepted good work practices during construction, and environmental management measures such as those discussed below. Please note that the following measures will be supplemented by further specific environmental protection measures that will be included in method statements prepared for specific tasks during the works and will form part of the detailed CEMP. These method statements will be prepared prior to the construction phase of the proposed wind farm and will incorporate all of the mitigation measures identified in the EIAR and NIS as well as the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned.

- All UGC construction materials shall be stored at the temporary construction compounds within the Lissinagroagh Wind Farm site and transported to the works zone immediately prior to construction;
- Where drains and watercourses are crossed with underground cables, the release of sediment will be prevented through the implementation of best practice construction methodologies.
- Weather conditions will be considered when planning construction activities to minimise risk of run off from site;
- Provision of 50m exclusion zones and barriers (silt fences) between any excavated material and any surface water features to prevent sediment washing into the receiving water environment;
- If dewatering is required as part of the works e.g. in trenches for underground cabling or in wet areas, water must be treated prior to discharge;
- The contractor shall ensure that silt fences are regularly inspected and maintained during the construction phase;
- If very wet ground must be accessed during the construction process bog mats/aluminium panel tracks will be used to enable access to these areas by machinery. However, works will be scheduled to minimise access requirements during winter months;
- The contractor shall ensure that all personnel working on site are trained in pollution incident control response. A regular review of weather forecasts of heavy rainfall is required, with the Contractor required to prepare a contingency plan for before and after such events;
- The contractor will carry out visual examinations of local watercourses from the works during the construction phase to ensure that sediment is not above baseline conditions. In the unlikely event of water quality concerns, the Environmental Manager and ECoW will be consulted;
- Excavations will be left open for minimal periods to avoid acting as a conduit for surface water flows.
- Only emergency breakdown maintenance will be carried out on site. Emergency procedures and spillage kits will be available and construction staff will be familiar with emergency procedures.
- Appropriate containment facilities will be provided to ensure that any spills from vehicles are contained and removed off site. Adequate stocks of absorbent materials, such as sand or commercially available spill kits shall be available;
- Concrete or potential concrete contaminated water run-off will not be allowed to enter any watercourses. Any pouring of concrete (delivered to site ready mixed) will only be carried out in dry weather. Washout of concrete trucks shall be strictly confined to a designated and controlled wash-out area within the Lissinagroagh Wind Farm site; remote from watercourses, drainage channels and other surface water features;
- Entry by plant equipment, machinery, vehicles and construction personnel into watercourses or wet drainage ditches shall not be permitted. All routes used for construction traffic shall be protected against migration of soil or waste water into watercourses;
- Cabins, containers, workshops, plant, materials storage and storage tanks shall not be located near any surface water channels and will be located beyond the 50m hydrological buffer at all times.

14.0 Implementation of Environmental Protection Measures

All environmental protection measures, invasive species management and waste management measures will be implemented in accordance with the measures set out in Section 14.0 of this report, the EIAR, NIS and the CEMP.

15.0 Invasive Species Best Practice Measures

Invasive species can be introduced into a location by contaminated plant, machinery and equipment which were previously used in locations that contained invasive species. Good site organisation and hygiene management shall be maintained always on site, and best practice measures will be implemented, as follows:

- The contractor will prepare an Invasive Species Action Plan to be implemented during construction, and all personnel will be made aware of the requirements contained within;
- Plant and machinery will be inspected upon arrival and departure from site and cleaned/washed as necessary to prevent the spread of invasive aquatic / riparian species such as Japanese knotweed *Fallopia japonica* and Himalayan Balsam *Impatiens glandulifera*. A sign off sheet will be maintained by the contractor to confirm the implementation of measures;
- Site hygiene signage will be erected in relation to the management of non-native invasive material.

16.0 Waste Management

All waste arising during the construction phase will be managed and disposed of in a way that ensures the provisions of the Waste Management Act 1996 and associated amendments and regulations and the Waste Management Plan. Soil will be reinstated into trenches where possible. In the event, there is excess material with no defined purpose, it will be transported to an authorised soil recovery site.

17.0 Construction Programme

Estimates for the duration of the construction works are included in the table below. Please note that some of the elements are likely to happen concurrently, therefore the overall start-to-finish duration is estimated to be thirty months.

Table 3: Estimated Construction Duration	
Development Element	**Estimated Construction Duration**
110kV Wind Farm Substation	18 months
Underground Cable route	30 months

Table 3 - Estimated Construction Duration

Appendix 2-4

Construction Environmental Management Plan (CEMP)

TOBIN

Lissinagroagh Wind Farm, Co. Leitrim

Construction Environmental Management Plan (CEMP)

BUILT ON KNOWLEDGE

Document Control Sheet	
Document Reference	Lissinagroagh Wind Farm CEMP
Client:	FuturEnergy Lissinagroagh DAC
Project Reference	10955

Rev	Description	Author	Date	Reviewer	Date	Approval	Date
A	CEMP	NC	20/02/2026	SR	08/04/26	SR	19/04/26

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QUALITY I.S. EN ISO 9001:2015 NSAI Certified
ACEI ASSOCIATION OF CONSULTING ENGINEERS OF IRELAND
ENGINEERS IRELAND CPD ACCREDITED EMPLOYER

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1. INTRODUCTION

FuturEnergy Lissinagroagh DAC, a development company supported by FuturEnergy Ireland, have applied to An Coimisiún Pleanála for planning permission to construct the proposed Lissinagroagh Wind Farm Project in County Leitrim.

The proposed project is described in detail in Chapter 2 of the project Environmental Impact Assessment Report (EIAR) and comprises:

- A proposed wind farm comprising fourteen (14) wind turbines, an on-site 110kV electrical substation and other ancillary infrastructure including access roads and drainage, within a site area of 170.5 hectares (ha), with a further 218.5 ha of proposed biodiversity enhancement lands;
- A proposed grid connection comprising a 110kV underground cable approximately 32km in length to connect the wind farm to the National Grid at an existing ESBN substation in Srananagh, Co. Sligo;
- A proposed turbine delivery route along the public road network between Killybegs, Co. Donegal and the wind farm site, which will require accommodations at specific locations to facilitate turbine and construction material delivery.

The proposed project is the subject of two separate planning applications. The first application is for the proposed wind farm and ancillary works. The second application is for the proposed on-site substation and underground grid connection. This Construction Environmental Management Plan (CEMP) considers the project as a whole.

1.1 SITE LOCATION

The proposed wind farm site is located within the townlands of Lisdarush, Shasmore, Faughary, Boleyboy, Cashelaveela, Tawnyfeacle, Lissinagroagh and Cherrybrookt in north County Leitrim. The closest turbine is located approximately 3 km northeast of Manorhamilton and approximately 4 km southwest of Kiltyclogher (Refer to Figure 1-2). The proposed biodiversity enhancement lands are located to the northeast and southwest of the wind farm in the townlands of Raheelin, Killea, Lugnasaghta, Cooloodonnell and Tullyskeherney and Cashelaveela.

The site is located in close proximity to the Northern Ireland border in County Fermanagh which is approximately 3 km to the north. The site ranges in elevation from 170 to 380 m AOD, with the eastern part of the site bordering Dough Mountain (462m). The northern turbines are situated within the Saddle Hill (375m) Coillte property at elevations between 280 and 310 m AOD generally in undulating terrain. The southern turbines are located between 170 m and 380m AOD.

The proposed landholding within which the wind farm is located extends to approximately 1,096 ha, of which 785 ha are currently commercial forest owned by Coillte. The remaining 311 ha are largely privately-owned third-party lands and comprise a mix of coniferous forestry, marginal agricultural land, peatbogs and transitional scrub. The planning application site boundary extends to 389 ha (Refer to Drawing 10955-2001).

1.2 Brief Project Description

1.2.1 Proposed Wind Farm

- Fourteen (14) wind turbines with a blade tip height range of 180 m to 185 m inclusive, a rotor diameter range from 149 m to 163 m inclusive, a hub height range from 101 m to 110.5 m inclusive, a minimum ground clearance of 22 m, and all associated foundations, hardstanding and assembly areas;
- A permanent meteorological mast with a height of 100 m, with a lightning finial extending above the mast;
- Modifications to an existing site access on the L61801 local road in the townland of Faughary in the west of the site, to be used as a permanent access during construction and operation;
- A new temporary access on the L6184 local road in the townland of Cherrybrook for use by turbine delivery vehicles during construction only, and subsequent reinstatement;
- Modifications to an existing site access on the L61844 local road in the townland of Lissinagroagh in the southeast of the site, to be used as a temporary access during construction phase only;
- Approximately 7.95 km of new internal access tracks to include passing bays and associated drainage;
- Upgrade of approximately 8.35 km of existing access tracks, to include passing bays and associated drainage;
- Temporary and permanent drainage and sediment control systems;
- Ten (10) clear span bridges and one (1) existing culvert extension at watercourse crossings by access tracks;
- Three (3) borrow pits with a total available area of 63,352 m2 for temporary use during construction. The borrow pits will subsequently be used for storage of excavated material;
- Two (2) temporary construction compounds each on an area of 9,100 m2 to contain site offices, storage containers, bunded fuel storage, waste storage, parking areas and security fencing;
- Seven (7) permanent controlled access points on the L61801 and L6184 Local Roads in the townlands of Faughary and Boleyboy to facilitate turbine delivery and construction works which will remain in place after the construction period;
- A temporary crossing of unnamed local road in the townland of Cherrybrook to facilitate turbine delivery vehicles during construction only;
- All associated underground electrical and communications cabling connecting the wind turbines to the on-site substation (the substation is subject to a separate planning application, see details below);
- All related site works and ancillary development including landscaping and soil excavation;
- Biodiversity enhancement areas (218.5 ha) to provide nesting and foraging habitat for birds and other land improvements; and
- Ancillary forestry felling to facilitate construction and operation of the proposed project.

Design flexibility has been sought from An Coimisiún Pleanála for the turbine ranges used by the project. The fourteen (14) wind turbines on site will have a maximum blade tip height

range from 180 m-185 m inclusive, a rotor diameter range from 149 m-163 m inclusive, and a hub height range from 101 m-110.5 m inclusive, and all associated foundations and hard-standing areas respective of each turbine.

1.2.2 Proposed Substation and Grid Connection

- A permanent 110kV on-site electrical substation to consist of: an EirGrid control building containing worker welfare facilities and equipment store; an Independent Power Producer (IPP) control building containing a high voltage switch room, site offices, kitchen facilities, storeroom and toilet amenities; all electrical plant and infrastructure and grid ancillary services equipment; a telecommunications mast; parking; lighting; security fencing; wastewater holding tank; rainwater harvesting equipment and all associated infrastructure and services including site works and signage;
- A 110 kV underground cable from the on-site 110kV substation to the existing ESBN Srananagh Substation in the townland of Ballysumaghan, Co. Sligo, approximately 32 km in length, of which 30.6 km will be in the public road corridor;
    - Eleven (11) existing bridge crossings, of which eight (8) will involve in-road HDD (Horizontal Directional Drill), two (2) will involve off-road HDD and one (1) will be a standard crossing within the bridge deck;
    - Eight (8) existing culvert crossings by open trenching;
    - All related site works and ancillary development.

A single grid connection will be constructed for the proposed project and will become a permanent component of the Irish national grid network.

1.2.3 Proposed Turbine Delivery Route

The proposed TDR extends from Killybegs Port to the wind farm site for 122 km along the R263, N56, N15 and N16 and L6184. There are fifty-seven (57) accommodation areas required along the route to facilitate the transport of oversize turbine components, comprising temporary vegetation management, local strengthening of road edges and street furniture management and subsequent reinstatement.

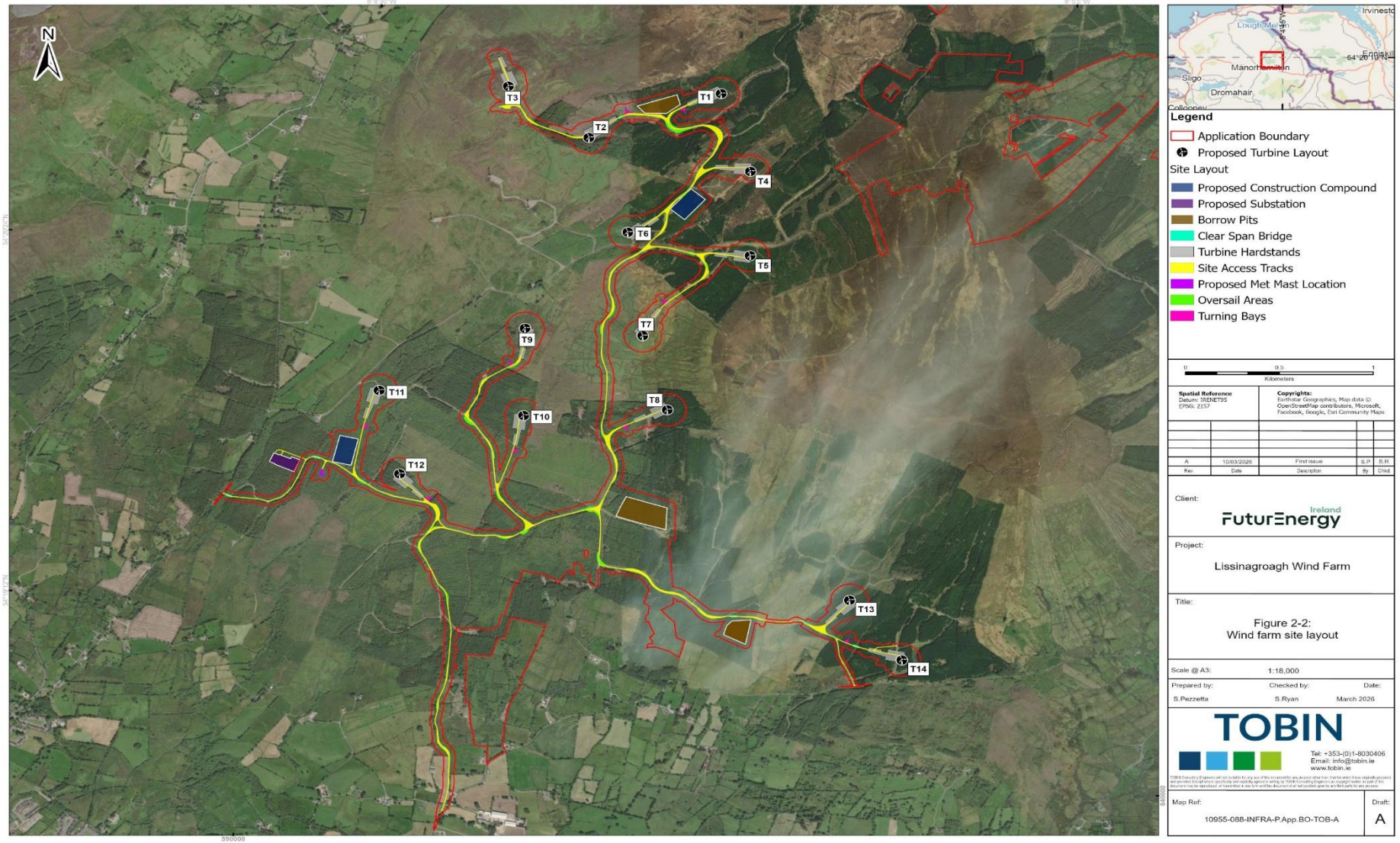

Figure 1-1 Proposed Wind Farm Layout

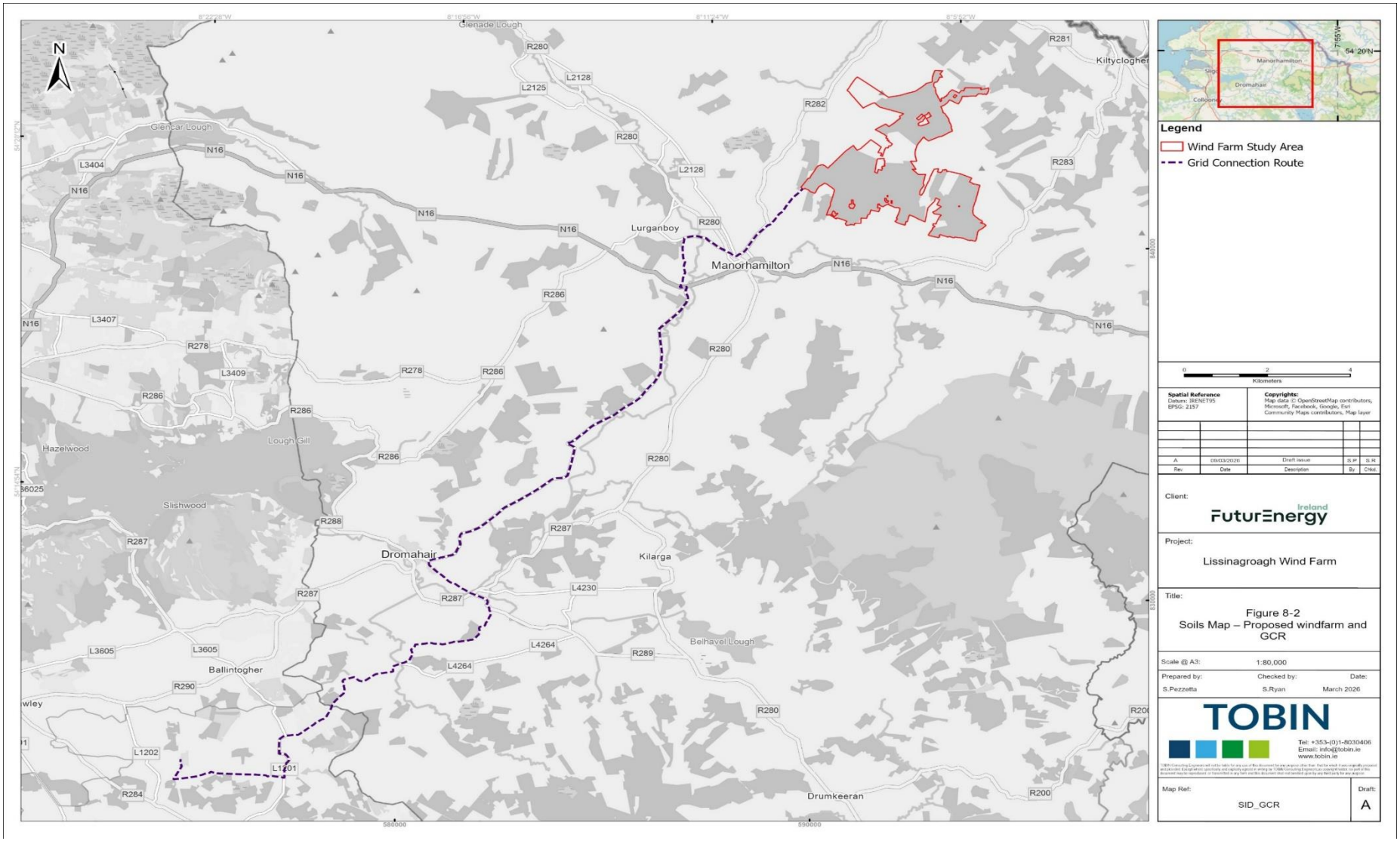

Figure 1-2 Proposed Grid Connection Route

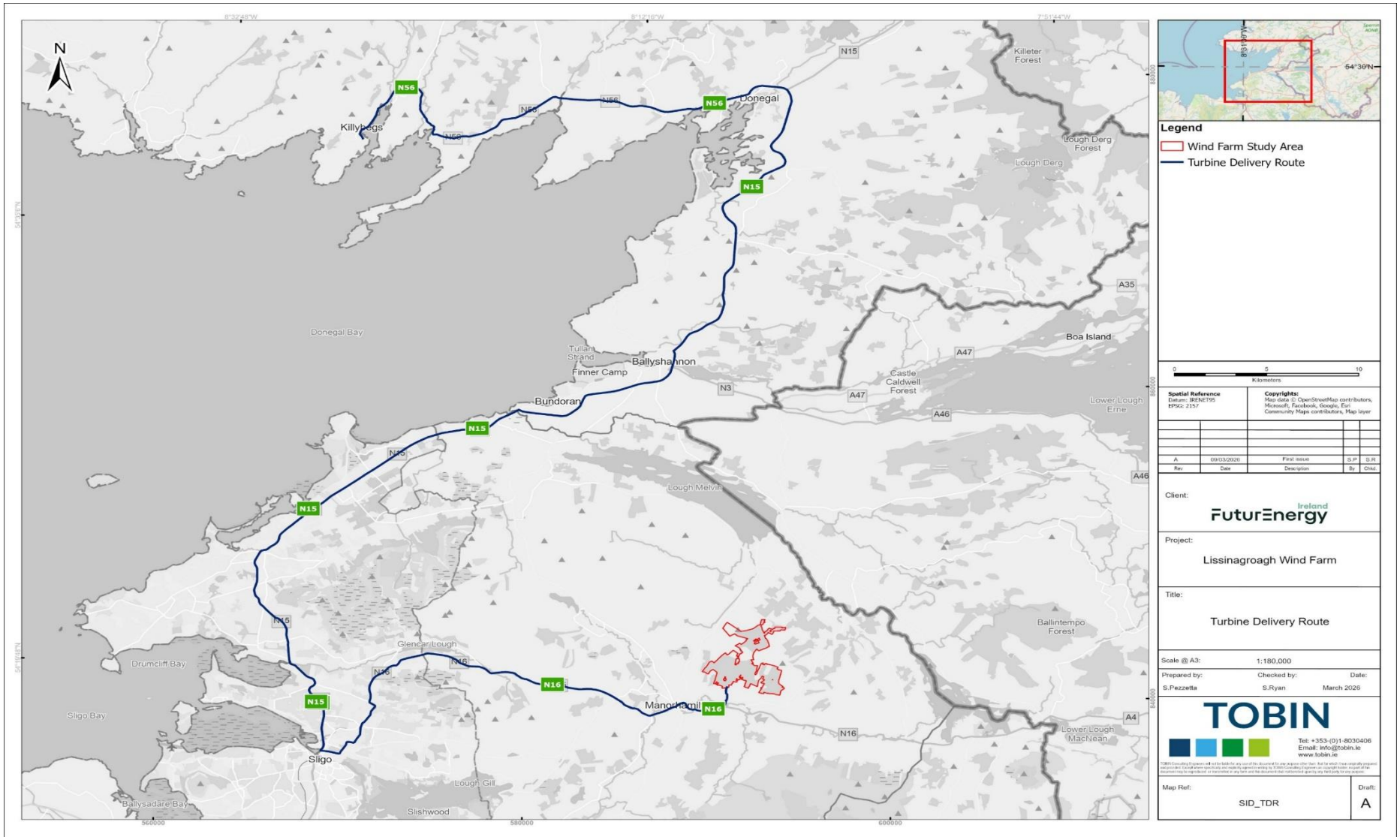

Figure 1-3 Proposed Turbine Delivery Route

1.3 CONSTRUCTION PROGRAMME

It is estimated that the construction phase will take approximately 24 months from starting onsite to completion of commissioning of the turbines.

The construction phase can be broken down into 5 no. main phases as follows (there will be overlap between these):

- 18 months – Civils (including forestry felling and vegetation clearance, drainage, construction of site roads, hardstands, turbine foundations);
- 9 months – Electrical grid connection/substation installation and commissioning;
- 12 months – Site electrical (installing between turbines and substation, pulling cables);
- 4 months – Turbine deliveries and erection;
- 2 months – Commissioning.

1.1.1 Construction Activities and Timing

It is anticipated that approximately 100 persons will be employed during the peak construction period (see EIAR Chapter 4 - Population and Human Health). With the exception of commercial forestry felling, vegetation clearance will commence outside the breeding birds season, which runs from the 1st of March to the 31st of August to protect any active bird nests and chicks. If any minor clearance or trimming is required within those dates, or if the initial vegetation clearance extends past the 1st of March due to unsuitable weather conditions, the works will be preceded by a confirmatory ecological survey (carried out by a qualified and suitably experienced ecologist) to ensure there are no active bird nests within the vegetation involved. If active bird nests are identified, works will stop and consultation will be undertaken with the National Parks and Wildlife Service (NPWS).

The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations will be restricted to between 07:00 hrs and 19:00 hrs Monday to Friday (excluding public holidays) and between 07:00 hrs and 14:00 hrs on Saturdays.

However, during the following critical periods longer hours will be required:

- Concrete pours for turbine foundations;
- During turbine installation when the weather is suitable (i.e. light winds);
- Delivery of oversized loads; and
- In the unlikely event of an emergency.

Any such out of hours working will be agreed in advance with Leitrim County Council apart from in the case of an emergency.

Due to the volume of concrete required for each turbine foundation, and the requirement for the concrete pours to be continuous, deliveries are often carried out outside normal working hours. Such activities are limited to the day of turbine foundation concrete pours, which are completed in a single day per turbine (can take >12 hours). Because of the scale of the main concrete pours that will be required to construct the proposed wind farm, the main pours will be planned weeks in advance, and refined in the days leading up to the pour. Concrete pours are required for 14 no. wind turbines so they will require 14 days of longer working hours. A similar number of days with longer working hours would be needed for installation of the turbines during a period of calm weather (this is mostly limited to on-site activity).

To accommodate delivery of large turbine components along public routes it will be necessary on occasion to work outside of the core hours, with delivery of these oversized loads in late evenings It is expected 23-38 delivery events will be needed on a maximum of 23-38 days for delivery of these oversized loads which usually travel in convoys of 3-5 vehicles with a Garda escort.

The phasing and scheduling of the main construction task items are outlined in Figure 1-4 below, where March 2028 has been selected as a start date for construction activities (based on likely timeframe to secure planning consent, complete pre-construction design and tendering work, etc.). Where there is overlap between phases, this reflects the anticipated progression of work through the site, with different areas within the site at different stages of completeness.

1.1.2 Construction Sequencing

It is proposed that works will commence at the southern end of the proposed wind farm site, where peat is either absent or extremely shallow, and the topography is flattest. The borrow pit in the southeastern area of the site near Turbines 13 and 14 will be used to source stone material for the southern half of the site, while the second borrow pit in the centre of the site will be used to temporarily deposit excess inorganic soils. As the construction moves to the northern half of the proposed wind farm site where the topography is steeper and there is slightly more peat in some locations (albeit still shallow at mostly <0.5m), the third borrow pit will be utilised as a source of stone after any temporarily stock-piled material is transferred to the first borrow pit. Any peat that is stripped at this stage will then be deposited straight into the first borrow pit, below ground level avoiding the potential for any slippage.

			2028			2029				2030
ID	Task Name	Task Description	Q1 Mar-Jun	Q3 Jul-Sep	Q4 Oct-Dec	Q1 Jan-Mar	Q2 Apr-Jun	Q3 Jul-Sep	Q4 Oct-Dec	2031 Q1 Jan-Mar
1	Site Health and Safety									
2	Site Compounds	Forestry felling & vegetation clearance (avoid Mar – Aug), construct site compounds, site accesses, fencing, gates								
3	Access Tracks	Forestry felling & vegetation clearance, construct tracks, install drainage measures, install clear span bridges & install water protection measures								
4	Turbine Hardstands	Forestry felling & vegetation clearance, excavate base, construct hardstanding areas								
5	Turbine Foundations	Fix steel, erect shuttering, concrete pour								
6	Substation Construction & Electrical Works	Construct substation and grid connection, underground cabling between turbines								
7	Backfilling & Landscaping									
8	Turbine Delivery & Erection									
9	Substation Commissioning									
10	Turbine Commissioning									

Figure 1-4: Indicative Construction Schedule

2. BACKGROUND

This CEMP has been prepared to present the proposed management and administration of site activities for the construction phase of the proposed project, to ensure that all construction activities are undertaken in an environmentally responsible manner. This CEMP summarises the environmental commitments related to the construction of the project, and the measures to ensure compliance with legislation and the requirements of statutory bodies, all as detailed in the project EIAR and Natura Impact Statement (NIS).

This CEMP will be a live document and will be reviewed and updated, as necessary. Upon appointment, the Main Contractor for construction of the proposed project shall update this document to produce an updated version of the CEMP (i.e. the Contractor's CEMP) which will account for any additional requirements set out in Planning Conditions.

The CEMP provides a summary of the requirements from relevant guidance, standards, and codes of practice applicable to the work being undertaken as part of the proposed project. The following is a non-exhaustive list of relevant guidance/standards/codes referenced in the preparation of this CEMP:

- Environmental Protection Agency (EPA), Guidelines on the Information to be contained in Environmental Impact Assessment Reports (May 2022);
- Department of Housing, Planning and Local Government (DHPLG), Draft Revised Wind Energy Development Guidelines (December 2019);
- Department of Environment, Heritage and Local Government (DEHLG), Wind Energy Development Guidelines (December 2006);
- EPA Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects (November, 2021);
- Inland Fisheries Ireland (IFI) Guidelines on the Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016);
- Construction Industry Research and Information Association (CIRIA) C532 publication 'Control of Water Pollution from Construction Sites: Guidance for Consultants and Contractors' (CIRIA, 2001);
- CIRIA C648 publication 'Control of water pollution from linear construction projects' (CIRIA, 2006);
- CIRIA C741 publication 'Environmental Good Practice on Site' (4th Edition) (CIRIA, 2015);
- CIRIA C750, 'Groundwater control: design and practice' (CIRIA, 2016);
- CIRIA C697 & C753F publications 'SuDS Manual' (CIRIA, 2007 & 2015);
- National Roads Authority (NRA) (2008). Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes. National Roads Authority;
- Irish Working Group on Groundwater (2005) Guidance Document GW5, Groundwater Working Group (WGGW) 2005;
- British Standards Institution (BSI), BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise;
- BSI, BS 5228: Part 1 and the European Communities (Construction Plant and Equipment) (Permissible Noise Levels);

- Scottish Natural Heritage (SNH) (2019) 'Good Practice during Wind Farm Construction' (4th edition). Scottish Natural Heritage;
- The Institute of Air Quality Management (IAQM) publication '*Guidance on the Assessment of Dust from Demolition and Construction*' (2014);
- Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes published by the NRA (now TII) in 2011;
- The Control of Dust and Emissions during Construction and Demolition published by the Greater London Authority (GLA) in 2014;
- Eastern Regional Fisheries Board (2004) guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites".
- Department of Agriculture, Food and the Marine. Forestry and Water Quality Guidelines. Forest Service, 2000.

3. PURPOSE AND SCOPE

The purpose of this document is to communicate the key environmental obligations that apply to all Contractors, their sub-Contractors and personnel while carrying out any form of construction activity for the development of the proposed project.

This CEMP should be read in conjunction with the Planning Documents and Drawings, the EIAR, Natura Impact Statement (NIS), and the Traffic Management Plan (TMP) (Appendix 16-1). The CEMP draws from relevant good practice guidance, standards, and codes of practice applicable to the work being undertaken as part of the proposed project. The documents used to prepare the CEMP are listed in the reference section at the end of this document.

The CEMP is a live document that will evolve during the project. As such it will be subject to constant review to address:

- Any conditions required in the planning permission;
- To ensure it reflects best practice at the time of construction;
- To ensure it incorporates the findings of pre-construction site investigations;
- Changes resulting from the construction methods used by the contractor(s);
- Unforeseen conditions encountered during construction.

This CEMP provides a mechanism for ensuring compliance with environmental legislation and statutory consents. It defines the approach to environmental management at the site during the construction phase and addresses all relevant environmental aspects of the management of site preparation and construction work within the development works area.

4. OBJECTIVES

The objectives of the CEMP are to:

- Outline the proposed mechanisms for ensuring the delivery of environmental measures to avoid or reduce environmental effects identified;
- Ensure procedures are in place so that there is a prompt response to effects requiring remediation, including reporting and any additional mitigation measures required to prevent a recurrence;
- Provide an outline of the content that will be supplied in the construction method statements and strategies that will be prepared in order to secure mitigation measures in relation to different design aspects of the proposed development.
- Ensure compliance with legislation and identify where it will be necessary to obtain authorisation from relevant statutory bodies;
- Ensure that appropriate proposed development monitoring and reporting will be in place;
- Provide a framework for reporting, compliance auditing and inspection to ensure environmental aims will be met; and
- Set out the client's expectations to guide contractors on their requirements with regards to environmental commitments and environmental management.

5. IMPLEMENTATION AND CONTROL

In terms of overall environmental responsibility, everyone on site is responsible for ensuring that their actions constitute good environmental practice. All site personnel are charged with following good practice and encouraged to provide feedback and suggestions for improvements. All site personnel are also required to ensure compliance with the requirements of the CEMP.

Compliance with the CEMP, the procedures, work practices and controls will be mandatory and must be adhered to by the Contractor, all site personnel, and sub-contractors employed during the construction phase. The CEMP seeks to:

- Provide a basis for achieving and implementing the construction related mitigation measures identified in the EIAR and NIS; and
- Promote best environmental on-site practices for the duration of the construction phase.

6. REVISIONS TO THE CEMP

As mentioned above, the CEMP is considered a 'live' document and as such will be reviewed on a regular basis to allow any changes to construction programme, operations or unforeseen issues be incorporated at any stage throughout the project as deemed necessary by the Applicant, their agents or relevant authorities. The CEMP will be subject to continual review to address, for example:

- Any conditions stipulated in the planning approval;
- Any requirements/issues highlighted through consultations prior to works e.g. by the National Parks and Wildlife Service (NPWS), Leitrim County Council, etc.;
- To ensure it reflects best practice at the time of construction; and

- To ensure it incorporates the findings of any pre-construction site investigations.

This CEMP will be provided to the appointed Main Contractor who will have responsibility for updating the document as necessary through the construction phase.

The Contractor's CEMP will incorporate the conditions associated with any grant of planning for the proposed project. This CEMP will be subject to ongoing review (throughout the construction phase of the development), through regular environmental auditing and site inspections. This will confirm the efficacy and implementation of all relevant mitigation measures and commitments identified in the application documentation.

The appointed Contractor is required to include further details and/or confirmation in the updated version of the CEMP which will include:

- Details of emergency plan including personnel and contact numbers;
- Site and traffic signage; and
- Method statements.

The appointed Contractor shall also agree and implement monitoring measures to monitor the effectiveness of the CEMP.

7. ENVIRONMENTAL AWARENESS AND CONTROL

In order to ensure that environmental awareness and compliance is communicated effectively at the start and throughout the construction works, this CEMP and its contents will be communicated to all site personnel, including management staff, operatives and sub Contractors. The key elements of this CEMP will form part of the site induction which will be mandatory for all employees, Contractors and visitors attending the site. Environmental toolbox talks will be provided to all site personnel and sub-consultants on a regular basis. These will be targeted at particularly sensitive environmental issues such as:

- Protection of sensitive ecological habitats and key ecological receptors;
- Works close to sensitive water bodies;
- Invasive species management;
- Water pollution and silt control;
- Water pollution in relation to cement and concrete handling;
- Spill prevention and control;
- Dust management.

8. ROLES AND RESPONSIBILITIES

At this stage it is envisaged that the following roles will be appointed for the construction phase of the proposed project; Construction/ Site Manager; Environmental Manager, Ecological Clerk of Works (ECoW), Project Geotechnical Engineer / Geologist; and Project Archaeologist.

The names and contact details of the individuals with responsibility for implementation and supervision of mitigation measures during all phases of the development will be clearly identified and set out in documents such as the Contractor's CEMP and site- specific method statements as appropriate.

Summary details of these roles are outlined in the following sections. At construction stage, the Contractor's CEMP will confirm roles and finalise responsibilities and contact details once appointed.

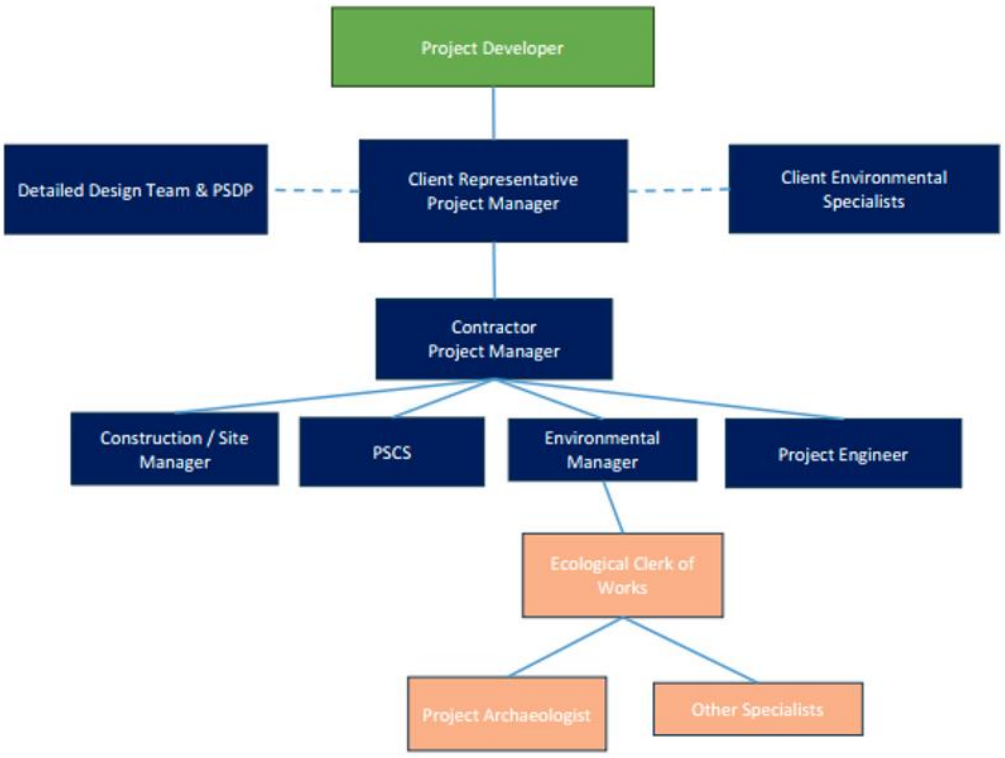

Figure 1-5 Example Project Development Organisation Chart

8.1 Construction Site Manager

A suitably qualified Construction / Site Manager will be appointed by the Contractor for the duration of the construction period. The Construction / Site Manager will have overall responsibility for the organisation and execution of all related environmental activities as appropriate, in accordance with regulatory and project environmental requirements.

8.2 Environmental Manager

The Environmental Manager will ensure compliance with all relevant environmental regulations, and environmental quality control on-site during the construction stage. The Environmental Manager will be responsible for:

- The daily implementation of the CEMP and any other monitoring/mitigation proposals required under the planning consent;
- Ensuring that the objectives of the CEMP are achieved and maintained;
- Informing the appointed contractor(s) of the CEMP and ensuring that appropriate training and awareness materials are developed and implemented on-site;
- Co-ordinating and monitoring the inputs from the ECoW, Project Geotechnical Engineer and Project Archaeologist;
- Implementing appropriate measures in the event of any environmental incidents and managing communications with relevant authorities; and
- Regular communication with the Construction/Site Manager detailing the execution and progress of environmental activities on-site.

8.3 Ecological Clerk of Works

The role of the ECoW is defined by British Standard BS 42020:2013[1] as "*person who has the ecological qualifications, training, skills and relevant experience to undertake appropriate monitoring and to provide specialist advice to "development" site personnel on necessary working practices required to i) safeguard ecological features on site and ii) aid compliance with any consents and relevant wildlife legislation related to the works.*".

Typically, the requirements of the ECoW role is largely fulfilled by a single individual, with support and assistance provided by technical specialists and senior colleagues when required, and will include:

- The ECoW (individual or team of individuals) must therefore have appropriate qualifications, training and experience to meet the requirements of the role and in addition, where needed, can access support from senior ecologists within the company with the required qualifications, training and experience;
- The ECoW will have the power to "Stop Works" at any time they deem it necessary to do so;
- The ECoW will be responsible for monitoring compliance with the mitigation measures and construction phase monitoring requirements relating to ecology / biodiversity as set out project EIAR, NIS and supporting documents such as the, CEMP, etc.;
- The ECoW will be responsible for the day to day management and interaction with the project Environmental Manager;

- The ECoW will have authority over the content of routine reports and will act independently in determining instances of non-compliance with the consents and licenses or any breaches of environmental legislation;
- The ECoW will provide the contractors team, with advice on environmental issues and compliance with planning conditions, commitments etc. as required. This includes managing certain activities that may be required in discharging consent conditions. The ECoW will inform the Contractor and Project Developer Teams of any information that could increase the risk of a non-compliance and/ or require a new licence, consent or approval.

During construction there will be occasions when the ECoW will be required to rapidly respond to unplanned events such as any wildlife incidents, pollution incidents, etc. The ECoW will have a very specific role within the emergency response teams responding to these incidents. Further detail is provided in Section 5.0. The ECoW will also be expected to support the project team in resolving any other unplanned events that are not classified as emergency responses or incidents.

Non-Compliance Events

The ECoW shall produce a procedure setting out the sequence of actions to be completed and the lines of communication required to resolve and appropriately report on a non-compliance event relating to ecology/biodiversity, should one occur.

This procedure shall be approved by the Project Developers team prior to construction commencing. The ECoW, and any other individual present on-site, has a duty of care to report any wildlife crime or breach of environmental legislation to the Project Developer. The Project Developer must report such breaches to the relevant authorities.

Reporting and Follow up

After the ECoW has responded to an incident or non-compliance event the ECoW will produce a report to the Environmental Manager for approval before it is issued to the Project Developer. The report will set out the following information as a minimum;

- Precise details of the event and those involved;
- Assessment of impact and severity (method for assessment to be developed by ECoW);
- Mitigation introduced;
- Subsequent revision of risk assessments and construction method statements and/or construction programme; and
- Lessons learnt.

Ad-Hoc Advice and Support

The ECoW will provide the Contractors Team, with advice on environmental issues and compliance with planning conditions, commitments etc. as required. This includes managing certain activities that may be required in discharging consent conditions.

8.4 PROJECT GEOTECHNICAL ENGINEER / GEOLOGIST

The Geotechnical Engineer / Project Geologist will report to the Environmental Manager and is responsible for inspection and review of geotechnical aspects associated with construction stage of the project. The Geotechnical Engineer / Project Geologist will be full time on-site during the site preparation and groundworks (such as excavation activities) and will visit site regularly at agreed periods during the construction phase.

8.5 PROJECT ARCHAEOLOGIST

The Project Archaeologist will report to the Environmental Manager and is responsible for inspection and review of any finds discovered during the construction of the project. The Project Archaeologist will monitor all stripping of topsoil, the demolition/alteration of structures and the programme of test trenching for the proposed project, including the proposed grid connection.

9. COMPLIANCE AUDITS AND COMMUNICATIONS

The ECoW and Environmental Manager will develop appropriate procedures and programmes for the following non exhaustive list of items:

- Environmental Audits, a programme of planned and spot check audits shall be developed and approved by the client;
- A programme of toolbox talks shall be developed. Toolbox talks covering relevant topics during construction;
- The ECoW and Environmental Manager will support the project team in producing site induction material tailored to the different activities carried out on site, and ensuring this material is appropriately incorporated into the overall project induction material. This will require attendance to project meetings, and production of material relevant to planning conditions and Environmental Legislation. The toolbox talks and site inductions shall include information on the role of the ECoW in the event of an incident;
- The ECoW shall ensure this information is included in the relevant induction and toolbox talk material. Once the above programmes and plans have been agreed, the Environmental Manager will be responsible for managing these plans and conducting the necessary audits, toolbox talks, etc.;
- The ECoW shall check progress, and the Environmental Manager will be reporting on progress against the programmes, plans and status of completed audits, toolbox talks etc to the ECoW on a daily basis;
- The ECoW will be required to report on audits and toolbox talks delivered in the monthly compliance report;
- Occasionally the ECoW will be required to deliver toolbox talks and produce site induction material depending on the topic being considered.

10. INCIDENTS AND COMPLAINTS

All safety or environmental incidents associated with the project will be reported and investigated in line with the ERP. Typically, the following procedures will be followed in the event of an incident:

- Works will stop immediately where safe to do so;
- The Environmental Manager will be contacted;
- The size of the incident will be assessed and determined if it can be controlled by site staff or if emergency services are required to attend;
- The appropriate enforcing authority will be contacted;
- The Environmental Manager will investigate after the incident;
- The findings will be sent to the appropriate authority; and
- An action plan will be prepared to set out any modifications to working practices required to prevent a recurrence.

This section sets out a procedure to manage and resolve any complaints received from members of the public during the construction phase of the proposed project. The following measures will be adopted and refined, as necessary, taking account of any relevant planning conditions.

A specific procedure for the management of noise complaints is provided in EIAR Appendix 9-10 and will be implemented by the Applicant and the Main Contractor.

The following measures will be implemented to deal with complaints and the Contractor's CEMP will contain more specific details with regard to phone numbers to contact:

- Clearly display a notice board at the site entrance so that the public know whom to contact if they have a complaint or comment;
- Personnel on site, including sub-contractors are required to perform their duties in accordance with this CEMP, and in such a way as to minimise the risk of complaints from third parties;
- All complaints received regarding the construction works will be recorded and categorised (e.g. noise, property damage, traffic, dust, shadow flicker etc.) within a central Site Complaints Log. This complaints log will include the following key details:
    - Name, address and contact details of the complainant (with the complainant's permission);
    - Brief outline of the complaint;
    - Date of Complaint;
    - Name of person receiving complaint details; and
    - Agreed timeline for response to complaint.
- All complaints will be communicated to the Project Manager and the Project Developer immediately;
- All complaints will be followed up and resolved in so far as is practicable; and
- The complainant, Project Developer and other stakeholders will be kept informed of the progress in resolving the complaint.

11. FACILITIES, SAFETY AND SECURITY

The proposed project will be constructed, in accordance with all relevant Health and Safety Legislation.

Aspects of the development that will present health and safety issues include:

- Health and safety aspects of construction activities;
- General construction site safety (e.g. slip/trip, moving vehicles etc);
- On site traffic safety during construction associated with localised high road embankments;
- Traffic safety during the transport of abnormal loads to the site;
- Lifting of heavy loads overhead using cranes;
- Working at heights; and
- Working with electricity during commissioning.

A (Preliminary) Health and Safety (H&S) Plan covering all aspects of the construction process, including the Health and Safety requirements must be prepared prior to the construction stage. This has been undertaken and prepared by the Project Supervisor for the Design Process (PSDP)for the project Egan Safety Solutions.

Rigorous safety checks will be conducted on the turbines during construction. Signs will be erected at suitable locations across the site as required.

12. ENVIRONMENTAL EMERGENCY RESPONSE

12.1 HAZARD IDENTIFICATION

In order to establish the type of potential emergencies that may occur, the hazards outlined in Table 12-1 have been identified as being potential situations that may require an emergency response should they occur.

Table 12-1: Potential Hazards Identified

Hazard Type	Emergency Incident
Plant / Machinery/tools causing damage	Accident resulting in injury / power failure / loss of critical infrastructure
Spillages / Leaks	Accidental spill / leak leading to significant environmental contamination
Flooding	Accident leading to injury / damage to site infrastructure
Severe Weather	Accident leading to injury / damage to site infrastructure
Fire / Explosion	Accident leading to injury / damage to site infrastructure
Turbine Collapse	Accident leading to injury / damage to site infrastructure
Landslide	Accident leading to injury / damage to site infrastructure
On-site/Construction Traffic – plant/machinery and construction vehicle movements	Traffic accident leading to injury / damage to site infrastructure
Wind Turbine Rotational Failure	Accident leading to injury / damage to site infrastructure

12.2 ENVIRONMENTAL EMERGENCY RESPONSE PROCEDURES

Every effort will be made to prevent environmental emergencies and incidents during the construction and operational phase of the project.

The Contractor will be responsible for developing a detailed environmental Emergency Response Plan (ERP) for the proposed construction works, environmental emergencies, as part of the H&S Plan.

This ERP will be activated in the event of an environmental emergency such as a fire, spillage, structure collapse etc. and will provide details on who is required to be notified etc. The ERP will also include details of all personnel inducted and authorised to work on the site.

In the event of an environmental emergency, the Environmental Manager, ECoW and Project Manager will be notified immediately and will determine the scale of the emergency and the requirement for the assistance of emergency services. Works will cease in the area of the incident and contact will be maintained with the emergency services to direct them to the scene of the incident as required.

If necessary, the Environmental Manager, with support from the ECoW will inform the appropriate regulatory authority depending on the nature of the incident. Details of the incident will be recorded (e.g. cause, extent, actions and remedial measures).

A record of all environmental incidents will be kept on file by the Environmental Manager. These records will be made available to the relevant authorities if required.

Furthermore, the Environmental Manager and ECoW will be responsible for outlining corrective actions required and will advise the Contractor and Project Developer Teams as appropriate.

The ERP must include contact names and telephone numbers for the relevant local authorities (all sections/departments) including ambulance, fire brigade, An Garda Siochána and the HSA. Reporting of environmental emergencies to the local authority will be required as well as other relevant stakeholders such as IFI, NPWS or the EPA.

12.2.1 EcoW Responsibilities

During construction there may be occasions when the ECoW could be required to rapidly respond to unplanned events such as any wildlife incidents, pollution incidents, etc.

The ECoW will have a very specific role within the emergency response teams responding to these incidents.

The ECoW will also be expected to support the project team in resolving any other unplanned events that are not classified as emergency responses or incidents.

12.2.2 Site Evacuation and Fire Drills

A site evacuation/fire drill procedure will be developed to provide basis for carrying out the immediate evacuation of all site personnel in the event of an emergency. At induction, all personnel will be made aware of the evacuation procedure. The Fire Services Acts of 1981 and 2003 require the holding of fire safety evacuation drills at specific intervals and maintaining records of such drills. The details of this procedure will be finalised in the Contractor's CEMP at construction stage and will include:

- Details regarding the notification of emergency situations to all those on site including use of a siren/horn to notify all personnel;
- Details of assembly point(s) and signage;
- Details of the roll call procedure to account for all personnel on site;
- Communication process between the Site Security Officer and the Site Manager during the procedure (i.e. notification of roll count etc.);
- Course of action to be undertaken by the Site Manager.

12.2.3 Spill Response and Control

A detailed spill response and control procedure will be developed and finalised in the Contractor's CEMP at construction stage, outlining the steps that will be followed in the event of an oil / fuel spill occurring, including:

- Identification and blocking of the source of the spill;
- Alerting personnel in the vicinity of the spill and any possible dangers;

- Elimination of any potential ignition sources in the vicinity of the spill;
- Spill containment approach and spill control materials;
- Covering or bunding off of any vulnerable areas where appropriate (i.e. drains, streams, sensitive habitats);
- Clean up using the spill control materials;
- Containment and disposal of used spill control materials;
- Communication with the ECoW – providing relevant information on the location, type and extent of the spill so that they can take appropriate action;
- ECoW actions including inspection of the site, making certain necessary measures are in place to manage the spill and prevent further spillage;
- ECoW notification to the appropriate regulatory body if necessary.

12.2.4 Emergency Contact Details

A list of emergency contacts is presented in Table 12-2. A copy of these contacts will be included in the Site Safety Manual and in the site offices and the various site welfare facilities.

Table 12-2: List of Emergency Contacts

Contact	Telephone
Emergency Services – Ambulance, Fire, Gardaí	112 / 999
Local Garda Station – Manorhamilton	(071) 982 0620
Local Fire Service	999 or 112
Local Doctor / GP Service – Manorhamilton Health Centre	071 985 5788
Our Lady's Hospital Manorhamilton	(071) 982 0406
ESB Faults / Emergencies	1850 372 999
Gas Networks Ireland 24hr Emergency Line	1850 20 50 50
Site Manager / Construction Manager / Site Supervisor	To be confirmed by Appointed Main Contractor
Client: FEI	01 669 8565
Ecological Clerk of Works (ECoW)	To be confirmed by Appointed Main Contractor
Environmental Manager	To be confirmed by Appointed Main Contractor
Project Supervisor Design Stage (PSDS)	To be confirmed by Appointed Main Contractor
Project Supervisor Construction Stage (PSCS)	To be confirmed by Appointed Main Contractor
Health and Safety Authority Ireland (HSA)	0818 289 389
Inland Fisheries Ireland (IFI)	0818 34 74 24

Project Ecologist	To be confirmed by Appointed Main Contractor
Project Hydrologist	To be confirmed by Appointed Main Contractor
Project Geotechnical Engineer / Geologist	To be confirmed by Appointed Main Contractor
Project Archaeologist	To be confirmed by Appointed Main Contractor

12.2.5 Emergency Communication Procedure

The Contractor's CEMP will be updated with an agreed Emergency Communication Response Procedure following appointment of the Contractor.

12.2.6 Induction Checklist

Table 12-3 below provides a list of items highlighted in the Emergency Response Procedure (ERP) which must be included in the induction or gathered from all personnel that will work on the proposed project during the mandatory site induction. This will be revised throughout the various stages of the project. This list will be updated and expanded on within the Contractor's CEMP.

Table 12-3: Site Induction Checklist

Emergency Response Plan – Site Induction Items TBC	Status
Site Induction (all personnel must undergo the site induction prior to commencing work on-site)	
All personnel must be made aware of site evacuation and fire drill procedures	
All personnel must be made aware of the spill response and control procedure	
All personnel must be made aware of environmental incident procedures	
All personnel must be made aware of incident and complaints procedures	
All personnel must be made aware of the emergency communication procedure and Emergency Contact Details for the project	
All personnel must be made aware and have access to the Site Safety Manual	
All personnel must be made aware of the personnel tracking procedure and provide their contact details at induction	

13. MITIGATION AND MONITORING MEASURES AGREED

All mitigation and monitoring measures relating to the pre-construction and construction phases of the proposed project were set out in the various sections of the project EIAR, this CEMP and the Natura Impact Statement (NIS) prepared as part of the planning applications for the overall project.

Mitigation and monitoring measures are presented in Table 19-1 of Chapter 19 - Schedule of Mitigation in the EIAR.

The mitigation and monitoring measures have been presented in this format as it is intended to provide a review list that can be easily checked and reported on during the future phases of the project. The use of a table to present the information will be further expanded upon over the course of the proposed project and will provide a template for use during site compliance audits.

This CEMP will be a key construction contract document, which will ensure that all mitigation measures, which are considered necessary to protect the environment are implemented.

14. ENVIRONMENTAL MANGEMENT PROCEDURES (EMP)

EMP 1: MANAGEMENT OF EXCAVATIONS

1.1 Purpose

To describe measures for the management of all excavations and excavated peat and rock on the site.

1.2 Excavation of Peat

- To reduce the risk of peat failure in areas of deeper peat (>2m), an 'excavate and replace' system will be used. Shortly after an area has been excavated, it will be backfilled with crushed stone. This stone will provide support to the adjacent peat mass.
- To reduce the construction impact on peat, the movement of machinery throughout the site will be controlled by requiring that construction vehicles and machinery do not encroach onto land beyond the proposed development footprint. These vehicles will also be required to travel via the constructed roads when moving between works areas. To emphasise this requirement, the boundaries of the footprint of the development will be fenced off with post and wire. The Environmental Manager will monitor vehicle movements throughout the construction phase.
- Temporary engineered deposition areas will be designated where necessary at the turbine and crane hardstand's locations to hold temporary stockpiles. In order to ensure the stability of the temporary stockpiles, acceptable slope angles will be specified as part of the temporary works designs. These will be completed on a case by case basis by a suitably qualified designer.
- To prevent sedimentation of local watercourses by excavated peat, excavation works in an area will not commence until the surrounding existing drainage regime is protected by interceptor drains and settlement ponds/silt fencing. Excavated peat will be reused where appropriate on site for re-grading or re-vegetation.
- Surplus excavated peat remaining after localised landscaping requirements will be deposited in the peat deposition areas.
- Peat turves, where identified by the project ecologist, will be separated and stored with the vegetated side upwards, peat stacks will not be higher than 1m.

1.3 Excavation of Rock

- To minimise the requirement for stockpiling rock and to reduce the volume of crushed stone imported onto site, excavated rock can be reused in the construction of the turbine hardstands.

  A detailed, site specific method statement for excavation of rock will be required from the Contractor(s) prior to commencement of works.

1.4 Responsibility

- The Geotechnical Engineer will supervise all excavation activities, ensuring they are carried out in accordance with the relevant designs and procedures, while also reviewing and monitoring associated data.
- Surplus excavated peat remaining after localised landscaping requirements will be deposited in the peat deposition areas.
- Peat turves, where identified by the project ecologist, will be separated and stored with the

vegetated side upwards, peat stacks will not be higher than 1m.

- The Environmental Manager will monitor the bog and the excavation areas and associated drainage.
- The Construction Manager will monitor vehicle movements throughout the construction phase.
- The Project Manager will oversee the phasing of the excavation and machinery movement across the site.
- Construction personnel will be informed of the measures to prevent pollution of water courses, particularly at stream crossings.
- The Design Engineer and Sub-contractors will have responsibilities as appropriate.
- All responsibilities will be finalised by the Appointed Contractor(s).

EMP 2: CONTROL AND MANAGEMENT OF SURFACE WATER RUN-OFF

2.1 Purpose

To describe measures for the management of all surface water and run-off on the site, for the protection of watercourses and in particular, sediment and erosion control.

2.1.1 Existing Site Drainage

The proposed wind farm site is located on the boundary of the Sligo Bay and Drowse (ID: 35) WFD Catchment and the Erne (ID: 36) WFD Catchment. The site is also subdivided between the WFD sub-catchment of Drowes_SC_010, Bonet_SC_010 and MacneanLoughs connector _SC_010.

The proposed wind farm study area is characterised by a large number of watercourses. These range from naturally occurring upland streams to modified drainage channels within forested areas at mid to lower elevations. The eastern is part of the site is characterised by several flashy watercourses in deep ravines the majority of which have existing crossings in place as part of the existing forestry road network. Many of the naturally-occurring streams have been modified by agricultural and forestry activities in the area. Streams and drainage channels were assessed and mapped during field surveys. This resulted in an update of the published EPA mapping at some locations, particularly in the southeastern part of the site.

2.2 PLAN

- Implement erosion control to prevent runoff flowing across exposed ground and become polluted by sediments.
- Intercept and divert clean water runoff away from construction site runoff to avoid cross- contamination of clean water with soiled water;
- Implement sediment control to slow down runoff allowing suspended sediments to settle in situ particularly on roads;
- Implement the erosion and sediment controls before starting site clearance works;
- Minimise area of exposed ground by maintaining existing vegetation that would otherwise be subject to erosion in the vicinity of the wind farm infrastructure and keeping excavated areas to a minimum;
- Delay clearing of soil and peat until before construction begins rather than stripping the entire site months in advance particularly during road construction;
- Avoid working near drains during or after prolonged rainfall or an intense rainfall event and cease work entirely near drains when it is evident that pollution is occurring;
- Install a series of silt fences or other appropriate silt retention measure where there is a risk of erosion runoff to watercourses from construction related activity particularly if working during prolonged wet weather period or if working during intense rainfall event;
- Implement sediment control measures that includes for the prevention of runoff from adjacent intact ground that is for the separation of clean and 'dirty' water;
- Install appropriate silt control measures such as silt-traps, check dams and sedimentation ponds;
- Provide public road cleaning where needed particularly in the vicinity of drains; and
- Controls need to be regularly inspected and maintained otherwise a failure may result, such

as a build up of silt or tear in a fence, which will lead to water pollution so controls must work well until the vegetation has re-established; inspection and maintenance is critical after prolonged or intense rainfall.

2.3 MONITORING

- The Environmental Manager will monitor the general level of suspended solids at designated sampling points in the rivers/streams downslope of the active construction areas using a turbidity meter.
- Implement erosion control to prevent runoff flowing across exposed ground and become polluted by sediments.
- The Environmental Manager will tour the site each day and check the cross-drain pipes, dirty water drains and outlets, settlement ponds, interceptor drains and silt fences for any damage or blockages. Any damage or blockages will be repaired or cleared promptly.
-
- Water quality monitoring will take place prior to and during the construction phase and for the first 6 months of the operational phase. The location of sampling points and the programme of monitoring of water quality will be agreed with the Planning Authority prior to the commencement of construction. This monitoring, together with visual monitoring, will help to ensure that the mitigation measures that are in place to protect water quality are effective.
- Water Monitoring Programme to include monitoring of streams and from end points of Sediment and Erosion Control system and visual monitoring of Sediment and Erosion Control measures.

2.4 RESPONSIBILITY

- The Environmental Manager is responsible for ensuring that appropriate water pollution prevention measures are put in place and that water sampling is carried out. Where standards are breached and remedial action is taken, an investigation must be carried out in conjunction with the Construction Manager, and further samples must be taken to verify that the situation has returned to normal.
- The Environmental Manager is responsible for ensuring spill kits are readily available in vulnerable locations and that booms for watercourses are long enough and have adequate anchorage.
- The Construction Manager (or a designate) is responsible for ensuring the spill kits are adequately stocked and should inform the Environmental Manager when items have been used.

EMP 3: FUEL AND OILS MANAGEMENT

3.1 Purpose

To describe measures for the management of all fuel and oils on site for the protection of watercourses from any spills.

3.2 Construction Machinery and Vehicles

- The potential for hydrocarbons getting into the existing drains and local watercourses will be mitigated by only refuelling construction machinery and vehicles in designated refuelling areas using a prescribed re-fuelling procedure.
- Refuelling will be carried out using 110% capacity double bunded mobile bowsers. The refuelling bowser will be operated by trained personnel. The bowser will have spill containment equipment which the operators will be fully trained in using.
- Plant nappies or absorbent mats to be place under refuelling point during all refuelling to absorb drips. Plant nappies to be provided beneath small mobile plant (e.g. small generators, pumps etc).
- Mobile bowsers, tanks and drums should be stored in secure, impermeable storage area, away from drains and open water;]
- To reduce the potential for oil leaks, only vehicles and machinery that are mechanically sound will be allowed onto the site. An up to date service record will be required from the main contractor(s).
- Potential leaks from delivery vehicles will be reduced by visually inspecting all delivery vehicles for major leaks. Contractors supplying concrete and crushed stone to the site will be contractually required to supply their products using roadworthy vehicles.
- Potential leaks from the cranes used for turbine erection will be mitigated by contractually requiring the crane suppler to supply cranes to site that are in good working order, up to date in servicing and free of leaks.
- Should there be an oil leak or spill, the leak or spill will be contained immediately using oil spill kits; the nearby dirty water drain outlet will be blocked with an oil absorbent boom until the fuel/oil spill has been cleaned up and all oil and any contaminated material removed from the area. This contaminated material will be properly disposed of in a licensed facility.
- The Environmental Manager will be immediately informed of the oil leak/spill, and will assess the cause and the management of the clean-up of the leak or spill. They will inspect nearby drains for the presence of oil, and initiate the clean-up if necessary.
- Immediate action will be facilitated by easy access to oil spill kits. An oil spill kit that includes absorbing pads and socks will be kept at the site compound and also in site vehicles and machinery.
- Correct action in the event of a leak or spill will be facilitated by training all vehicle/machinery operators in the use of the spill kits and the correct containment and cleaning up of oil spills or leaks. This training will be provided by the Environmental Manager at site induction.
- In the event of a major oil spill, a company who provide a rapid response emergency service for major fuel spills will be immediately called for assistance, their contact details will be kept in the site office and in the spill kits kept in site vehicles and machinery.

3.3 Oil Storage during the Construction Phase

- The scale of potential impacts on downstream water quality will be reduced by only storing the required volume of oils for the works taking place at the time.
- Fuel containers must be stored within a secondary containment system e.g. bund for static tanks or a drip tray for mobile stores;
- Access to oil stores will be controlled by the storage of oils within a locked steel container within the site compound. The site compound will be surrounded by a palisade fence and locked when there are no site personnel present.
- Collision with oil stores will be prevented by locating oils within a steel container in a designated area of the site compound away from vehicle movements.
- Leakages of oil from oil stores will be prevented by storing these oils in bunded tanks which have a capacity of 110% of the total volume of the stored oil. Ancillary equipment such as hoses and pipes will be contained within the bunded storage container. Taps, nozzles or valves will be fitted with a lock system.
- The volume of leakages will be prevented through monitoring oil storage tanks/drums for leaks and signs of damage. This will be carried out daily by the Environmental Manager.
- Long term storage of waste oils will not be allowed on site. These waste oils will be collected in leak-proof containers and removed from the site for disposal or re-cycling by an approved service provider.

3.4 Responsibilities

The Construction Manager and Environmental Manager are responsible for ensuring Fuel and Oils are managed in line with this procedure. The Appointed Contractor(s), in updating the CEMP, must designate personnel to the tasks relating to Fuels and Oil, as outlined below.

…… is the designated person for …….. area responsible for being present during tanker refilling operations of oil storage tanks.

…….. is the designated person responsible for checking bunds weekly.

…….. Is the designated person authorised to pump from the bund only when accumulated rainwater is clear

3.5 Reference

- Best Practice Guidelines BPGCS005 – Oil Storage Guidelines (Enterprise Ireland).

EMP 4: MANAGEMENT OF CONCRETE

4.1 Purpose

To describe measures for the management of concrete on site for the protection of watercourses.

4.2 Supervision of Concrete Pours

- To reduce the potential for cementitious material entering watercourses, concrete pours will be supervised by the Construction Manager, a suitably qualified Engineer and the Environmental Manager.
- The Construction Manager will ensure that the area of the pour is completely drained of water before a pour commences.
- Pours will not take place during forecasted heavy rainfall.
- Incidental rainfall from light showers during the period of a pour is typically absorbed into the concrete matrix but heavier showers can result in some run off from the top surface of the concrete pour. If run-off is encountered, the Environmental Manager will block the outflow from the drains to retain or treat the run-off until the pH is neutral before discharge to the drainage network.
- In the event of a spillage on site, the Environmental Manager will temporarily block the dirty water drains in the immediate area and monitor the pH levels of the water in the associated settlement ponds and if necessary will adjust the pH levels using CO_2 entrainment. Any spillage will be cleared immediately and deposited in the Chute wash down area.

4.3 Concrete Water

- Pours will not take place during heavy rainfall.
- To reduce the volume of cementitious water, washout of concrete trucks will not take place on site. Concrete trucks will be washed out off site at the source quarry.
- To reduce the volume of cementitious water, only concrete truck chutes will be washed down on site. The concrete trucks will wash down their chutes at a designated chute wash down area in the site compound. The wash down area will consist of a polythene lined bunded area with a capacity of about $20m^3$. This capacity will be sufficient to accommodate the chute wash down for two turbine base pours.
- The Environmental Manager will monitor the pH of the water in the chute wash down bund and can dose with CO2 or acidic water from the drains until the washout water achieves neutrality before discharge.

4.4 Responsibilities

- All concrete pours will be supervised by suitable personnel.
- The Environmental Manager is responsible for ensuring that appropriate water pollution prevention measures are put in place and that water sampling is carried out. Where standards are breached, he/she should carry out an investigation and in conjunction with the Construction Manager, he/she should ensure remedial action is taken and further samples taken to verify that the situation has returned to normal.
- The Environmental Manager is responsible for ensuring spill kits are readily available in vulnerable locations and that booms for watercourses are long enough and have adequate

anchorage.

EMP 5: CONSTRUCTION WASTE MANAGEMENT PLAN

5.1 Purpose

To describe measures for the management of waste associated with the construction of the wind farm. Based on a 24-month construction period and an average of 100 construction staff each year, the maximum municipal waste generated for the proposed project is expected to be in the region of 61,500 kg over 2 years.

5.2 WASTE MANAGEMENT PLAN

- The Waste Management Hierarchy (illustrated below) will be assessed and applied in the preparation and maintenance of the Construction Phase Waste Management Plan.
- The Construction Phase Waste Management Plan will address the following aspects of the Project:
- Analysis of the waste arising/material surpluses;
- Specific waste management objectives for the project;
- Methods proposed for prevention, reuse and recycling of wastes, and
- Material handling procedures.

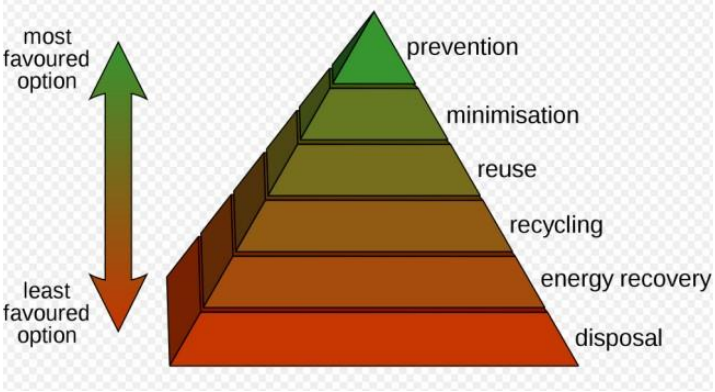

Figure 1-6 The Waste Management Hierarchy

5.2.1 Construction Methodology and Raw Materials

The construction phase of the wind farm will require a variety of construction methodologies. The anticipated phasing of the construction phase will be as follows:

Table 14-1: Construction Phasing

Activity
Prepare site, pre-construction activities, site accesses
Access track construction & drainage plan implementation
Crane hardstand construction

Turbine foundation construction
Substation construction
Internal trenching and ducting
External grid connection trenching and ducting
Turbine delivery
Turbine erection
Permanent meteorological mast erection
Reinstatement/Landscaping
Wind farm commissioning
Project closeout

5.2.2 Construction

Contractors working on site during the works will be responsible for the collection, control and disposal of all waste generated by the works. Construction phase waste may consist of hardcore, stone, concrete, steel reinforcement, shuttering timber, food waste from the canteen and unused oil, diesel and building materials. This waste will be collected at the end of the construction phase and taken off site to be reused, recycled and disposed of in accordance with best practice procedures at an approved facility. Domestic wastewater from the on-site holding tank will be collected on a regular basis by approved contractors and disposed of in an authorised facility in accordance with best practice. Plastic waste will be taken for recycling by an approved contractor(s) and disposed or recycled at an approved facility.

5.2.3 General Waste Management on Site

To manage waste effectively, focus on the following:

- Ordering the correct amount of materials to be delivered when needed.
- Ensuring materials are not delivered to site damaged and unusable
- Reducing the amount of packaging used by suppliers
- Where possible, establish a 'take back' system with suppliers
- Ensuring wastes are handled and stored correctly

Limiting the amount waste going to landfill by reusing and recycling where possible.

5.2.4 Construction Compounds

Construction compounds /waste storage area(s) will be created for storage of waste materials, plant, and equipment and for site offices, and welfare facilities.

5.2.5 Wastes Generation

Best practice procedures in general will minimise waste generated on-site. Measures including good site management will be taken to limit the quantity of waste generated during construction phase. Waste such as excavated material on-site will be recycled where possible.

Surplus materials will include materials generated by the excavation/extraction works during construction of tracks, construction compounds and turbine foundations, mainly comprising excavated excess peat and sub-soils.

Waste streams will include wastes generated by plant, machinery and construction workers over the period of the works, for example waste oils, sewage, refuse (paper, carton, plastic etc), wooden pallets, waste batteries, fluorescent tubes etc.

5.2.6 Minimisation, Reuse, Recycling and Management of Construction Watse

The primary aim of this Waste Management Plan is to ensure that wastes generated during the course of the project are managed in a systematic manner in accordance with Waste Management Legislation and the principles of the waste Hierarchy, i.e. Prevention, Minimisation, Reuse, Recovery, and Recycling.

Waste generated during the construction phase will be identified and segregated according to their category as described by the European Waste Catalogue (EWC). In order to effect this designated waste storage areas will be created at Construction Compound(s), other suitable locations, for storage and segregation of wastes prior to transport for recovery/disposal at suitably licensed/permitted facilities. Suitably sized containers for each waste stream will be provided and will be supervised by the Waste Management Coordinator (WMC). The WMC will be responsible for the management of wastes during the entire project. The numbers and sizing of the containers will be agreed with the Waste Contractors/ Hauliers in advance of the commencement of the road improvement works. Source segregation of the wastes generated will result in cost savings, in addition to providing an environmentally sound route for the management of all the Construction and Demolition Waste.

Under Waste Management Regulations 2007 a waste collection permit, for appropriate waste codes and destinations is required by the waste haulier, to transport the waste from one site to another. The contractor(s) will ensure the movement of all wastes are carried out in compliance with relevant waste regulations.

Wastes will only be treated or disposed of at waste facilities to carry out a specific activity (i.e. chemical treatment, landfill, incineration etc.) for the specific waste types. Records of all waste movements and associated documentation will be held on site. It is planned that all waste activities at the site will comprise of;

- source,
- segregation,
- storage, and
- collection

In order to prevent/minimise the generation of wastes, the contractor(s) will ensure that raw materials are ordered so that the timing of the delivery/quantity delivered, and the storage is not conducive to the creation of unnecessary waste.

The Contractor(s) will continuously seek to improve the waste management process on the site during all stages of the construction phase and maximise opportunities for reuse/recycling where ever they exist. For example in relation to waste packaging, the contractor(s) will seek to negotiate take back of as much packaging waste as possible at source, to ensure maximum recycling. The Construction Waste Management Plan will be included in the team weekly meetings. In addition the plan will be communicated to the whole construction team regularly on site, including any updates form earlier revisions of the plan.

An overview of the methods to manage the primary waste streams is presented in the following sections:

Soils and Spoil

Any materials excavated on site in the course of the construction works (i.e. soil/peat stripping for track construction, turbine foundations/ hardstanding areas) will be stored on site and re-used on site. As such, off-site disposal of this material is not expected.

No waste soils, subsoils, bedrock will require disposal outside the overall boundary of the proposed development site. All excavated material will be reused within the site except for some material used during the construction of the GCR.

Concrete

Concrete waste may potentially occur. There shall be no washout of trucks at site. Excess concrete will be returned to the supplier for reuse. Concrete trucks will be washed out off site at the source quarry. To reduce the volume of cementitious water, only concrete truck chutes will be washed down on site. The concrete trucks will wash down their chutes at a designated chute wash down area in the site compound. The wash down area will consist of a polythene lined bunded area. The capacity of this will be sufficient to accommodate the chute wash down for two turbine base pours.

The environmental manager will monitor the pH of the water in the chute wash down bund(s) and can dose with CO_2 or acidic water from the drains until the wash out water achieves neutrality before discharge.

Waste-Water Treatment / Effluent disposal

During the construction time period, the maximum wastewater production is estimated to be the same as the maximum water consumption (3,000 litres per day). The project will include an enclosed wastewater management system at the temporary compound capable of handling the demand during the construction phase when as many as 100 people will be working on site. A holding tank is proposed for wastewater management.

During the construction phase, staff facilities will be provided at the site compound/other suitable locations. A cabin comprising a canteen, washroom and toilets will be provided. This cabin will contain three integrated holding tanks; one for clean water, one for waste water and the third for sewage. The waste water tank and sewage tank will be emptied as required by a

vacuum tanker and removed from site to a licensed facility. These staff facilities will be removed at the end of the construction phase.

Hazardous and Other Waste

The following Table lists some of the waste types that may be generated during the construction works. Although some waste types may be generated in locations other than the construction compounds (for example if absorbent filters are required at foundation/track locations etc., such waste materials will be stored within the construction compounds only. Waste materials generated out with the construction compounds will be taken to the compounds on a daily basis.

Table 14-2: Common Construction Wastes

Common Construction Wastes					
Concrete	Wood	Cables	Ducting	Metallic packaging/tins	Cardboard packaging
Paper packaging	Plastic packaging	Wooden packaging	Office paper	Non-hazardous detergent	Plastic containers
Plastic bottles	Mixed waste	Septic tank sludge	Ferrous metal	Non-hazardous electrical waste (WEEE)	

Table 14-3: Hazardous Waste

Hazardous Waste, as categorised by the European Waste Catalogue	
13 01 10: Used mineral hydraulic oil (non-chlorinated)	13 02 08: Other waste engine, gear or lube oil
13 02 05: Waste engine, gear or lube oil (non-chlorinated)	13 02 08: Other waste engine, gear or lube oil
16 01 07: Oil filters	20 01 23: Discarded equipment containing CFCs
16 06 01: Lead batteries	16 07 08: Oily waste from transport and storage tanks
16 10 01: Hazardous liquid wastes to be treated off-site	20 01 21: Fluorescent tubes and other mercury-containing waste
20 01 33: Hazardous batteries and accumulators that are collected separately	15 02 02: Absorbents, filter materials, wiping cloths, clothing contaminated by dangerous substances

If hazardous waste is encountered, then appropriate handling, storage, transportation, and disposal will be carried out. Prior to being removed from the site, the waste will undergo a

comprehensive waste assessment and classification by suitably trained/qualified person(s), in accordance with the European Waste Catalogue hazardous waste list.

If non hazardous waste becomes contaminated with hazardous waste, the entire load will be considered hazardous. At the site every effort will be made to segregate waste, and properly segregate hazardous waste from non hazardous and inert waste arising. Hazard wastes will be identified, removed and kept separate from other wastes in order to avoid cross contamination. Specific method statement detailing the necessary mitigation measures during the excavation/handling, transportation, and disposal of hazardous materials encountered at the site will be prepared as required.

Oil paints, adhesives and chemicals will be kept in a separate contained secured storage area. Lids will be kept on containers to avoid spillage/evaporation. Waste oils, adhesives etc will handled, and disposed of appropriately. Every effort will be made at the site for no long-term storage of hazardous materials/fuels/oils/chemicals, etc. There shall be no long-term storage of waste oils etc. at the site.

Gravel/Stone/Asphalt/ Bituminous Materials

There will be no requirement for the storage of Asphalt/bitumen materials on site. Road surface materials will be delivered to site as required, with excess returned to supplier.

Metals

It is now common practice to segregate metals for reuse and recycling, however there are still sites where waste metal is thrown away in the general rubbish. One of primary sources of metal on sites is rebar. Waste of rebar will be reduced by ordering 'made to measure' from the source, and detailed scheduling of all reinforced concrete structural elements.

Timber

Timber waste will be stored separately. Any pallets will be returned to the supplier for reuse. Off- cuts/trimmings will be used in formwork where at all possible. A container for waste wood, covered where possible will be located at compound/other storage areas. This waste will be collected by the waste contractor and will forward it for wood recycling.

- An open skip will be put in place to collect at the temporary site construction compounds.
- Special care will be taken to segregate the timber into treated and untreated fractions.
- The following timber materials are considered as waste by timber recyclers - plywood, painted timber and pressure treated timber. This waste timber fraction will be disposed of to mixed waste skip.
- This material will be collected by the contracted and licensed non-hazardous waste collectors and brought to a licensed waste recycling facility.

Blocks, Bricks, and Tiles

The careful storage of these materials will significantly reduce the volumes of wastes occurring at the site. Every effort will be made to use broken blocks/off-cuts. Final quantities of these wastes generated will be stockpiled (possibly crushed/screened), and reused at the site as sub base materials for road/other suitable hardstanding locations.

Packaging/Plastic

Double handling will be avoided by segregating packaging wastes immediately after un-wrapping. Waste packaging will be segregated and in separate containers, at storage area for collection by the waste contractor for disposal to licensed facility.

Mixed Waste

- This waste stream will arise from waste packaging of electrical and engineering components.
- An open skip will be put in place to collect mixed waste within a designated waste area at the temporary site construction compounds.
- This skip will accept plastic packaging, plastic piping, cardboard and timber waste.
- Special care will be taken to ensure that no green waste or food waste will be disposed of in this skip. The purpose of this arrangement is to stop birds scattering food items across the site and therefore prevent vermin infestation.
- This material will be collected by contracted and licensed non-hazardous waste collectors.

Mixed Waste/Canteen Waste

- Staff canteens have the potential to generate food waste and packaging waste. Designated receptacles will be provided at the canteen(s) to allow for segregation, and storage of individual waste streams. These will include receptacles for food waste, dry recyclables, and residual bin. All offices and canteens will be equipped with black plastic refuse bags and wheelie bins for the purpose of collecting and delivering this waste stream to the compactor. This material will be collected by the contracted waste management company/transported to licensed facility.

Dry recyclable collection from welfare facilities

- All offices and canteens will be equipped with clear plastic bags and wheelie bins for the purpose of collecting dry recyclables. This will be strictly managed to prevent any food waste entering the dry recyclable stream.
- Recycling wheelie bins will be located at all welfare facilities and offices associated with the wind farm project.
- This material will be collected by the contracted and licensed non-hazardous waste collectors.

Other waste

Other wastes which may be generated may include residual non recyclable waste such as paper, cloth, some cardboards, or plastics. Others may include fibreglass and geotextiles, and polystyrene. These types of materials will be stored in a dedicated container at the site compound. All residual wastes will be dispatched to suitably licensed facility for disposal. Other construction and demolition waste will be collected and disposed of appropriately.

5.2.6.1 Management of General Waste

- Access to materials will be controlled. A dedicated storage area will be provided in the site construction compounds for building materials such as cables, plastic piling for the settlement ponds, geotextile matting, blocks, tools and equipment, fence posts and wire, booms, pipes.
- Access to stored materials will be restricted; the site compound will be securely fenced from

the outset and will be locked when there are no site personnel present.

- To contain and manage construction phase waste, multiple skips will be provided at the temporary site construction compounds; one for recyclable waste and others for various construction waste. These skips will be emptied when required by a licensed waste management company. Waste oil and waste oil drums will be collected and stored in containers and on a bunded tray within the storage container.
- At the end of each phase, the completed works areas will be tidied of any unused material or waste; this material will be brought to the site compound for storage and reuse or placed in the appropriate skip for disposal.

5.2.7 Construction Phase General Waste

- Construction waste (timber, steel, concrete) These elements will be segregated and stored in dedicated bins on site for recycling.
- Timber waste will be kept to a minimum through the re-use of shutters throughout the job. At the end of the job, the majority of timber will be sent onto a new site for re-use. Any timber that cannot be re-used because of poor quality will be recycled.
- All waste steel reinforcing will be stockpiled and at the end of each work unit, it will be collected for recycling by Licensed Facility.
- Plastics and packaging will be segregated and stored in dedicated bins on site for recycling.
- Waste oil stored on site will be stored in labelled containers and will be collected by licensed facility/licensed oil-recycling contractor as necessary. Records will be maintained on the volumes of waste oil generated.
- Paper / cardboard, this material will be recycled.
- Wastewater from office and welfare facilities. These facilities will be regularly emptied by licensed/suitable contractors.

5.2.8 Alignment of Responsibilities

A Waste Management Coordinator (WMC) will be assigned at the wind farm site, to have an overall responsibility for the management of waste that may be generated at the site. As part of the record keeping procedures, the WMC will keep records of all waste being removed from site. This information will be recorded in a standard format. The effectiveness and accuracy of the documentation will be monitored on a regular basis. The Waste Management Plan will be updated on a regular basis where required and made available as required (i.e. sub contractors). The WMC will be appropriately trained/suitably qualified in all aspects of materials wastes management, and the site personnel will be in a position to;

- Distinguish reusable materials from materials suitable for recycling
- Ensure maximum segregation at source
- Cooperate with Site Management, on locations for stockpiling reusable materials
- Separate materials for recovery
- Identify and liaise with operators for recovery outlets

The WMC will be responsible for educating site personnel, sub contractors, and suppliers, about

the best alternatives to conventional waste disposal/Waste Management Regime at the wind farm site. Training will also be given to site personnel in materials management on site. The WMC will continually identify waste minimisation actions on site and these will be updated in the plan.

5.2.9 Training

Copies of the Waste Management Plan will be available to all site personnel. All site personnel and sub contractors will be instructed about the objectives of the Waste Management Plan for the site and informed of the responsibilities which fall upon them as a consequence of its provisions. This will be carried out during the site induction process for all site personnel. Where source segregation and materials reuse techniques apply, each member of the construction team will be given instructions on how to comply with the Waste Management Plan for the site. Site notices will be designed to reinforce the key messages of the waste management plan and will be displayed prominently for the benefit for all on site personnel.

5.2.10 Waste Records

All details of wastes (arising/generated/movement, etc) will be recorded during the project. Each consignment of waste removed from the site will be documented in the form of a waste management movement record form which will ensure full traceability of the material to its final destination. All records will be retained at a designated location at the site office/construction compound and made available for auditing of the waste management plan.

5.2.11 Waste Management Plan Summary

Wastes will inevitably be generated during the construction phase of the project. There shall be no requirement to remove peat/spoil etc from the site. A certain amount of surplus soils/materials will be generated. These materials will be reused as backfill/landscaping around turbine bases and hardstands.

Other than spoils from excavations, waste arising during the construction phase will be minimised by site management, by timing the ordering of materials required at the site, in a manner which reduces the likelihood of over-ordering, or damaging during storage. Furthermore, several of the traditional waste streams arising maybe used at the site where appropriate. Waste will be segregated and stored on site at designated locations/in containers prior to transport to appropriate licensed facilities.

A Waste Management Coordinator will be appointed to ensure the Waste Management Plan is followed. Training will be given to all site personnel, so that they are aware of the Waste Management Regime at the site and know their responsibilities.

Records will be kept tracing the inputs and outputs of the construction works at the site. These records will be made available to relevant authorities, should it be required.

The design and implementation of the Waste Management Plan will provide for the optimum planning/management and handling of wastes generated during the construction phase of the wind farm development.

5.3 REFERENCES

Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (DoEHLG, July 2006).

EMP 6: CONSTRUCTION TRAFFIC MANAGEMENT

6.1 Purpose

To describe measures for the management of all traffic, including construction traffic and oversized loads, for the minimisation of disturbance and nuisance to the local community.

6.2 General

The Appointed Contractor(s) will prepare a detailed Traffic Management Plan prior to the works commencing. This Plan will be finalised in agreement with An Garda Síochána and Leitrim County Council.

The plan will include provision for:

- Communicating with the local community, An Garda Síochána and Leitrim County Council.
- Details of site access and any site traffic rules, including security, parking, loading and unloading, required speed or other relevant details.
- Details of the turbine component delivery and any road closures.
- Programme of maintenance and upkeep of public roads.
- Site operating hours (including delivery) to be outlined.

6.3 Public Roads

- In order to mitigate from a significant impact during peak traffic hours, the majority of staff will either arrive on-site before or after the peak morning traffic and finish work before or after the evening peak traffic hours.
- The condition of the public roads will be monitored on an on-going basis and a road sweeper provided to clean the public roads if required.

6.4 Site Entrance

- There will be no parking of any vehicles on the public road near the wind farm site entrance.
- Adequate parking will be provided on site for both employees and visitors.
- The condition of the site entrance will be monitored on an on-going basis and a road sweeper provided to clean the public road if required.

6.5 Responsibility

- Project Manager
- Construction Manager
- Construction personnel
- Delivery personnel

EMP 7: WHEEL WASH MANAGEMENT PROCEDURE

7.1 Purpose

To describe measures for the protection of watercourses and public roads from dirty water from vehicles.

7.2 PROCEDURE

The Appointed Contractor(s) will reduce the potential for the roads being dirtied by heavy vehicle traffic, by including the following:

- A Wheel Wash facility will be provided at the Site Entrance.
- Wheel washes will be cleaned as required

Dry Option: At assigned locations at the site entrance a wheel wash will be installed for wheel washing prior to vehicles leaving site. A dry wheel wash (vibrating) will be used to remove any mud from the vehicle's wheels, with excess mud / etc. being collected and treated/disposed of following treatment.

The wheel wash station will remain on site until the development is complete. The wheel cleaning procedure will consist of:

1) Before leaving the site, vehicles will enter the wheel wash and be inspected for any heavy deposits left on wheels. If present, these will be removed manually.
2) Following inspection, all wheels are to be cleaned down with the vibration system, until clear of all deposits.
3) Vehicles will be permitted to leave site following approval of the operating manager/ site representative that the above steps have been completed to a satisfactory standard.

Daily inspections of the wheel wash will be completed to check it is operating as described above, and to make sure there is no excess material collected posing risk during periods of rain. The washout area will be cleaned as required, with excess material disposed of appropriately (Deposition area), or used as back fill within the site. If required, drainage ditches/berms will divert dirty water to sedimentation pond for treatment, prior to outfall to vegetated area (preventing sedimentation (runoff /rainwater washing material away).

On site roads/local roads will be kept as free of mud as is practicable during ground working operations. Machine trafficking around the site will be kept to a minimum in order to reduce the effects of rain on 'broken' ground.

If wheel wash facility is not sufficient, a road sweeper will also be used in the immediate area which will be ordered directly via the site manager.

7.3 RESPONSIBILITY

The Construction Manager/Environmental Manager will monitor the wheel wash area/sediment control infrastructure and carry out corrective action where required.

EMP 8: CONSTRUCTION DUST MANAGEMENT

8.1 Purpose

To describe the measures for the management of nuisance impacts on air quality from construction generated dust.

8.2 PROCEDURE

In order to ensure that no dust nuisance occurs, a series of measures will be implemented:

- Site roads will be regularly cleaned and maintained as appropriate.
- Hard surface roads will be swept to remove mud and aggregate materials from their surface.
- Furthermore, any road that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during dry and/or windy conditions.
- Speeds will be restricted on hard surfaced roads as site management dictates.
- Public roads in the vicinity of the site will be regularly inspected for cleanliness and cleaned as necessary.

A temporary vehicle wheel wash facility will be installed in proximity to the site entrance.

The dust minimisation plan will be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures.

8.3 RESPONSIBILITY

- The Environmental Manager is responsible for ensuring the standard construction dust management measures highlighted in section 11.7.2, Table 11.10 are followed.

8.4 REFERENCES

- Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (Consultation Draft, National Roads Authority, October 2006)
- Control of Dust from Construction and Demolition Activities (BRE, 2003).

EMP 9: CONSTRUCTION NOISE MANAGEMENT

9.1 Purpose

To describe measures for the management of impacts from construction noise.

A specific procedure for the management of noise complaints is provided in EIAR Appendix 9-10 and will be implemented by the Applicant and the Appointed Contractor.

9.2 Procedure- Control of Noise at Source

- Only properly functioning and maintained plant/equipment will be permitted on site.
- No unnecessary revving of machinery on site.
- Plant will be properly used and regularly maintained.
- Compressors, if needed, will be 'sound related' models fitted with properly lined and sealed acoustic covers which will be kept closed whenever machines are in use.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers.
- Machinery will be turned off where practicable when not in use.

9.3 Responsibility

- The Construction Manager will be familiar with the noise sensitive receptors and alert the Environmental Manager in good time prior to work commencing in the areas closest to any noise sensitive receptors.
- The Environmental Manager will review any relevant planning conditions in updating this plan.

9.4 References

- BS5228 –1&2:2009, Code of Practice for the Control of Noise and Vibration on Construction and Open Site

EMP 10: ARCHAEOLOGICAL AND HERITAGE PROTECTION

10.1 Purpose

To describe measures for the management and protection of archaeological and cultural heritage on the site.

10.2 PROCEDURE

- Prior to the commencement of construction, a programme of archaeological test trenching will be carried out at the greenfield locations across the proposed wind farm site. This work will be carried out under licence to the NMS. Dependent on the results of the testing assessment, further mitigation will be implemented as required and agreed with the National Monuments Service (NMS) of the DoHLGH.
- If archaeological remains are identified during the course of these works, further mitigation will be implemented as required and agreed with the NMS of the DoHLGH.

10.3 RESPONSIBILITY

- Project Manager
- Environmental Manager
- Construction Manager
- Project Archaeologist

EMP 11: ECOLOGICAL MANAGEMENT PLAN FOR THE PROTECTION OF HABITATS AND FAUNA

11.1 PURPOSE

To describe measures for the management and protection of habitats and fauna on the site.

11.2 PROCEDURE

- Ensuring implementation of ecological protection measures outlined below.
- Advising on re-vegetation onsite.
- Monitoring of success of re-vegetation.

11.3 ECOLOGICAL PROTECTION MEASURES

General Habitats

Habitat degradation will be limited by controlling the movement of construction vehicles and machinery. Construction vehicles and machinery will not encroach onto habitats beyond the proposed development footprint and will be required to travel via the constructed roads when moving between works areas. To emphasise this requirement, the boundaries of the footprint of the development will be fenced off with post and wire. The Environmental Manager will also monitor vehicle movements.

Monitoring

- The following confirmatory surveys will be undertaken:
    - Confirmatory bird surveys breeding season.
    - Confirmatory terrestrial mammal survey, particularly, for otters.
    - Confirmatory surveys for Flora Protection Order species.
- Bird surveys will be carried out prior to, during the construction phase and post construction in accordance with the approved Bird Monitoring Programme.
- Water quality monitoring will take place prior to, during the construction phase and post construction in accordance with the approved Water Quality Monitoring Programme.
- Routine inspections and maintenance of sediment and erosion control measures will take place regularly during the construction phase and during the operational life of the project. Silt traps and settlement ponds will be cleaned on a regular basis to ensure their effectiveness.
- To reduce the level of disturbance to fauna, construction activities will be restricted to between 7:00hrs and 19:00hrs Monday to Friday (excluding public holidays) and between 07:00hrs and 14:00hrs on Saturdays. Construction work will not take place outside of these hours unless in exceptional circumstances. Construction activities (including human presence) along the GCR, (inclusive of the following WFD river waterbodies Bonet_030, Bonet_040, and Bonet_050.and Shanvaus_010), will not begin until one hour after dawn and will cease an hour before dusk. Noise, vibration, lighting, and human activity, have the potential to temporarily disturb/displace European otter within Lough Gill SAC, particularly during dawn and dusk when the species is most active.
- In the unlikely event that protected faunal species are found actively using the Site for

breeding/roosting during the construction phase, works in the affected areas will cease immediately, and the relevant area will be cordoned off until advice is sought from a suitable qualified expert/NPWS, Full details on pre-construction confirmatory surveys can be found in EIAR Chapter 5- Biodiversity Section 5.12.4 Pre-Construction Confirmatory Surveys.

11.4 RESPONSIBILITY

- Ecological Clerk of Works
- Environmental Manager
- Construction Manager
- Project Ecologist

EMP 12: MANAGEMENT OF INVASIVE SPECIES

12.1 PURPOSE

To describe measures for the management of invasive species on site.

12.2 PROCEDURE

Areas where invasive species are present will be identified and demarcated prior to commencement of construction:

Invasive Species Control

The following principles will be applied during the management of Invasive Species at the Development site:

- Prevention/Biosecurity: Preventing invasive species from arriving on site/preventing spread of invasive species.
- Response: Regular monitoring combined with a rapid response to treat/ eradicate invasive species that are identified encroaching on the site, to ensure that they do not become established.
- Eradication: Aiming to eradicate invasive species on site will prevent the problem increasing.
- Containment: It may not be realistic to completely eradicate invasive species from a particular site. This could be due to level of infestation or the species involved, and resourcing limitations (both financial and personnel required).

Informing

- Invasive Species 'Tool Box Talks'/Site Inductions will be delivered to ensure all site personnel are of aware of/what invasive species looks like that are potentially at the location/greater area, i.e. Japanese Knotweed and issues associated with the same. To reduce the likelihood of invasive species spreading, the construction personnel involved in works will be trained in basic relevant invasive species prevention and management ('Tool Box talk').
- Prior to the commencement of construction, the development footprint will be surveyed for the presence of invasive species. If invasive species are present, the Project Manager/Environmental Manager will manage their control. The control methods will be specific to the local site conditions as well as the invasive species being managed. Control

methods can include physical and/or chemical control methods and monitoring.

- Where any non-native species is present, a management plan will be put in place, to manage the risks and implications of the species, along with legal requirements.
- A distribution map of the invasive alien plant species at the development site has been developed, and will be incorporated into the CEMP.
- Where a non-native species is identified as a risk of being introduced, spread within, or moved off site, mitigation measures will be in place to prevent spread of the species.
- If required, the project will be phased, to allow time to deal with the presence and/or risk of spread of non-native species.
- Where a species requires long-term management (e.g. Japanese knotweed), a site management plan will be developed that addresses all issues associated with it.
- Locations of invasive species within the overall site will be highlighted and excluded from the works.
- To reduce the likelihood of invasive species being introduced to the site from quarries, the aggregate will be crushed stone which will be biologically inert and would not be expected to have a seed bank.
- No machinery will be permitted to park within demarcated/exclusion areas.
- If excavations are required/movement of invasive species such as Japanese Knotweed, relevant licenses will be obtained, and any excavations/movement of the same will be in line with current beast practice.

Biosecurity

- To reduce the likelihood of invasive species being introduced to the site from construction works on other sites, it will be required that vehicles and tools will arrive on site clean. Work boots will be dipped in or scrubbed with a disinfectant solution and thoroughly dried afterwards before being used on the site for the first time (Also requirement during water quality sampling between different catchments). All PPE will be visually inspected and any attached vegetation or debris removed. PPE and tools will remain on site for the duration of construction. Any machinery or equipment returning from a different construction site will be cleaned, power washed/steam washed and visually inspected again before re-entering the site.

Equipment/Machinery

To maintain good site hygiene when dealing with any non-native species:

- A fence/signage that can be clearly seen will mark out any area of issue. Signs should be erected to warn people working there that the area is infested / contaminated. No entry signage will be put in place.
- Where contaminated soil, materials or water are located, signage should be erected to indicate them.
- Personnel working on or between sites will ensure their clothing and footwear are cleaned where appropriate to prevent spread.
- Tracked vehicles should not be used within the area of infestation.
- All vehicles leaving the infested area and / or transporting infested soil/materials must be thoroughly pressure-washed in a designated wash-down area before being used for other work.

- Where cross-contamination is possible (i.e. from one site to another), vehicles or machinery will be designated to specific sites where possible to prevent spread.
- Material / water left after vehicles have been pressure-washed must be contained, collected and disposed of appropriately.
- All chemicals used for the control of non-native species should be stored and used in an appropriate manner carried out by specialist/suitability trained personnel.

Methodologies

Invasive species management methodologies and plans outlining Best Available Techniques (BAT) will be sourced from the National Invasive Species Database, from previously published documents/current best practice, and from the Invasive Species Ireland and Inland Fisheries Ireland websites. See the Invasive Species Management Plan, Appendix 5-6 of the main EIAR.

12.3 RESPONSIBILITY

- Project Manager
- Environmental Manager
- Construction Manager
- Project Ecologist

12.4 REFERENCES

Information on invasive species is provided in the National Road Authority (NRA) (now Transport Infrastructure Ireland (TII))[1], and Invasive Species Ireland (ISI)[2] documents provided in Annexes I and II, in relation to identification, control and eradication of Japanese Knotweed.

EMP 13: MONITORING AND AUDITING

13.1 Purpose

To describe measures for environmental monitoring during the construction works and audit of control measures to ensure environmental protection.

13.2 PROCEDURE

All mitigation measures, any planning conditions and relevant construction methods will be monitored on site. The Appointed Contractor(s) will nominate an Environmental Manager for the works. The Environmental Manager will provide Audit Checklists to ensure regular checks of the site's control measures for the ongoing protection of the environment.

Monitoring will be carried to ensure adherence with the following;

EMP-2	Surface Water Management and Run-off Control (Sediment and Erosion Control)
EMP-3	Fuels and Oils Management
EMP-4	Management of Concrete
EMP-5	Construction Waste Management Plan
EMP-6	Construction Traffic Management
EMP-7	Wheel Wash Management Procedure
EMP-8	Construction Dust Management
EMP-9	Construction Noise Management
EMP-10	Archaeological & Heritage Protection
EMP-11	Ecological Management Plan Protection of Habitats and Fauna

Checklists for daily, weekly or monthly site audits will be finalised by the Environmental Manager and the relevant personnel informed of their duties. Checklists will include (but are not limited to) confirmation that fuel is stored appropriately, waste management rules are adhered to, all environmental buffers are maintained, Surface water and run-off control measures of the are in place and functioning, and concrete chute wash-out procedure is being followed. Checklists will be finalised with the Final Contractor(s)'s EOP.

All environmental records, including completed checklists, will be retained at the site office.

13.3 RESPONSIBILITY

- Project Manager
- Environmental Manager
- Construction Manager
- Project Ecologist
- Project Archaeologist

Details of Monitoring Procedure and Checklists to be finalised by Appointed Contractor(s)'s Environmental Manager

15. DECOMMISSIONING PLAN

The Decommissioning Plan sets out the framework for the safe and environmentally responsible removal of the proposed wind farm infrastructure at the end of its operational life. It ensures that all works are undertaken in accordance with best practice, relevant legislation, and the mitigation measures outlined in the Environmental Impact Assessment Report (EIAR) and associated planning documentation.

15.1 SCOPE OF WORKS

Decommissioning will include the dismantling and removal of all above-ground infrastructure, including wind turbines and the meteorological mast. Underground cabling will be removed where practicable, with ducting generally left in situ to minimise environmental disturbance. Turbine foundations will be backfilled and reinstated rather than fully removed to reduce impacts such as noise, dust, and soil disturbance. Reinstatement of disturbed areas will be undertaken following removal works.

15.2 ENVIRONMENTAL MANAGEMENT

A range of environmental control measures will be implemented during decommissioning to minimise potential impacts. These include drainage protection, dust and noise control, pollution prevention, invasive species management, and traffic management. A Construction Waste Management Plan will guide the handling of materials, prioritising waste prevention, reuse, and recycling in accordance with the waste hierarchy and relevant legislation.

15.3 MATERIALS AND WASTE MANAGEMENT

Materials generated during decommissioning will be segregated and managed to maximise reuse and recycling opportunities. Components such as metals and cabling will be recovered for recycling, while any non-recyclable materials will be disposed of at appropriately licensed facilities. Waste handling will comply with all applicable regulatory requirements and permit conditions.

15.4 EMERGENCY RESPONSE

An Emergency Response Plan (ERP) will be implemented to address potential incidents such as accidents, spills, fire, or peat instability. The ERP will define roles and responsibilities,

communication procedures, evacuation protocols, and incident reporting requirements to ensure a timely and effective response.

15.5 Programme and Duration

The decommissioning phase is expected to take approximately five months to complete, from initial dismantling works through to final site reinstatement. A detailed programme of works will be developed prior to commencement.

15.6 Monitoring and Compliance

Environmental monitoring, inspections, and audits will be undertaken throughout the decommissioning phase to ensure compliance with mitigation measures and environmental commitments. The Environmental Clerk of Works (ECoW) and Site Manager will oversee implementation, and corrective actions will be taken where required. The Decommissioning Plan will be reviewed and updated as necessary to reflect site conditions and project requirements.



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Appendix 2-5

Spoil and Peat Management Plan

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Lissinagroagh Wind Farm

Spoil and Peat Management Plan

Appendix 2-5

BUILT ON KNOWLEDGE

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1. INTRODUCTION

The proposed project, known as Lissinagroagh Wind Farm is located in Leitrim approximately 2km northeast of Manorhamilton.

The proposed project comprises:

- A wind farm containing fourteen (14) wind turbines, an on-site 110 kV electrical substation and other ancillary infrastructure including access roads and drainage;
- A 110 kV underground grid connection to connect the wind farm to the National Grid at the existing ESBN Srananagh substation in Co. Sligo;
- Works required along the public road network between Killybegs, Co. Donegal and the proposed site to facilitate turbine and construction material delivery.

The proposed wind farm site is located in a relatively mountainous area. Operator in the northwest of the site is 360m AOD (above ordinance datum) and Dough Mountain is located within and along the eastern site boundary and has a maximum elevation of 462m AOD. The proposed wind farm site stretches through the valley between these two elevated areas and gently rises to the north. The southern portion of the site is where elevation is lowest at 100-140m AOD. As the site extends northwards through the valley between the two mountains, the elevation rises steadily to 285m AOD. The eastern section of the study area is mapped as elevated mountain dome, while the western section is mapped as mountain ridge, according to GSI physiographic mapping.

The Grid Connection Route (GCR) extends southward from the proposed substation location. The proposed GCR runs from the proposed substation in the west of the proposed wind farm southwest along the public road network for approximately 33.5 km to the existing ESBN 110/220kV Srananagh substation in Co. Sligo.

The land use/activities on the site itself is predominantly forestry plantation with agricultural lands to the northwest and east of the site. Forestry is comprised predominantly of coniferous with limited broadleaf areas. Approximately 800 ha are in Coillte's ownership whilst the remaining comprise third-party owned areas of agricultural grassland, and commercial forest. There is an extensive network of existing internal access roads and track across the proposed wind farm to facilitate the ongoing forestry operations as well as local access to farmlands. The wind farm site is characterised by locally steep topography.

Peat is defined as the partially decomposed remains of plants and soil organisms which have accumulated at the surface of the soil profile. Active peatlands are traditionally described using a simple 2-layer model; the acrotelm including active peat vegetation and catotelm. No active peat was recorded in the footprint of the proposed project.

Peat and peaty soils were encountered mainly to the north and northwest of the site at T1 to T7. No peat (>0.5m) was encountered at the proposed substation. The peaty soil and peat on site is predominantly drained or modified due to historical turf cutting, farming activity and afforestation. It is proposed to manage peat within the site boundaries. There are no indications of peat instability on the wind farm site.

1.1 OBJECTIVE

The role of the Spoil and Peat Management Plan (SPMP) is to demonstrate that the management of peat excavated during construction of the proposed project has been considered and will be treated appropriately during the construction process.

This SPMP also includes a monitoring programme which will be implemented during the construction phase of the proposed project and a contingency plan should peat instability/failure occur at the site. The SPMP acts as a live document arising from information presented during the consenting process, possible planning conditions and the content of which will be updated as work is carried out on site.

The SPMP contains some drainage guidelines for construction works and for management of peat on site. It should be noted that the control of water quality and drainage measures for site is outlined in detail in Chapter 8 (Hydrology and Hydrogeology) of the Environmental Impact Assessment Report (EIAR) and within the Construction and Environmental Management Plan (CEMP), Appendix 2-4 of the EIAR.

The SPMP outlines the overall design approach that has been applied to the proposed project to minimise peatland disruption and aims to ensure that all opportunities to minimise peat disturbance and extraction during construction will be taken. The SPMP identifies appropriate and industry proven methods for the reuse of excess peat to restore the effects of construction activities, without significant environmental or health and safety implications, to reduce the release of carbon and minimise risk in terms of human health.

1.1.1 Guidance

The legislation and guidance regarding the management of peat includes:

- Scottish Environment Protection Agency (SEPA), Regulatory Position Statement – Developments on Peat (2010);
- Scottish Government, Guidance on Developments on Peatland – Site Surveys (2014);
- Floating Roads on Peat, Scottish Natural Heritage (2011); and
- Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste, Scottish Renewables and SEPA (2014).

The following guidance specifically relates to wind farm construction and peatland:

- Investigating the impacts of wind farm development on peatlands in England: Part 1 Final Report (2011);
- Best Practice Guidance to Planning Policy Statement 'Renewable Energy' (2009);
- Wind Farm Developments on Peat Land fact sheet. Scottish Government (2011); and
- Good practice during wind farm construction, A joint publication by Scottish Renewables, Scottish Natural Heritage, Scottish Environment Protection Agency, Forestry Commission Scotland (2015).

Many of the publications listed above have been developed by the Scottish Government. The Scottish documents are considered to be best practice in Ireland and are therefore appropriate for use within this SPMP.

The guidance identifies three main stages in the development process and describes what data should be gathered and assessed at each to inform a site specific SPMP:

- Stage 1: Environmental Impact Assessment (EIA);
- Stage 2: Post-consent / pre-construction; and
- Stage 3: Construction.

This SPMP has been prepared in accordance with the principles in the guidance for Stage 1 and proposes that prevention and re-use are the most appropriate means of managing peat excavated during construction at the proposed wind farm site. This report details the methodologies required to assess all potential surplus materials and presents the expected volume of excavated materials and required reuse volumes for reinstatement and restoration purposes.

1.2 PEAT DESCRIPTION

Organic material less than 0.5 m depth is not defined as peat. This is in accordance with guidance from:

- Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland states that *'Peat soil is an organic soil which contains more than 60 per cent of organic matter and exceeds 50 centimetres in thickness'*; and
- The James Hutton Institute define shallow peat as having *'a prescribed depth of organic matter of 50 – 100 cm*[1]*'*

Also, The Forestry Commission use 45 cm as the critical depth for peat to occur (*Understanding the greenhouse gas (GHG) implications of forestry on peat soils in Scotland*, 2010[2]);

- Peat can therefore be classified as organic material over 0.5 m in depth.

Peat can be separated into three main layers: acrotelm (the upper living layer), catotelm (the middle to lower layer) and occasionally amorphous (lower layer) peat:

- Acrotelm peat is the living layer of the peat including the peat turf or turve being a thin, vegetation mat layer. The acrotelm is found within the top layer of peat (often less than 0.5m) depending on the degree of decomposition and fibrous nature of the peat (H1 to H6 on the von post classification scale). The acrotelm is generally of high permeability, decreasing with depth. The water table fluctuates in this layer and conditions vary from aerobic to anaerobic. Material may be fibrous or pseudofibrous (plant remains recognisable), spongy, and when excavated strength is lost but retains integral structure and can stand unsupported when stockpiled >1m.
- Catotelm peat is the dead layer of peat found deeper than acrotelm peat which has some remnant plant structures. Material has high water content and is permanently below the water table (saturated) therefore organic matter decomposes anaerobically. Some plant structures may be recognisable but are highly humified losing most of their characteristics (approximately H6 to H9 on the von post classification scale) and

[1] https://www.hutton.ac.uk/learning/exploringscotland/soils/organicsoils

[2] https://www.forestresearch.gov.uk/publications/understanding-the-greenhouse-gas-ghg-implications-of-forestry-on-peat-soils-in-scotland/

strength. Water flow in the catotelm is slow unless peat structures such as sink holes or peat pipes are present.

The best management option to minimise potential surplus peat is to prevent its production. Therefore, the design of the proposed project has aimed to minimise peat excavation. Discussion of design considerations to avoid deeper areas of peat is included in Appendix 8-4: Peat Stability Risk Assessment and Chapter 3: Consideration of Alternatives of this EIAR.

SEPA has provided a hierarchy of management approaches in which the effectiveness of the approach to peat management is optimised at development sites as summarised below (SEPA 2010, SEPA 2012):

1. Prevention: avoiding generating excess peat during construction (e.g., by avoiding peat areas or by using construction methods that do not require excavation);
2. Re-use: use peat produced on site in habitat restoration of hardstanding or landscaping;
3. Recycling/recovery/treatment: modify peat produced on site for use as fuel, or as a compost/soil conditioner, or dewater peat to improve its mechanical properties in support of re-use; and
4. Storage: temporarily store peat on-site (for example, during short periods in the construction phase) and then re-use.

In relation to the SEPA guidance the following has been applied to the design and construction of the proposed project:

1. Reuse of material is proposed for landscaping and restoration of borrow pits;
2. Recycling/recovery is not appropriate on this site; and
3. Temporary storage and reuse are proposed on shallow gradients (<3 degrees and outside of borrow pits).

1.2.1 Peat Conditions on Site

The proposed wind farm site was assessed for peat vegetation in desktop review of maps and plans, site walkovers by ecologists and hydrologists in 2020 to 2025; and in 2021/2025 intrusive site investigation in terms of peat depth probing and coring across the proposed wind farm site and access track routes.

Peat, where present on the proposed wind farm site, is characterised by drained peatland i.e. degraded blanket bog (Plate 1). The land cover for the proposed wind farm site comprises of coniferous forestry and rough grassing in the surrounding area (Plate 3). Areas of turf cutting are evident with historical turf cutting within the site and active turf cutting in a number of turbary areas. The peat where present is relatively dry and overlies glacial subsoils i.e. clayey till and weathered bedrock. Areas of silty gravel and sandy till are evident as shown in Plate 2 below.



Plate 1 Peaty topsoil layer overlying shallow bedrock (Saddle hill area)



Plate 2 Peaty podzol topsoil layer over glacial till (near T10)



Plate 3 Gley-like soils to the centre and south of the proposed windfarm – near BP3

In Ireland, upland blanket bog tends to either completely conceal the underlying bedrock substrate or in areas of rugged geology, fills the hollows between areas of upstanding rock outcrop to form a discontinuous cover of highly variable peat depth. Review of peat landslide locations indicates that peat instability is overwhelmingly reported in the former setting rather than in areas of rock outcrop. Based on the site walkovers, peatland is generally filling the hollows and is discontinuous in most areas.

Based on a review of the peat probe data, the areas where excavation are <0.5m are very limited on south of the proposed wind farm site. It should be noted that the peat probe data appears to overestimate the depth of peat by 0.2 m to 0.5 m where the underlying soils comprise of soft glacial tills. Results from the SI confirm the peat on the proposed wind farm site has a relatively low moisture content and high shear vane strength values. The peat is fibrous and relatively easy to manage. No evidence of instability was noted on the proposed wind farm site. Turves (peaty topsoils) will be used to reinstate the borrow pits.

1.2.2 Construction Activities Covered by Spoil and Peat Management Plan

The proposed project is described in Chapter 2, Description of the Proposed Project. The proposed wind farm site is located northeast of Manorhamilton. The proposed wind farm site (Figure 1-2 of this EIAR) has an area of 911 ha and comprises an elongated land parcel approximately 5 km long in the north/south direction and is approximately 4 km wide in an east/west direction at the widest point.

The land use/activities on the proposed wind farm site are primarily commercial forestry, with some areas of open peatland/heathland that is grazed. Limited areas of peat were found to the south of the proposed wind farm site.

2. CONSTRUCTION ACTIVITIES

Peat management of the construction activities are covered individually in this report. The topography of the proposed wind farm site can be described as gradual to steeply rising ranging in elevation from 170 m to 380 m Above Ordnance Datum (AOD) with the eastern part of the site bordering Dough Mountain (462m). The northern turbines are situated within the Coillte property at elevations between 280 m and 350 m AOD generally in undulating terrain. The southern turbines are located between 170 m and 260m AOD. No peat was encountered along the TDR access road. To the north of the site, peat depths are varied.

The proposed wind farm site is covered with thick glacial deposits with drumlins/ribbed moraines, to the south the site resulting in local variations in topography. Very limited peat and peaty topsoil Podzols, peaty podzols) were encountered to the south of the proposed wind farm site.

2.1 EXCAVATIONS OF PEAT FOR INFRASTRUCTURE FOUNDATIONS

The material encountered in the trial pits excavated at each proposed turbine location was soft to stiff generally firm with depth - see Table 7-7, Chapter 7 (Soils and Geology) of the EIAR. Deeper excavations to more competent material will be required to construct the proposed turbine foundations.

During proposed turbine construction, peaty soils and peat will be excavated to the substrate to make room for the concrete turbine foundation, and for a small working area surrounding the foundation footprint. Typically, turbine bases are 28 m in diameter with detailed foundation design being dictated by the local ground conditions and the requirements of the turbine supplier.

Volume calculations provide an estimation of fill that will be required for all the proposed turbine foundations. Excavation of peat and subsoil will be required for construction of works for the installation of access roads. This will result in a permanent removal and relocation of cutover peat and subsoil.

The calculated volume of peaty soils is 101,911 m^3. In order to utilise and reuse the peaty soils, the construction works will be sequenced as follows:

- Construction works to commence to the south and centre of the site i.e. T6 to T14, substation, TDR access road and southern compounds;
- Construction of clear span bridges Br3-Br11 to the south of the site and access to substation;
- Construction material from BP2 and BP3 and external quarries will be utilised to construct T6 to T14;
- Construction of bridge across to T1 and Northern construction compounds;
- Stripping of peat and soils for T1/T5 and placement in BP1-BP3; and
- Reinstatement of borrow pits in a phased basis.

Peat or peaty soil will all be relocated within the proposed wind farm site. Due to the proposed phasing of the works, the southern section of the proposed wind farm site and upgrades to the

southern roads will be constructed first. The borrow pits will be available to accept material at the later stages of the construction works.

The proposed excavations will be battered at a 1:2 to 1:3 gradient. Once excavated, the proposed turbine foundation is installed, occupying a foundation footprint, approximately 28 m in diameter. The works at one turbine base require excavation through shallow peat to a competent founding stratum. This will be confirmed at detailed design stage following additional ground investigation.

Borrow Pits and deposition areas

Bedrock is present underlying the gravelly till. An initial walkover of the proposed wind farm site was undertaken, in September 2022 and a review of the wind farm site investigations has been carried out. There are three areas considered for the borrow pit locations. With a excavation in the area, material up to 8.0 m bgl. A summary of potential volumes is included in **Error! Reference source not found.**.

Table 2-1: Borrow Pit - Potential Material Volumes and Summary of the Area Characteristics

Borrow Pit Ref No.	Material Type	Depth minus Overburden	Potential Volume (m^3)[3]	Ecological/Other Constraints
BP1	Class1/2 soils, Sandstone bedrock	(3 m – 1 m) 2 m of available material	21,600 m^3 Overburden 13,500 m^3	No significant constraints, average 0.5 m peat/soft sediment encountered
BP2	Sandstone bedrock	(8 m – 1.5 m) 6.5 m of available material	174,720 m^3 Overburden 50,400 m^3	No significant constraints, average <0.5m peat / soft sediment encountered
BP3	Class1/2, Sandstone bedrock	(6 m – 1.5 m) 4.5 m of available material	51,847 m^3 Overburden 21,603 m^3	No significant constraints, no peat encountered

Similarly, hardstanding for cranes and other infrastructure foundations on the proposed wind farm site are to be founded on material underlying peat deposits which will also require excavation through peat. A crane hardstanding is required adjacent to each proposed turbine for the purpose of turbine installation and maintenance. Each crane pad has an area of 25 m x 40 m and will require the full excavation of peat (where present) to substrate and replacement

[3] Conservatively assumes 80% usage for bedrock

with rock is required to provide a suitably stable surface for turbine component handling. Once excavated, peat will be re-used to batter the edges of platforms grading the bases into the local topography.

Full excavation of peat (where present) to substrate and replacement with rock is required to provide a suitably stable surface for turbine placement. Once excavated, peat will be re-used to batter the edges grading the bases into the local topography.

2.2 Excavations for the Underground Cable

The proposed wind farm site will connect to the grid via an underground cable along onsite access tracks and the public road corridor.

It is proposed to excavate the trenches for the underground cable at a uniform level in peat or overburden material. The trenches will typically be 600 mm wide and 1250 mm deep with variations on this design to adapt to bridge crossings, culvert crossings, service crossings and watercourse crossings, etc.

2.3 Construction of New Tracks

2.3.1 Track Construction Types

To provide access within the site and to connect the proposed wind turbines and associated infrastructure new tracks will need to be constructed. The identification of the access track layout is an iterative procedure. While the majority of tracks on the proposed wind farm site will be constructed on mineral soil, there are some locations where construction on peat and peaty soils will be required.

The track construction preliminary design has considered the following key factors:

- Requirement to minimise disruption to peat/soil hydrology;
- Minimise excavation arisings;
- Serviceability requirements for construction and wind turbine delivery and maintenance vehicles; and
- Buildability considerations.

Whilst the above key factors are used to determine the proposed track design, the actual construction technique employed for a particular length of track will be determined on the prevailing ground conditions encountered along that length of track.

Proposed access tracks will be constructed to enable the construction works to take place and to provide access to turbine locations and infrastructure of the proposed wind farm site. The proposed tracks will be constructed using unbound crushed aggregates and incorporate drainage to maintain the performance of the pavement during wet weather. All of the tracks will be constructed as founded tracks. Founded tracks are excavated down to and constructed up from a competent geological stratum with adequate cross drainage to prevent water accumulation on the upgradient side. Ground investigations in the form of peat probing and trial pitting has been carried out along the proposed access routes to inform the depth of excavation and upfill required for the access tracks.

2.4 General Access Track Construction Techniques

Prior to the construction of any access tracks on the proposed wind farm site a detailed design will need to be carried out. Given the topography and relatively shallow peat on the proposed wind farm site, excavated access tracks are deemed an appropriate construction technique for the majority of the proposed wind farm site.

This methodology includes procedures that are to be included in the construction phase to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations.

- Interceptor drains will be installed upslope of the access track alignment to divert any surface water away from the construction area;
- Proposed excavation of tracks shall be to the line and level given in the design requirements. Excavation will take place to a competent stratum beneath the peat (as agreed with the proposed wind farm site designer);
- Track construction will be carried out in sections of approximately 50 m lengths; i.e. no more than 50 m of access track will be excavated without re-placement with stone fill unless otherwise agreed with the resident engineer on the proposed wind farm site;
- All excavated peat shall be placed/spread alongside the excavations;
- Side slopes in peat shall be not greater than 1 (v): 2 or 3 (h). This slope inclination will be reviewed during construction, as appropriate. Battering of the side slopes of the excavations will be carried out as the excavation progresses;
- The surface of the finished excavated access track will be finished above current ground level;
- A layer of geogrid/geotextile may be required at the surface of the competent stratum (to be confirmed by the designer);
- Where slopes of greater than 5 degrees are encountered along with relatively deep peat (i.e. greater than 1 m) and where it is proposed to construct the access track perpendicular to the slope contours it is best practice to start construction at the bottom of the slope and work towards the top. This method avoids any unnecessary loading to the adjacent peat and greatly reduces risk of peat instability; and
- A final surface layer shall be placed over the excavated track, as per design requirements, to provide a track profile and graded to accommodate wind turbine construction and delivery traffic.

Access tracks to the proposed wind farm site require careful monitoring to ensure that there is no significant standing water forming, which would lead to potholes in the surface. If areas of track are causing concern, repairs will be carried out in favourable, preferably dry, conditions, to ensure that there is no saturation of the surface of the track.

3. EXCAVATION AND STORAGE OF ARISINGS

The handling, storage and re-use of excavated materials are of importance during the construction phase of the proposed project. The majority of the site is on forestry lands with some areas under agricultural production. It is intended that peat soils (101,911 m^3) will be placed at the borrow pit areas.

Any surplus soil and topsoil excavated material will be reused, either in profiling/landscaping or constructing berms close to the excavation areas. The proposed wind farm site has been extensively drained and afforested resulting in well drained and extensively trafficked peat and soils.

3.1.1 Excavation & Storage of Arisings Methodology

This methodology includes procedures that are to be included in the proposed construction phase to minimise any adverse impact on peat and soil stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations.

Prior to any excavations, the Principal Contractor will produce a detailed Method Statement identifying where and how excavated peat will be used in reinstatement or landscaping works. Specific requirements for the excavation, handling, storage and reinstatement of peat will be outlined in a detailed Method Statement. The Principal Contractor will consider potential impacts on downstream receptors and the potential for instability issues with the excavated material.

Some of the requirements to be contained within this are outlined below. The majority of the proposed wind farm site comprises bare peat with some areas where revegetation is occurring. Areas of peat within the footprint of excavation will have the top layer of vegetation stripped prior to construction by an experienced specialist contractor. Underlying peat or bare peat will then be removed.

Classification of excavated materials will depend on their identified re-use in reinstatement works. At the proposed wind farm site it is anticipated that the material to be excavated will comprise peat and mineral subsoil.

3.2 SUMMARY OF EXCAVATED PEAT VOLUMES ON SITE

A summary of the excavated peat volumes calculated for the proposed wind farm site is provided in Table 3-1. The quantity of peat to be excavated has been estimated based on high-level volumetric calculations using peat probe data, providing a conservative figure for planning purposes. Peat probe data can overestimate peat depths as the total probed depth may include underlying non-peat mineral soils due to the testing method, meaning the actual volume of peat material requiring storage in borrow pits will likely be significantly less than calculated. Due to the significantly lower density of peat (typically 0.1–0.2 tonnes/m^3) compared to bedrock (1.92 tonnes/m^3), a greater volume of peat can be accommodated in borrow pits using the same mass removed.

Table 3-1: Excavation Volume Summary[4]

	Average Peat or Peaty topsoil depth	Hardstand area m^2	Total m^3
Substation	0.0	24,281	0
T1	1.0	7,765	7765
T2	1.6	7,765	12424
T3	0.3	7,765	2329.5
T4	0.9	7,765	6988
T5	0.4	7,765	3106
T6	0.4	7,765	3106
T7	0.3	7,765	2329.5
T8	1.0	7,765	7765
T9	0.8	7,765	6212
T10	0.2	7,765	1553
T11	0.2	7,765	1553
T12	0.3	7,765	2329.5
T13	0.3	7,765	2329.5
T14	0.4	7,765	3106
Roads	0.2	43,725	8745
Borrow Pit 1	0.5	13,500	6750
Borrow Pit 2	0.5	33,600	16800
Borrow Pit 3	0.0	14,402	0
Compound 1	0.1	16800	1,680
Compound 2	0.3	16800	5,040
			101,911

3.2.1 Peat Excavation Method

Areas of peat on the proposed wind farm site are shallow or not present to the south with variable peat depths to the north. The following methodologies for excavation of peat are recommended:

- Specific requirements for the excavation, handling, storage and reinstatement of peat will be outlined in this Method Statement. The Contractor will consider potential impacts on downstream hydrological receptors and also the potential for instability issues with the excavated material. The contractor will implement the mitigation measures set out in the Land and Soils chapter (Chapter 7).
- Areas of peat will have the top layer of vegetation stripped off as turf prior to construction by an experienced specialist contractor. When excavating areas of peat, excavated turfs will be as intact as possible.
- Excavated soils and turfs will be handled so as to avoid cross contamination between distinct horizons and ensure reuse potential is maximised.
- Care will be taken when stripping and removing topsoil and peat turfs and appropriate storage methods used on the proposed wind farm site, i.e. excavated material will be stored in separate horizons and vegetation rich top layers will be stored vegetation side up.

[4] Assuming full replacement

- Classification of excavated materials will depend on their identified re-use in reinstatement works. At the proposed wind farm site, it is anticipated that the material to be excavated will comprise peat (which may be sub-divided into peaty soils, peat and mineral soils (subsoil and topsoil)).

3.2.2 Temporary Storage

Temporary storage of excavated soils will only occur where peat thickness is minimal or absent. It is proposed that any temporary onsite stockpiles of soil, rock and other excavated material shall be removed and utilised in the site reinstatement programme to infill any excavated areas which will then be mounded and capped with sod prior to the completion of works.

The majority of the peat on site is located to the north of the site. Based on the volume of peaty soils/peat encountered at T1 to T5, a total of 32,613 m^3 will require excavation from these proposed turbine bases. The peat soils will be transported to the borrow pit/deposition area. Peat material will be used to reinstate the borrow pit areas.

Mineral soil, may be temporarily stored on the proposed wind farm site. In this case, the following good practice applies:

- Excavated material will not be stored adjacent to turbine bases, on or adjacent to slopes (>5 degrees gradient), or in areas of peat.
- Diffuse drainage lines and locally steep slopes should be avoided for peat storage; and
- Stored upper turves (incorporating vegetation) will be organised and stored according to soil type.

For borrow pits and compounds (with longer term storage requirements), the following applies:

- Peat generated from crane pad locations will be transported directly to its allocated restoration location, to minimise the volume being stockpiled with the possibility of drying out;
- Stored peat will be stored and placed at the borrow pit below the current land profile to promote stability;
- Monitoring of areas of peat storage during wet weather; and
- No permanent stockpiles will be left on the proposed wind farm site after the completion of the construction phase works.

Transport

- Movement of peaty soils will be kept to a minimum once excavated, and therefore it is preferable to transport peat planned for reinstatement to its destination at the time of excavation;
- Carefully evaluate potential restoration sites, such as borrow pits, and agree phasing as appropriate with the ECoW, landowners and relevant consultees; and
- Undertake restoration and revegetation work as soon as possible.
- Spoil will be deposited, in layers of 0.50 m and will not exceed a total thickness of 1.5m.

After completion of the turbine base reinstatement works all remaining stockpiles are to be removed for permanent disposal at the proposed borrow pit areas within the proposed wind farm site.

3.2.3 Excavated Rock and Glacial subsoils

Stone and soil material will be excavated during proposed construction. This will be used under and around key infrastructure including the proposed turbines, substation, site roads, hardstands and construction compounds. By sourcing stone from the onsite borrow pits, the volume of traffic that will occur on public roads in the area will be significantly reduced. Stone from offsite sources will be used for surface dressing, while stone sourced onsite will be used for the initial capping layer. Further information on the proposed traffic volumes and impacts are discussed in Chapter 16 of this EIAR (Traffic & Transportation).

Hardstands and site roads will be constructed to be above the existing ground level. The lower layer (approx. 400 mm) of this will be lower grade stone, with the top 150 mm being a higher quality compacted aggregate. The surplus excavated material (101,911 m^3) will be used to complete the backfilling of the borrow pit. Approximately, 120,608 m^3 of rock material will be required. The calculated quantity of available material from the borrow pits equates to 248,167 m^3, with sufficient storage capacity for the excavated material.

3.3 General Recommendations for Good Construction Practice

The recommendations of the PSRA are incorporated into this document and summarised below. The following outlines an overview of the tasks for the proposed construction phase:

- Client's Geotechnical Engineer to provide a Geotechnical Induction to all contractor supervisory staff.
- Client to appoint a Site Geotechnical Supervisor to carry out supervision of the proposed wind farm site works as required. The Site Geotechnical Supervisor will be required to inspect that works are carried in accordance with the requirements of the PSRA, identifying new risks and ensuring all method statements for works are in place and certified.
- Retain a Site Geotechnical Folder which contains all the information relevant to the geotechnical aspects of the proposed wind farm site including but not limited to risk register, site investigation information, method statements etc.
- Contractor to develop a Method Statement for the works to be carried out in each of the PSRA areas in compliance with the required mitigating measures.
- Client's Geotechnical Engineer/Site Geotechnical Supervisor to approve the method statement.
- Contractor to provide toolbox talks and on-site supervision prior to and during the works.
- Daily sign off by supervising staff on completed works.
- Implementation of emergency plan and unforeseen event plan by the contractor.

3.3.1 Operation and Maintenance Phase:

The following outlines an overview of the tasks for the proposed operation and maintenance phase:

- Communication of residual stability risk to appropriate site operatives.
- Ongoing monitoring of residual risks and maintenance if required. Such items would consist of regular inspection of drains and culverts to prevent blockages and inspections

of specific areas such as settlement ponds and access roads after a significant rainfall event.

- Routine inspection of the proposed wind farm site by contractor to include an assessment of ground stability conditions (e.g. cracking, excessive track settlement, disrupted surface, closed-up drains) and drainage conditions (e.g. blocked drains, absence of water in previously flowing drains, springs, etc).
- An identified feature will be assessed and added to the Risk Register

3.3.2 Decommissioning Phase:

All above proposed ground infrastructure will be disassembled and remaining infrastructure will remain in place, therefore very limited excavations will be required for decommissioning.

4. MONITORING

To monitor possible peat/soil movements, it is proposed to install sighting posts upslope and downslope of the access track at staggered intervals at locations where the peat depth is greater than 1.0m. Details of sighting posts are given below. Areas adjacent to the access roads at T1 to T5 should be fenced off to allow for the reestablishment of peatland and heath habitats along the access road and avoid peat hagging or erosion due to sheep grazing. The fenced area should be monitored on a biannual basis.

4.1.1 Excessive Movement

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

- All activities (if any) shall cease within the affected area;
- Increased monitoring at the location shall be carried out. The area will be monitored, as appropriate, until movements have ceased; and
- Re-commencement of activities shall only start following a cessation of movement and agreement with all parties.

4.1.2 Onset of Peat Slide

Due to the drained cutaway nature of the proposed wind farm site, the risk of a regional scale landslide is low/negligible as detailed in the PSRA. In the event of a localised peat movement the following measures will be put in place. Where the onset or actual detachment of peat (e.g. cracking, surface rippling) then the following shall be carried out:

- On alert of a peat slide incident, all activities (if any) in the area will cease and all available resources will be diverted to assist in the required mitigation procedures, as outlined in the Peat Stability Risk Assessment (Appendix 7-1).
- Where considered possible, actions outlined in the Peat Stability Risk Assessment (Appendix 7-1), will be taken to prevent a peat slide reaching any watercourse. This will take the form of the construction of check barrages on land; and
- All relevant authorities will be notified if a peat slide event occurs on the proposed wind farm site.

For localised peat slides which 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 movements have ceased.



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Appendix 2-6A

Site Investigation Report 2022

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Ground Investigations Ireland

Lissinagroagh Wind Farm

Tobin Consulting Engineers

Ground Investigation Report

February 2022

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

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APPENDICES

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Appendix 2 Trial Pit Records
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1.0 Preamble

On the instructions of Tobin Consulting Engineer, a site investigation was carried out by Ground Investigations Ireland Ltd., between October 2021 to February 2022 at the site of the proposed Wind Farm in Manorhamiliton Co. Leitrim.

2.0 Overview

2.1. Background

It is proposed to construct a Wind Farm with associated services and access roads at the proposed site. The site is currently greenfield and is situated on Coillte Forestry and Farmland in the hills around Dough Mountain to the North of Manorhamilton Town, Co. Leitrim. The proposed construction is envisaged to consist of pile foundations and pavement make up with some local excavations for services and plant.

2.2. Purpose and Scope

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

- Visit project site to observe existing conditions
- Carry out 36 No. Trial Pits to a maximum depth of 4.1m BGL
- Carry out 16 No. Russian Samples to a maximum depth of 2.50m BGL.
- Carry out 2 No. Rotary Core Boreholes to a maximum depth of 15m BGL
- Installation of 2 No. Groundwater monitoring wells
- Geotechnical & Environmental Laboratory testing
- Report with recommendations

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.
The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.2. Trial Pits

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

3.3. Russian Sampling

The Russian Peat Sampler is a side filling chambered-type sampler. This discrete point sampler is inserted in the closed (empty) position. Once the target depth is reached, the “T” handle is turned clockwise to initiate the sampling while the pivotal cover plate supports the cutting action of the bore. As the sampler is turned 180 degrees, the sharpened edge of the bore longitudinally cuts a semi-cylindrical shaped sample until the opposite side of the cover plate is contacted. The contained sample can now be recovered without risk of contamination by overlying sediments. The sample is extruded from the bore by a counter clockwise rotation where sample rests on cover plate ready for sectioning. The Russian sample records are provided in Appendix 3 of this Report.

3.4. Rotary Boreholes

The rotary coring was carried out by a track mounted T44 Beretta rig at the locations shown on the location plan in Appendix 1. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring.

The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the “overshoot” recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit, and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 4 of this Report.

3.5. Surveying

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

3.6. Groundwater Monitoring Installations

Groundwater Monitoring Installation were installed upon the completion of the boreholes to enable sampling and the determination of the equilibrium groundwater level. The typical groundwater monitoring installation consists of a 50mm uPVC/HDPE slotted pipe with a pea gravel response zone and bentonite seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report.

3.7. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.
Environmental & Chemical testing as required by the specification, including pH and organic matter content was carried out by Element Materials Technology Laboratory in the UK.
Geotechnical testing consisting of moisture content, Atterberg limits, Particle Size Distribution (PSD), hydrometer, and 2.5kg Vibrating Rammer Compaction tests were carried out in NMTL's Geotechnical Laboratory in Carlow and PROSOILS laboratory in the UK.
The results of the laboratory testing are included in Appendix 5 of this Report.

4.0 Ground Conditions

4.1. General

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

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

- Topsoil
- Made Ground
- Peat Deposits
- Granular Deposits
- Cohesive Deposits
- Bedrock

TOPSOIL: Topsoil was encountered in the majority of exploratory holes and was present to a maximum depth of 0.3m BGL.

MADE GROUND: Made Ground deposits were encountered beneath the Topsoil in TP05 and was present to a depth of 0.44m BGL. These deposits were described generally as *Light brown slightly clayey sandy angular to subangular fine to coarse Gravel.*

PEAT DEPOSITS: Peat deposits were encountered in the majority of trial pit locations. These deposits were typically described as *dark brown slightly sandy slightly gravelly pseudo fibrous PEAT* and were generally present to depths ranging between 0.30m and 1.30m BGL. At location TP38 and TP35 peat deposits was encountered to depths of 2.30m BGL and 3.50m BGL respectively.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Peat and were described typically as *brown*, *grey brown* or *blue grey* slightly *sandy slightly gravelly CLAY with occasional cobbles and boulders*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the cohesive till matrix. The strength of the cohesive deposits typically increased with depth and was firm becoming firm to stiff or stiff in the majority of the exploratory holes. These deposits had some, occasional or frequent cobble and boulder content where noted on the exploratory hole logs.

GRANULAR DEPOSITS: Granular deposits were also encountered beneath the PEAT deposits and were typically described as G*rey brown slightly clayey slightly sandy angular to subangular fine to coarse GRAVEL with occasional cobbles and rare boulders.* The secondary sand/gravel and silt/clay constituents

varied across the site and with depth while occasional or frequent cobble and boulder content also present where noted on the exploratory hole logs.

BEDROCK: The rotary core borehole BH01 recovered *Medium strong to strong grey mottled orange fine to medium grained SANDSTONE with some clay smearing and banding interbedded with strong thinly to thickly laminated grey fine grain SILTSTONE with some clay smearing and banding*. At borehole location BH02 rotary core recovered *Strong thinly laminated to thickly bedded grey fine grain fossiliferous LIMESTONE with many clay ands and some cavities*.
The depth to rock varies from 2.70m BGL in BH01 to a maximum of 4.00m BGL in BH02. The total core recovery is good, typically 100% with some of the uppermost runs dropping to 80 or 90%. The SCR and RQD both are relatively poor in the upper weathered zone, often recovered as non-intact, however both indices show an increase with depth in each of the boreholes.

4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred and where possible drilling or excavations were suspended for twenty minutes to allow the subsequent rise in groundwater to be recorded. We would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the tide, time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in BH01 and BH02 to allow the equilibrium groundwater level to be determined.

4.3. Laboratory Testing

4.3.1. Geotechnical Laboratory Testing

The geotechnical testing carried out on soil samples recovered generally confirm the descriptions on the logs with the primary constituent of the cohesive deposits found to be a CLAY of low to intermediate plasticity. The Particle Size Distribution tests confirm that generally the cohesive deposits are well-graded with percentages of sands and gravels ranging between 2% and 39% generally with fines contents of 35% to 88%.
The Particle Size Distribution tests confirm that generally the granular deposits are gap graded with percentages of silt/clay typically 21% with a gravel/sand content of typically 45%.

4.3.2. Chemical Laboratory Testing

The pH testing carried out indicate that the pH results are acidic. Organic matter content ranged from 1.80% to 82.40%

The results from the completed laboratory testing is included in Appendix 5 of this report.

5.0 Recommendations & Conclusions

5.1. General

The recommendations given and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes. Limited information has been provided at the ground investigation stage and any designs based on the recommendations or conclusions should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory hole logs.

5.2. Foundations

Generally foundations on stiff cohesive deposits are feasible, however the density and nature of the underlying deposits should be assessed prior to the details design.

Wind Turbine Locations

Where wind turbine foundations are proposed, it is recommended to carry our dynamic probes to establish the allowable bearing capacity of the overburden deposits. Boreholes to establish the underlying strata details are also recommended

5.3. Excavations

Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry.

Excavations in the Made Ground, Peat or soft Cohesive Deposits will require to be appropriately battered or the sides supported due to the low strength of these deposits.

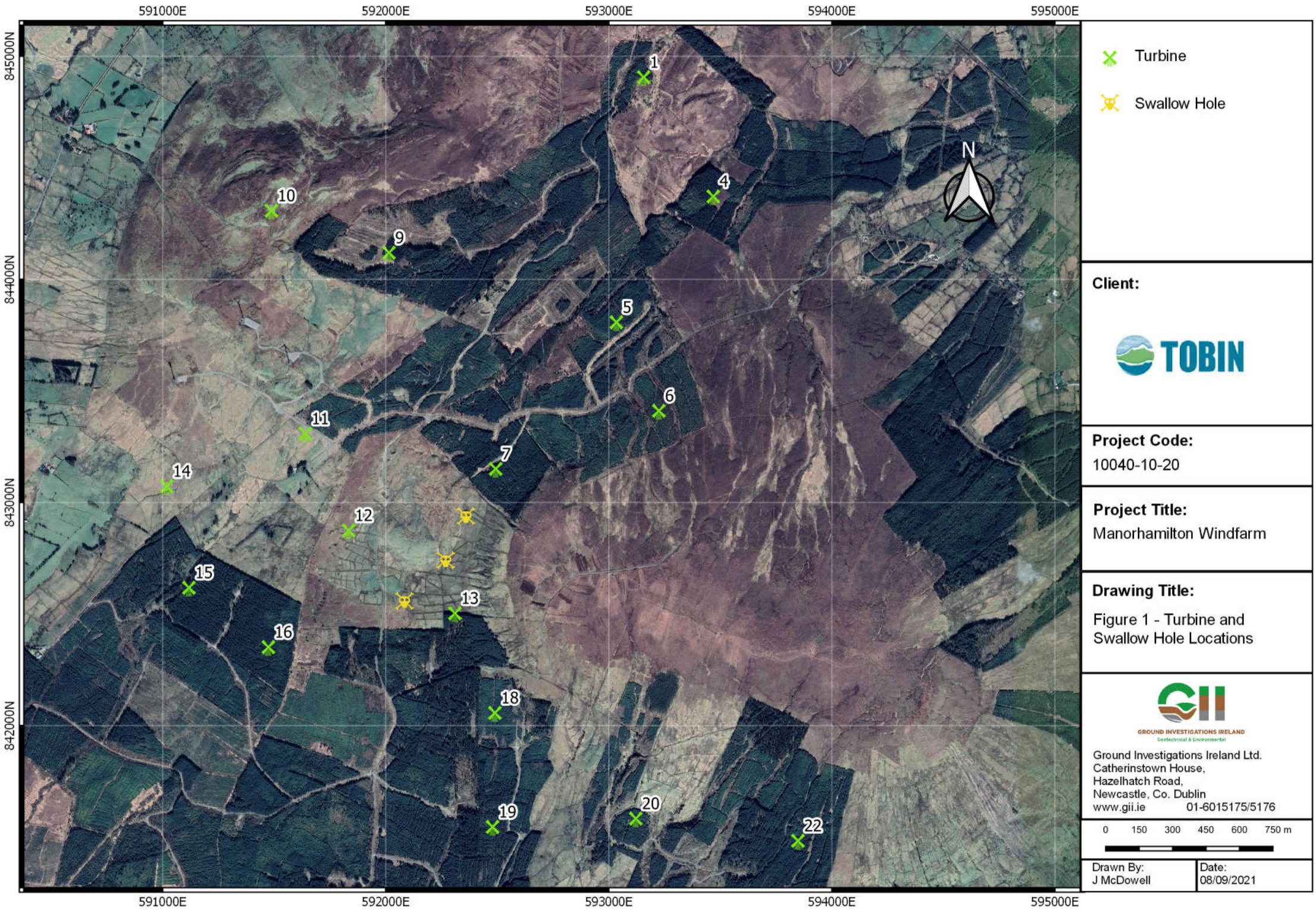
Any excavations which penetrate the granular deposits will require to be appropriately battered or the sides supported and are likely to require dewatering due to the groundwater seepages noted in the exploratory hole logs in the Appendices of this Report.

The groundwater and stability noted on the trial pit logs should be consulted when determining the most appropriate construction methods for excavations.

Any waste material to be removed off site should be disposed of to a suitably licenced landfill.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

APPENDIX 1 - Site Location Plan



Client:

TOBIN

Project Code:
10040-10-20

Project Title:
Manorhamilton Windfarm

Drawing Title:
Figure 1 - Turbine and Swallow Hole Locations

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Drawn By:	Date:
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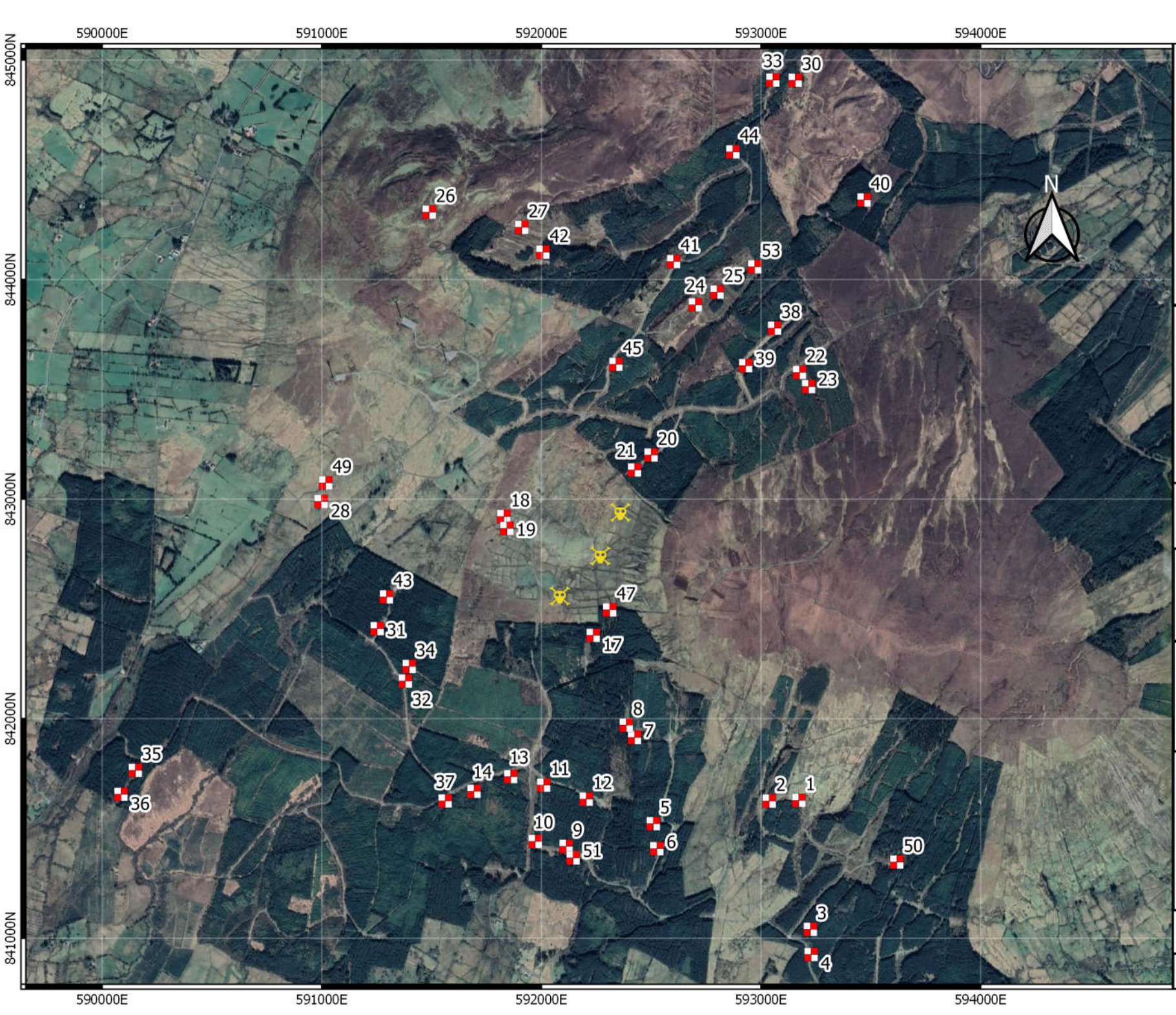

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0 150 300 450 600 750 m

Drawn By:	Date:
J McDowell	08/09/2021



Gouge

Swallow Hole

Client:

TOBIN

Project Code:
10040-10-20

Project Title:
Manorhamilton Windfarm

Drawing Title:
Figure 1 - Turbine and Swallow Hole Locations

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Hazelhatch Road,
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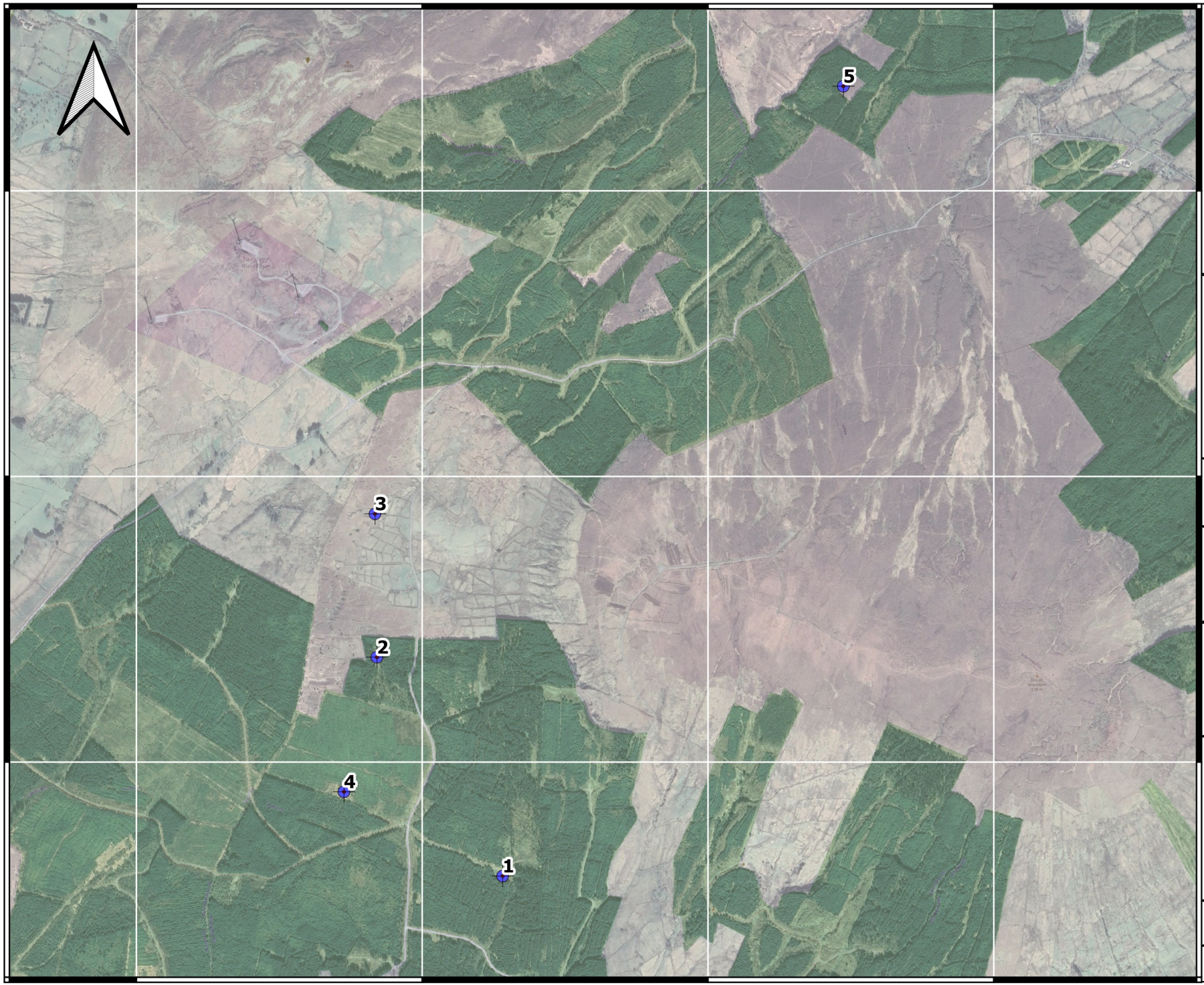
0 150 300 450 600 750 m

Drawn By:	Date:
J McDowell	08/09/2021



Boreholes

Client:

TOBIN

Project Code:
10040-10-20

Project Title:
Manorhamilton Windfarm

Drawing Title:
Figure 1 Borehole Locations

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0 250 500 750 m

Drawn By:	Date:
JS	30/09/21

APPENDIX 2 – Trial Pit Records

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Site Manorhamilton Windfarm			**Trial Pit Number** TP02
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.50m x 1.00m x 3.70m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 06/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			medium seepage(1) at 0.00m.		(0.30)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		▽1
					0.30			
0.50	I 40.00kPa		40,41,39/Av. 40.00			Soft to firm dark brown slightly sandy slightly gravelly pseudo fibrous PEAT with occasional tree stumps		
0.50	T							
0.50	R 34.00kPa		35,35,32/Av. 34.00		(0.70)			
					1.00			
1.00	I 52.67kPa		55,50,53/Av. 52.67			Firm dark brown slightly sandy slightly gravelly pseudo fibrous PEAT with occasional tree stumps		
1.00	T							
1.00	R 44.33kPa		45,42,46/Av. 44.33		(0.30)			
					1.30			
			medium seepage(2) at 1.50m.			Greyish black slightly clayey slightly sandy angular to subangular fine to coarse GRAVEL with occasional angular to subangular cobbles and boulders		▽2
2.00	B							
					(2.40)			
3.00	B							
						OBSTRUCTION at 3.70m BGL		
					3.70	Complete at 3.70m		

Plan

Remarks

Surface water encountered (medium seepage). Groundwater encountered at 1.50m (medium seepage)
Side walls stable
Shear vane attempted at 0.50m and 1.00m
Trial pit terminated at 3.70m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP02

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Site Manorhamilton Windfarm			**Trial Pit Number** TP04
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.40m x 1.00m x 2.50m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 06/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
					(0.50)	Soft to firm dark brown slightly sandy slightly gravelly pseudo fibrous PEAT		
0.50	I 31.33kPa		32,32,30/Av. 31.33		0.60			
0.50	T					Firm brownish grey slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles		
0.50	R 28.33kPa		28,30,27/Av. 28.33		(0.30)			
					0.90			
1.00	B					Stiff bluish grey slightly sandy slightly gravelly silty CLAY with occasional angular to subrounded cobbles and boulders		
					(1.60)			
2.00	B					OBSTRUCTION at 2.50m BGL		
					2.50	Complete at 2.50m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too stiff at 1.00m)
Trial pit terminated at 2.50m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP04

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Site Manorhamilton Windfarm			**Trial Pit Number** TP05
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.90m x 1.00m x 3.70m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 04/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.05	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
					(0.39)	MADE GROUND: Light brown slightly clayey sandy angular to subangular fine to coarse Gravel		
					0.44			
0.50	T				(0.16)	Firm brown slightly sandy slightly gravelly clayey pseudo fibrous PEAT with tree stumps		
					0.60			
1.00	B				(1.10)	Firm bluish grey slightly sandy slightly gravelly silty CLAY with occasional angular to subrounded cobbles		
					1.70			
2.00	B				(2.00)	Stiff bluish grey slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles and some angular to subangular boulders		
3.00	B					OBSTRUCTION at 3.70m BGL		
					3.70	Complete at 3.70m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too granular and tree stumps)
Trial pit terminated at 3.70m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP05

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Site Manorhamilton Windfarm			**Trial Pit Number** TP06
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.00m x 1.00m x 4.10m (Lx W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 04/10/2021	**Engineer**	**Sheet** 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			slow seepage(1) at 0.00m.		(0.30)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		▽1
					0.30			
0.50	B				(0.50)	Firm greyish brown slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles		
					0.80			
1.00	B				(1.10)	Stiff grey slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles (large water content)		
					1.90			
2.00	B				(1.90)	Stiff grey slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
3.00	B				3.80			
4.00	B				(0.30)	Light brown slightly sandy clayey angular to subangular fine to coarse GRAVEL with occasional angular to subangular cobbles and boulders (weathered rock)		

Plan

Remarks

Surface water encountered (slow seepage)
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too granular)
Trial pit terminated at 4.10m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP06

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Site Manorhamilton Windfarm			**Trial Pit Number** TP06
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.00m x 1.00m x 4.10m (Lx W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 04/10/2021	**Engineer**	**Sheet** 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					4.10	OBSTRUCTION at 4.10m BGL Complete at 4.10m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP06

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Site Manorhamilton Windfarm			**Trial Pit Number** TP09
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.80m x 1.00m x 3.40m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 04/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
						Soft dark brown slightly sandy slightly gravelly fibrous PEAT with tree stumps		
0.50	T				(0.70)			
					0.80	Soft to firm light brown sandy slightly gravelly slightly silty CLAY with occasional angular to subangular cobbles		
1.00	I 35.33kPa		35,36,35/Av. 35.33		(0.40)			
1.00	B							
1.00	R 30.67kPa		31,31,30/Av. 30.67		1.20	Firm bluish grey slightly sandy slightly gravelly slightly silty slightly peaty CLAY with occasional angular to subangular cobbles		
					(0.30)			
					1.50	Stiff bluish grey slightly sandy slightly gravelly slightly silty CLAY with occasional angular to subangular cobbles and boulders		
2.00	B							
					(1.90)			
3.00	B							
						OBSTRUCTION at 3.40m BGL		
					3.40	Complete at 3.40m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too many tree stumps at 0.50m)
Trial pit terminated at 3.40m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP09

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Site Manorhamilton Windfarm			**Trial Pit Number** TP10
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.40m x 1.00m x 3.00m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 04/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.60)	Soft to firm brown slightly sandy slightly gravelly fibrous PEAT with tree stumps and an organic odour		
0.50 0.50 0.50	I 37.33kPa T R 31.33kPa		38,38,36/Av. 37.33 32,30,32/Av. 31.33		0.60			
1.00	B				(1.20)	Firm bluish grey slightly sandy gravelly silty CLAY with occasional angular to subrounded cobbles		
2.00	B				1.80	Stiff bluish grey slightly sandy gravelly silty CLAY with occasional angular to subrounded cobbles and boulders		
					(1.20)	OBSTRUCTION at 3.00m BGL		
3.00	B		slow seepage(1) at 3.00m.		3.00	Complete at 3.00m		▽1

Plan

Remarks

Groundwater encountered at 3.00m (slow seepage)
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too stiff at 1.00m)
Trial pit terminated at 3.00m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP10

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Site Manorhamilton Windfarm			**Trial Pit Number** TP11
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.70m x 1.00m x 2.40m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 04/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
					0.30			
					(0.20)	Soft greyish brown slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
0.50	B				0.50			
						Firm bluish grey slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles		
1.00	B				(1.00)			
					1.50			
						Stiff bluish grey slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
2.00	B				(0.90)			
						OBSTRUCTION at 2.40m BGL		
					2.40	Complete at 2.40m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too stiff and granular)
Trial pit terminated at 2.40m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP11

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Site Manorhamilton Windfarm			**Trial Pit Number** TP12
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.00m x 1.00m 1.10m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 04/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
					0.30			
0.50	T				(0.70)	Dark brown/black slightly sandy slightly gravelly slightly clayey pseudo fibrous PEAT with occasional angular to subangular boulders and tree stumps		
1.00	B				1.00 (0.10) 1.10	Soft orangey brown slightly sandy gravelly CLAY with occasional angular to subangular cobbles and boulders OBSTRUCTION at 1.10m BGL		
						Complete at 1.10m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too granular and tree stumps)
Trial pit terminated at 1.10m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP12

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Site Manorhamilton Windfarm			**Trial Pit Number** TP13
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.40m x 1.00m x 2.50m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 05/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			slow seepage(1) at 0.00m.		(0.20)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		▽1
					0.20			
					(0.40)	Soft to firm dark brown slightly sandy slightly gravelly pseudo fibrous PEAT		
0.50	I 32.33kPa		35,30,32/Av. 32.33					
0.50	T				0.60			
0.50	R 15.67kPa		16,17,14/Av. 15.67			Firm brownish grey slightly sandy gravelly slightly silty CLAY with occasional angular to subangular cobbles		
					(0.70)			
1.00	B							
					1.30			
						Firm grey mottled light brown slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
					(1.20)			
2.00	B							
					2.50	OBSTRUCTION at 2.50m BGL		
						Complete at 2.50m		

Plan

Remarks

Surface water encountered (slow seepage)
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too granular at 1.00m)
Trial pit terminated at 2.50m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP13

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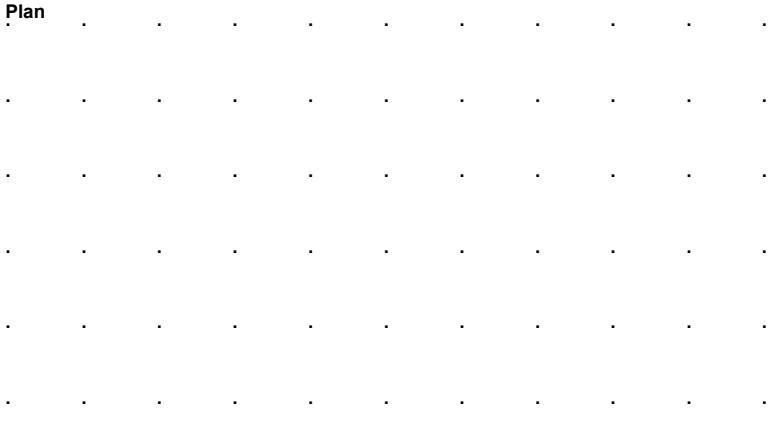
Site Manorhamilton Windfarm			**Trial Pit Number** TP14
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.00m x 1.00m x 3.30m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 05/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
					0.30	Firm dark brown slightly sandy slightly gravelly fibrous PEAT		
0.50	I 42.00kPa		45,40,41/Av. 42.00					
0.50	T							
0.50	R 24.00kPa		25,25,22/Av. 24.00		(0.80)			
1.00	I 29.33kPa		35,25,28/Av. 29.33					
1.00	T				1.10			
1.00	R 15.33kPa		15,14,17/Av. 15.33			Firm greyish lightly orangey brown slightly sandy gravelly slightly silty CLAY with occasional angular to subangular cobbles and boulders		
					(1.00)			
2.00	B				2.10	Stiff greyish light orangey brown slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
					(1.20)			
3.00	B					OBSTRUCTION at 3.30m BGL		
					3.30	Complete at 3.30m		

Plan



Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m
Trial pit terminated at 3.30m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP14

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Site Manorhamilton Windfarm			**Trial Pit Number** TP17
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.70m x 1.00m x 3.50m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 06/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
					0.30			
0.50	I 27.33kPa		28,26,28/Av. 27.33		(0.40)	Soft dark brown slightly sandy slightly gravelly pseudo fibrous PEAT		
0.50	T							
0.50	R 24.00kPa		25,23,24/Av. 24.00		0.70			
1.00	B				(0.90)	Firm bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles		
					1.60			
2.00	B				(1.90)	Stiff bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
3.00	B					OBSTRUCTION at 3.50m BGL		
					3.50	Complete at 3.50m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too stiff at 1.00m)
Trial pit terminated at 3.50m due to bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP17

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Site Manorhamilton Windfarm			**Trial Pit Number** TP20
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.80m x 1.00m x 3.90m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 06/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			medium seepage(1) at 0.00m.		(0.20)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		▽1
					0.20			
					(0.40)	Soft dark brown slightly sandy slightly gravelly slightly clayey fibrous PEAT		
0.50	I 20.67kPa		22,20,20/Av. 20.67					
0.50	T				0.60			
0.50	R 11.67kPa		12,11,12/Av. 11.67			Soft brownish grey slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles		
					(0.70)			
1.00	I 32.00kPa		33,30,33/Av. 32.00					
1.00	B							
1.00	R 22.67kPa		22,22,24/Av. 22.67					
					1.30	Firm bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
					(0.40)			
					1.70	Stiff bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
2.00	B							
					(2.20)			
3.00	B							
						OBSTRUCTION at 3.90m BGL		
					3.90	Complete at 3.90m		

Plan

Remarks

Surface water encountered (medium seepage)
Side walls stable
Shear vane attempted at 0.50m and 1.00m
Trial pit terminated at 3.90m BGL
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP20

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Site Manorhamilton Windfarm			**Trial Pit Number** TP21
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.50m x 1.00m x 2.40m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 06/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			fast seepage(1) at 0.00m.		(0.30)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		▽1
					0.30			
0.50	B					Soft dark brown slightly sandy gravelly clayey pseudo fibrous PEAT		
					(1.00)			
1.00	B							
					1.30			
						Dark brown slightly sandy gravelly peaty CLAY with occasional angular to subangular cobbles and boulders		
					(1.10)			
2.00	B							
						OBSTRUCTION at 2.40m BGL		
					2.40	Complete at 2.40m		

Plan

Remarks

Surface water encountered (fast seepage)
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too granular)
Trial pit terminated at 2.40m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP21

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Site Manorhamilton Windfarm			**Trial Pit Number** TP22
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.70m x 1.00m x 2.80m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 07/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
					(0.40)	Soft dark brown slightly sandy slightly gravelly fibrous PEAT with occasional tree stumps		
0.50	I 27.33kPa		28,28,26/Av. 27.33		0.50			
0.50	T					Soft brown sandy gravelly slightly silty CLAY with occasional angular to subangular cobbles		
0.50	R 21.00kPa		22,20,21/Av. 21.00		(0.30)			
					0.80			
1.00	B					Stiff bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
					(2.00)			
2.00	B					OBSTRUCTION at 2.80m BGL		
					2.80	Complete at 2.80m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too stiff)
Trial pit terminated at 2.80m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP22

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Site Manorhamilton Windfarm			**Trial Pit Number** TP24
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.10m x 1.00m x 1.30m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 07/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			medium seepage(1) at 0.00m.		(0.20) 0.20	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		▽1
						Soft dark brown slightly sandy slightly gravelly fibrous PEAT with tree stumps		
0.50 0.50 0.50	I 25.67kPa T R 22.33kPa		26,25,26/Av. 25.67 23,23,21/Av. 22.33		(1.00)			
1.00 1.00 1.00	I 30.67kPa T R 23.67kPa		31,30,31/Av. 30.67 24,21,26/Av. 23.67		1.20 (0.10) 1.30	Grey slightly sandy angular to subangular fine to coarse GRAVEL of Slate OBSTRUCTION at 1.30m BGL		
						Complete at 1.30m		

Plan

Remarks

Surface water encountered (medium seepage)
Side walls stable
Shear vane attempted at 0.50m and 1.00m
Trial pit terminated at 1.30m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP24

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Site Manorhamilton Windfarm			**Trial Pit Number** TP25
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.40m x 1.00m x 1.50m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 07/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
						Soft dark brown slightly sandy slightly gravelly fibrous PEAT with tree stumps		
0.50	I 28.67kPa		30,28,28/Av. 28.67					
0.50	T							
0.50	R 30.33kPa		31,31,29/Av. 30.33		(1.30)			
1.00	I 39.33kPa		40,41,37/Av. 39.33					
1.00	T							
1.00	R 30.33kPa		31,31,29/Av. 30.33					
					1.40 (0.10) 1.50	Grey slightly sandy angular to subangular fine to coarse GRAVEL with occasional angular to subangular cobbles and boulders		
						Complete at 1.50m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m
Trial pit terminated at 1.50m due to presumed bedrock of boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP25

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Site Manorhamilton Windfarm			**Trial Pit Number** TP27
Machine : 13 Tonne Tracked Excvator **Method :** Trial Pit	**Dimensions** 2.60m x 1.00m x 2.10m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 08/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
					0.20			
						Firm dark brown slightly sandy slightly gravelly pseudo fibrous PEAT with some tree stumps		
0.50	I 35.00kPa		36,34,35/Av. 35.00					
0.50	T							
0.50	R 20.67kPa		20,22,20/Av. 20.67					
					(1.10)			
1.00	I 28.33kPa		30,27,28/Av. 28.33					
1.00	T							
1.00	R 12.33kPa		14,10,13/Av. 12.33					
			medium seepage(1) at 1.30m.		1.30			▽1
						Brownish grey sandy slightly clayey slightly silty angular to subangular fine to coarse GRAVEL with occasional angular to subangular cobbles and boulders		
					(0.80)			
2.00	B					OBSTRUCTION at 2.10m BGL		
					2.10	Complete at 2.10m		

Plan

Remarks

Groundwater encountered at 1.30m (medium seepage)
Side walls stable
Shear vane attempted at 0.50m and 1.00m
Trial pit terminated at 2.10m due to presumed bedrock or boulder
Trial pit backfilled at completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP27

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Site Manorhamilton Windfarm			**Trial Pit Number** TP28
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.5m x 1.00m x 2.30m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 11/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
					0.20	Firm orangey brown mottled grey slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
0.50	I 53.33kPa		52,55,53/Av. 53.33					
0.50	B							
0.50	R 44.67kPa		45,46,43/Av. 44.67					
					(1.30)			
1.00	I 59.00kPa		60,59,58/Av. 59.00					
1.00	B							
1.00	R 44.00kPa		42,45,45/Av. 44.00					
					1.50	Stiff bluish grey slightly sandy gravelly slightly silty CLAY with occasional angular to subangular cobbles and boulders		
					(0.80)			
2.00	B					OBSTRUCTION at 2.30m BGL		
					2.30	Complete at 2.30m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m
Trial pit terminated at 2.30m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP28

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Site Manorhamilton Windfarm			**Trial Pit Number** TP31
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.70m x 1.00m x 2.10m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 05/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			medium seepage(1) at 0.00m.		(0.20) 0.20	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		▽1
0.50 0.50 0.50	I 24.67kPa T R 19.33kPa		25,24,25/Av. 24.67 20,20,18/Av. 19.33		(0.60)	Soft dark brown slightly sandy slightly gravelly pseudo fibrous PEAT with occasional tree stumps		
1.00	B				0.80 (1.00)	Firm bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
2.00	B				1.80 (0.30) 2.10	Stiff bluish grey sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders OBSTRUCTION at 2.10m BGL		
						Complete at 2.10m		

Plan

Remarks

Surface water encountered (medium seepage)
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too stiff at 1.00m)
Trial pit terminated at 2.10m due to presumed boulder or bedrock
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP31

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Site Manorhamilton Windfarm			**Trial Pit Number** TP32
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.60m x 1.00m x 2.30m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 05/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			fast seepage(1) at 0.00m.		(0.20)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		▽1
					0.20	Very soft dark brown slightly sandy slightly gravelly fibrous PEAT with occasional tree stumps		
0.50 0.50 0.50	I 19.00kPa T R 14.67kPa		20,19,18/Av. 19.00 15,15,14/Av. 14.67		(0.70)			
					0.90	Firm bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
1.00 1.00 1.00	I 28.67kPa B R 26.67kPa		33,25,28/Av. 28.67 34,21,25/Av. 26.67					
			medium seepage(2) at 1.50m.		(1.40)			▽2
2.00	B					OBSTRUCTION at 2.30m BGL		
					2.30	Complete at 2.30m		

Plan

Remarks

Surface water encountered (fast seepage). Groundwater encountered at 1.50m (medium seepage)
Side walls stable
Shear vane attempted at 0.50m and 1.00m
Trial pit terminated at 2.30m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP32

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Site Manorhamilton Windfarm			**Trial Pit Number** TP33
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.30m x 1.00m x 2.20m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 07/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			medium seepage(1) at 0.00m.		(0.10) 0.10	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		▽1
0.50	B				(1.30)	Firm brownish grey slightly sandy gravelly slightly silty CLAY with occasional angular to subangular cobbles and boulders		
1.00	B					OBSTRUCTION at 2.20m BGL		
2.00	B				1.40	Complete at 2.20m		

Plan

Remarks

Surface water encountered (medium seepage)
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too granular)
Trial pit terminated at 2.20m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP33

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Site Manorhamilton Windfarm			**Trial Pit Number** TP35
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.30m x 1.00m x 1.80m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 05/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			slow seepage(1) at 0.00m.		0.05	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		▽1
0.50	B				(0.95)	Firm to stiff bluish grey slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
1.00	B				1.00	Stiff bluish grey slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
					(0.80)	OBSTRUCTION at 1.80m BGL		
					1.80	Complete at 1.80m		

Plan

Remarks

Surface water encountered (slow seepage)
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too stiff)
Trial pit terminated at 1.80m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP35

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Site Manorhamilton Windfarm			**Trial Pit Number** TP36
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.10m x 1.00m x 1.60m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 05/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
0.50	B					Stiff blueish grey slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
1.00	B				(1.50)			
					1.60	OBSTRUCTION at 1.60m BGL Complete at 1.60m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too stiff)
Trial pit terminated at 1.60m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP36

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Site Manorhamilton Windfarm			**Trial Pit Number** TP37
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.60m x 1.00m x2.60m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 05/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			fast seepage(1) at 0.00m.		(0.10) 0.10	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		▽1
						Very soft dark brown/black slightly sandy slightly gravelly pseudo fibrous PEAT		
0.50 0.50 0.50	I 19.67kPa T R 17.67kPa		18,22,19/Av. 19.67 16,19,18/Av. 17.67		(0.90)			
1.00 1.00 1.00	I 14.33kPa T R 10.00kPa		15,13,15/Av. 14.33 10,9,11/Av. 10.00		1.00	Firm bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
			medium seepage(2) at 1.50m.		(1.10)			▽2
2.00	B				2.10	Stiff bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
					(0.50)			
2.50	B					OBSTRUCTION at 2.60m BGL		
					2.60	Complete at 2.60m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m
Trial pit terminated at 2.60m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP37

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Site Manorhamilton Windfarm			**Trial Pit Number** TP38
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.70m x 1.00m x 3.70m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 06/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			slow seepage(1) at 0.00m.		(0.30)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		▽1
					0.30	Very soft dark brown slightly sandy slightly gravelly pseudo fibrous PEAT		
0.50 0.50 0.50	I 9.33kPa T R 3.25kPa		10,8,10/Av. 9.33 5,4,4,/Av. 3.25					
1.00 1.00 1.00	I 4.75kPa T R 3.67kPa		5,7,7,/Av. 4.75 2,4,5/Av. 3.67		(1.50)			
					1.80	Soft brownish grey slightly sandy gravelly peaty slightly silty CLAY		
2.00	B				(0.50)			
					2.30	Stiff bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
3.00	B				(1.40)	OBSTRUCTION at 3.70m BGL		
					3.70	Complete at 3.70m		

Plan

Remarks

Surface water encountered (slow seepage)
Side walls collapsing
Shear vane attempted at 0.50m and 1.00m
Trial pit terminated at 3.70m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP38

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Site Manorhamilton Windfarm			**Trial Pit Number** TP39
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.60m x 1.00m x 3.80m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 06/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			slow seepage(1) at 0.00m.		(0.30)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		▽1
					0.30			
0.50	I 25.67kPa		26,25,26/Av. 25.67			Soft dark brown slightly sandy slightly gravelly fibrous PEAT with tree stumps		
0.50	T							
0.50	R 20.33kPa		20,21,20/Av. 20.33		(0.80)			
1.00	I 28.00kPa		28,29,27/Av. 28.00					
1.00	T							
1.00	R 23.33kPa		24,24,22/Av. 23.33		1.10			
						Firm bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
					(1.10)			
2.00	B							
					2.20			
						Stiff bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
					(1.60)			
3.00	B							
						OBSTRUCTION at 3.80m BGL		
					3.80			
						Complete at 3.80m		

Plan

Remarks

Surface water encountered (slow seepage)
Side walls stable
Shear vane attempted at 0.50m and 1.00m
Trial pit terminated at 3.80m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP39

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Site Manorhamilton Windfarm			**Trial Pit Number** TP41
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.50m x 1.00m x 2.50m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 07/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20) 0.20	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
					(0.40) 0.60	Soft dark brown slightly sandy slightly gravelly pseudo fibrous PEAT with tree stumps		
0.50	I 19.33kPa		17,18,23/Av. 19.33			Firm oragngey brown sandy gravelly slightly silty CLAY with occasional angular to subangular cobbles and boulders		
0.50	T							
0.50	R 10.00kPa		11,11,8/Av. 10.00					
1.00	B				(0.90) 1.50			
						Stiff oragngey brown sandy gravelly slightly silty CLAY with occasional angular to subangular cobbles and boulders		
2.00	B				(1.00) 2.50	OBSTRUCTION at 2.50m BGL		
						Complete at 2.50m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too granular at 1.00m)
Trial pit terminated at 2.50m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP41

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Site Manorhamilton Windfarm			**Trial Pit Number** TP42
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.60m x 1.00m x 2.20m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 08/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
0.50	I 17.33kPa		16,17,19/Av. 17.33		0.40	Very soft dark brown slightly sandy slightly gravelly pseudo fibrous PEAT with tree stumps		
0.50	T							
0.50	R 13.33kPa		14,14,12/Av. 13.33					
1.00	I 17.00kPa		16,19,16/Av. 17.00					
1.00	T							
1.00	R 14.00kPa		15,12,15/Av. 14.00		(1.80)			
2.00	I 23.33kPa		22,24,24/Av. 23.33			OBSTRUCTION at 2.20m BGL		
2.00	T							
2.00	R 13.67kPa		13,15,13/Av. 13.67		2.20	Complete at 2.20m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m, 1.00m and 2.00m
Trial pit terminated at 2.20m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP26

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Site Manorhamilton Windfarm			**Trial Pit Number** TP43
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.70m x 1.00m x 2.10m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 05/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
0.50	B					Stiff bluish grey slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
1.00	B				(2.00)			
2.00	B					OBSTRUCTION at 2.10m BGL		
					2.10	Complete at 2.10m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too stiff)
Trial pit terminated at 2.10m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP43

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Site Manorhamilton Windfarm			**Trial Pit Number** TP44
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.60m x 1.00m x 2.70m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 07/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.50)	Soft dark brown slightly sandy slightly gravelly pseudo fibrous PEAT with occasional tree stumps		
0.50	I 23.00kPa		22,24,23/Av. 23.00		0.50			
0.50	T					Firm brown mottled grey sandy gravelly slightly silty CLAY with occasional angular to subangular cobbles and boulders		
0.50	R 18.67kPa		18,18,20/Av. 18.67					
					(0.90)			
1.00	I 42.67kPa		42,45,41/Av. 42.67					
1.00	B							
1.00	R 21.67kPa		20,25,20/Av. 21.67					
					1.40	Stiff brown mottled grey sandy gravelly slightly silty CLAY with occasional angular to subnagular cobbles and boulders		
2.00	B				(1.30)			
						OBSTRUCTION at 2.70m BGL		
					2.70	Complete at 2.70m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m
Trial pit terminated at 2.70m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP44

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Site Manorhamilton Windfarm			**Trial Pit Number** TP45
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.30m x 1.00m x 0.50m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 07/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.05	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
					(0.45)	Soft brown sandy gravelly slightly silty CLAY with occasional angular to subangular cobbles and boulders OBSTRUCTION at 0.50m BGL		
0.50	B				0.50	Complete at 0.50m		

Plan

Remarks

No groundwater encountered
Side walls stable
No shear vane attempted(too granular)
Trial pit terminated at 0.50m BGL to to presumed bedrock
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP45

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Site Manorhamilton Windfarm			**Trial Pit Number** TP49
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.80m x 1.00m x 2.70m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 11/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			slow seepage(1) at 0.00m.		(0.20)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		▽1
					0.20	Firm grey mottled orangey brown slightly sandy slightly gravelly silty CLAY with some angular to subangular cobbles and boulders		
0.50	I 47.33kPa		46,48,48/Av. 47.33					
0.50	B							
0.50	R 38.00kPa		39,37,38/Av. 38.00					
1.00	B				(1.60)			
					1.80	Stiff bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
2.00	B				(0.90)			
						OBSTRUCTION at 2.70m BGL		
					2.70	Complete at 2.70m		

Plan

Remarks

Surface water encountered (slow seepage)
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too stiff at 1.00m)
Trial pit terminated at 2.70m due to presumed bedrock or boulders
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP49

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Site Manorhamilton Windfarm			**Trial Pit Number** TP50
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.30m x 1.00m x 1.80m (Lx W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 06/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets		
					0.30			
0.50	B				(0.50)	Firm bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles		
					0.80			
1.00	B				(1.00)	Stiff orangey brown sandy gravelly slightly silty CLAY with sand lenses and occasional angular to subangular cobbles and boulders OBSTRUCTION at 1.80m BGL		
					1.80	Complete at 1.80m		

Plan

Remarks

Groundwater encountered at 0.90m (medium seepage)
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too stiff)
Trial pit terminated at 1.80m due to presumed bedrock
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP50

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Site Manorhamilton Windfarm			**Trial Pit Number** TP51
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.50m x 1.00m x 1.80m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 04/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Dark brown/black slightly sandy slightly gravelly fibrous PEAT		
0.30	T				0.30	Soft light brown sandy gravelly slightly silty CLAY with occasional angular to subangular cobbles and boulders		
0.50	I 27.33kPa		29,25,28/Av. 27.33		(0.60)			
0.50	B							
0.50	R 20.67kPa		21,20,21/Av. 20.67					
					0.90	Stiff bluish grey slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
1.00	B				(0.90)			
						OBSTRUCTION at 1.80m BGL		
					1.80	Complete at 1.80m		

Plan

Remarks

No groundwater encountered
Side walls stable
Shear vane attempted at 0.50m and 1.00m (too stiff at 1.00m)
Trial pit terminated at 1.80m due to presumed bedrock or boulder
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP51

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Site Manorhamilton Windfarm			**Trial Pit Number** TP53
Machine : 13 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.70m x 1.00m x 3.80m (L x W x D)	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 07/10/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders		
					0.30	Soft dark brown slightly sandy slightly gravelly fibrous PEAT with tree stumps		
0.50	T							
1.00	T							
					(3.20)			
2.00	T							
3.50	B				3.50	Firm bluish grey slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles		
					(0.30)			
					3.80	Complete at 3.80m		

Plan

Remarks

No groundwater encountered
Side wall collapse
Shear vane not attempted (too unstable)
Trial pit terminated at 3.80m due to side walls collapse
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	M.Sheehan	10040-10-20.TP53

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Manorhamilton Trial Pit Photographs.



TP02



TP02



TP02



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TP04



TP04



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APPENDIX 3 –Russian Sample Records

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Site Manorhamilton Windfarm			**Number** RS01
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 16/11/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T				(0.50) 0.50	Soft brown slightly sandy slightly gravelly fibrous PEAT Refusal at 0.50m BGL Complete at 0.50m		

Remarks
Peat probe refused at 0.65m BGL
Russian Sampler refused at 0.50m BGL

Scale (approx)	Logged By
1:25	M.S & J.S

Figure No. 10040-10-20.RS01

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Site Manorhamilton Windfarm			**Number** RS02
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 16/11/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.20	T				(0.20)	Soft brown slightly sandy slightly gravelly pseudo-fibrous PEAT		
0.20-0.40	T				0.20 (0.20)	Soft grey slightly clayey slightly sandy slightly gravelly slightly peaty SILT		
					0.40	Refusal at 0.40m BGL Complete at 0.40m		

Remarks
Peat probe refused at 0.40m BGL
Russian Sampler refused at 0.40m BGL

Scale (approx)	Logged By
1:25	M.S & J.S

Figure No. 10040-10-20.RS02

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Site Manorhamilton Windfarm			**Number** RS03
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 17/11/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.30	T				(0.30) 0.30	Soft dark brown slightly sandy slightly gravelly fibrous PEAT		
						Complete at 0.30m		

Remarks
Peat probe to 0.40m BGL
Russian Sampler to 0.30m BGL

Scale (approx)	Logged By
1:25	M.S & D.M

Figure No. 10040-10-20.RS03

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Site Manorhamilton Windfarm			**Number** RS04
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 16/11/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.10	T				(0.10) 0.10	Soft brown slightly sandy slightly gravelly pseudo-fibrous PEAT Refusal at 0.10m BGL Complete at 0.10m		

Remarks
Peat probe refused at 0.10m BGL
Russian Sampler refused at 0.10m BGL

Scale (approx)	Logged By
1:25	M.S & J.S

Figure No. 10040-10-20.RS04

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Site Manorhamilton Windfarm			**Number** RS05
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 16/11/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.40	T				(0.40) 0.40	Soft brown slightly silty slightly sandy slightly gravelly pseudo-fibrous PEAT Refusal at 0.40m BGL Complete at 0.40m		

Remarks
Peat probe refused at 0.40m BGL
Russian Sampler refused at 0.40m BGL

Scale (approx)	Logged By
1:25	M.S & J.S

Figure No. 10040-10-20.RS05

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Site Manorhamilton Windfarm			**Number** RS07
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 15/11/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.35	T				(0.35) 0.35	Soft dark brown slightly sandy slightly gravelly pseudo fibrous PEAT with an organic odour Refusal at 0.35m BGL		
						Complete at 0.35m		

Remarks
Peat probe refused at 0.80m BGL
Russian Sampler 0.35m BGL

Scale (approx)	Logged By
1:25	M.S & J.S

Figure No. 10040-10-20.RS07

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Site Manorhamilton Windfarm			**Number** RS08
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 15/11/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.20	T				(0.20)	Soft dark brown slightly sandy slightly gravelly pseudo fibrous PEAT		
0.20-0.50	T				0.20	Soft greyish brown slightly sandy slightly gravelly silty CLAY		
					(0.30)			
					0.50	Refusal at 0.50m BGL		
						Complete at 0.50m		

Remarks
Peat probe refused at 0.60m BGL
Russian sampler refused at 0.50m BGL

Scale (approx)	Logged By
1:25	M.S & J.S

Figure No. 10040-10-20.RS08

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Site Manorhamilton Windfarm			**Number** RS09
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 15/11/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.25	T				(0.25) 0.25	Soft brown slightly sandy slightly gravelly fibrous PEAT		
0.25-1.00	T				(0.75) 1.00	Soft dark greyish brown silty clayey fibrous PEAT Refusal at 1.00m BGL		
						Complete at 1.00m		

Remarks
Peat probe refused at 1.10m BGL
Russian Sampler refused at 1.00m BGL

Scale (approx)	Logged By
1:25	M.S & J.S

Figure No. 10040-10-20.RS09

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Site Manorhamilton Windfarm			**Number** RS10
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 15/11/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.28	T				(0.28)	Soft dark brown slightly sandy slightly gravelly fibrous PEAT with an organic odour		
0.28-0.80	T				0.28 (0.52)	Soft brownish grey sandy slightly clayey slightly peaty SILT		
0.80-1.00	T				0.80 (0.20)	Firm bluish grey slightly sandy slightly gravelly silty CLAY Refusal at 1.00m BGL		
					1.00	Complete at 1.00m		

Remarks
Peat probe refused at 0.80m BGL
Russian sampler refused at 1.00m BGL

Scale (approx)	Logged By
1:25	M.S & J.S

Figure No. 10040-10-20.RS10

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Site Manorhamilton Windfarm			**Number** RS11
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 15/11/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20) 0.20	Soft dark brown slightly sandy slightly gravelly pseudo fibrous PEAT Refusal at 0.20m BGL Complete at 0.20m		

Remarks
Peat probe refused at 0.30m BGL
Russian sampler refused at 0.20m BGL

Scale (approx)	Logged By
1:25	

Figure No. 10040-10-20.RS11

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Site Manorhamilton Windfarm			**Number** RS12
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 16/11/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T				(0.50)	Soft dark brown slightly clayey slightly sandy slightly gravelly pseudo-fibrous PEAT Refusal at 0.50m BGL		
					0.50	Complete at 0.50m		

Remarks
Peat probe refused at 0.50m BGL
Russian Sampler refused at 0.50m BGL

Scale (approx)	Logged By
1:25	M.S & J.S

Figure No. 10040-10-20.RS12

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Site Manorhamilton Windfarm			**Number** RS14
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 17/11/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T				(2.50)	Soft brown slightly sandy slightly gravelly fibrous PEAT		
1.00-1.50	T							
2.00-2.50	T				2.50	Complete at 2.50m		

Remarks
Peat probe to 2.70m BGL
Russian Sampler to 2.50m BGL

Scale (approx)	Logged By
1:25	M.S & D.M

Figure No. 10040-10-20.RS14

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Site Manorhamilton Windfarm			**Number** RS15
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 16/11/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.45	T				(0.45)	Soft brown slightly silty slightly sandy slightly gravelly pseudo-fibrous PEAT		
					0.45	Refusal at 0.40m BGL		
0.45-0.50	T				0.50	Soft grey slightly clayey slighlty sandy SILT		
						Complete at 0.50m		

Remarks
Peat probe refused at 1.20m BGL
Russian Sampler refused at 0.50m BGL

Scale (approx)	Logged By
1:25	M.S & J.S

Figure No. 10040-10-20.RS15

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Site Manorhamilton Windfarm			**Number** RS16
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 16/11/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T				(0.50)	Soft dark brown slightly sandy slightly gravelly fibrous PEAT Refusal at 0.50m BGL		
					0.50	Complete at 0.50m		

Remarks
Peat probe refused at 0.60m BGL
Russian Sampler refused at 0.50m BGL

Scale (approx)	Logged By
1:25	M.S & J.S

Figure No. 10040-10-20.RS16

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Ground Investigations Ireland Ltd
www.gii.ie

Site Manorhamilton Windfarm			**Number** RS18
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin **Job Number** 10040-10-20
	Location (Handheld GPS) 591835 E 842879 N	**Dates** 14/12/2021	**Engineer** **Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T				(0.50) 0.50	Soft brown slightly sandy slightly silty fibrous PEAT Refusal at 0.50m BGL Complete at 0.50m		

Remarks
Peat probe refused at 1.90m BGL
Russian Sampler refused at 0.50m BGL

Scale (approx)	Logged By
1:25	DML

Figure No. 10040-10-20.RS18

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Ground Investigations Ireland Ltd
www.gii.ie

Site Manorhamilton Windfarm			**Number** RS19
Machine : Russian Sampler **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location (Handheld GPS) 591824 E 842843 N	**Dates** 14/12/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50	T				(0.50) 0.50	Soft light brown slightly sandy fibrous PEAT Refusal at 0.50m BGL Complete at 0.50m		

Remarks
Peat probe refused at 1.90m BGL
Russian Sampler refused at 0.50m BGL

Scale (approx)	Logged By
1:25	DML

Figure No. 10040-10-20.RS19

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Manorhamilton Russian Sampler Photographs

RS01 - 0.00-0.50m BGL



RS02 – 0.0-0.40m BGL



RS03 – 0.00 -0.30m BGL



RS04 – 0.00-0.10m BGL



RS05 – 0.00-0.40m BGL



RS07 – 0.00-0.35m BGL



RS08 – 0.00-0.50m BGL



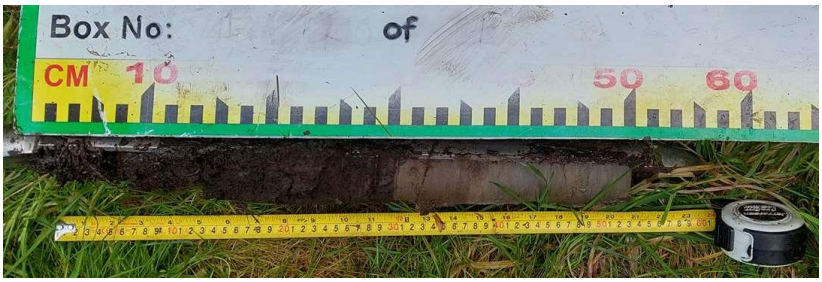
RS09 - 0.00-0.50m BGL



RS09 – 0.50-1.00m BGL



RS10 – 0.00-0.50m BGL



RS10 – 0.50-1.00m BGL



RS11 – 0.00-0.20m BGL



RS12 – 0.00-0.50m BGL



RS14 – 0.00-0.50m BGL



RS14 – 1.00-1.50m BGL



RS14 – 2.00-2.50m BGL



RS15 – 0.00-0.50m BGL



RS16 – 0.00-0.50m BGL



RS18 – 0.00-0.50m BGL



RS19 – 0.00-0.50m BGL



APPENDIX 4 - Rotary Borehole Records

www.gii.ie

Ground Investigations Ireland Ltd
www.gii.ie

Site Manorhamilton Windfarm			**Borehole Number** BH-1
Machine : Beretta T41 **Flush :** water **Core Dia :** 102 mm **Method :** Rotary Cored	**Casing Diameter** 104mm cased to 9.70m	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 15/11/2021	**Engineer**	**Sheet** 1/1

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00	30	14					(2.50)	Driller notes road fill. Recovery consists of Fill: Light brown angular to subrounded medium to coarse Gravel with cobbles and boulders of Sandstone.			
2.50	90	51	33	NI			2.50 (0.90)	Strong thickly laminated to thinly bedded grey mottled orange fine to medium grained SANDSTONE with some clay banding. Distinctly weathered to residual. . 2.50m - 3.40m BGL: Non-Intact Zone with Clay bands			
3.40	100	93	80	16			3.40 (2.10)	Strong to very strong thickly laminated to thinly bedded brown mottled grey medium to coarse-grained SANDSTONE with some orange surface staining and slight clay banding. Unweathered to partially weathered. 3.40m - 4.80m BGL: 2 Fracture sets - F1: Fractures are dipping 0 - 20 degrees, closely to widely spaced, smooth planar to rough undulating, with some clay infilling. F2: Fractures are dipping 30 - 50 degrees, closely to widely spaced, smooth planar to smooth undulating, with some clay infilling. 3.50m - 3.55m BGL: Clay band. 3.65m - 3.68m BGL: Clay band.			
4.00 5.50							5.50				
5.85	100	89	71	10			(1.80)	Medium strong to very strong thickly laminated to thinly bedded brown mottled grey fine to coarse-grained SANDSTONE with some clay smearing and banding interbedded with strong thinly to thickly laminated dark brown to black fine-grained SILTSTONE with some black clay banding. Unweathered to partially weathered. 4.80m - 7.30m BGL: 2 Fracture sets - F1: Fractures are dipping 0 - 30 degrees, closely to medium spaced, rough planar to rough undulating, with some clay infilling. F2: Fractures are dipping 70 - 85 degrees, medium to widely spaced, rough planar, with some clay infilling. 5.85m - 6.05m BGL: Clay band. 6.35m - 6.43m BGL: Clay band.			
7.00 7.30	100	78	56	18			7.30 (2.40)	Strong thinly to thickly laminated grey black fine-grained SILTSTONE with some clay smearing and banding. Unweathered to partially weathered. 7.35m - 7.39m BGL: Clay band. 7.30m - 9.70m BGL: 2 Fracture sets - F1: Fractures are dipping 0 - 30 degrees, very closely to closely spaced, smooth planar to rough planar, with some clay infilling. F2: Fractures are dipping 60 - 85 degrees, medium to widely spaced, rough planar to rough undulating, with some clay infilling. 8.95m - 8.97m BGL: Clay band			
8.50	100	77	33	20			9.70				
9.70								Complete at 9.70m			

Remarks
Borehole complete at 9.70m BGL.
Standpipe installed in borehole upon completion. Slotted standpipe installed from 9.70m - 3.0m BGL with a pea gravel surround. Plain standpipe installed from 3.0m BGL to GL with a bentonite seal and a flush cover.

Scale (approx)	Logged By
1:50	CE

Figure No. 10040-10-20.BH-1

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Ground Investigations Ireland Ltd
www.gii.ie

Site Manorhamilton Windfarm			**Borehole Number** BH-2
Machine : Beretta T41 **Flush :** water **Core Dia:** 102 mm **Method :** Rotary Cored	**Casing Diameter** 104mm cased to 15.00m	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 16/11/2021-17/11/2021	**Engineer**	**Sheet** 1/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00											
	40						(1.50)	Driller notes road infill. Recovery consists of MADE GROUND: Light grey angular to subrounded medium to coarse Gravel with occasional cobbles and wood fragments. (Fill)			
1.50							1.50				
1.50-1.95	40				6,4/8,8,12,22 SPT(C) N=50		(1.00)	Driller notes cobbles. Recovery consists of POSSIBLE MADE GROUND: Light grey angular to subrounded medium to coarse Gravel with frequent cobbles of Limestone and occasional wood fragments.			
2.40-2.70					10,10/15,35 SPT(C) 50/150		2.50				
2.50	33						(1.50)	Driller notes cobbles. Recovery consists of Light grey slightly clayey angular to subrounded medium to coarse GRAVEL with frequent cobbles of Limestone. (Weathered rock)			
4.00					25,25/25,25 SPT(C) 50/150		4.00				
4.00-4.30	100	79	43	16			(1.30)	Strong to very strong thinly laminated to thinly bedded light grey fine-grained fossiliferous LIMESTONE with clay smearing and banding. Partially to distinctly weathered. 4.0m - 5.30m BGL: 2 Fracture sets - F1: Fractures are dipping 0 - 20 degrees, very closely to medium spaced, smooth planar to rough undulating, with some clay infilling. F2: Fractures are dipping 70 - 85 degrees, closely to medium spaced, rough planar to rough undulating, with some clay infilling.			
5.30							5.30				
5.50	100	35	7	NI			(1.80)	Strong thinly laminated to thinly bedded light grey fine-grained fossiliferous LIMESTONE with clay smearing and banding, and weathered out Limestone gravel. Distinctly weathered to residual. 5.30m - 7.10m BGL: Non-Intact Zone with clay bands			
7.00											
7.10	83	48	31	CAVITY			7.10 (0.95)	CAVITY infilled with light brown slightly sandy slightly gravelly Clay and cobbles and boulders of fossiliferous Limestone. 7.10m - 8.05m BGL: Infilled CAVITY.			
8.05							8.05				
8.50	100	50	20	NI			(1.45)	Strong thinly laminated to thinly bedded grey fine-grained fossiliferous LIMESTONE with clay banding. Distinctly weathered to residual 8.05m - 9.50m BGL: Non-Intact Zone with clay bands			
9.00											
9.50	100	50	50				9.50				
10.00								Strong thinly laminated to thinly bedded grey fine-grained fossiliferous LIMESTONE with lots of clay banding and some Limestone gravel lenses. Distinctly weathered to residual. 9.50m - 10.50m BGL: 1 Fracture set - F1:			

Remarks
Borehole complete at 15.0m BGL.
Standpipe installed in borehole upon completion. Slotted standpipe installed from 15.0m to 3.0m BGL with a geo sock and a pea gravel surround, Plain standpipe installed from 3.0m BGL to GL with a bentonite seal and a flush cover.

Scale (approx)	Logged By
1:50	CE

Figure No. 10040-10-20.BH-2

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Ground Investigations Ireland Ltd
www.gii.ie

Site Manorhamilton Windfarm			**Borehole Number** BH-2
Machine : Beretta T41 **Flush :** water **Core Dia :** 102 mm **Method :** Rotary Cored	**Casing Diameter** 104mm cased to 15.00m	**Ground Level (mOD)**	**Client** Tobin	**Job Number** 10040-10-20
	Location	**Dates** 16/11/2021-17/11/2021	**Engineer**	**Sheet** 2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
				7				Fractures are dipping 0 - 30 degrees, closely to medium spaced, smooth planar to rough planar, with some clay infilling. 10.35m - 10.45m BGL: Clay band.			
10.50	83	47	28	NI			(2.40)	10.50m - 11.50m BGL: Non-Intact Zone with clay bands			
11.50				CAVITY				11.50m - 11.90m BGL: Infilled CAVITY.			
11.90	100	59	47	16			11.90	Strong to very strong thinly laminated to thinly bedded grey fine-grained fossiliferous LIMESTONE with many clay bands and some Limestone gravel lenses. Distinctly weathered to residual. 11.90m - 14.10m BGL: 2 Fracture sets - F1: Fractures are dipping 0 - 30 degrees, closely to medium spaced, rough planar to rough undulating, with some clay infilling. F2: Fractures are dipping 60 - 85 degrees, closely to widely spaced, smooth planar to rough undulating, with some clay infilling. 12.20m - 12.40m BGL: Clay band. 12.50m - 12.60m BGL: Clay band. 13.25m - 13.29m BGL: Clay band. 13.45m - 13.60m BGL: Clay band. 13.70m - 13.90m BGL: Clay band.			
13.00	92	82	48				(3.10)				
14.10								14.10m - 14.70m BGL: Infilled CAVITY.			
14.30				CAVITY							
14.70	71	46	46	1				14.70m - 15.0m BGL: 1 Fracture set - F1: Fractures are dipping 40 - 60 degrees, closely spaced, smooth planar, with some clay infilling.			
15.00							15.00	Complete at 15.00m			

Remarks

Scale (approx)	Logged By
1:50	CE

Figure No. 10040-10-20.BH-2

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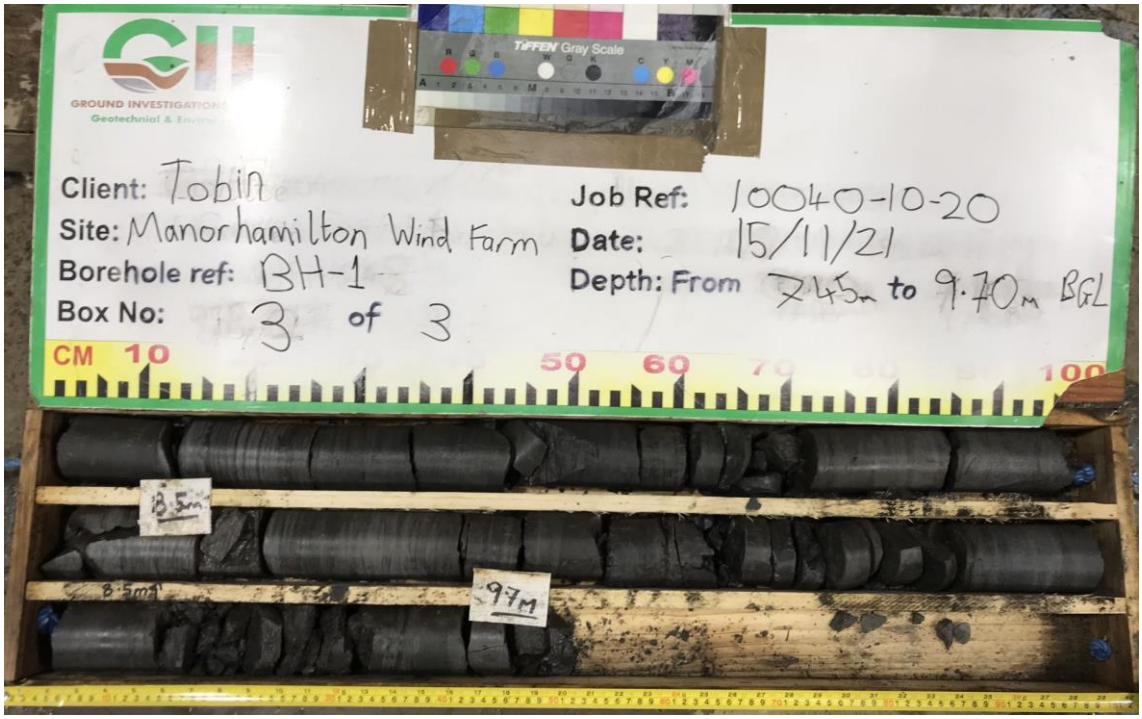
Manorhamilton Windfarm

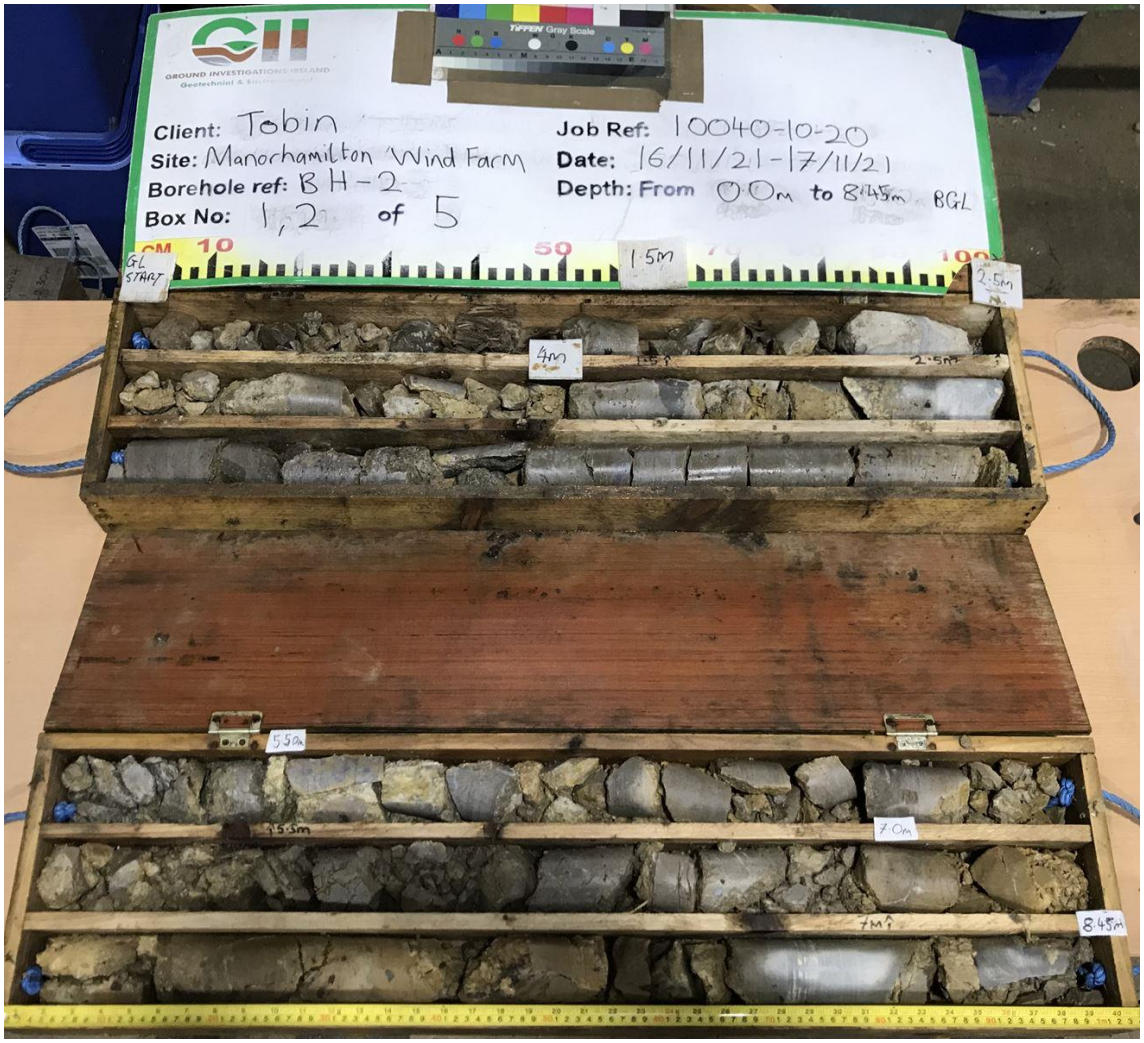
Rotary Core Photographs



BH-1 (1, 2 of 3)


GROUND INVESTIGATIONS
Geotechnical & Environmental
Client: Tobin
Site: Manorhamilton Wind Farm
Borehole ref: BH-1
Box No: 3 of 3
Job Ref: 10040-10-20
Date: 15/11/21
Depth: From 2.45m to 9.70m BGL
CM 10
50
60
100
8.5m
9.7m

BH-1 (3 of 3)


GROUND INVESTIGATIONS IRELAND
Client: Tobin
Site: Manorhamilton Wind Farm
Borehole ref: BH-2
Box No: 1, 2 of 5
Job Ref: 10040-10-20
Date: 16/11/21-17/11/21
Depth: From 0.0m to 8.45m BGL
1.5m
2.5m
4m
5.5m
7.0m
8.45m

BH-2 (1, 2 of 5)


Client: Tobin
Site: Manorhamilton Wind Farm
Borehole ref: BH-2
Box No: 3,4,5 of 5
Job Ref: 10040-10-20
Date: 16/11/21-17/11/21
Depth: From 8.45m to 15.0m BGL
10m
11.5m
13m
14.3m
15.0m

BH-2 (3, 4, 5 of 5)

APPENDIX 5 – Laboratory Testing

National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

			Particle			Index Properties		Bulk	Cell	Undrained Triaxial Tests		Shear Strength	
BH/TP	Depth	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Cu	Mode of
No	m	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	Failure
RS01	0.0-0.5	384.3											
RS02	0.20-0.40	72.3											
RS03	0.00-0.30	222.5											
RS04	0.00-0.10	303.5											
RS05	0.00-0.40	219.0											
RS08	0.20-02.50	41.3											
RS09	0.25-1.00	106.8											
RS10	0.80-1.00	35.2											
RS12	0.0-0.50	174.9											
RS14	0.00-0.50	714.8											
RS14	1.00-1.50	977.3											
RS14	2.00-2.50	913.7											
RS15	0.00-0.45	329.1											
RS15	0.45-0.50	77.4											
RS16	0.0-0.50	397.0											
RS18	0.00-0.50	459.2											
RS19	0.00-0.50	605.0											
NMTL	Notes :									Job ref No.	NMTL 3493-GIIProject ID:10010-10-20		
	1. All BS tests carried out using preferred (definitive) method unless otherwise stated.									Location	Manorhamilton		

LABORATORY REPORT

4043

Contract Number: PSL21/8440

Report Date: 24 November 2021

Client's Reference: 10040-10-20

Client Name: Ground Investigations Ireland Ltd
Catherinestown House
Hazelhatch Road
Newcastle
Co Dublin
D22 YD52

For the attention of: Jim Stokes

Contract Title: Manorhamilton

Date Received: 25/10/2021
Date Commenced: 25/10/2021
Date Completed: 24/11/2021

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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

Checked and Approved Signatories:

A Watkins (Director)	R Berriman (Quality Manager)	S Royle (Laboratory Manager)
L Knight (Assistant Laboratory Manager)	S Eyre (Senior Technician)	T Watkins (Senior Technician)

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awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP11		B	0.50		Grey & dark brown sandy organic CLAY.
TP12		T	0.50		Dark brown very clayey PEAT.
TP02		T	1.00		Dark brown very clayey PEAT.
TP02		B	2.00		Dark brown slightly sandy gravelly organic CLAY.
TP04		T	0.50		Brown mottled grey slightly sandy slightly gravelly organic CLAY.
TP17		T	0.50		Dark brown peaty CLAY.
TP38		T	1.00		Dark brown clayey PEAT.
TP39		T	0.50		Dark brown peaty CLAY.
TP39		T	1.00		Dark brown peaty CLAY.
TP27		B	1.00		Dark brown slightly sandy slightly gravelly CLAY.
TP28		B	2.00		Brown slightly sandy slightly gravelly CLAY.
TP49		B	2.00		Brown sandy very clayey GRAVEL of cobbles.
TP22		T	0.50		Dark brown clayey PEAT.
TP24		T	1.00		Dark brown clayey PEAT.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
TP11		B	0.50		50							
TP12		T	0.50		269							
TP02		T	1.00		216							
TP02		B	2.00		52							
TP04		T	0.50		82			107	43	64	85	Extremely High Plasticity CE
TP17		T	0.50		277							
TP38		T	1.00		459							
TP39		T	0.50		148							
TP39		T	1.00		232							
TP27		B	1.00		22							
TP28		B	2.00				2.62					
TP49		B	2.00		14			29	16	13	25	Low Plasticity CL
TP22		T	0.50		375							
TP24		T	1.00		411							

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Manorhamilton

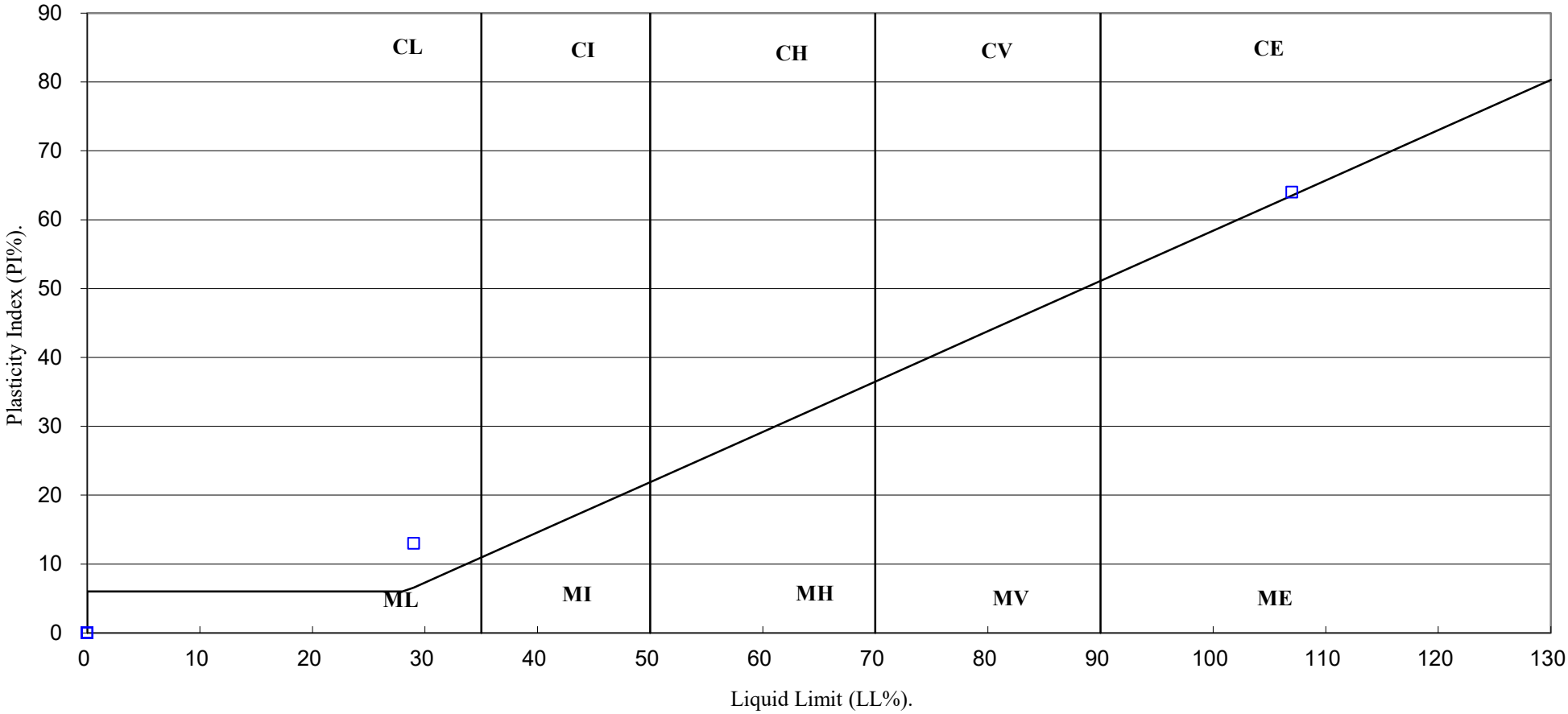
Contract No:

PSL21/8440

Client Ref:

10040-10-20

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	Manorhamilton	Contract No: PSL21/8440 Client Ref: 10040-10-20

PARTICLE SIZE DISTRIBUTION TEST

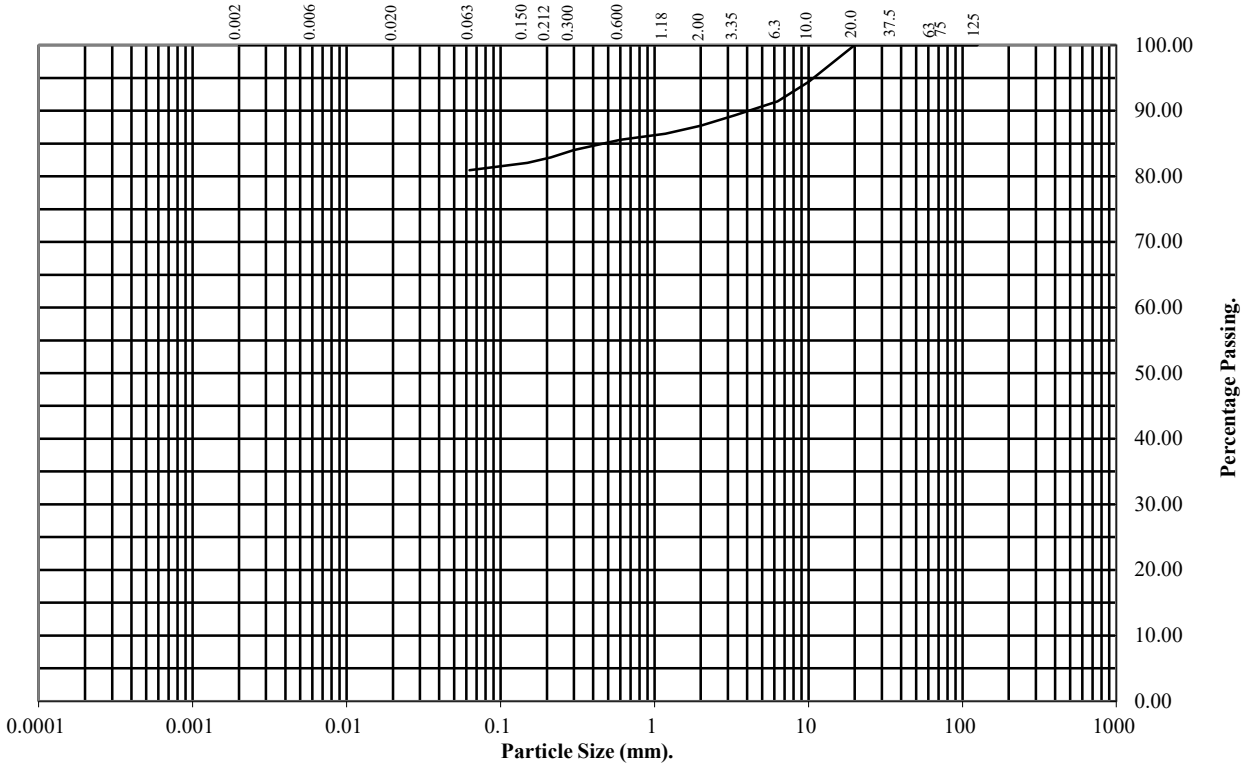
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP04 **Top Depth (m):** 0.50

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

Sample Type: T



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	94
6.3	91
3.35	89
2	88
1.18	86
0.6	86
0.3	84
0.212	83
0.15	82
0.063	81

Soil Fraction	Total Percentage
Cobbles	0
Gravel	12
Sand	7
Silt/Clay	81

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

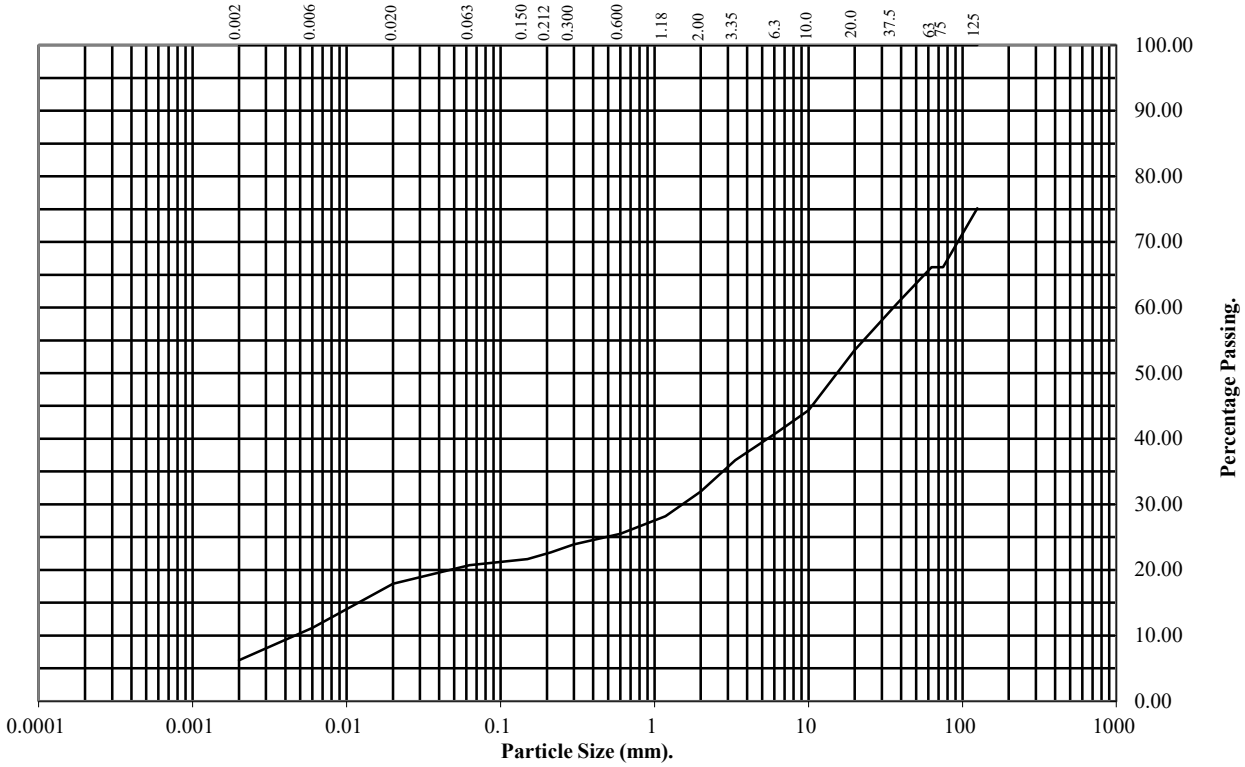
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: TP49 **Top Depth (m):** 2.00

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

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	75
75	66
63	66
37.5	61
20	53
10	44
6.3	41
3.35	37
2	32
1.18	28
0.6	26
0.3	24
0.212	23
0.15	22
0.063	21

Particle Diameter	Percentage Passing
0.02	18
0.006	11
0.002	6

Soil Fraction	Total Percentage
Cobbles	34
Gravel	34
Sand	11
Silt	15
Clay	6

Remarks:
See Summary of Soil Descriptions

LABORATORY REPORT

4043

Contract Number: PSL21/8836

Report Date: 07 December 2021

Client's Reference: 10040-10-20

Client Name: Ground Investigations Ireland Ltd
Catherinestown House
Hazelhatch Road
Newcastle
Co Dublin
D22 YD52

For the attention of: Jim Stokes

Contract Title: Manorhamilton

Date Received: 10/11/2021
Date Commenced: 10/11/2021
Date Completed: 7/12/2021

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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Checked and Approved Signatories:

A Watkins (Director)

R Berriman (Quality Manager)

S Royle (Laboratory Manager)

L Knight (Assistant Laboratory Manager)

S Eyre (Senior Technician)

M Fennell (Senior Technician)

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SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP33		B	1.00		Brown silty slightly sandy slightly gravelly CLAY.
TP41		T	0.50		Dark brown PEAT.
TP53		T	0.50		Dark brown PEAT.
TP53		T	2.00		Dark brown PEAT.
TP42		T	1.00		Dark brown CLAY.
TP32		B	1.00		Brown slightly sandy gravelly CLAY.
TP20		B	2.00		Brown slightly sandy slightly gravelly CLAY.
TP21		B	2.00		Brown slightly sandy slightly gravelly clayey PEAT.
TP37		T	1.00		Brown clayey PEAT.
TP43		B	1.00		Brown silty slightly sandy slightly gravelly CLAY.
TP43		B	2.00		Brown slightly sandy slightly gravelly CLAY.
TP05		T	0.50		Dark brown clayey PEAT.
TP05		B	2.00		Dark brown slightly gravelly CLAY.
TP05		B	3.00		Grey slightly sandy slightly gravelly CLAY.
TP06		B	1.00		Dark brown mottled grey slightly gravelly slightly sandy CLAY.
TP09		T	0.50		Dark brown clayey PEAT.
TP10		T	0.50		Dark brown clayey PEAT.
TP51		T	0.30		Dark brown clayey PEAT.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
TP33		B	1.00		21			34	17	17	45	Low Plasticity CL
TP41		T	0.50		190							
TP53		T	0.50		831							
TP53		T	2.00		875							
TP42		T	1.00		1052							
TP32		B	1.00		20			43	23	20	52	Intermediate Plasticity CI
TP20		B	2.00		28			34	18	16	68	Low Plasticity CL
TP21		B	2.00		468			707	200	507	89	Extremely High Plasticity CE
TP37		T	1.00		663							
TP43		B	1.00		20			35	19	16	45	Intermediate Plasticity CI
TP05		T	0.50		200							
TP05		B	2.00		17			34	17	17	80	Low Plasticity CL
TP06		B	1.00				2.55					
TP09		T	0.50		230							
TP10		T	0.50		461							
TP51		T	0.30		202							

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Manorhamilton

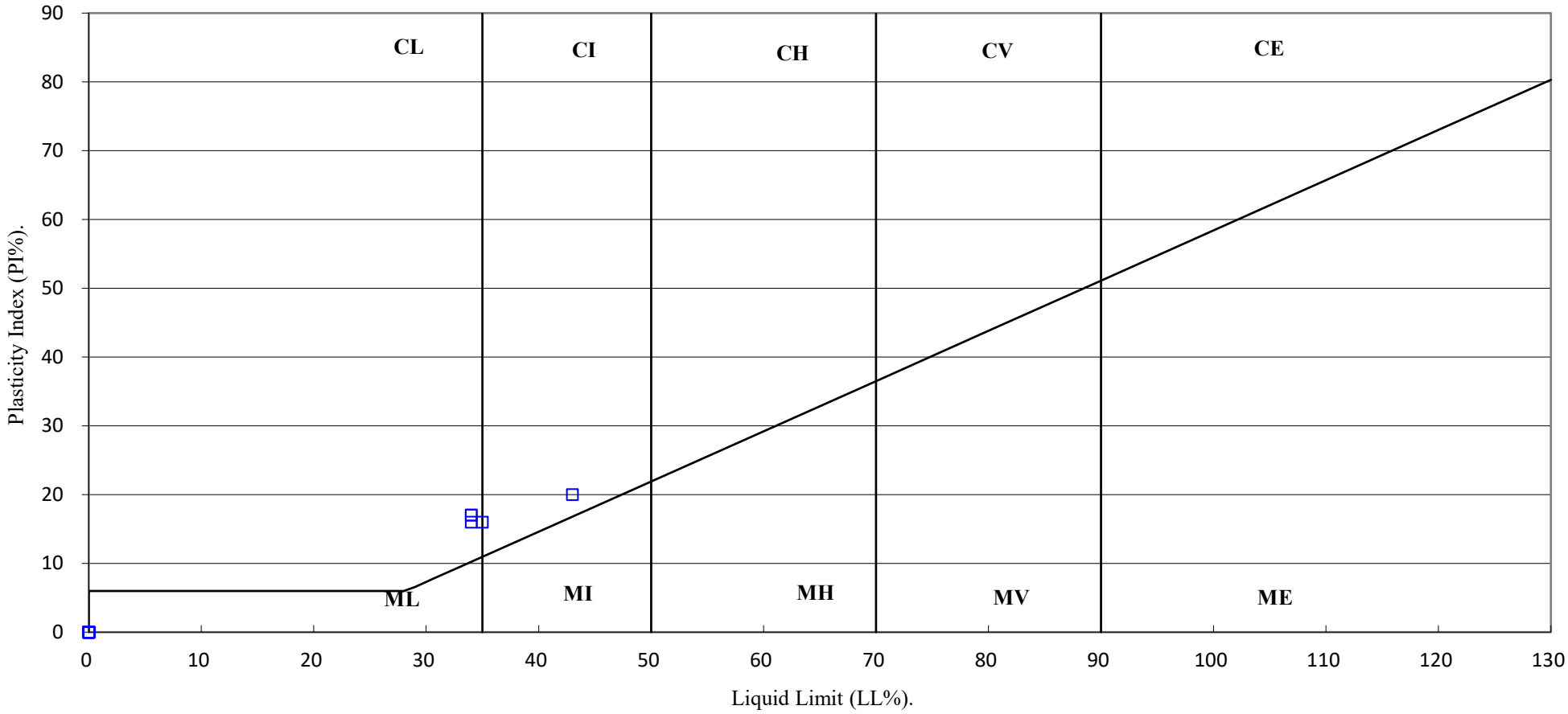
Contract No:

PSL21/8836

Client Ref:

10040-10-20

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	Manorhamilton	Contract No: PSL21/8836 Client Ref: 10040-10-20

PARTICLE SIZE DISTRIBUTION TEST

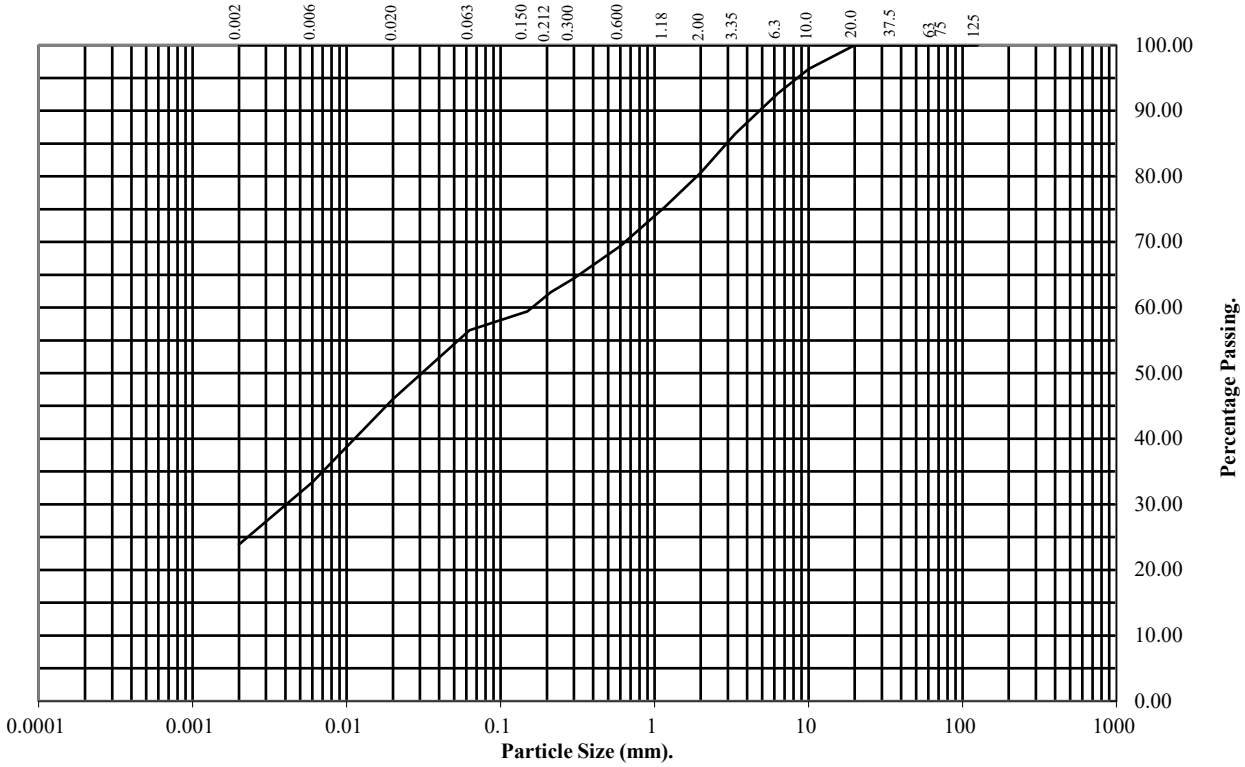
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP05** **Top Depth (m):** **3.00**

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

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	96
6.3	93
3.35	87
2	81
1.18	75
0.6	69
0.3	64
0.212	62
0.15	59
0.063	57

Particle Diameter	Percentage Passing
0.02	46
0.006	33
0.002	24

Soil Fraction	Total Percentage
Cobbles	0
Gravel	19
Sand	24
Silt	33
Clay	24

Remarks:
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

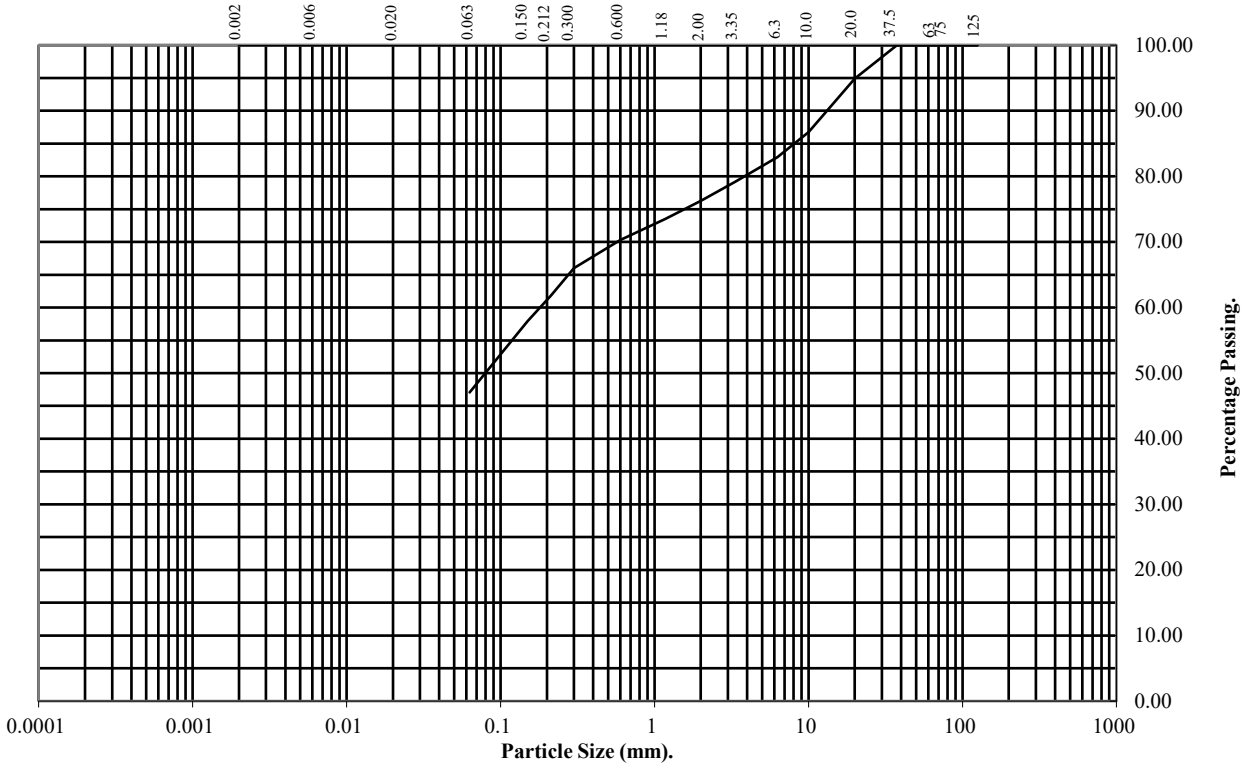
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP20 **Top Depth (m):** 2.00

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

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	95
10	87
6.3	83
3.35	79
2	76
1.18	74
0.6	70
0.3	66
0.212	62
0.15	58
0.063	47

Soil Fraction	Total Percentage
Cobbles	0
Gravel	24
Sand	29
Silt/Clay	47

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

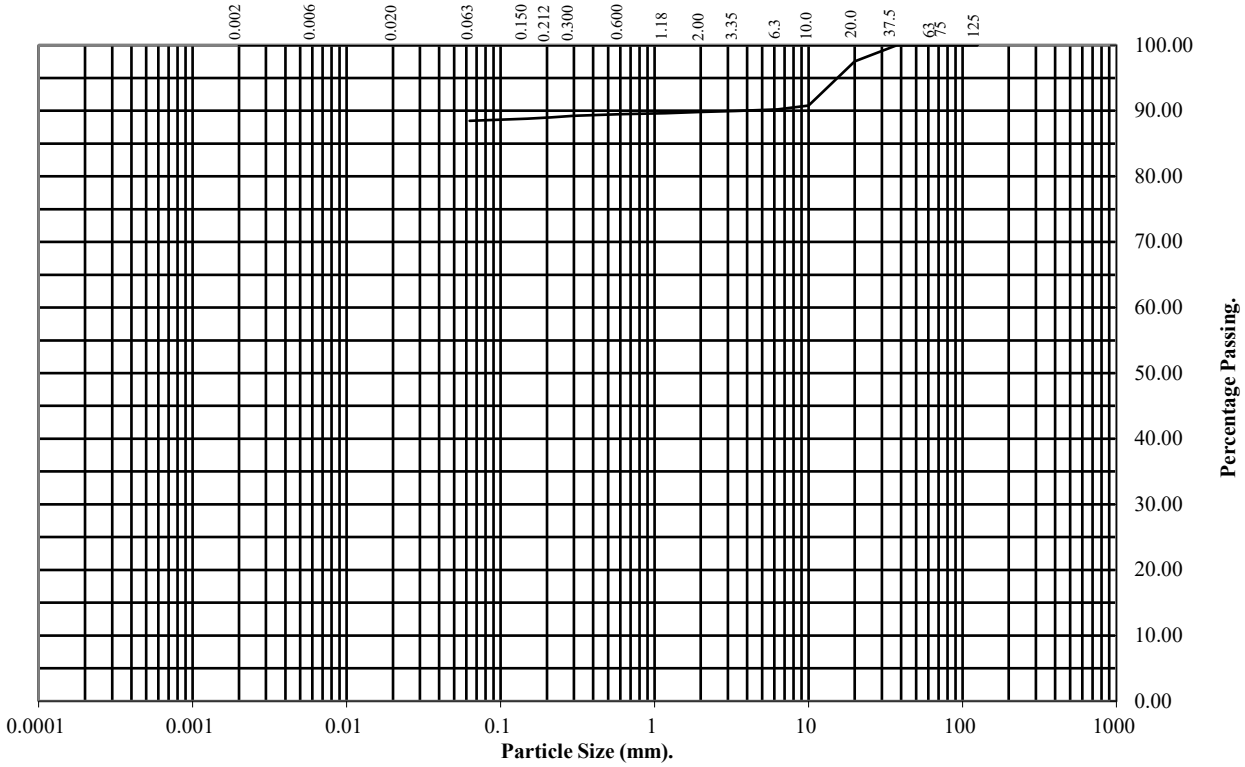
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP21 **Top Depth (m):** 2.00

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

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	98
10	91
6.3	90
3.35	90
2	90
1.18	90
0.6	89
0.3	89
0.212	89
0.15	89
0.063	88

Soil Fraction	Total Percentage
Cobbles	0
Gravel	10
Sand	2
Silt/Clay	88

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

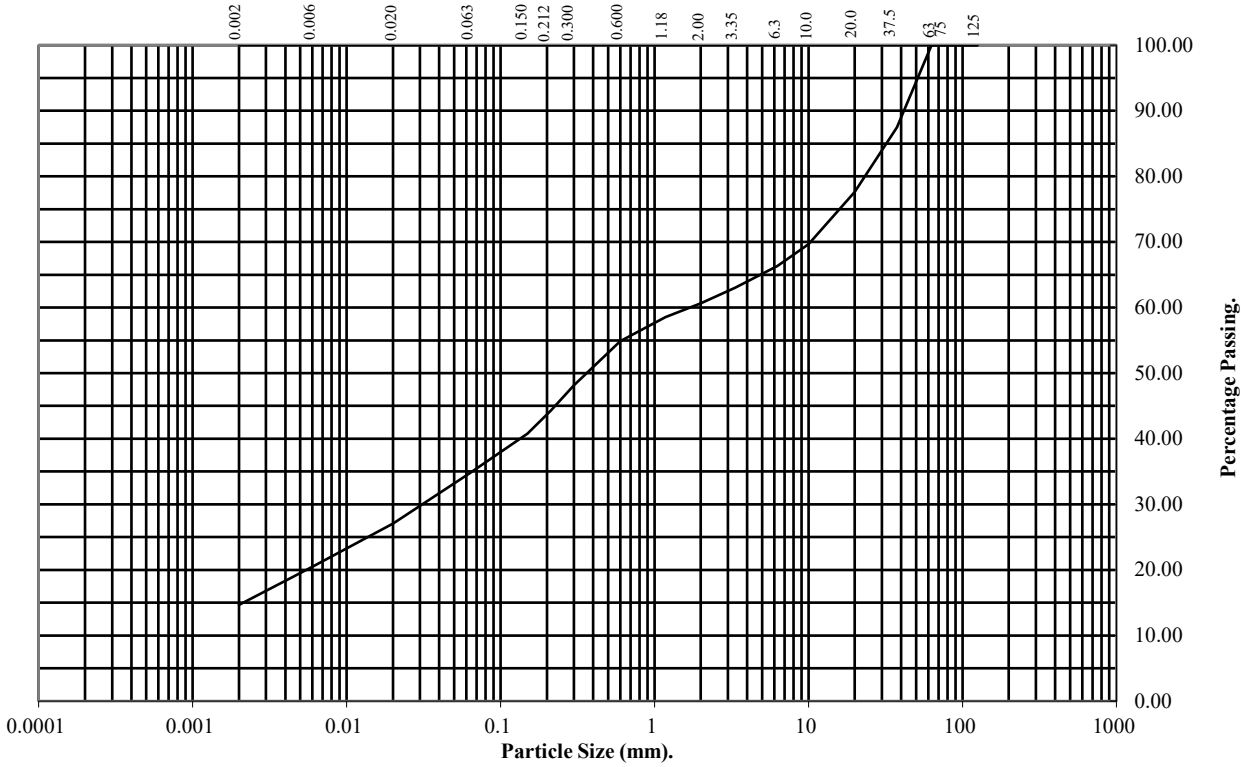
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: TP32 **Top Depth (m):** 1.00

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

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	87
20	78
10	70
6.3	66
3.35	63
2	61
1.18	59
0.6	55
0.3	48
0.212	44
0.15	41
0.063	35

Particle Diameter	Percentage Passing
0.02	27
0.006	20
0.002	15

Soil Fraction	Total Percentage
Cobbles	0
Gravel	39
Sand	26
Silt	20
Clay	15

Remarks:

See Summary of Soil Descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Manorhamilton

Contract No:
PSL21/8836
Client Ref:
10040-10-20

PARTICLE SIZE DISTRIBUTION TEST

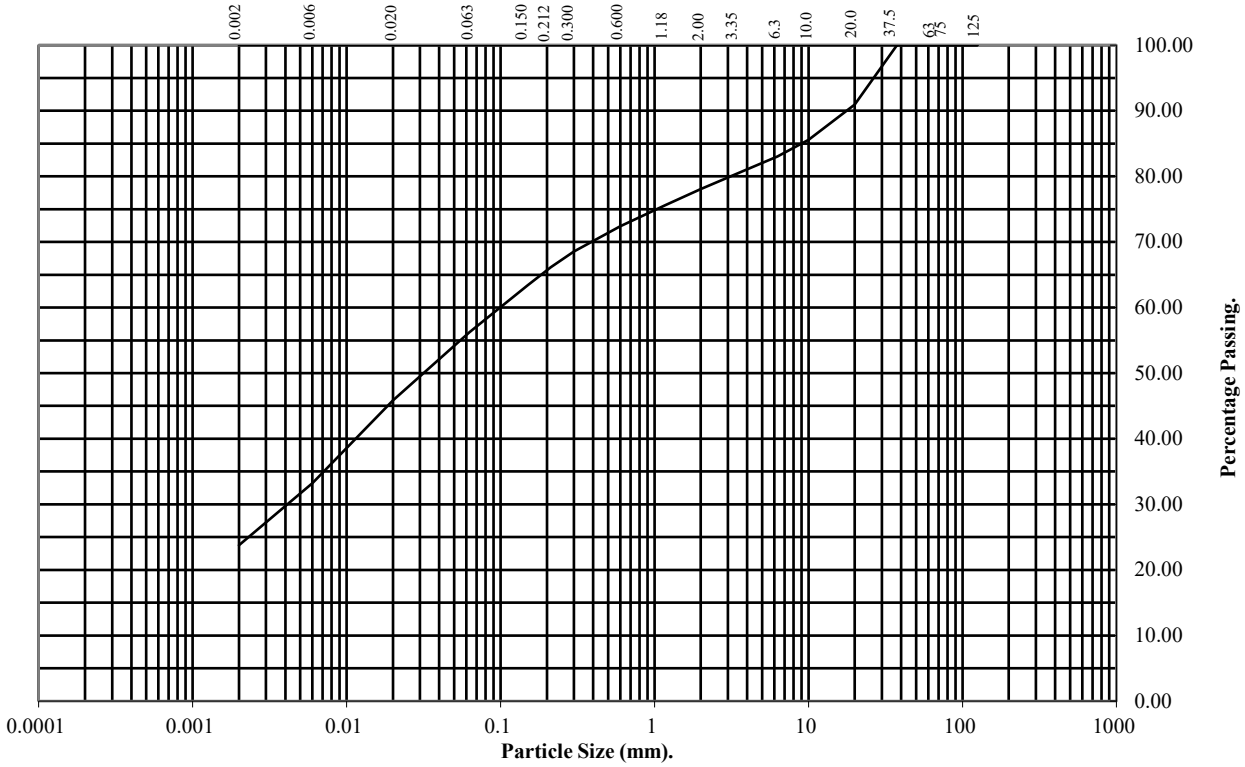
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: TP43 **Top Depth (m):** 2.00

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

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	91
10	86
6.3	83
3.35	80
2	78
1.18	76
0.6	72
0.3	69
0.212	66
0.15	63
0.063	56

Particle Diameter	Percentage Passing
0.02	46
0.006	33
0.002	24

Soil Fraction	Total Percentage
Cobbles	0
Gravel	22
Sand	22
Silt	32
Clay	24

Remarks:
See Summary of Soil Descriptions

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
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Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

Attention :	Diarmaid MagLochlainn
Date :	22nd November, 2021
Your reference :	10040-10-20
Our reference :	Test Report 21/18037 Batch 1
Location :	Manorhamilton Windfarm
Date samples received :	15th November, 2021
Status :	Final Report
Issue :	1

One sample was received for analysis on 15th November, 2021 and was scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Hayley Prowse
Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

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F: +44 (0) 1244 833781
W: www.element.com

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

Attention :	Diarmaid MagLochlainn
Date :	3rd November, 2021
Your reference :	10040-10-20
Our reference :	Test Report 21/16876 Batch 1
Location :	Manorhamilton Windfarm
Date samples received :	26th October, 2021
Status :	Final Report
Issue :	1

Two samples were received for analysis on 26th October, 2021 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:



Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology Environmental UK Limited
Registered in England and Wales
Registered Office: 10 Lower Grosvenor Place, London, SW1W 0EN
Company Registration No: 11371415

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 10040-10-20
Location: Manorhamilton Windfarm
Contact: Diarmaid MagLochlainn
EMT Job No: 21/16876

Report : Solid

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

EMT Sample No.	1	2											
Sample ID	TP02	TP11											
Depth	1.00	0.50											
COC No / misc													
Containers	T	T											
Sample Date	06/10/2021	04/10/2021											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	26/10/2021	26/10/2021											

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Organic Matter	24.5	1.8									<0.2	%	TM21/PM24
pH #	-	5.84									<0.01	pH units	TM73/PM11

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

Client Name: Ground Investigations Ireland
Reference: 10040-10-20
Location: Manorhamilton Windfarm
Contact: Diarmaid MagLochlainn

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 21/16876						

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 21/16876

SOILS

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

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

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

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

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

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

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

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

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

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

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

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

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

WATERS

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

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

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

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

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

ABBREVIATIONS and ACRONYMS USED

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

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 21/16876

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 10040-10-20
Location: Manorhamilton Windfarm
Contact: Diarmaid MagLochlainn
EMT Job No: 21/18037

Report : Solid

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

EMT Sample No.	1										Please see attached notes for all abbreviations and acronyms		
Sample ID	TP53												
Depth	1.00												
COC No / misc													
Containers	T												
Sample Date	07/10/2021												
Sample Type	Soil												
Batch Number	1										LOD/LOR	Units	Method No.
Date of Receipt	15/11/2021												
Organic Matter	82.4										<0.2	%	TM21/PM24
pH #	3.88										<0.01	pH units	TM73/PM11

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

Client Name: Ground Investigations Ireland

Reference: 10040-10-20

Location: Manorhamilton Windfarm

Contact: Diarmaid MagLochlainn

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
21/18037	1	TP53	1.00	1	pH	Sample holding time exceeded prior to receipt

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

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NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 21/18037

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

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

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

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

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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BLANKS

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REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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ABBREVIATIONS and ACRONYMS USED

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

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 21/18037

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

Appendix 2-6B

Site Investigation Report 2024 & Geophysical Survey

CAUSEWAY GEOTECH







24-0430

LISSINAGROAGH, LEITRIM GROUND INVESTIGATION REPORT

Client:
FUTURE ENERGY IRELAND

Client's Representative:
TOBIN

Date:
FEBRUARY 2025

Status:
FINAL

GIR VERSION 1

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APPENDIX I – SPT HAMMER ENERGY MEASUREMENT REPORT

DOCUMENT CONTROL SHEET

REPORT NO:		**24-0430**			
PROJECT TITLE:		**LISSINAGROAGH, LEITRIM**			
CLIENT:		**FUTURE ENERGY IRELAND**			
CLIENT'S REPRESENTATIVE:		**TOBIN**			
REVISION	**A01**	**STATUS**	**FINAL**	**ISSUE DATE**	**19 FEB 2025**
PREPARED BY:		**REVIEWED BY:**		**APPROVED BY:**	
 Eoin Lundy **BSC (HONS) MSC**		 Carin Cornwall **BSC MSC PHD**		 Matthew Gilbert **MEARTHSCI PGEO FGS**	

This report presents a factual account of the ground investigation in accordance with the Specification and Related Documents for Ground Investigation in Ireland 2nd Edition, published by Engineers Ireland (2016).

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.

1 AUTHORITY

On the instructions of TOBIN, ("the Client's Representative"), acting on the behalf of Future Energy Ireland ("the Client"), a ground investigation was undertaken at the site to provide geotechnical and environmental information for input to the design and construction of a proposed wind farm development.

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 PURPOSE, RATIONALE & SCOPE OF THE INVESTIGATION

The purpose of this investigation is to assess the ground conditions and to allow an evaluation of the geotechnical with the current site and proposed development. The rationale has been determined by the Client's Representative, with the extent of the investigation including boreholes, trial pits, peat augering, soil and rock core sampling, in-situ and laboratory testing, and the preparation of a factual account of the ground investigation findings.

3 DESCRIPTION OF SITE

The site is located at Irish Transverse Mercator 592179 842835 on predominantly forestry and agricultural land in Lissinagroagh, Co. Leitrim. The site location is presented in Appendix A.

4 SITE OPERATIONS

4.1 SUMMARY OF SITE WORKS

Site operations, which were conducted between 16/09/2024 and 13/11/2024, comprised:

- one rotary drilled borehole
- thirty-nine peat augers with follow-on peat probes
- three machine-dug trial pits
- Standard Penetration Tests
- GPS survey of all completed locations
- geophysical surveying

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 ROTARY DRILLED BOREHOLE

One rotary drilled borehole was put to completion by rotary drilling techniques only to a depth of 10.20 metres. The borehole was completed using a Comacchio 405 tracked rotary drilling rig.

A hand dug inspection pit was carried out between ground level and 1.00m depth to ensure the borehole was put down at a location clear of services or subsurface obstructions.

Symmetrix-cased full hole rotary percussive drilling techniques were employed to advance the boreholes to bedrock, after which rotary coring was employed to recover core samples of the bedrock. SPTs were carried out at standard intervals throughout the overburden, with small and bulk disturbed samples obtained where possible through the soil strata.

The core was extracted in up to 1.5m lengths using a metric T2-101 core barrel, which produced core of nominal 84mm diameter, and was placed in triple channel wooden core boxes.

The core was subsequently photographed and examined by a qualified and experienced Engineering Geologist, thus enabling the production of an engineering log in accordance with BS 5930: 2015+A1:2020: Code of practice for ground investigations.

Appendix B presents the borehole logs, with core photographs presented in Appendix C.

4.3 STANDARD PENETRATION TESTS

Standard penetration tests were carried out in accordance with BS EN 22476-3:2005+A1:2011 (BSI, 2011) at standard depth intervals using the split spoon sampler ($SPT_{(s)}$) or solid cone attachment ($SPT_{(c)}$). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible.

The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix I.

4.4 PEAT AUGERS

Thirty-nine peat augers were conducted at locations shown in Appendix A using an Edelman auger to a target depth of 2.00 metres or until refusal. A follow-on peat probe was carried out if peat extended past 2.00 metres.

Probing was conducted by manually driving a series of interconnecting probe rods into the ground and pushing until a noticeable change in resistance was encountered within the subsoil. The depth to this refusal was nominally taken as the thickness of peat at that location.

The results of the peat thickness assessment are included in Appendix F.

4.5 TRIAL PITS

Three trial pits (TP244-246) were excavated using a 13t tracked excavator fitted with a 600mm wide bucket, to depths of 3.50m.

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

Stability of the trial pit walls was noted on completion.

Appendix D presents the trial pit logs with photographs of the pits and arisings provided in Appendix E.

4.6 GEOPHYSICAL SURVEY

A geophysical survey was completed by Apex Geophysics at the location shown in Adjacent to BH001.

The geophysical investigation consisted of 2D Electrical Resistivity Tomography and 2D Seismic Refraction profiling. The full geophysical survey report can be found in Appendix H.

4.7 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.

5 LABORATORY WORK

Laboratory testing was carried out between 15/10/2024 and 03/02/2025.

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.
- **compaction related:** particle density by Gas jar method
- **soil chemistry:** organic matter content

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

The test results are presented in Appendix G.

5.2 GEOTECHNICAL LABORATORY TESTING OF ROCK

Laboratory testing of rock sub-samples comprised:

- point load index
- unconfined compressive strength (UCS) tests

Laboratory testing of rock sub-samples was carried out in accordance with the testing standards presented below in Table 1.

Table 1: Rock testing standards

Test	Test carried out in accordance with
Point load index	International Society for Rock Mechanics (IRSM). (1985) ISRM Suggested Methods: Suggested method for determining point-load strength. Int. J. Rock Mech. Min. Sci. Geomech. Abstr. 22, pp. 53–60
Uniaxial compression strength tests	International Society for Rock Mechanics (IRSM). (1981) ISRM Suggested Methods: Suggested method for determining deformability of rock materials in uniaxial compression, Part 2 International Society for Rock Mechanics (IRSM). (2007) The complete ISRM suggested methods for rock characterization, testing and monitoring.

The test results are presented in Appendix G.

6 GROUND CONDITIONS

6.1 GENERAL GEOLOGY OF THE AREA

Published geological mapping from the online Geological Survey Ireland spatial resources database indicate the superficial deposits underlying the site comprise glacial till. These deposits are shown to be underlain by limestones of the Dartry Formation and sandstones of the Glenade Foundation.

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:

- **Topsoil:** encountered typically in 20-30mm thickness across the site.
- **Recent deposits (peat):** encountered in thicknesses from 0.20m to 2.30m of spongy pseudo-fibrous peat.
- **Glacial Till:** sandy gravelly clay, frequently with medium cobble and boulder content, typically firm in upper horizons, becoming stiff with increasing depth with occasional beds of sands and gravels.
- **Limestone Bedrock:** Rockhead was encountered at 4.0m in BH001.

6.3 GROUNDWATER

Groundwater was not noted during drilling or excavation at any of the exploratory hole locations. However, it should be noted that the casing used in supporting the borehole walls during drilling may have sealed out any groundwater strikes and the possibility of encountering groundwater during excavation works should not be ruled out. It should be noted that any groundwater strikes within bedrock may have been masked by the fluid used as the drilling flush medium.

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

7 REFERENCES

British Standards Institute (BSI). (1990) *BS 1377:1990: Methods of test for soils for civil engineering purposes – Parts 2-9.*

British Standards Institute (BSI). (2007) *BS EN 1997-2:2007: Eurocode 7 – Geotechnical Design – Part 2: Ground investigation and testing.*

British Standards Institute (BSI). (2011) *BS EN ISO 22476-3:2006+A1:2011 Geotechnical investigation and testing. Field testing – Standard penetration test.*

British Standards Institute (BSI). (2014) *PAS 128: Specification for underground utility detection, verification and location.*

British Standards Institute (BSI). (2016) *BS 1377-1:2016: Methods of test for soils for civil engineering purposes – Part 1: General requirements and sample preparation.*

British Standards Institute (BSI). (2015) BS 8004:2015 *Code of practice for foundations*.

British Standards Institute (BSI). (2018a) *BS EN ISO 14688-1:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 1 Identification and description.*

British Standards Institute (BSI). (2018b) *BS EN ISO 14688-2:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification.*

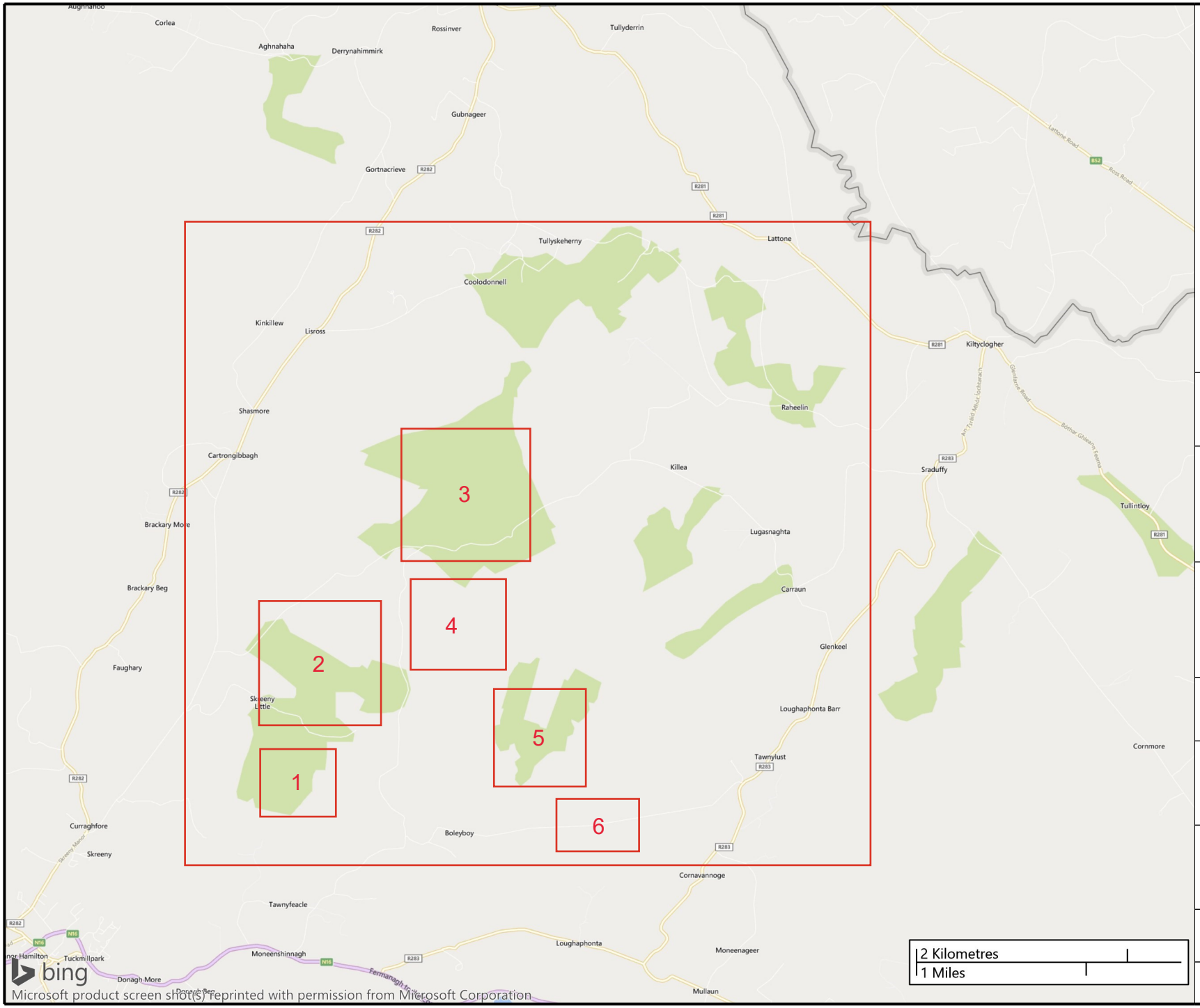
British Standards Institute (BSI). (2018c) *BS EN ISO 14689-1:2018: Geotechnical investigation and testing. Identification and classification of rock. Identification and description.*

British Standards Institute (BSI). (2020) *BS5930:2015+A1:2020: Code of practice for ground investigations.*

Geotechnical Society of Ireland. (2016) *Specification and Related Documents for Ground Investigation in Ireland.* 2nd Edition. Engineers Ireland.

Geological Survey Ireland (GSI). Geological Survey Ireland spatial resources database. Available at: https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228

APPENDIX A – SITE AND EXPLORATORY HOLE LOCATION PLANS



Legend Key

Project No.	24-0430
Client	Tobin
Client's Rep	N/A

Site Location Plan

Lissinagroagh, Leitrim

CAUSEWAY GEOTECH

Last Revision	29/11/2024
Scale	1:50000



Legend Key

- Locations By Type - HA
- Locations By Type - TP

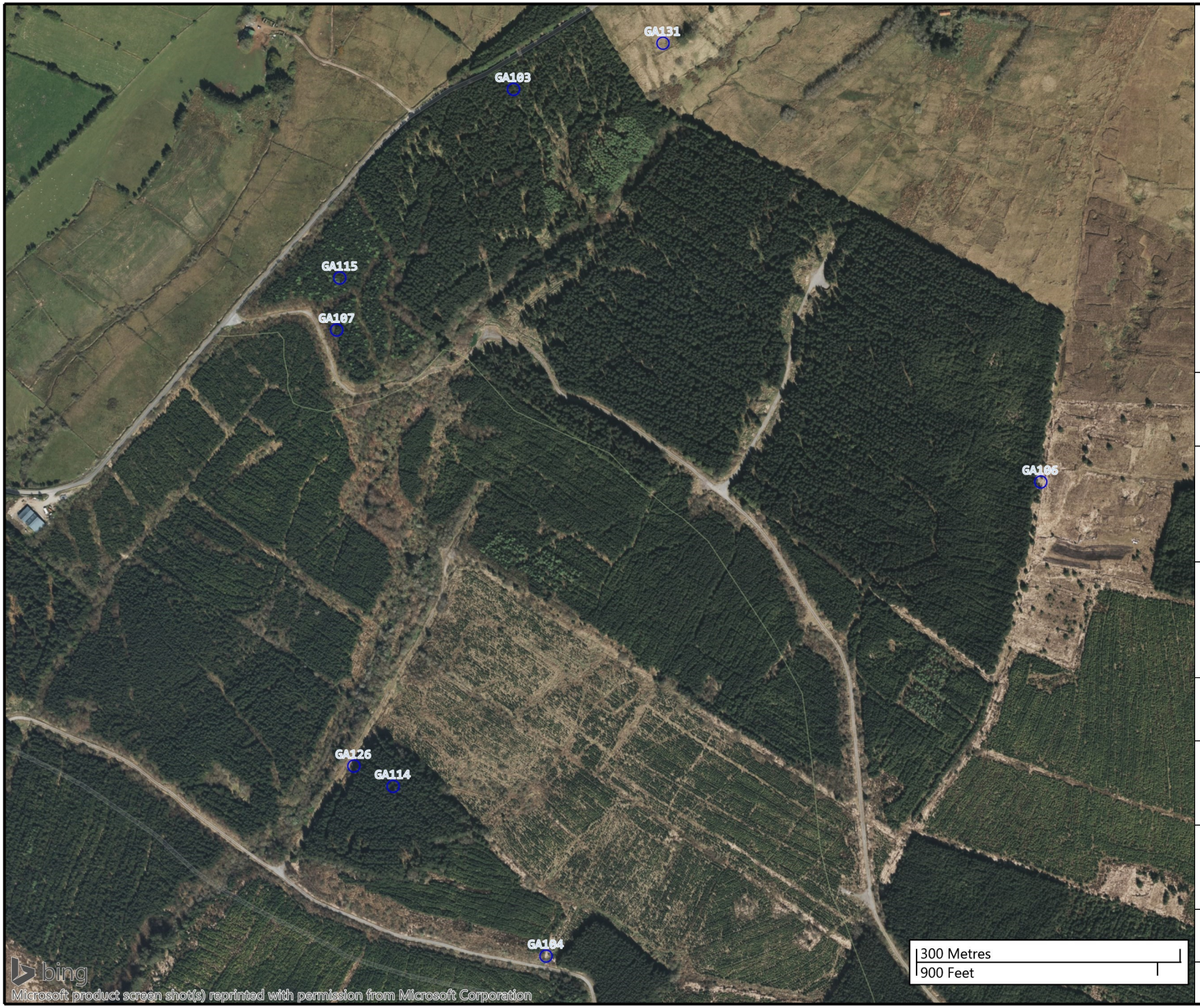
Project No.	24-0430
Client	Tobin
Client's Rep	N/A

Exploratory Hole Plan Area 1

Lissinagroagh, Leitrim

CAUSEWAY GEOTECH

Last Revision	29/11/2024
Scale	1:1500



Legend Key

- Locations By Type - HA
- Locations By Type - TP

Project No.	24-0430
Client	Tobin
Client's Rep	N/A

Exploratory Hole Plan Area 2

Lissinagroagh, Leitrim

CAUSEWAY GEOTECH

Last Revision	29/11/2024
Scale	1:6000



Legend Key

- Locations By Type - HA
- Locations By Type - TP

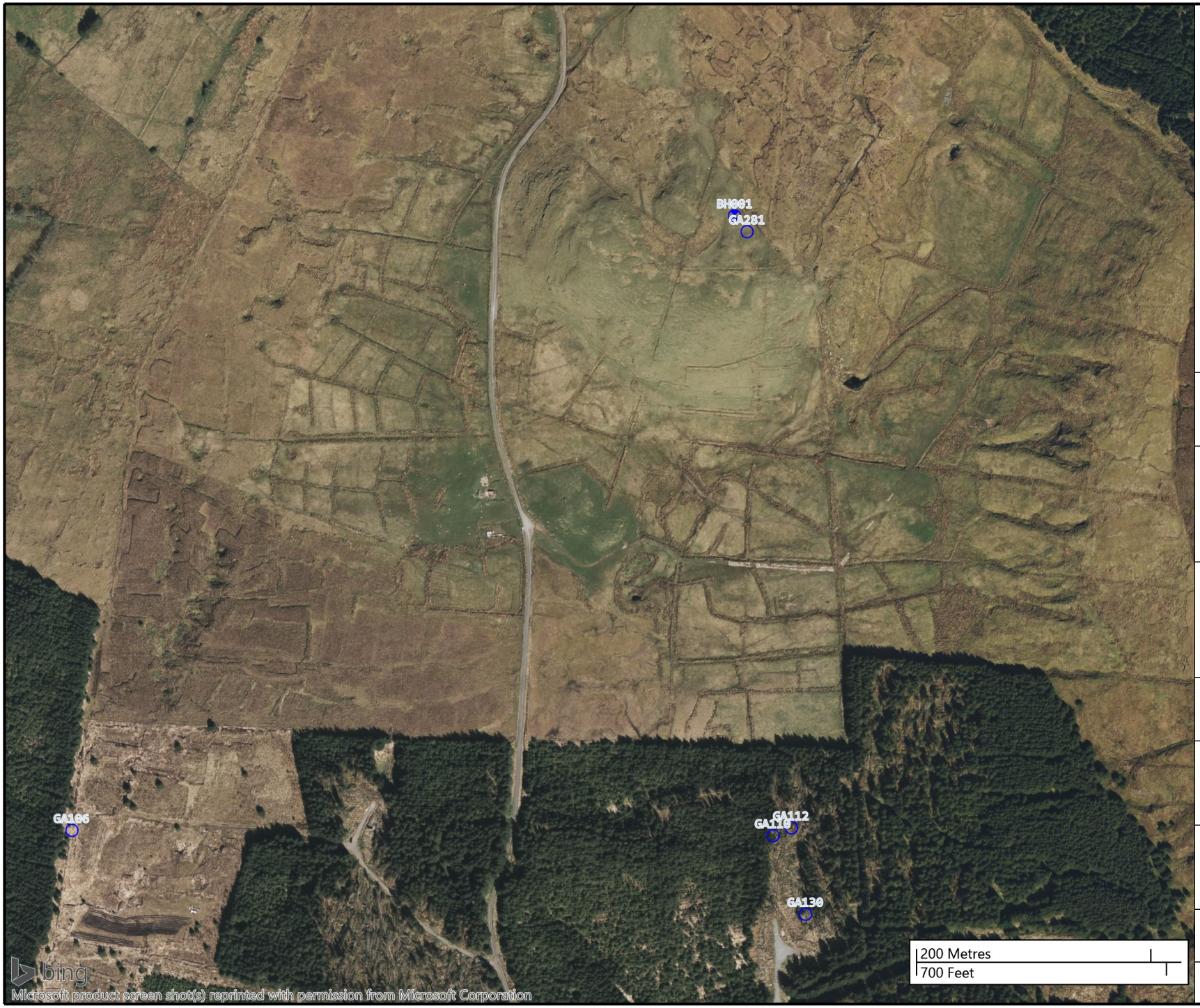
Project No.	24-0430
Client	Tobin
Client's Rep	N/A

Exploratory Hole Plan Area 3

Lissinagroagh, Leitrim

CAUSEWAY GEOTECH

Last Revision	29/11/2024
Scale	1:5500



Legend Key

- Locations By Type - HA
- Locations By Type - RC

Project No.	24-0430
Client	Tobin
Client's Rep	N/A

Exploratory Hole Plan Area 4

Lissinagroagh, Leitrim

CAUSEWAY GEOTECH

Last Revision	06/12/2024
Scale	1:4500



Legend Key

- Locations By Type - HA
- Locations By Type - TP

Project No.	24-0430
Client	Tobin
Client's Rep	N/A

Exploratory Hole Plan Area 5

Lissinagroagh, Leitrim

CAUSEWAY GEOTECH

Last Revision	29/11/2024
Scale	1:4500



Legend Key

- Locations By Type - HA
- Locations By Type - TP

Project No.	24-0430
Client	Tobin
Client's Rep	N/A

Exploratory Hole Plan Area 6

Lissinagroagh, Leitrim

CAUSEWAY GEOTECH

Last Revision	29/11/2024
Scale	1:4000

APPENDIX B – BOREHOLE LOGS



CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	BH001
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 2
Rotary Drilling	Comacchio 405	0.00	4.00	592170.88 E	10.20 m	12/11/2024	TA	Scale: 1:40
Rotary Coring	Comacchio 405	4.00	10.20	842883.75 N	Elevation: 341.94 mOD	End Date: 13/11/2024	Logger: EL	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.40	B1							341.54	0.40		Spongy dark brown pseudo-fibrous PEAT with with fine roots (0.5-2.0mm).		
											Dense brown sandy very clayey subangular fine to coarse GRAVEL with low cobble and boulder content and occasional fine rootlets. Sand is fine to coarse. Cobbles and boulders are subangular.		
1.00 - 1.04	SPT(S) 50 (25 for 20mm/50 for 25mm) Hammer SN = 1377					1.00							
1.20	D11												
2.00 - 2.50	B2												
2.50 - 2.54	SPT(C) 50 (25 for 20mm/50 for 20mm) Hammer SN = 1377							339.34	2.60		Dense brown sandy clayey subangular fine to coarse GRAVEL with high cobble and boulder content. Sand is fine to coarse. (Possibly highly weathered bedrock.)		
3.50 - 4.00	B3												
4.00 - 4.05	SPT(C) 50 (25 for 25mm/50 for 25mm) Hammer SN = 1377							337.94	4.00		Strong medium bedded grey LIMESTONE. Moderately weathered: closer fracture spacing and strong orangish brown discolouration on fracture surfaces. Discontinuities: 1. 0-15 degree bedding fractures, medium spaced (75/205/260), planar, rough, with strong orangish brown staining on most fracture surfaces. 2. 50 degree joint at 5.30-5.35m, planar, rough, with patchy orangish brown staining on joint surfaces.		
4.50 - 4.62	C4	80	73	60	7								
4.85 - 4.98	C5												
5.40 - 5.52	C6							336.59	5.35		Strong medium bedded grey LIMESTONE. Slightly weathered: patchy orangish brown staining on some fracture surfaces. Discontinuities: 1. 0-20 degree bedding fractures, widely spaced (170/950/1350), planar, rough, with patchy orangish brown staining on some fracture surfaces. 2. 75 degree joint at 9.55-9.90m, planar, rough, with patchy orangish brown staining on joint surfaces. 3. >85 degree joint at 7.95-8.60m, undulating, rough, with strong orangish brown staining on joint surfaces.		
5.40		100	100	100	1								
6.60													
7.05 - 7.20	C7												
7.20 - 7.50	C8												
		TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
4.00	151

Core Barrel

T2-101

Flush Type

Water

Remarks

Inspection pit excavated to 1.00m. Coordinates approximate.

Termination Reason

Terminated at scheduled depth.

Last Updated

18/02/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	BH001
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 2 of 2
Rotary Drilling	Comacchio 405	0.00	4.00					Scale: 1:40
Rotary Coring	Comacchio 405	4.00	10.20	592170.88 E	10.20 m	12/11/2024	TA	
				842883.75 N	Elevation: 341.94 mOD	End Date: 13/11/2024	Logger: EL	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
7.65 - 7.80	C9	100	81	81	5								
8.10		100	80	74									
9.40 - 9.59	C10				1								
9.50		100	86	86									
10.20								331.74	10.20		End of Borehole at 10.20m		
		TCR	SCR	RQD	FI								

7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
4.00	151

Core Barrel

T2-101

Flush Type

Water

Remarks

Inspection pit excavated to 1.00m. Coordinates approximate.

Termination Reason

Terminated at scheduled depth.

Last Updated

18/02/2025

AGS

APPENDIX C – CORE PHOTOGRAPHS

BH001


CAUSEWAY GEOTECH
Project: LISSINAGROAGH
Project No.: 24-0430
BH No.: 001
Box: 1
Depth: 4.00 - 7.65m
(m) 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0


CAUSEWAY GEOTECH
Project: LISSINAGROAGH
Project No.: 24-0430
BH No.: 001
Box: 2
Depth: 7.65 - 10.20m
(m) 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

APPENDIX D – TRIAL PIT LOGS



TP244



TP244


CAUSEWAY
GEOTECH
Project Name
LISSINAGROAGH
Project Number
24-0430
Date
07/11/24
EH Number
TP244
(m)
0.2
0.5

TP244



TP245



TP245


CAUSEWAY
GEOTECH
Project Name
LISSINAGROAGH
Project Number
24-0430
Date
07/11/24
EH Number
TP245
(m)
0.1
0.2
0.3
0.4

TP245


CAUSEWAY
GEOTECH
Project Name
LISSINAGROAGH
Project Number
24-0430
Date
07/11/24
EH Number
TP245
(m) 0.1 0.2 0.3 0.4 0.5

TP245



TP246



TP246



TP246


CAUSEWAY
GEOTECH
Project Name
LISSINAGROAGH
Project Number
24-0430
Date
07/11/24
TP246
0.1
0.2
0.3
0.4
0.5
(m)

TP246

APPENDIX E – TRIAL PIT PHOTOGRAPHS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA101
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	0.30	592588.31 E	0.30 m	18/09/2024	IC	Scale: 1:50
				843793.61 N	Elevation: 329.81 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				329.71	0.10		TOPSOIL: dense moss and roots		
					329.51	0.30		Firm dark brown fibrous PEAT with coarse roots (>5mm).		
								End of Borehole at 0.30m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger on dense roots. Peat probe unable to push.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA102
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.00	592668.53 E 843275.85 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.00 m	16/09/2024	IC	Scale: 1:50
Elevation: 345.83 mOD	**End Date:** 16/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					345.73	0.10		TOPSOIL Very stiff greyish brown sandy CLAY. Sand is fine to coarse.		
0.50	D1									
1.00	D2				344.83	1.00		End of Borehole at 1.00m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger. Heard grinding sound at base of hole. Moved several metres adjacent but same result.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA103
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	0.60	590996.89 E 842807.81 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
0.60 m	18/09/2024	IC	Scale: 1:50
Elevation: mOD	**End Date:** 18/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.50	D1					0.10		TOPSOIL Stiff brown slightly sandy slightly gravelly organic CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
						0.60		End of Borehole at 0.60m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 224.5m.

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA104
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	1.10	591032.32 E	1.10 m	19/09/2024	IC	Scale: 1:50
				841816.36 N	Elevation: 177.18 mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					176.98	0.20		TOPSOIL: dense roots		
0.30	D1							Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.00	D2				176.08	1.10		End of Borehole at 1.10m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA106
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.60	591600.09 E 842357.53 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.60 m	19/09/2024	IC	Scale: 1:50
Elevation: 253.92 mOD	**End Date:** 19/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					253.82	0.10		TOPSOIL Spongy dark greyish brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.00	D1									
1.50	D2									
					252.32	1.60		End of Borehole at 1.60m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Possible very stiff clay at base of hole.

Termination Reason

Terminated at refusal of auger. Attempted peat probe but probe would not push.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA107
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet / Scale
Hand Augering	Hand Auger	0.00	0.70	590794.13 E 842532.91 N	0.70 m	18/09/2024	IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1					0.10		TOPSOIL Firm becoming stiff light brown slightly sandy organic CLAY. Sand is fine to coarse.		
						0.70		End of Borehole at 0.70m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 192m.

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA108
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	1.00	593333.68 E	1.00 m	17/09/2024	EL	Scale: 1:50
				840647.09 N	Elevation: 213.23 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					213.13	0.10		TOPSOIL Very stiff dark brown slightly sandy CLAY. Sand is fine to coarse.		
0.40	D1				212.63	0.60		Very stiff light brown CLAY.		
1.00	D2				212.23	1.00		End of Borehole at 1.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger. Heard grinding sound at base of hole.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA109
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	0.70	593131.47 E 841625.64 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
0.70 m	17/09/2024	IC	Scale: 1:50
Elevation: 290.66 mOD	**End Date:** 17/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					290.56	0.10		TOPSOIL		
0.25	D2							Stiff dark brown slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
0.54	D1									
0.70	D3				289.96	0.70		End of Borehole at 0.70m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger. Heard grinding sound at base of hole. Tried location several metres adjacent but same refusal depth.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA110
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	2.00	592202.78 E 842351.88 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.00 m	18/09/2024	IC	Scale: 1:50
Elevation: 306.43 mOD	**End Date:** 18/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					306.33	0.10		TOPSOIL: dense sphagnum. Firm light brown organic CLAY.		
0.50	D1									
					305.63	0.80		Spongy dark brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
1.00	D2									
1.90	D3				304.63	1.80		Stiff grey slightly silty CLAY.		
					304.43	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated at scheduled depth.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA111
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	2.00	592611.16 E 844231.39 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.00 m	16/09/2024	IC	Scale: 1:50
Elevation: 275.10 mOD	**End Date:** 16/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					275.00	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.00	D1									
2.00	D2				273.10	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Peat probe pushed to 2.20m.

Termination Reason

Continued by peat probe to 2.20m.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA112
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.50	592218.48 E 842358.62 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.50 m	18/09/2024	IC	Scale: 1:50
Elevation: 308.24 mOD	**End Date:** 18/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					308.04	0.20		TOPSOIL		
								Firm dark brown fibrous PEAT with medium roots (2.0-5.0mm).		
1.00	D1									
1.40	D2									
					306.74	1.50		End of Borehole at 1.50m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Peat probe refused at 1.50m.

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA113
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	2.00	592712.60 E 843867.30 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.00 m	18/09/2024	IC	Scale: 1:50
Elevation: 321.02 mOD	**End Date:** 18/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					320.92	0.10		TOPSOIL Spongy reddish brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
1.00	D1									
1.90	D2									
					319.02	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Continued by peat probe. Probe refused on possible rock at 2.10m.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA114
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	0.50	590857.25 E	0.50 m	19/09/2024	IC	Scale: 1:50
				842010.87 N	Elevation: mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.40	D1					0.10		TOPSOIL Stiff grey very sandy CLAY. Sand is fine to coarse.		
						0.50		End of Borehole at 0.50m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 157.5m.

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA115
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	0.90	590797.91 E 842592.43 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
0.90 m	18/09/2024	IC	Scale: 1:50
Elevation: mOD	**End Date:** 18/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1					0.10		TOPSOIL Firm becoming stiff greyish brown slightly sandy organic CLAY with rootlets. Sand is fine to coarse.		
						0.90		End of Borehole at 0.90m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 194m.

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA116
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	1.00	591003.94 E	1.00 m	19/09/2024	IC	Scale: 1:50
				841040.74 N	Elevation: mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.80	D2					0.10		TOPSOIL Stiff light greyish brown very sandy CLAY. Sand is fine to coarse.		
						1.00		End of Borehole at 1.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 130m.

Termination Reason

Terminated at refusal of auger. Audible grinding sound from hole.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA117
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	0.40	593524.37 E	0.40 m	17/09/2024	IC	Scale: 1:50
				840803.66 N	Elevation: 230.86 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					230.76	0.10		TOPSOIL		
0.30	D1				230.46	0.40		Stiff dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to coarse.		
								End of Borehole at 0.40m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger. Heard grinding sound from base of hole.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA118
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	2.00	593198.35 E 841038.21 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.00 m	17/09/2024	IC	Scale: 1:50
Elevation: mOD	**End Date:** 17/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1					0.10		TOPSOIL Stiff greyish brown CLAY.		
1.00	D2									
2.00	D3					2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 240m.

Termination Reason

Terminated at scheduled depth.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA119
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	2.00	593189.00 E 841078.03 N

Final Depth: 2.00 m	**Start Date:** 17/09/2024	**Driller:** IC	Sheet 1 of 1	
Elevation: 239.78 mOD	**End Date:** 17/09/2024	**Logger:** EL	Scale: 1:50	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					239.68	0.10		TOPSOIL Stiff dark brown CLAY.		
1.00	D1									
2.00	D2				237.78	2.00		End of Borehole at 2.00m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at scheduled depth.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA120
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.00	590958.93 E 841012.70 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.00 m	19/09/2024	IC	Scale: 1:50
Elevation: 133.32 mOD	**End Date:** 19/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1				133.22	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
					132.32	1.00		End of Borehole at 1.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA121
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet / Scale
Hand Augering	Hand Auger	0.00	0.60	590943.63 E 841015.76 N	0.60 m	19/09/2024	IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
						0.10		TOPSOIL		
0.30	D1					0.40		Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
0.50	D2					0.60		Grey clayey SAND.		
								End of Borehole at 0.60m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 130m.

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA123
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	2.00	592638.14 E	2.00 m	16/09/2024	IC	Scale: 1:50
				844252.47 N	Elevation: 273.28 mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					273.18	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.00	D1									
1.50	D2									
1.80	D3				271.48	1.80		Spongy dark brown slighty sandy pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
					271.28	2.00		End of Borehole at 2.00m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Peat probe pushed to 2.40m

Termination Reason

Continued by peat probe to 2.40m.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA125
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet / Scale
Hand Augering	Hand Auger	0.00	0.30	593850.26 E 840677.31 N	0.30 m	18/09/2024	IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 239.35 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				239.25	0.10		TOPSOIL		
					239.05	0.30		Spongy dark brown fibrous PEAT with medium roots (2.0-5.0mm).		
								End of Borehole at 0.30m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA126
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	0.50	590812.27 E 842034.16 N

Final Depth: 0.50 m	**Start Date:** 19/09/2024	**Driller:** IC	Sheet 1 of 1	
Elevation: 161.36 mOD	**End Date:** 19/09/2024	**Logger:** EL	Scale: 1:50	
			FINAL	

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					161.26	0.10		TOPSOIL Firm dark brown fibrous PEAT with coarse roots (>5mm).		
0.40	D1				160.86	0.50		End of Borehole at 0.50m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger. Peat probe unable to be pushed.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA128
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet / Scale
Hand Augering	Hand Auger	0.00	2.00	592122.51 E 843419.16 N	2.00 m	16/09/2024	IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
						0.20		TOPSOIL		
0.50	D1							Spongy dark brown pseudo-fibrous PEAT with very fine roots (<0.5mm).		
1.00	D2									
						1.60				
1.80	D3							Stiff light brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
						2.00		End of Borehole at 2.00m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 305m.

Termination Reason

Terminated at scheduled depth.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA129
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	2.00	593592.76 E 841574.74 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.00 m	17/09/2024	IC	Scale: 1:50
Elevation: 326.39 mOD	**End Date:** 17/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					326.29	0.10		TOPSOIL: dense sphagnum moss Plastic dark brown pseudo-fibrous PEAT with very fine roots (<0.5mm).		
1.00	D1									
					324.39	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Peat probe refusal at 2.15m due to roots.

Termination Reason

Continued by peat probe. Probe refused on dense tree roots at 2.15m.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA130
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.50	592230.72 E 842284.47 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.50 m	18/09/2024	IC	Scale: 1:50
Elevation: 302.85 mOD	**End Date:** 18/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					302.75	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
1.00	D1									
1.40	D2									
					301.35	1.50		End of Borehole at 1.50m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Peat probe refused at 1.50m.

Termination Reason

Terminated at refusal of auger. Followed on with peat probe to same refusal depth.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA131
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.40	591168.14 E 842860.16 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.60 m	16/09/2024	IC	Scale: 1:50
Elevation: 226.77 mOD	**End Date:** 16/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					226.57	0.20		TOPSOIL		
								Soft brown organic SILT with rootlets and leaves.		
1.00	D1									
1.40	D2				225.37	1.40		Stiff brown gravelly organic SILT with rootlets.		
					225.17	1.60		End of Borehole at 1.60m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of sampler.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA132
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.10	594070.43 E 840724.61 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.10 m	18/09/2024	IC	Scale: 1:50
Elevation: 234.24 mOD	**End Date:** 18/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					234.14	0.10		TOPSOIL		
0.30	D1							Spongy light orangish brown fibrous PEAT with medium roots (2.0-5.0mm).		
					233.34	0.90		Stiff dark brown organic CLAY with rootlets.		
1.00	D2				233.14	1.10		End of Borehole at 1.10m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA134
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	0.40	593872.07 E	0.40 m	18/09/2024	IC	Scale: 1:50
				840655.03 N	Elevation: 239.37 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				239.27	0.10		TOPSOIL		
					238.97	0.40		Spongy dark brown amorphous PEAT with medium roots (2.0-5.0mm).		
								End of Borehole at 0.40m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Peat probe refused at 0.40m.

Termination Reason

Terminated at refusal of auger. Probe refused 0.40m.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA135
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	0.60	592678.53 E 843264.41 N

Final Depth: 0.60 m	**Start Date:** 16/09/2024	**Driller:** IC	Sheet 1 of 1	
Elevation: 348.05 mOD	**End Date:** 16/09/2024	**Logger:** EL	Scale: 1:50	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				347.95	0.10		TOPSOIL Stiff grey sandy CLAY with rootlets. Sand is fine to coarse.		
0.50	D2				347.45	0.60		End of Borehole at 0.60m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal on dense roots.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA136
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	0.20	593883.47 E	0.20 m	18/09/2024	IC	Scale: 1:50
				840672.73 N	Elevation: 240.65 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					240.45	0.20		TOPSOIL		
								End of Borehole at 0.20m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA137
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	0.80	593042.37 E 841598.34 N	0.80 m	17/09/2024	IC	Scale: 1:50
					Elevation: 280.06 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					279.96	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
0.60	D1				279.56	0.50		Very stiff dark grey slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
0.80	D2				279.26	0.80		End of Borehole at 0.80m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger. Heard grinding sound at base of hole. Tried alternate location with no success.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA138
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	0.80	593333.13 E 841482.97 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
0.80 m	17/09/2024	IC	Scale: 1:50
Elevation: 283.77 mOD	**End Date:** 17/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					283.67	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
0.50	D1									
0.70	D2				283.07	0.70		Light brown slightly clayey fine to coarse SAND.		
					282.97	0.80		End of Borehole at 0.80m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Difficult access due to very steep boggy ground and thick brush.

Termination Reason

Terminated at refusal on possible cobbles. Moved few metres for same result.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA139
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	1.50	593005.62 E	1.50 m	17/09/2024	IC	Scale: 1:50
				841546.52 N	Elevation: 272.07 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					271.97	0.10		TOPSOIL Firm dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.00	D1									
1.50	D2				270.57	1.50		End of Borehole at 1.50m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Couldn't push auger further at 1.5m. Followed on with peat probe to 2.20m.

Termination Reason

Continued by peat probe to 2.20m.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA140
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet / Scale
Hand Augering	Hand Auger	0.00	1.00	593560.84 E 841537.02 N	1.00 m	17/09/2024	IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 317.33 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					317.23	0.10		TOPSOIL Firm dark brown slightly sandy organic CLAY. Sand is fine to coarse.		
1.00	D1				316.33	1.00		End of Borehole at 1.00m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Slow access due to steep boggy ground and fallen trees.

Termination Reason

Terminated at refusal of sampler on possible dense roots. Tried adjacent site with same result.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA141
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	2.00	593724.80 E 841587.66 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.00 m	17/09/2024	IC	Scale: 1:50
Elevation: 338.95 mOD	**End Date:** 17/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					338.85	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.00	D1									
2.00	D2				336.95	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Peat probe pushed to 2.30m

Termination Reason

Continued by peat probe to 2.30m.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA142
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	1.10	592132.43 E 843420.49 N	1.10 m	16/09/2024	IC	Scale: 1:50
					Elevation: mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
						0.10		TOPSOIL Firm light brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
0.50	D1					0.60		Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
0.90	D2					1.00		Very stiff dark brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies.		
1.10	D3					1.10		End of Borehole at 1.10m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 303m.

Termination Reason

Terminated at refusal of sampler.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA143
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.40	593156.13 E 841485.36 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.40 m	17/09/2024	IC	Scale: 1:50
Elevation: mOD	**End Date:** 17/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
						0.10		TOPSOIL		
								Stiff dark greyish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
0.60	D1									
1.00	D2					1.00		Stiff dark grey slightly sandy CLAY with rootlets. Sand is fine to coarse.		
1.40	D3					1.40		End of Borehole at 1.40m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 260m.

Termination Reason

Terminated at refusal of auger. Tried adjacent position with no success.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA281
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	0.30	592181.61 E 842869.99 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
0.30 m	16/09/2024	IC	Scale: 1:50
Elevation: 344.66 mOD	**End Date:** 16/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1				344.46 344.36	0.20 0.30		TOPSOIL Soft brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies. End of Borehole at 0.30m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal on possible shallow rock/cobbles.

Last Updated

06/12/2024

AGS

APPENDIX F – PEAT AUGER LOGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA101
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	0.30	592588.31 E	0.30 m	18/09/2024	IC	Scale: 1:50
				843793.61 N	Elevation: 329.81 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				329.71	0.10		TOPSOIL: dense moss and roots		
					329.51	0.30		Firm dark brown fibrous PEAT with coarse roots (>5mm).		
								End of Borehole at 0.30m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger on dense roots. Peat probe unable to push.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA102
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.00	592668.53 E 843275.85 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.00 m	16/09/2024	IC	Scale: 1:50
Elevation: 345.83 mOD	**End Date:** 16/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					345.73	0.10		TOPSOIL Very stiff greyish brown sandy CLAY. Sand is fine to coarse.		
0.50	D1									
1.00	D2				344.83	1.00		End of Borehole at 1.00m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger. Heard grinding sound at base of hole. Moved several metres adjacent but same result.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA103
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	0.60	590996.89 E 842807.81 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
0.60 m	18/09/2024	IC	Scale: 1:50
Elevation: mOD	**End Date:** 18/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.50	D1					0.10		TOPSOIL Stiff brown slightly sandy slightly gravelly organic CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
						0.60		End of Borehole at 0.60m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 224.5m.

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA104
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	1.10	591032.32 E	1.10 m	19/09/2024	IC	Scale: 1:50
				841816.36 N	Elevation: 177.18 mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					176.98	0.20		TOPSOIL: dense roots		
0.30	D1							Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.00	D2				176.08	1.10		End of Borehole at 1.10m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA106
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.60	591600.09 E 842357.53 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.60 m	19/09/2024	IC	Scale: 1:50
Elevation: 253.92 mOD	**End Date:** 19/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					253.82	0.10		TOPSOIL Spongy dark greyish brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.00	D1									
1.50	D2									
					252.32	1.60		End of Borehole at 1.60m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Possible very stiff clay at base of hole.

Termination Reason

Terminated at refusal of auger. Attempted peat probe but probe would not push.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA107
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet / Scale
Hand Augering	Hand Auger	0.00	0.70	590794.13 E 842532.91 N	0.70 m	18/09/2024	IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1					0.10		TOPSOIL Firm becoming stiff light brown slightly sandy organic CLAY. Sand is fine to coarse.		
						0.70		End of Borehole at 0.70m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 192m.

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA108
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	1.00	593333.68 E	1.00 m	17/09/2024	EL	Scale: 1:50
				840647.09 N	Elevation: 213.23 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					213.13	0.10		TOPSOIL Very stiff dark brown slightly sandy CLAY. Sand is fine to coarse.		
0.40	D1				212.63	0.60		Very stiff light brown CLAY.		
1.00	D2				212.23	1.00		End of Borehole at 1.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger. Heard grinding sound at base of hole.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA109
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	0.70	593131.47 E 841625.64 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
0.70 m	17/09/2024	IC	Scale: 1:50
Elevation: 290.66 mOD	**End Date:** 17/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					290.56	0.10		TOPSOIL		
0.25	D2							Stiff dark brown slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
0.54	D1									
0.70	D3				289.96	0.70		End of Borehole at 0.70m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger. Heard grinding sound at base of hole. Tried location several metres adjacent but same refusal depth.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA110
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	2.00	592202.78 E 842351.88 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.00 m	18/09/2024	IC	Scale: 1:50
Elevation: 306.43 mOD	**End Date:** 18/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					306.33	0.10		TOPSOIL: dense sphagnum. Firm light brown organic CLAY.		
0.50	D1									
					305.63	0.80		Spongy dark brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
1.00	D2									
1.90	D3				304.63	1.80		Stiff grey slightly silty CLAY.		
					304.43	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated at scheduled depth.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA111
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	2.00	592611.16 E 844231.39 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.00 m	16/09/2024	IC	Scale: 1:50
Elevation: 275.10 mOD	**End Date:** 16/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					275.00	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.00	D1									
2.00	D2				273.10	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Peat probe pushed to 2.20m.

Termination Reason

Continued by peat probe to 2.20m.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA112
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.50	592218.48 E 842358.62 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.50 m	18/09/2024	IC	Scale: 1:50
Elevation: 308.24 mOD	**End Date:** 18/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					308.04	0.20		TOPSOIL		
								Firm dark brown fibrous PEAT with medium roots (2.0-5.0mm).		
1.00	D1									
1.40	D2									
					306.74	1.50		End of Borehole at 1.50m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Peat probe refused at 1.50m.

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA113
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	2.00	592712.60 E 843867.30 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.00 m	18/09/2024	IC	Scale: 1:50
Elevation: 321.02 mOD	**End Date:** 18/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					320.92	0.10		TOPSOIL Spongy reddish brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
1.00	D1									
1.90	D2									
					319.02	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Continued by peat probe. Probe refused on possible rock at 2.10m.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA114
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	0.50	590857.25 E	0.50 m	19/09/2024	IC	Scale: 1:50
				842010.87 N	Elevation: mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.40	D1					0.10		TOPSOIL Stiff grey very sandy CLAY. Sand is fine to coarse.		
						0.50		End of Borehole at 0.50m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 157.5m.

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA115
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	0.90	590797.91 E 842592.43 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
0.90 m	18/09/2024	IC	Scale: 1:50
Elevation: mOD	**End Date:** 18/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1					0.10		TOPSOIL Firm becoming stiff greyish brown slightly sandy organic CLAY with rootlets. Sand is fine to coarse.		
						0.90		End of Borehole at 0.90m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 194m.

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA116
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	1.00	591003.94 E	1.00 m	19/09/2024	IC	Scale: 1:50
				841040.74 N	Elevation: mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.80	D2					0.10		TOPSOIL Stiff light greyish brown very sandy CLAY. Sand is fine to coarse.		
						1.00		End of Borehole at 1.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 130m.

Termination Reason

Terminated at refusal of auger. Audible grinding sound from hole.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA117
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	0.40	593524.37 E	0.40 m	17/09/2024	IC	Scale: 1:50
				840803.66 N	Elevation: 230.86 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					230.76	0.10		TOPSOIL		
0.30	D1				230.46	0.40		Stiff dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to coarse.		
								End of Borehole at 0.40m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger. Heard grinding sound from base of hole.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA118
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	2.00	593198.35 E 841038.21 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.00 m	17/09/2024	IC	Scale: 1:50
Elevation: mOD	**End Date:** 17/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1					0.10		TOPSOIL Stiff greyish brown CLAY.		
1.00	D2									
2.00	D3					2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 240m.

Termination Reason

Terminated at scheduled depth.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA119
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	2.00	593189.00 E 841078.03 N

Final Depth: 2.00 m	**Start Date:** 17/09/2024	**Driller:** IC	Sheet 1 of 1	
Elevation: 239.78 mOD	**End Date:** 17/09/2024	**Logger:** EL	Scale: 1:50	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					239.68	0.10		TOPSOIL Stiff dark brown CLAY.		
1.00	D1									
2.00	D2				237.78	2.00		End of Borehole at 2.00m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at scheduled depth.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA120
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.00	590958.93 E 841012.70 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.00 m	19/09/2024	IC	Scale: 1:50
Elevation: 133.32 mOD	**End Date:** 19/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1				133.22	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
					132.32	1.00		End of Borehole at 1.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA121
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet / Scale
Hand Augering	Hand Auger	0.00	0.60	590943.63 E 841015.76 N	0.60 m	19/09/2024	IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
						0.10		TOPSOIL		
0.30	D1					0.40		Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
0.50	D2					0.60		Grey clayey SAND.		
								End of Borehole at 0.60m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 130m.

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA123
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	2.00	592638.14 E	2.00 m	16/09/2024	IC	Scale: 1:50
				844252.47 N	Elevation: 273.28 mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					273.18	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.00	D1									
1.50	D2									
1.80	D3				271.48	1.80		Spongy dark brown slighty sandy pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
					271.28	2.00		End of Borehole at 2.00m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Peat probe pushed to 2.40m

Termination Reason

Continued by peat probe to 2.40m.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA125
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet / Scale
Hand Augering	Hand Auger	0.00	0.30	593850.26 E 840677.31 N	0.30 m	18/09/2024	IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 239.35 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				239.25	0.10		TOPSOIL		
					239.05	0.30		Spongy dark brown fibrous PEAT with medium roots (2.0-5.0mm).		
								End of Borehole at 0.30m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA126
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	0.50	590812.27 E 842034.16 N

Final Depth: 0.50 m	**Start Date:** 19/09/2024	**Driller:** IC	Sheet 1 of 1	
Elevation: 161.36 mOD	**End Date:** 19/09/2024	**Logger:** EL	Scale: 1:50	
			FINAL	

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					161.26	0.10		TOPSOIL Firm dark brown fibrous PEAT with coarse roots (>5mm).		
0.40	D1				160.86	0.50		End of Borehole at 0.50m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger. Peat probe unable to be pushed.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA128
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet / Scale
Hand Augering	Hand Auger	0.00	2.00	592122.51 E 843419.16 N	2.00 m	16/09/2024	IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
						0.20		TOPSOIL		
0.50	D1							Spongy dark brown pseudo-fibrous PEAT with very fine roots (<0.5mm).		
1.00	D2									
						1.60				
1.80	D3							Stiff light brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
						2.00		End of Borehole at 2.00m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 305m.

Termination Reason

Terminated at scheduled depth.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA129
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	2.00	593592.76 E 841574.74 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.00 m	17/09/2024	IC	Scale: 1:50
Elevation: 326.39 mOD	**End Date:** 17/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					326.29	0.10		TOPSOIL: dense sphagnum moss Plastic dark brown pseudo-fibrous PEAT with very fine roots (<0.5mm).		
1.00	D1									
					324.39	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Peat probe refusal at 2.15m due to roots.

Termination Reason

Continued by peat probe. Probe refused on dense tree roots at 2.15m.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA130
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.50	592230.72 E 842284.47 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.50 m	18/09/2024	IC	Scale: 1:50
Elevation: 302.85 mOD	**End Date:** 18/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					302.75	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
1.00	D1									
1.40	D2									
					301.35	1.50		End of Borehole at 1.50m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Peat probe refused at 1.50m.

Termination Reason

Terminated at refusal of auger. Followed on with peat probe to same refusal depth.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA131
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.40	591168.14 E 842860.16 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.60 m	16/09/2024	IC	Scale: 1:50
Elevation: 226.77 mOD	**End Date:** 16/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					226.57	0.20		TOPSOIL		
								Soft brown organic SILT with rootlets and leaves.		
1.00	D1									
1.40	D2				225.37	1.40		Stiff brown gravelly organic SILT with rootlets.		
					225.17	1.60		End of Borehole at 1.60m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of sampler.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA132
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.10	594070.43 E 840724.61 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.10 m	18/09/2024	IC	Scale: 1:50
Elevation: 234.24 mOD	**End Date:** 18/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					234.14	0.10		TOPSOIL		
0.30	D1							Spongy light orangish brown fibrous PEAT with medium roots (2.0-5.0mm).		
					233.34	0.90		Stiff dark brown organic CLAY with rootlets.		
1.00	D2				233.14	1.10		End of Borehole at 1.10m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA134
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	0.40	593872.07 E	0.40 m	18/09/2024	IC	Scale: 1:50
				840655.03 N	Elevation: 239.37 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				239.27	0.10		TOPSOIL		
					238.97	0.40		Spongy dark brown amorphous PEAT with medium roots (2.0-5.0mm).		
								End of Borehole at 0.40m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Peat probe refused at 0.40m.

Termination Reason

Terminated at refusal of auger. Probe refused 0.40m.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA135
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	0.60	592678.53 E 843264.41 N

Final Depth: 0.60 m	**Start Date:** 16/09/2024	**Driller:** IC	Sheet 1 of 1	
Elevation: 348.05 mOD	**End Date:** 16/09/2024	**Logger:** EL	Scale: 1:50	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				347.95	0.10		TOPSOIL Stiff grey sandy CLAY with rootlets. Sand is fine to coarse.		
0.50	D2				347.45	0.60		End of Borehole at 0.60m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal on dense roots.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA136
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	0.20	593883.47 E	0.20 m	18/09/2024	IC	Scale: 1:50
				840672.73 N	Elevation: 240.65 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					240.45	0.20		TOPSOIL		
								End of Borehole at 0.20m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA137
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	0.80	593042.37 E 841598.34 N	0.80 m	17/09/2024	IC	Scale: 1:50
					Elevation: 280.06 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					279.96	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
0.60	D1				279.56	0.50		Very stiff dark grey slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
0.80	D2				279.26	0.80		End of Borehole at 0.80m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal of auger. Heard grinding sound at base of hole. Tried alternate location with no success.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA138
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	0.80	593333.13 E 841482.97 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
0.80 m	17/09/2024	IC	Scale: 1:50
Elevation: 283.77 mOD	**End Date:** 17/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					283.67	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
0.50	D1									
0.70	D2				283.07	0.70		Light brown slightly clayey fine to coarse SAND.		
					282.97	0.80		End of Borehole at 0.80m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Difficult access due to very steep boggy ground and thick brush.

Termination Reason

Terminated at refusal on possible cobbles. Moved few metres for same result.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA139
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	1.50	593005.62 E	1.50 m	17/09/2024	IC	Scale: 1:50
				841546.52 N	Elevation: 272.07 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					271.97	0.10		TOPSOIL Firm dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.00	D1									
1.50	D2				270.57	1.50		End of Borehole at 1.50m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Couldn't push auger further at 1.5m. Followed on with peat probe to 2.20m.

Termination Reason

Continued by peat probe to 2.20m.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA140
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet / Scale
Hand Augering	Hand Auger	0.00	1.00	593560.84 E 841537.02 N	1.00 m	17/09/2024	IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 317.33 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					317.23	0.10		TOPSOIL Firm dark brown slightly sandy organic CLAY. Sand is fine to coarse.		
1.00	D1				316.33	1.00		End of Borehole at 1.00m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Slow access due to steep boggy ground and fallen trees.

Termination Reason

Terminated at refusal of sampler on possible dense roots. Tried adjacent site with same result.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA141
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	2.00	593724.80 E 841587.66 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.00 m	17/09/2024	IC	Scale: 1:50
Elevation: 338.95 mOD	**End Date:** 17/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					338.85	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.00	D1									
2.00	D2				336.95	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Peat probe pushed to 2.30m

Termination Reason

Continued by peat probe to 2.30m.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA142
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Hand Auger	0.00	1.10	592132.43 E 843420.49 N	1.10 m	16/09/2024	IC	Scale: 1:50
					Elevation: mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
						0.10		TOPSOIL Firm light brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
0.50	D1					0.60		Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
0.90	D2					1.00		Very stiff dark brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies.		
1.10	D3					1.10		End of Borehole at 1.10m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 303m.

Termination Reason

Terminated at refusal of sampler.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA143
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	1.40	593156.13 E 841485.36 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.40 m	17/09/2024	IC	Scale: 1:50
Elevation: mOD	**End Date:** 17/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
						0.10		TOPSOIL		
								Stiff dark greyish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
0.60	D1									
1.00	D2					1.00		Stiff dark grey slightly sandy CLAY with rootlets. Sand is fine to coarse.		
1.40	D3					1.40		End of Borehole at 1.40m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Coordinates approximate. Elevation approx 260m.

Termination Reason

Terminated at refusal of auger. Tried adjacent position with no success.

Last Updated

06/12/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-0430	Lissinagroagh, Leitrim	GA281
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Hand Auger	0.00	0.30	592181.61 E 842869.99 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
0.30 m	16/09/2024	IC	Scale: 1:50
Elevation: 344.66 mOD	**End Date:** 16/09/2024	**Logger:** EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1				344.46 344.36	0.20 0.30		TOPSOIL Soft brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies. End of Borehole at 0.30m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated at refusal on possible shallow rock/cobbles.

Last Updated

06/12/2024

AGS

APPENDIX G – GEOTECHNICAL LABORATORY TEST RESULTS



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ROI: +353 (0)1 526 7465
Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

12 November 2024

Project Name:	Lissinagroagh, Leitrim
Project No.:	24-0430
Client:	Tobin

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 15/10/2024 and 12/11/2024.

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: Lissinagroagh, Leitrim

Report Reference: Schedule 1

The table below details the tests carried out, the specifications used, and the number of tests included in this report. 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.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Water Content of Soil	*BS 1377-2: 2022: Cl 4*	29

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)*	Organic Matter Content	*Documented In-House Method No DETSC 2002 based on BS 1377: Part 3:1990*	2

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.	Project Name
24-0430	Lissinagroagh, Leitrim

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	
GA101	1	0.20		D	Dark brown fibrous PEAT.			259						
GA102	2	1.00		D	Greyish brown sandy clayey SILT.			52						
GA103	1	0.50		D	Greyish brown sandy clayey SILT.			70						
GA104	2	1.00		D	Dark brown fibrous PEAT.			228						
GA106	2	1.50		D	Greyish brown sandy clayey SILT.			49						
GA110	1	0.50		D	Dark brown fibrous PEAT.			171						
GA110	2	1.00		D	Dark brown pseudo fibrous PEAT.			247						
GA110	3	1.90		D	Grey slightly sandy clayey SILT.			78						
GA111	2	2.00		D	Dark brown pseudo fibrous PEAT.			550						
GA112	1	1.00		D	Dark brown fibrous PEAT.			389						
GA113	2	1.90		D	Brown pseudo fibrous PEAT.			665						
GA116	2	0.80		D	Brown sandy clayey SILT.			26						

All tests performed in accordance with BS1377-2:2022 unless specified otherwise

LAB 26R - Version 1

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

11/12/2024 00:00

Approved By

Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.	Project Name
24-0430	Lissinagroagh, Leitrim

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	
GA118	2	1.00		D	Brown sandy clayey SILT.			81						
GA118	3	2.00		D	Brown sandy clayey SILT.			73						
GA121	2	0.50		D	Greyish brown sandy clayey SILT.			38						
GA123	1	1.00		D	Dark brown pseudo fibrous PEAT.			331						
GA123	3	1.80		D	Dark brown pseudo fibrous PEAT.			401						
GA128	2	1.00		D	Dark brown pseudo fibrous PEAT.			147						
GA128	3	1.80		D	Bronsih grey sandy clayey SILT.			46						
GA129	1	1.00		D	Dark brown pseudo fibrous PEAT.			339						
GA131	1	1.00		D	Brown sandy clayey SILT.			43						
GA131	2	1.40		D	Brown sandy clayey SILT.			54						
GA135	2	0.50		D	Grey slightly sandy clayey SILT.			47						
GA138	1	0.50		D	Dark brown fibous PEAT.			264						

All tests performed in accordance with BS1377-2:2022 unless specified otherwise

LAB 26R - Version 1

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

11/12/2024 00:00

Approved By

Stephen Watson

UKAS TESTING

10122

Summary of Classification Test Results

Project No.	Project Name
24-0430	Lissinagroagh, Leitrim

Hole No.	Sample				Specimen Description	Density bulk / dry Mg/m3		*w* %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type										
GA139	2	1.50		D	Dark brown pseudo fibrous PEAT.			265						
GA141	2	2.00		D	Dark brown pseudo fibrous PEAT.			93						
GA142	3	1.10		D	Dark brown sandy clayey SILT.			49						
GA143	2	1.00		D	Dark brown sandy clayey SILT.			43						
GA143	3	1.40		D	Dark brown sandy clayey SILT.			41						

All tests performed in accordance with BS1377-2:2022 unless specified otherwise

LAB 26R - Version 1

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

11/12/2024 00:00

Approved By

Stephen Watson

UKAS TESTING

10122

Certificate of Analysis

Certificate Number	24-23929	*Issued:*	11-Nov-24

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

Our Reference	24-23929
Client Reference ~	24-0430
Order No ~	(not supplied)
Contract Title ~	Lissinagroagh, Leitrim
Description	2 Soil samples.
Date Received	06-Nov-24
Date Started	06-Nov-24
Date Completed	11-Nov-24
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

ilac-MRA UKAS TESTING 2139

Summary of Chemical Analysis
Soil Samples

Our Ref 24-23929
Client Ref ~ 24-0430
Contract Title ~ Lissinagroagh, Leitrim

			Lab No	2419682	2419683
			Sample ID ~	GA110	GA131
			Depth ~	0.50	1.00
			Other ID ~	1	1
			Sample Type ~	D	D
			Sampling Date ~	05/11/2024	05/11/2024
			Sampling Time ~	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Inorganics					
Organic matter	DETSC 2002#	0.1	%	15	1.3

Information in Support of the Analytical Results

Our Ref 24-23929
Client Ref ~ 24-0430
Contract ~ Lissinagroagh, Leitrim

Containers Received & Deviating Samples

Lab No	Sample ID ~	Date Sampled ~	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2419682	GA110 0.50 SOIL	05/11/24	PT 500ml		
2419683	GA131 1.00 SOIL	05/11/24	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

Key:

~ Sample details are provided by the client and can affect the validity of the results
***** -not accredited.
# -MCERTS (accreditation only applies if report carries the MCERTS logo).
$ -subcontracted.
n/s -not supplied.
I/S -insufficient sample.
U/S -unsuitable sample.
t/f -to follow.
nd -not detected.

End of Report

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Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

3 February 2025

Project Name:	Lissinagroagh, Leitrim
Project No.:	24-0430
Client:	Tobin

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 17/01/2025 and 03/02/2025.

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: Lissinagroagh, Leitrim

Report Reference: Schedule 1

The table below details the tests carried out, the specifications used, and the number of tests included in this report. 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.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Water Content of Soil	*BS 1377-2: 2022: Cl 4*	9
SOIL	Liquid and Plastic Limits of soil-4-point cone penetrometer method	*BS 1377-2: 2022: Cl 5.2*	6
SOIL	Particle density by Gas jar method	*BS 1377-2: 2022: Cl 9.2*	1
SOIL	Particle size distribution - wet sieving	*BS 1377-2: 2022: Cl 10*	5
SOIL	Particle size distribution - sedimentation hydrometer method	*BS 1377-2: 2022: Cl 10*	4

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.	Project Name
24-0430	Lissinagroagh, Leitrim

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	
BH001	11	1.20		D	Grey slightly sandy clayey subangular fine to coarse GRAVEL.			10.4						
BH001	2	2.00	2.50	B	Brown slightly sandy very clayey subangular fine to coarse GRAVEL.			11.6	54	30	16	14	2.65-gj	CL
TP244	2	0.30		B	Brownish black fibrous PEAT.			618						
TP245	4	0.70		B	Brown sandy slightly gravelly clayey SILT.			26.2	70	24	19	5		ML
TP245	6	1.40		B	Brown sandy slightly gravelly silty CLAY.			13.6	71	27	15	12		CL
TP246	1	0.40		D	Grey sandy slightly gravelly silty CLAY.			11.2	77	30	4	26		CL
TP246	3	1.00		B	Grey sandy slightly gravelly silty CLAY.			14.7						
TP246	4	1.80		B	Grey sandy slightly gravelly silty CLAY.			14.8	75	29	15	14		CL
TP246	7	3.10		D	Brown sandy slightly gravelly silty CLAY.			11	74	32	17	15		CL

All tests performed in accordance with BS1377-2:2022 unless specified otherwise

LAB 26R - Version 2

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

02/03/2025 00:00

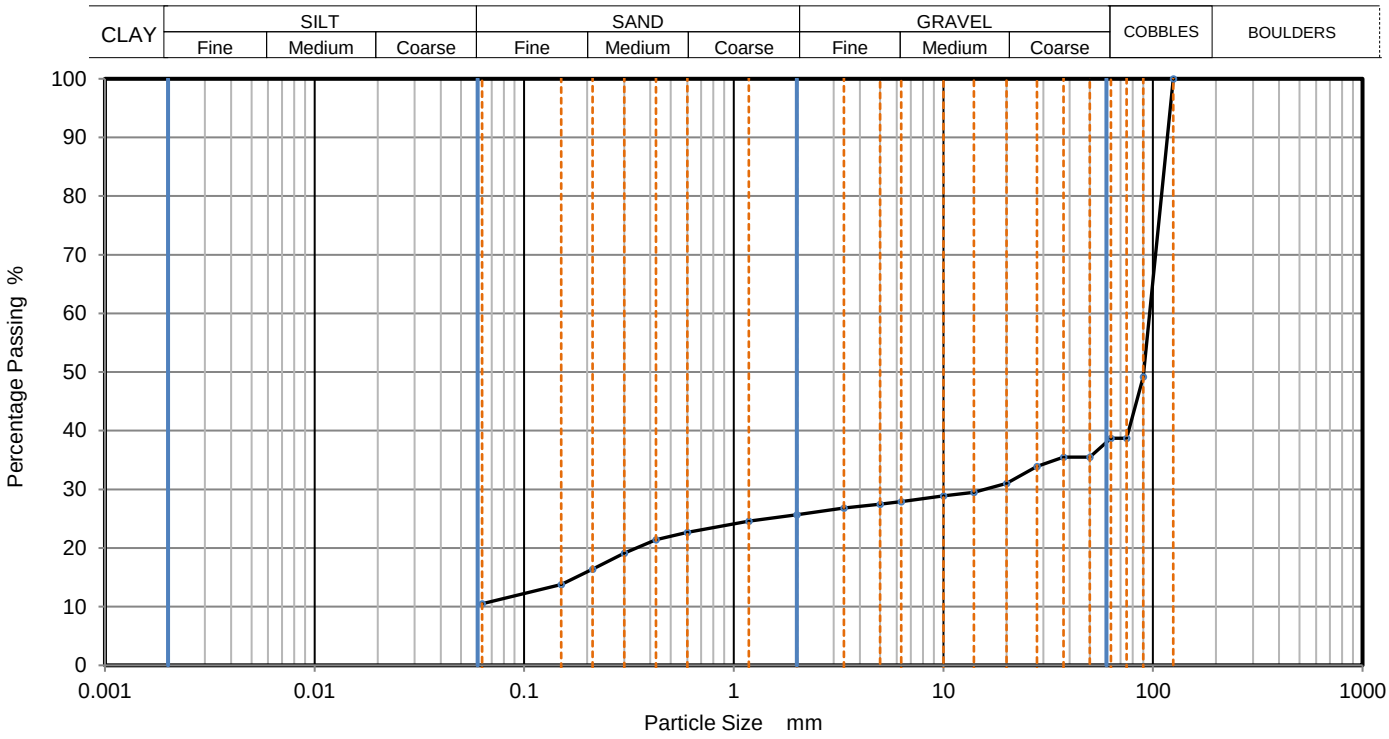
Approved By

Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION			Job Ref		24-0430
				Borehole/Pit No.		BH001
Site Name	Lissinagroagh, Leitrim			Sample No.		3
Specimen Description	Grey COBBLES with grey slightly sandy slightly clayey subangular fine to coarse gravel.			Sample Depth (m)	Top	3.50
					Base	4.00
Specimen Reference	2	Specimen Depth	3.5 m	Sample Type		B
Test Method	BS1377-2:2022 Clause 10			KeyLAB ID		Caus202412172



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	49		
75	39		
63	39		
50	36		
37.5	36		
28	34		
20	31		
14	30		
10	29		
6.3	28		
5	28		
3.35	27		
2	26		
1.18	25		
0.6	23		
0.425	21		
0.3	19		
0.212	16		
0.15	14		
0.063	11		

Dry Mass of sample, g	6775

Sample Proportions	% dry mass
Cobbles	61.3
Gravel	13.0
Sand	15.2
Fines <0.063mm	11.0

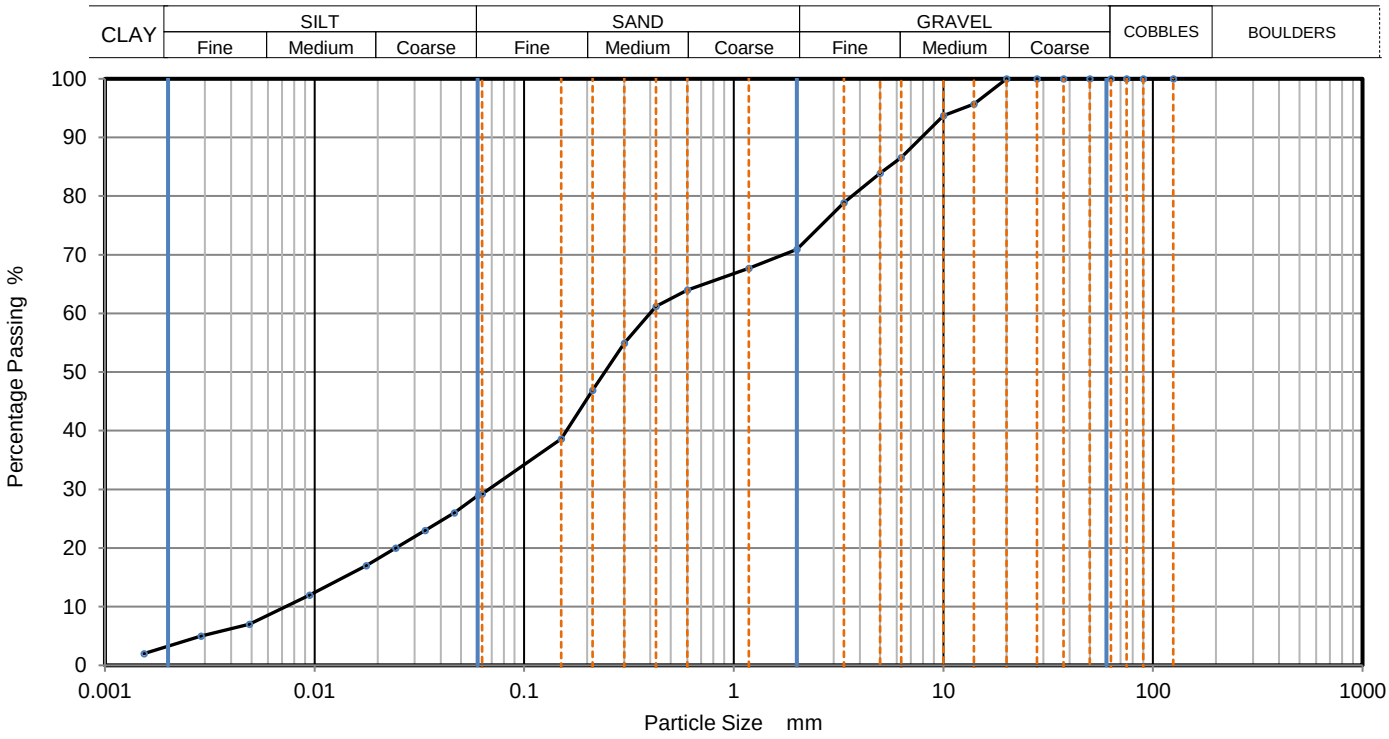
Grading Analysis		
D100	mm	125
D60	mm	96.5
D30	mm	15.8
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**24-0430**
				Borehole/Pit No.	TP245
Site Name	Lissinagroagh, Leitrim			Sample No.	3
Specimen Description	Brown sandy slightly gravelly clayey SILT.			Sample Depth (m) Top	0.50
				Sample Depth (m) Base	
Specimen Reference	3	Specimen Depth	0.5 m	Sample Type	D
Test Method	BS1377-2:2022 Clause 10			KeyLAB ID	Caus202412174



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06050	29
90	100	0.04637	26
75	100	0.03373	23
63	100	0.02434	20
50	100	0.01766	17
37.5	100	0.00946	12
28	100	0.00489	7
20	100	0.00287	5
14	96	0.00153	2
10	94		
6.3	87		
5	84		
3.35	79		
2	71		
1.18	68		
0.6	64	Particle density	(assumed)
0.425	61	2.65	Mg/m3
0.3	55		
0.212	47		
0.15	39		
0.063	29		

Dry Mass of sample, g: 320

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	29.1
Sand	41.7
Silt	25.7
Clay	3.5

Grading Analysis		
D100	mm	
D60	mm	0.399
D30	mm	0.068
D10	mm	0.00705
Uniformity Coefficient		57
Curvature Coefficient		1.6

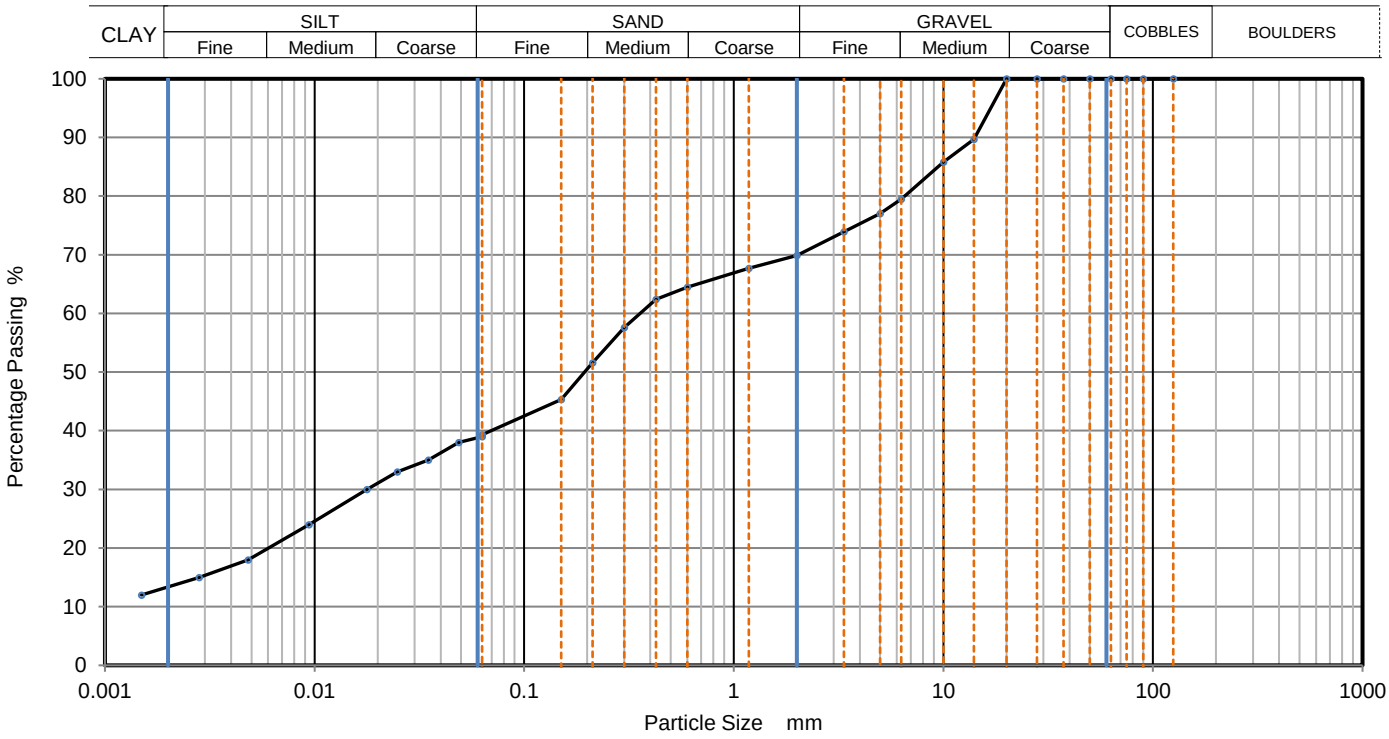
Remarks

Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					**24-0430**
Borehole/Pit No.					TP245
Site Name	Lissinagroagh, Leitrim			Sample No.	8
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	2.60
				Base	
Specimen Reference	3	Specimen Depth	2.6 m	Sample Type	B
Test Method	BS1377-2:2022 Clause 10			KeyLAB ID	Caus202412177



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	39
90	100	0.04869	38
75	100	0.03488	35
63	100	0.02482	33
50	100	0.01778	30
37.5	100	0.00940	24
28	100	0.00481	18
20	100	0.00281	15
14	90	0.00149	12
10	86		
6.3	80		
5	77		
3.35	74		
2	70		
1.18	68		
0.6	65	Particle density	(assumed)
0.425	62	2.65	Mg/m3
0.3	58		
0.212	52		
0.15	45		
0.063	39		

Dry Mass of sample, g: 385

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	30.1
Sand	30.7
Silt	25.7
Clay	13.5

Grading Analysis		
D100	mm	
D60	mm	0.358
D30	mm	0.0173
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

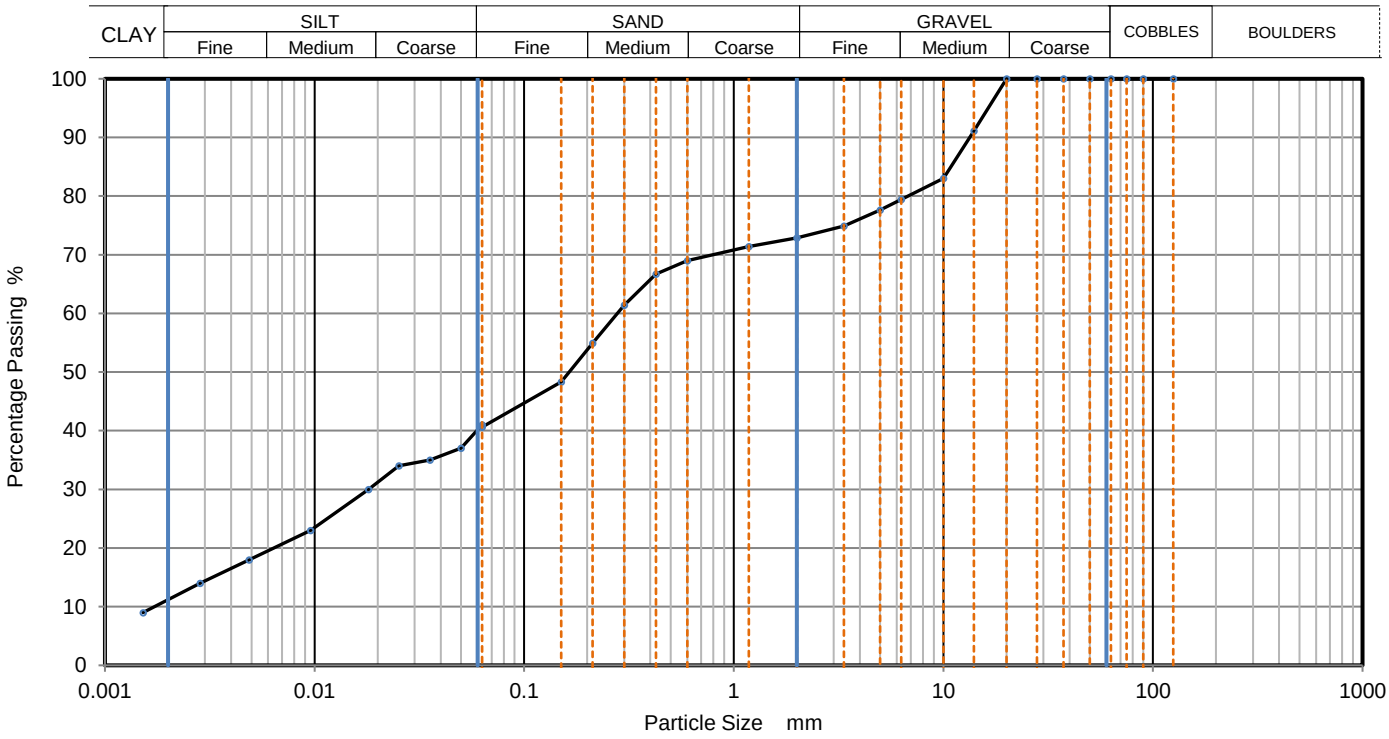
Remarks

Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					**24-0430**
Borehole/Pit No.					TP246
Site Name	Lissinagroagh, Leitrim			Sample No.	6
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	2.00
				Base	
Specimen Reference	3	Specimen Depth	2 m	Sample Type	D
Test Method	BS1377-2:2022 Clause 10			KeyLAB ID	Caus2024121711



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	41
90	100	0.04996	37
75	100	0.03555	35
63	100	0.02529	34
50	100	0.01810	30
37.5	100	0.00957	23
28	100	0.00487	18
20	100	0.00284	14
14	91	0.00152	9
10	83		
6.3	79		
5	78		
3.35	75		
2	73		
1.18	71		
0.6	69	Particle density	(assumed)
0.425	67	2.65	Mg/m3
0.3	61		
0.212	55		
0.15	48		
0.063	41		

Dry Mass of sample, g: 350

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	27.1
Sand	32.3
Silt	29.4
Clay	11.2

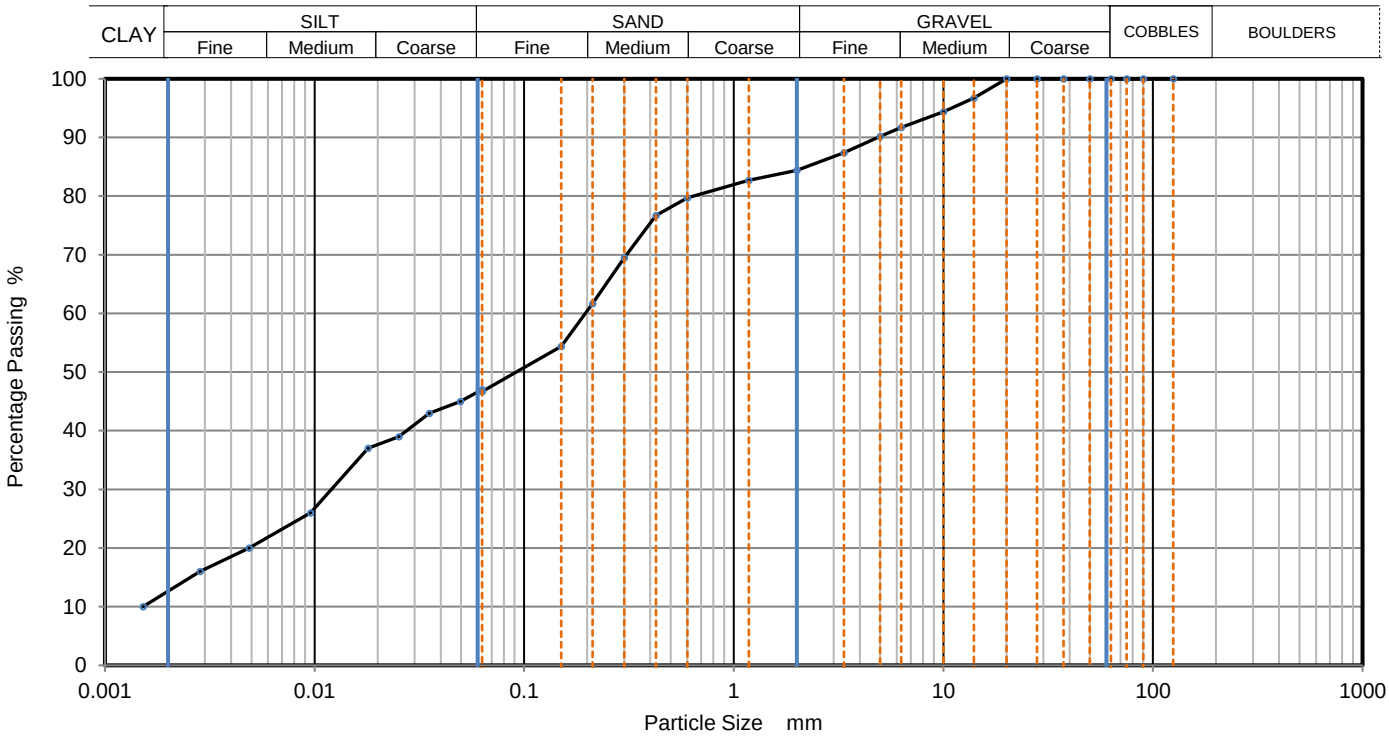
Grading Analysis		
D100	mm	
D60	mm	0.278
D30	mm	0.0181
D10	mm	0.00175
Uniformity Coefficient		160
Curvature Coefficient		0.67

Remarks

Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION				Job Ref		24-0430
					Borehole/Pit No.		TP246
Site Name	Lissinagroagh, Leitrim				Sample No.		5
Specimen Description	Brown sandy slightly gravelly silty CLAY.				Sample Depth (m)	Top	2.80
						Base	
Specimen Reference	3	Specimen Depth	2.8	m	Sample Type		B
Test Method	BS1377-2:2022 Clause 10				KeyLAB ID		Caus2024121712



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	47
90	100	0.04965	45
75	100	0.03533	43
63	100	0.02529	39
50	100	0.01800	37
37.5	100	0.00957	26
28	100	0.00487	20
20	100	0.00284	16
14	97	0.00152	10
10	94		
6.3	92		
5	90		
3.35	87		
2	84		
1.18	83		
0.6	80	Particle density	(assumed)
0.425	77	2.65	Mg/m3
0.3	70		
0.212	62		
0.15	54		
0.063	47		

Dry Mass of sample, g: 360

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	15.6
Sand	37.7
Silt	33.9
Clay	12.8

Grading Analysis		
D100	mm	
D60	mm	0.196
D30	mm	0.012
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

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SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

25 November 2024

Project Name:	Lissinagroagh, Leitrim
Project No.:	24-0430
Client:	Tobin

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 22/11/2024 and 25/11/2024.

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: Lissinagroagh, Leitrim

Report Reference: Rock Schedule 1

The table below details the tests carried out, the specifications used, and the number of tests included in this report. 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.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK	Point load index	*ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985*	6
ROCK	Uniaxial Compressive Strength (UCS)	*The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006, Editors: R Ulusay & J A Hudson*	1

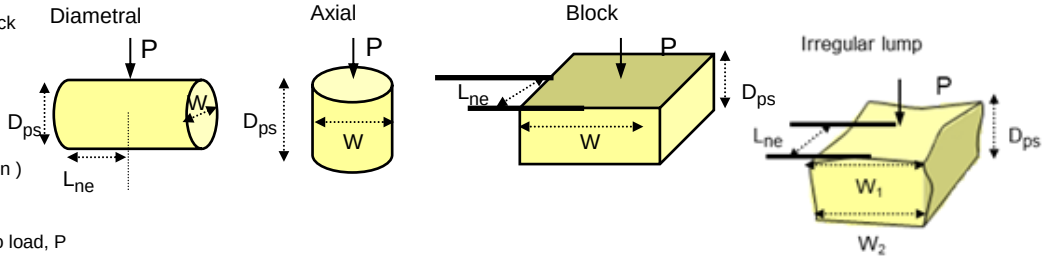
CAUSEWAY GEOTECH

Point Load Strength Index Tests
Summary of Results

Project No.	Project Name
24-0430	Lissinagroagh, Leitrim

Borehole No.	Sample			Specimen		Rock Type	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including water content if measured)
	Depth	Ref.	Type	Ref.	Depth		Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)	
	m				m					mm	mm	mm	mm	kN	mm	MPa	MPa	
BH001	4.50	4	C	2	4.50	LIMESTONE	A	U	YES		80.9	104.0	101.0	20.8	102.0	2.0	2.8	
BH001	4.85	5	C	2	4.85	LIMESTONE	D	U	YES	69.2	76.7	76.7	74.0	21.1	75.3	3.7	4.5	
BH001	5.40	6	C	2	5.40	LIMESTONE	A	U	NO		82.4	94.0	91.0	22.4	97.7	2.3	3.2	
BH001	7.05	7	C	2	7.05	LIMESTONE	D	U	YES	77.2	83.1	83.1	80.0	25.7	81.5	3.9	4.8	
BH001	7.65	9	C	2	7.65	LIMESTONE	A	U	NO		82.9	97.0	94.0	21.3	99.6	2.1	2.9	
BH001	9.40	10	C	2	9.40	LIMESTONE	D	U	NO	92.9	83.0	83.0	80.0	19.6	81.5	3.0	3.7	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Test performed in accordance with ISRM Suggested Methods : 1985, unless noted otherwise

Detailed legend for test and dimensions, based on ISRM, is shown above.

Size factor, F = (De/50)0.45 for all tests.

LAB 17R - Version 5

Date Printed: 25/11/2024

Approved By: Stephen Watson

UKAS TESTING
10122

CAUSEWAY GEOTECH	**UNIAXIAL COMPRESSIVE STRENGTH** ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006				
Site Name	Lissinagroagh, Leitrim			Project number	24-0430
Sample Description	LIMESTONE			Location ID	BH001
Sample Type	C	Sample number	8	Top Depth	7.20
Date of sampling	NOT KNOWN	Date of receipt	25/11/2024	Base Depth	7.50
Test Method	International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007, p153, part 1			Keylab ID	Caus2024112221

Specimen Details

Test number	1	
Diameter	82.5	mm
Height	173.9	mm
Water Content	0.3	%
Sample Mass	2580	g
Bulk Density	2.78	Mg/m3
Dry Density	2.77	Mg/m3
Length to Diameter Ratio	2.1	

Specimen Remarks

Test Results

Load Frame	LF01	
Test Supplier	Impact Test Equipment	
Test Machine	CT341	
Test Date	22/11/2024	
Test Duration	31.0	Secs
Orientation of sample	VERTICAL	
Rate of Strain	0.75	MPa/s
Strain at Failure	345.0	kN
Unconfined Compressive Strength	64.50	MPa
Mode of failure	FRAGMENTED	

Test Remarks

Approved

Stephen Watson

UKAS TESTING

10122

APPENDIX H – GEOPHYSICAL SURVEY REPORT



AGP24088_02

Report on the Geophysical Investigation At Lissinagroagh Wind Farm Co. Leitrim, For Causeway Geotech Limited

13TH December 2024

APEX Geophysics Limited
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W: www.apexgeophysics.com

PRIVATE AND CONFIDENTIAL

THE FINDINGS OF THIS REPORT ARE THE RESULT OF A GEOPHYSICAL SURVEY USING NON-INVASIVE SURVEY TECHNIQUES CARRIED OUT AT THE GROUND SURFACE. INTERPRETATIONS CONTAINED IN THIS REPORT ARE DERIVED FROM A KNOWLEDGE OF THE GROUND CONDITIONS, THE GEOPHYSICAL RESPONSES OF GROUND MATERIALS AND THE EXPERIENCE OF THE AUTHOR. APEX GEOPHYSICS LTD. HAS PREPARED THIS REPORT IN LINE WITH BEST CURRENT PRACTICE AND WITH ALL REASONABLE SKILL, CARE AND DILIGENCE IN CONSIDERATION OF THE LIMITS IMPOSED BY THE SURVEY TECHNIQUES USED AND THE RESOURCES DEVOTED TO IT BY AGREEMENT WITH THE CLIENT. THE INTERPRETATIVE BASIS OF THE CONCLUSIONS CONTAINED IN THIS REPORT SHOULD BE TAKEN INTO ACCOUNT IN ANY FUTURE USE OF THIS REPORT.

PROJECT NUMBER	AGP24088		
AUTHOR	**CHECKED**	**REPORT STATUS**	**DATE**
SEBASTIAN CORRALES B.SC. (GEOPHYSICS)	TONY LOMBARD M.SC. (GEOPHYSICS)	V.01	25TH OCTOBER 2024
SEBASTIAN CORRALES B.SC. (GEOPHYSICS)	TONY LOMBARD M.SC. (GEOPHYSICS)	V.02	13TH DECEMBER 2024

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1. EXECUTIVE SUMMARY

APEX Geophysics Limited was requested by Causeway Geotech Limited to carry out a geophysical investigation within the site of the proposed Lissinagroagh Wind Farm in County Leitrim. The purpose of the geophysical investigation is to assess subsoil conditions at a proposed turbine base.

The objectives of the geophysical investigation were to estimate the overburden stiffness, type and thickness, assess the depth to, type of and weathering of bedrock, identify any potential fault/fissure zones within the bedrock and propose direct investigation locations.

The site is situated on a hillside, approximately 5.0 km northeast of Manorhamilton town, Co. Leitrim. The site consists of open ground and is located around 120 m from the access road to the west. The ground rises from 326.4 mOD in the northwest to 347.1 mOD in the southeast.

The Geological Survey of Ireland (GSI) Quaternary sediments and bedrock maps indicates blanket peat across the site, underlain by mudbank limestone.

The survey was carried out on the 7th of October 2024 and involved the collection of an ERT profile, seismic refraction profiles with a 1D MASW sounding acquired at the centre of each seismic refraction profile and soft ground probing along the ERT profile. In December 2024 additional direct investigation was provided for inclusion in this final report.

The results of the combined geophysical and direct investigation data have interpreted as follows:

- **Layer 1**: consists of soft sandy gravelly clay, which is 0.6 to 1.1 m thick (average 0.7m), with a possible 'pocket' of peat.
- **Layer 2**: consists of firm to stiff sandy gravelly clay which is 0.6 to 3.0 m thick (average 2.0 m). This layer is thickest towards the centre of the ERT profile.
- The seismic velocities indicate some completely to highly weathered rock may be present towards the base of layers 1 and 2.
- **Layer 3**: consists of dense clayey sand/gravel and/or moderately weathered/fractured limestone which is 0.2m to 3.9 m thick (average 2.1 m). Depth to the top of this layer ranges from 0.6 to 4.0 m bgl (average 2.1 m bgl).
- **Layer 4**: consists of slightly weathered/fractured to fresh limestone. Depth to the top of this layer ranges from 2.7 m bgl in the northwest to 4.8 m bgl to the southeast (average 3.8m bgl).

The seismic velocities indicate that any moderately weathered/fractured rock will be marginally rippable to requiring breaking/blasting if within proposed construction depth. Slightly weathered/fractured to fresh rock will require breaking/blasting.

Where bedrock excavation is proposed, a detailed assessment of excavatability should be carried out combining the results of the geophysical survey, any rotary core drilling, strength testing and trial excavation pits using a high-powered excavator of similar rating to that to be used during construction. Trial excavations should be attempted down to formation level.

The findings of the geophysical investigation should be reviewed following any further direct investigation.

2. INTRODUCTION

APEX Geophysics Limited was requested by Causeway Geotech Limited to carry out a geophysical investigation within the site of the proposed Lissinagroagh Wind Farm in County Leitrim. The purpose of the geophysical investigation is to assess subsoil conditions at one proposed turbine base.

2.1 Survey Objectives

The objectives of the geophysical investigation were to provide information on:

- Soil stiffness, type and thickness
- Depth to bedrock
- Type of bedrock
- Weathering and excavatability of bedrock
- Potential faults / fissure zones
- Propose direct investigation locations

2.2 Site Background

The site is situated on a hillside, approximately 5.0 km northeast of Manorhamilton town, Co. Leitrim. The site consists of open ground and is located around 120 m from the access road to the west (Fig.2.1a). The ground rises from 326.4 mOD in the northwest to 347.1 mOD in the southeast (Fig.2.1b). South of the survey area rock is exposed on the hillside (Fig. 2.1c).



Fig 2.1a: Survey location map.



Fig 2.1b: Undulating nature of the survey area, looking north.



Fig 2.1c: rock outcrop south of survey line, looking north.

2.2.1 Soils

The Geological Survey of Ireland (GSI) Quaternary sediments map for the area (Fig. 2.2) indicates blanket peat across the site. Bedrock outcrop or subcrop is indicated to the west of the survey profile while Karstified bedrock outcrop or subcrop is indicated to the northeast of the survey profile.

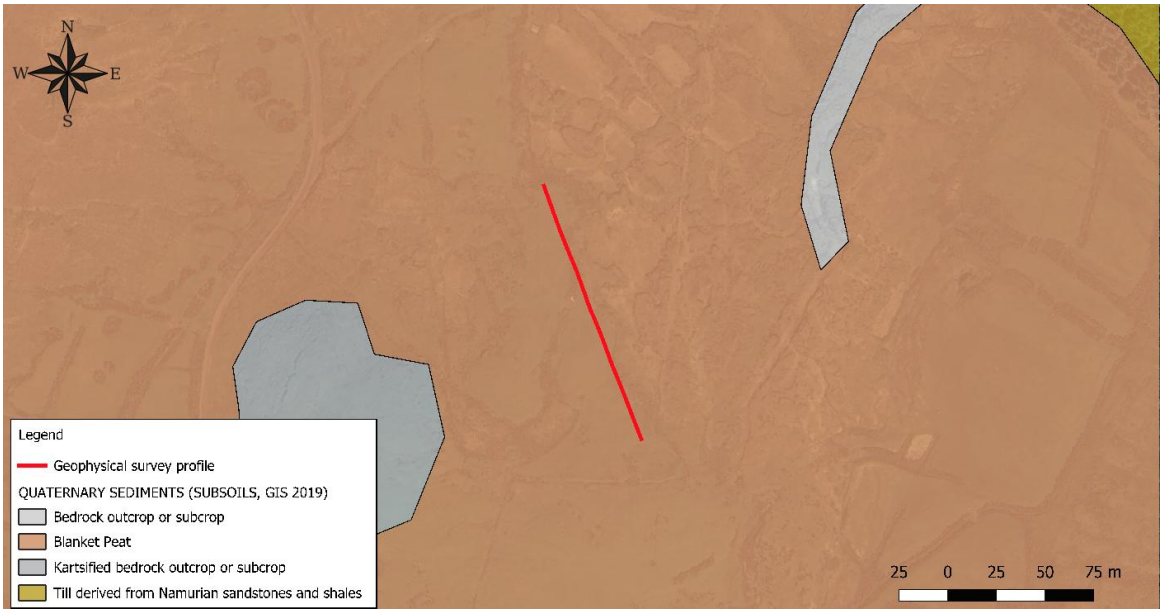

Fig 2.2: GSI soils map.

2.2.2 Geology

The GSI 1:100k Bedrock Geology map (Fig. 2.3) indicates that the survey area is underlain by Mudbank Limestone. Bedrock outcrop is shown to the west and southeast of the survey profile. Faults are indicated to the west and east of the survey profile.

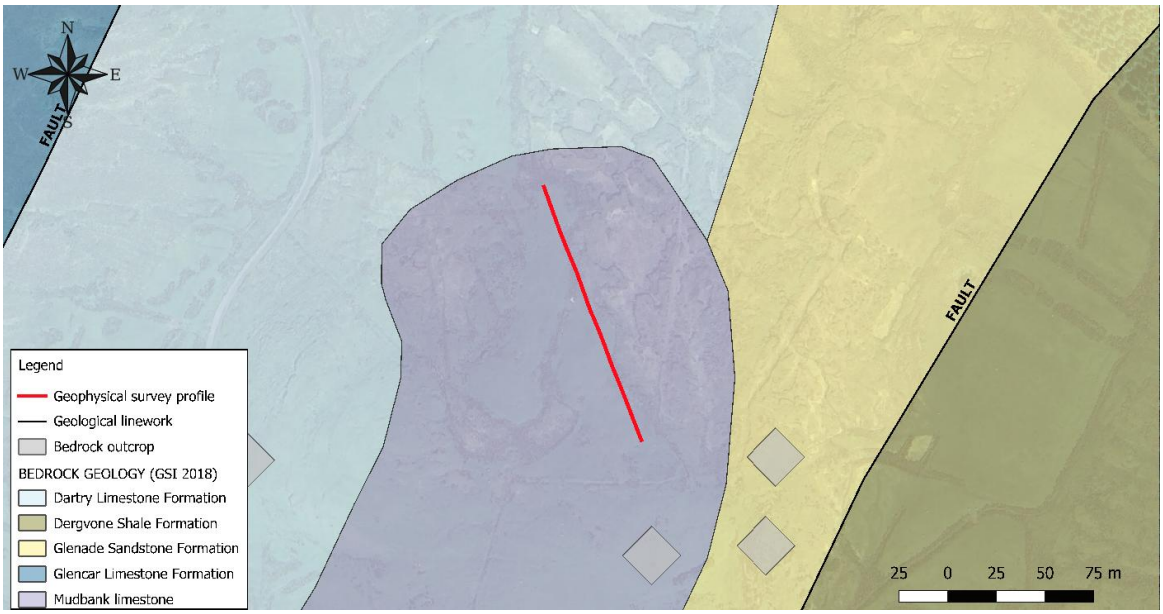

Fig 2.3: GSI bedrock map.

2.2.3 Groundwater Vulnerability

The GSI Groundwater Vulnerability map (Fig. 2.4) indicates that the survey area is in an area of high vulnerability. Rock at or near surface or karst is shown to the southwest and northeast of the survey profile.



Fig 2.4: GSI groundwater vulnerability map.

2.2.4 Bedrock Aquifers

The bedrock is classified as a 'Regionally important aquifer Karstified (conduit)', (Fig. 2.5).

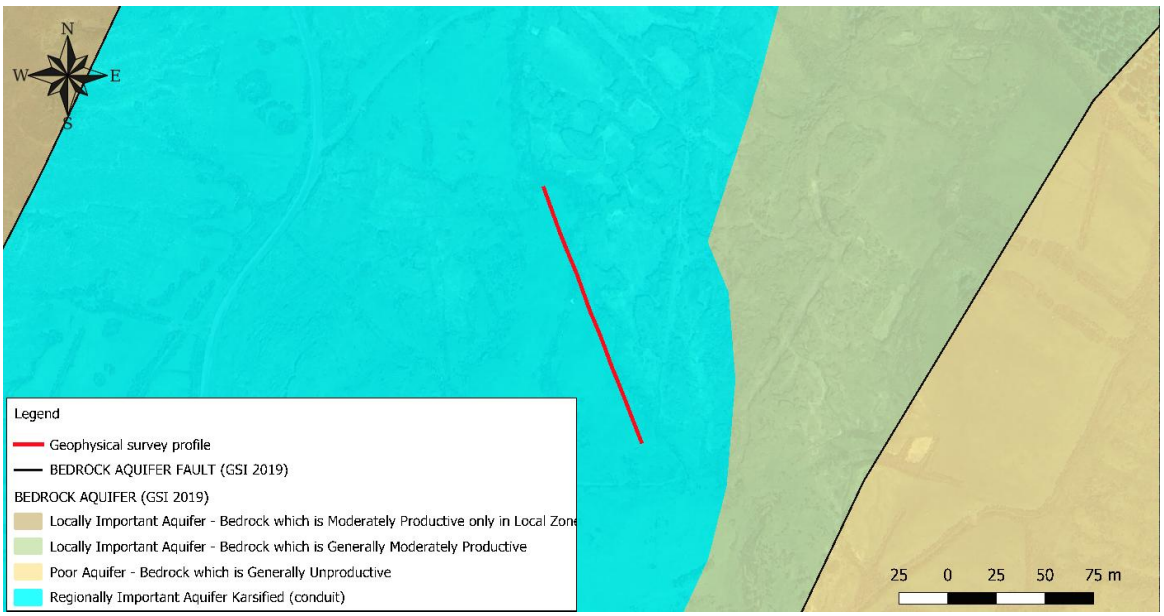

Fig 2.5: GSI bedrock aquifer map.

2.2.5 Historical Geological Mapping

The historical 6-inch map (Fig. 2.6) indicates massively bedded quartzose grits to the north of the survey profile, with a strike orientation of southwest-northeast and a dip of 10 degrees to the southeast. To the south of the survey profile, the map shows limestone (blue area on map) which has a strike of northeast-southwest and a dip of 5 degrees to the southeast. Massive grits, sandstone and black ferruginous shale are also indicated to the southeast of the survey profile.



Fig 2.6: Historical 6-inch map.

2.2.6 Direct Investigation

The log for a hand auger, acquired prior to this geophysical investigation was provided by the client. The auger encountered 0.2 m of topsoil over soft sandy gravelly clay. The auger terminated at 0.3 m due to refusal on possible shallow rock/cobbles.

A rotary corehole (BH001) was completed between the 12th and 13th November 2024. The corehole encountered 0.4 m of peat over dense sandy clayey gravel over moderately weathered limestone at 4.0 m bgl over slightly weathered limestone at 5.35 m bgl with termination depth at 10.2 m bgl.

The direct investigation location is shown on Drawing AGP24088_01 (Appendix D).

2.3 Survey Rationale

The investigation consisted of 2D Electrical Resistivity Tomography (ERT), Seismic Refraction profiling and Multi-channel Analysis of Surface Waves (MASW).

ERT images the resistivity of the materials in the subsurface along a profile to produce a cross-section showing the variation in resistivity with depth, depending on the length of the profile. Each cross-section will be interpreted to determine the material type along the profile at increasing depth, based on the typical resistivities returned for Irish ground materials.

Seismic Refraction profiling measures the velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities. Readings are taken using geophones connected via multi-core cable to a seismograph. This method should allow us to profile the depth to the top of the bedrock, along profiles across the site.

The **MASW** method is used to estimate shear-wave (S-wave) velocities in the ground material to indicate possible soft zones. Overburden material with an S-wave velocity of <175 m/s is generally classified as soft/loose. The depth of investigation for this method will depend on the source type and geophone spacing. This method may also be used to indicate bedrock depth.

As with all geophysical methods the results are based on indirect readings of the subsurface properties. The effectiveness of the proposed approach will be affected by variations in the ground properties. By combining a number of techniques it is possible to provide a higher quality interpretation and reduce any ambiguities which may otherwise exist. Further information on the detailed methodology of each geophysical method employed in this investigation is given in **APPENDIX A: DETAILED GEOPHYSICAL METHODOLOGY**.

3. RESULTS

The survey was carried out on the 7th of October 2024 and involved the collection of an ERT profile, 3 seismic refraction profiles with a 1D MASW sounding acquired at the centre of each seismic refraction profile. In addition soft ground probing was also conducted along the ERT profile. The geophysical survey locations are shown on Drawing AGP24048_01 (Appendix D).

3.1 Soft Ground Probing

Soft ground probing was carried out during the geophysical survey at 29 locations along the ERT profile R1 using a series of 1 m long metal rods. The refusal depths vary from 0.1 m to 1.1 m bgl in the centre of the profile and they are plotted on Drawing AGP24088_R1 (Appendix D).

3.2 ERT

The ERT resistivity values have been interpreted in conjunction with the seismic refraction data on the following basis:

Resistivity (Ohm-m)	Interpretation
50-250	PEAT / sandy gravelly SILT/CLAY
	Possible weathered/fractured LIMESTONE
250-500	Clayey SAND/GRAVEL
	Weathered/fractured LIMESTONE
500-3000	LIMESTONE

3.3 Seismic refraction profiling

Three seismic refraction profiles were acquired in line with the ERT profile, and have been interpreted in conjunction with the ERT and direct investigation data, on the following basis:

P-Wave Seismic Velocity (m/s)	Interpretation	Stiffness/Rock Quality	Excavatability
289*	Soils	Soft / Loose	Diggable
941	Soils	Firm / Medium Dense	Diggable
	Possible highly weathered/fractured rock	Very poor	Diggable
1296-1610**	Soils	Stiff / Dense	Diggable
	Moderately weathered/fractured rock	Poor	Marginally rippable to break/blast
3989-4476	Slightly weathered/fractured to fresh rock	Good	Break/Blast

** Completely weathered/fractured rock may be present at the base of this layer.*

***It should be noted that the cut-off velocity for excavatability will be lower if excavating in trenches.*

3.4 MASW

A 1D MASW sounding was recorded at the centre of each seismic profile. The MASW data was acquired with the aim of resolving a Shear-wave velocity (Vs) profile (indicative of soil stiffness) and deriving a Gmax profile and other dynamic moduli of the non-peat soil layers. While the data quality was good a satisfactory 'dispersion curve' could not be generated in the processing sequence due to the presence of thin non peat soils/shallow rock.

3.5 Interpretation

The results of the combined geophysical and direct investigation data are shown on Drawing AGP24088_R1 and have been interpreted as follows:

Layer 1: consists of soft sandy gravelly clay, which is 0.6 to 1.1 m thick (average 0.7m), with a possible 'pocket' of peat.

Layer 2: consists of firm to stiff sandy gravelly clay which is 0.6 to 3.0 m thick (average 2.0 m). This layer is thickest towards the centre of ERT profile R1.

The seismic velocities indicate some completely to highly weathered rock may be present towards the base of layers 1 and 2.

Layer 3: consists of dense clayey sand/gravel and/or moderately weathered/fractured limestone which is 0.2m to 3.9 m thick (average 2.1 m). Depth to the top of this layer ranges from 0.6 to 4.0 m bgl (average 2.1 m bgl).

Layer 4: consists of slightly weathered/fractured to fresh limestone. Depth to the top of this layer ranges from 2.7 m bgl in the northwest to 4.8 m bgl to the southeast (average 3.8m bgl).

While the corehole encountered dense sandy clayey gravel, the velocity of seismic waves (Vp), 1296-1610 m/s, and resistivity values 250-500 Ohm-m indicate this layer may also contain moderately weathered/fractured limestone.

Within the bedrock areas of slightly decreased resistivity values of 500-1,000 Ohm-m may indicate zones of some increased weathering/fracturing.

The seismic velocities indicate that any moderately weathered/fractured rock will be marginally rippable to requiring breaking/blasting if within proposed construction depth. Slightly weathered/fractured to fresh rock will require breaking/blasting.

4. RECOMMENDATIONS

The results of the geophysical investigation should be reviewed based on the findings of any further direct investigation.

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APPENDIX A: DETAILED METHODOLOGY

A combination of geophysical techniques was used to provide a high quality interpretation and reduce any ambiguities, which may otherwise exist.

Electrical Resistivity Tomography (ERT)

Electrical Resistivity Tomography was carried out to provide information on lateral variations in the overburden material as well as on the underlying overburden and bedrock.

Principles
This surveying technique makes use of the Gradient resistivity array. The 2D-resistivity profiling method records a large number of resistivity readings in order to map lateral and vertical changes in material types. This method involves the use of electrodes connected to a resistivity meter, using computer software to control the process of data collection and storage.

Data Collection
Profiles were recorded using an Abem Terrameter LS resistivity meter, up to three 21 takeout multicore cables and up to 61 stainless steel electrodes. Saline solution was used at the electrode/ground interface in order to gain a good electrical contact required for the technique to work effectively. The recorded data were processed and viewed immediately after surveying.

Data Processing
The field readings were stored in computer files and inverted using the RES2DINV package (Geotomo Software, 2006) with up to 5 iterations of the measured data carried out for each profile to obtain a 2D-depth model of the resistivities.

The inverted 2D resistivity models and corresponding interpreted geology are displayed on the accompanying drawings alongside the processed seismic sections. Profiles have been contoured using the same contour intervals and colour codes. Distance is indicated along the horizontal axis of the profiles.

P-wave Seismic Refraction Profiling

Principles
This method measures the velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities.

Seismic profiling measures the p-wave velocity (Vp) of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher Vp velocities while soft, loose or fractured materials have lower Vp velocities. Readings are taken using geophones connected via multi-core cable to a seismograph.

Data Collection
A Geode high resolution 24 channel digital seismograph, 24 10 Hz vertical geophones and a 10 kg hammer were used to provide first break information, with a 24 take-out cable (3m spacing). Equipment was carried was operated by a three-people crew.

Readings are taken using geophones connected via multi-core cable to a seismograph. The depth of resolution of soil/bedrock boundaries is determined by the length of the seismic spread, typically the depth of resolution is about one third the length of the profile (e.g. 69m profile ~ 23m depth).

Shots from seven different positions were taken (2 x off-end, 2 x end, 3 x middle) to ensure optimum coverage of all refractors.

Data Processing
The recorded data was processed and interpreted using the ray-tracing and tomographic inversion methods, to acquire depths to boundaries and the P-wave velocities of these layers, using the SeisImager/2D programme from Geometrics.

SeisImager/2D interprets seismic refraction data as a laterally varying layered earth structure. The programme includes three methods for data analysis, time-term inversion, the reciprocal method and tomography.

The tomography method creates an initial velocity model, then traces rays through the model, comparing the calculated and measured traveltimes. The model is then modified and the process repeated to minimise the difference between the calculated and measured times. The data was processed using this method and was then converted to a layer model for display and interpretation.

Approximate errors for Vp velocities are estimated to be +/- 10%. Errors for the calculated layer thicknesses are of the order of +/-20%. Possible errors due to the "hidden layer" and "velocity inversion" effects may also occur (Soske, 1959).

Multichannel Analysis of Surface Waves (MASW)

Principles
The Multi-channel Analysis of Surface Waves (MASW) (Park et al., 1998, 1999) utilizes Surface waves (Rayleigh waves) to determine the elastic properties of the shallow subsurface (<15m). Surface waves carry up to two/thirds of the seismic energy but are usually considered as noise in conventional body wave reflection and refraction seismic surveys. The penetration depth of surface waves changes with wavelength, i.e. longer wavelengths penetrate deeper. When the elastic properties of near surface materials vary with depth, surface waves then become dispersive, i.e. propagation velocity changes with frequency. The propagation (or phase) velocity is determined by the average elastic property of the medium within the penetration depth. Therefore, the dispersive nature of surface waves may be used to investigate changes in elastic properties of the shallow subsurface. The MASW method employs multi-channel recording and processing techniques (Sheriff and Geldart, 1982) that have similarities to those used in a seismic reflection survey and which allow better waveform analysis and noise elimination.

To produce a shear wave velocity (Vs) profile and a stiffness profile of the subsurface using Surface waves the following basic procedure is followed:
(i) A point source (e.g. a sledgehammer) is used to generate vertical ground motions,
(ii) The ground motions are measured using low frequency geophones, which are disposed along a straight line directed toward the source,
(iii) the ground motions are recorded using either a conventional seismograph, oscilloscope or spectrum analyzer,

(iv) a dispersion curve is produced from a spectral analysis of the data showing the variation of Surface wave velocity with wavelength,
(iv) the dispersion curve in inverted using a modelling and least squares minimization process to produce a subsurface profile of the variation of Surface wave and shear wave velocity with depth.

Data Collection
The recording equipment consisted of a Geode 24 channel digital seismograph, 24 no. 10 Hz vertical geophones, hammer energy source with mounted trigger and a 24 take-out cable.

Data Processing
MASW processing was carried out using the SURFSEIS processing package developed by Kansa Geological Survey (KGS, 2000). SURFSEIS is designed to generate a shear wave (Vs) velocity profile.

SURFSEIS data processing involves three steps:
(i) Preparation of the acquired multichannel record. This involves converting data file into the processing format.
(ii) Production of a dispersion curve from a spectral analysis of the data showing the variation of Raleigh wave phase velocity with wavelength. Confidence in the dispersion curve can be estimated through a measure of signal to noise ratio (S/N), which is obtained from a coherency analysis. Noise includes both body waves and higher mode surface waves. To obtain an accurate dispersion curve the spectral content and phase velocity characteristics are examined through an overtone analysis of the data.
(iii) Inversion of the dispersion curve is then carried out to produce a subsurface profile of the variation of shear wave velocity with depth.

Spatial Relocation

All the geophysical investigation locations were acquired using Trimble Geo 7X high-accuracy GNSS handheld using the settings listed below. This system allows collecting GPS data with c.20mm accuracy.

Coordinate zone:	Irish Transverse Mercator (ITM)
Datum:	IRENET95
Coordinate units:	Meters
Altitude units:	Meters
Survey altitude reference:	MSL
Geoid model:	OSGM15_Malin

APPENDIX B: EXCAVATABILITY

The seismic velocity of a rock formation is related to characteristics of the rock mass which include rock hardness and strength, degree of weathering and discontinuities. Usually, the velocity is just one of several parameters used in the assessment of excavatability. The excavatability of a rock formation is favoured by the following factors:

- Open fractures, faults and other planes of weakness of any kind
- Weathering
- Brittleness and crystalline nature
- High degree of stratification or lamination
- Large grain size
- Low compressive strength

Weaver (1975) presented a comprehensive rippability rating chart (Fig.1) in which the p-wave velocity value and the relevant geological factors could be entered and assigned appropriate weightings. The total weighted index was found to correlate very well with actual rippability.

Fig.1 Rippability Rating Chart

Rock class	I	II	III	IV	V
Description	Very good rock	Good rock	Fair rock	Poor rock	Very poor rock
Seismic velocity (m/s) Rating	>2150 26	2150-1850 24	1850-1500 20	1500-1200 12	1200-450 5
Rock hardness Rating	Extremely hard rock 10	Very hard rock 5	Hard rock 2	Soft rock 1	Very soft rock 0
Rock weathering Rating	Unweathered 9	Slightly weathered 7	Weathered 5	Highly weathered 3	Completely weathered 1
Joint spacing (mm) Rating	>3000 30	3000-1000 25	1000-300 20	300-50 10	<50 5
Joint continuity Rating	Non continuous 5	Slightly continuous 5	Continuous-no gouge 3	Continuous-some gouge 0	Continuous-with gouge 0
Joint gouge Rating	No separation 5	Slight separation 5	Separation <1mm 4	Gouge <5mm 3	Gouge >5mm 1
Strike and dip orientation Rating	Very unfavourable 15	Unfavourable 13	Slightly unfavourable 10	Favourable 5	Very favourable 3
Total rating	100-90	90-70*	70-50	50-25	<25
Rippability assessment Tractor horsepower Tractor kilowatts	Blasting	Extremely hard ripping and blasting 770/385 575/290	Very hard ripping 385/270 290/200	Hard ripping 270/180 200/135	Easy ripping 180 135

APPENDIX C: SEISMIC REFRACTION DATA

The tomographic inversion results for the seismic refraction spreads are shown below:

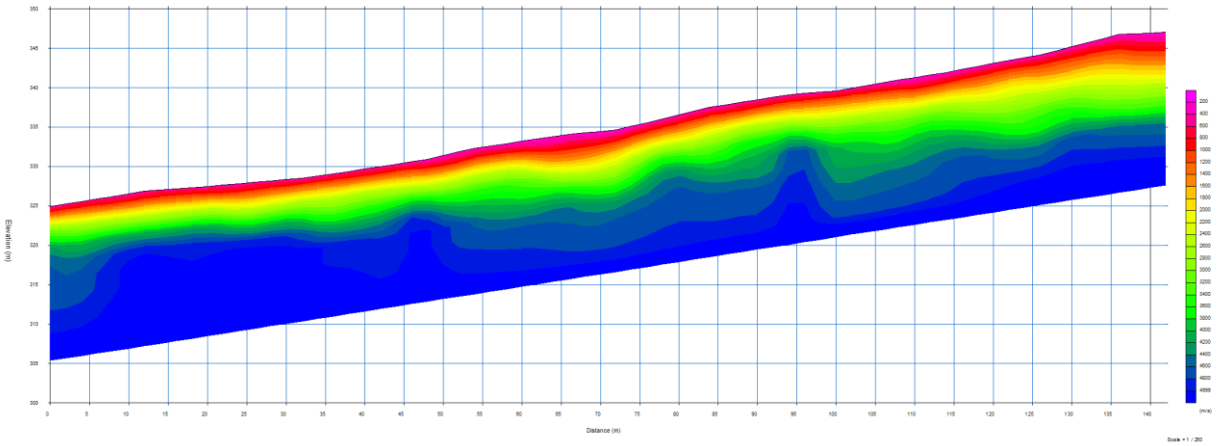


Fig.C.1. Tomographic inversion for seismic refraction spreads S1, S2 & S3 (NW-SE).

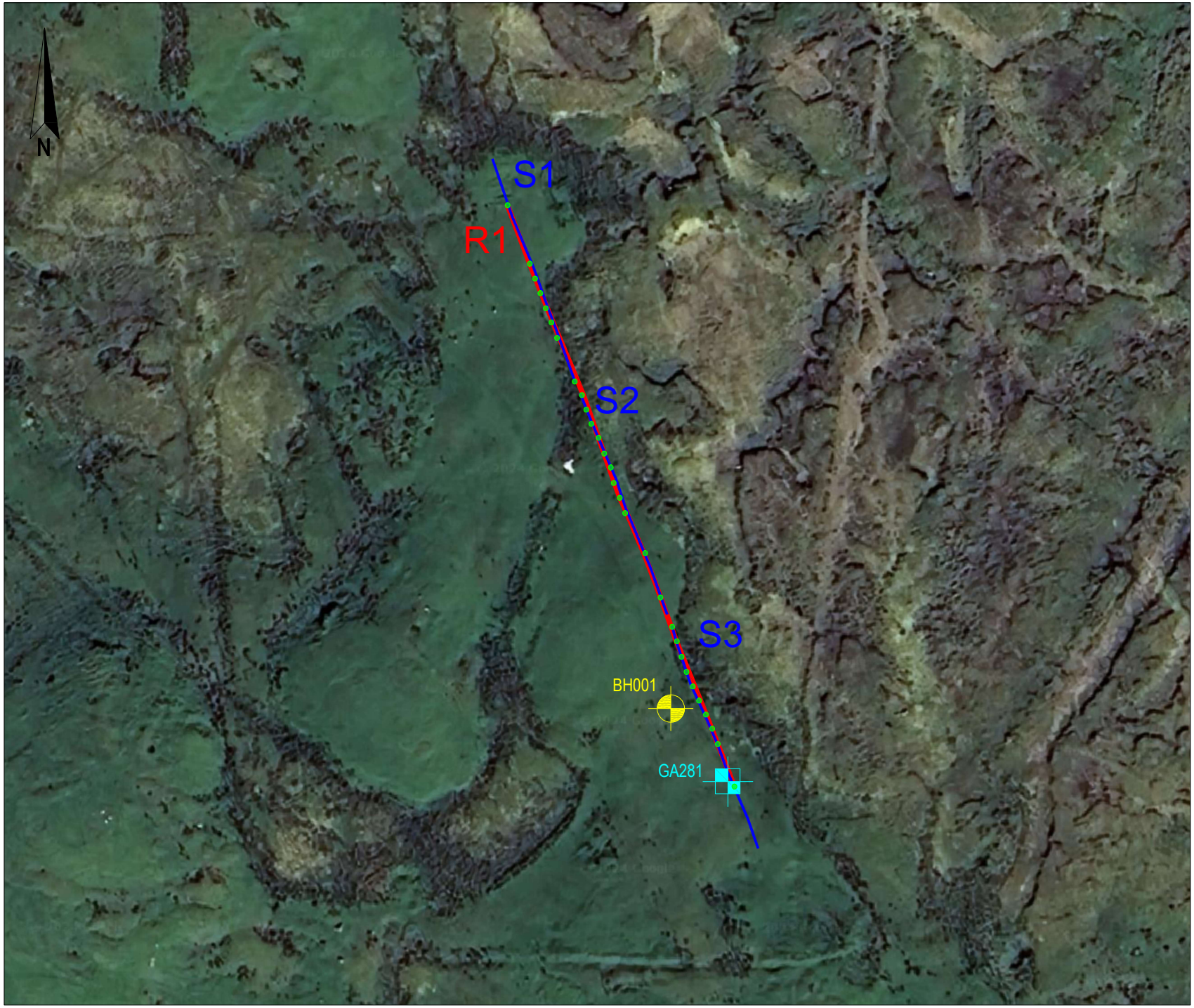
APPENDIX D: DRAWINGS

The information derived from the geophysical investigation as well as correlation with the available direct investigation is presented in the following drawings:

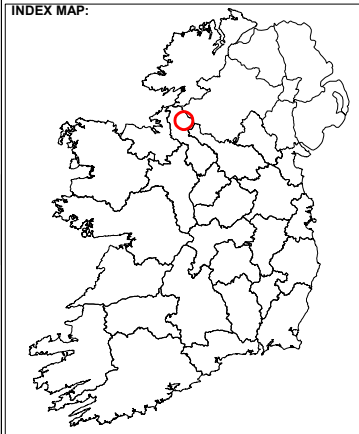
AGP24088_01	Geophysical survey Locations	1:1000@A4
AGP24088_R1	Results & interpretation of ERT R1 & seismic refraction profiles S1, S2 & S3	1:750@A4

GEOPHYSICAL SURVEY LOCATIONS

SCALE 1:1000



INDEX MAP:



LEGEND:

- R1 — 2D resistivity profile
- S1 — Seismic refraction profile
- Soft probe location
- GA281 — Hand auger location
- BH001 — Borehole location

The information displayed here is to be used in conjunction with AGP24088_02 Report on the Geophysical Investigation at Lissinagroagh Wind Turbine, Co. Leitrim for Causeway Geotech Ltd., APEX Geophysics Ltd. 13th December 2024.

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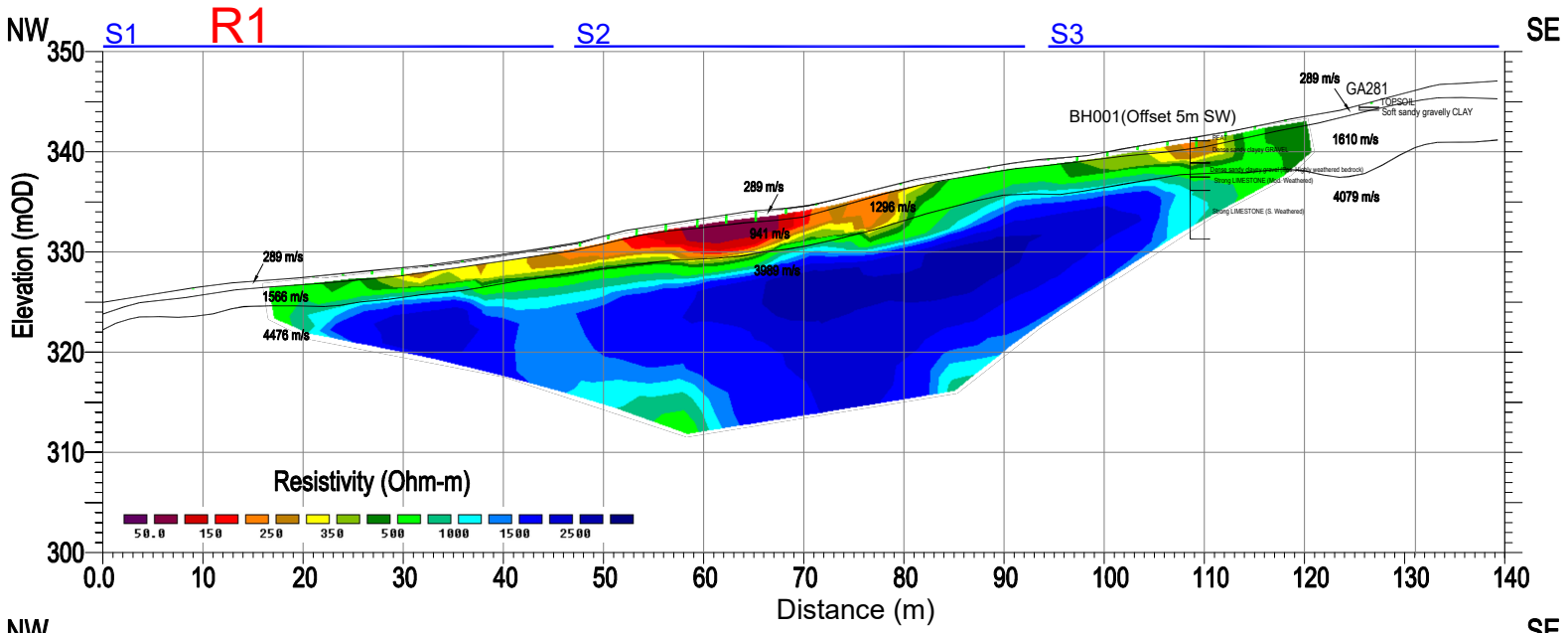
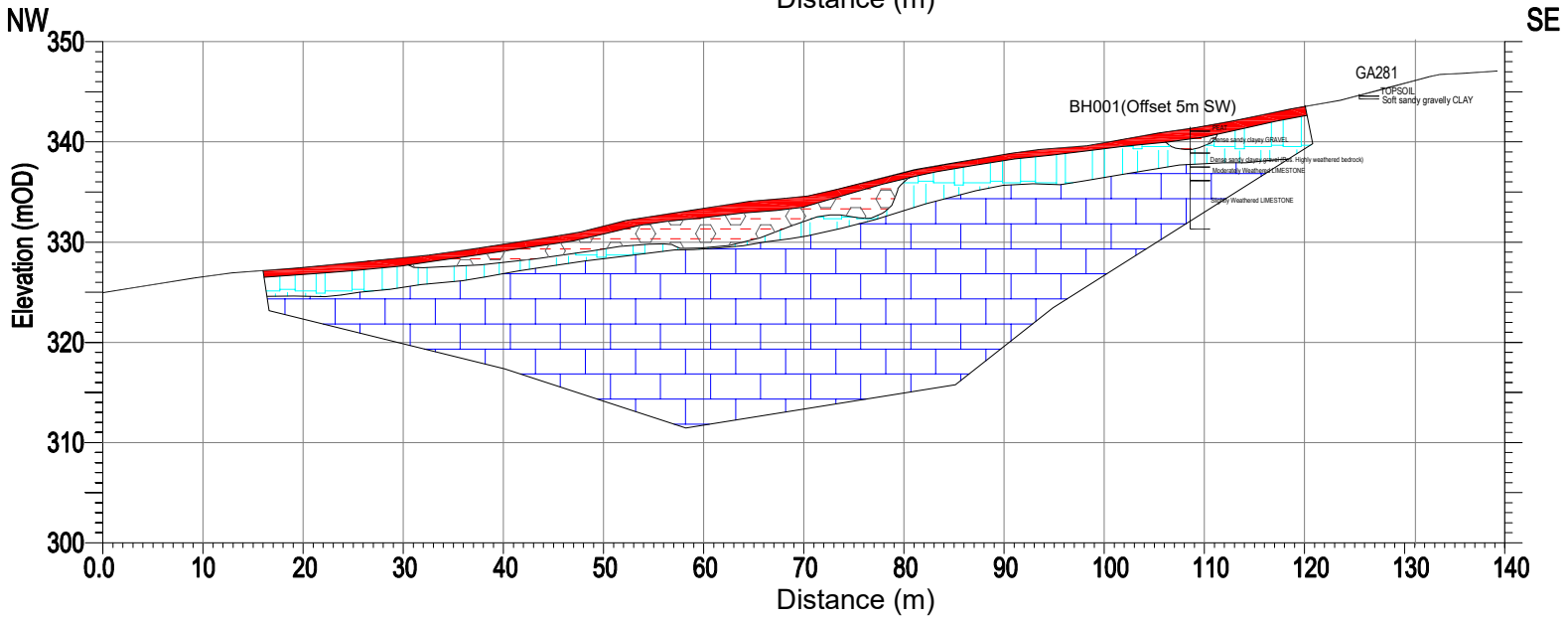
PROJECT:	LISSINAGROAGH WIND FARM GEOPHYSICAL INVESTIGATION
CLIENT.:	CAUSEWAY GEOTECH LIMITED
DRAWING NO:	AGP24088_01
SCALE:	AS INDICATED @ A4
DATE:	13-12-2024

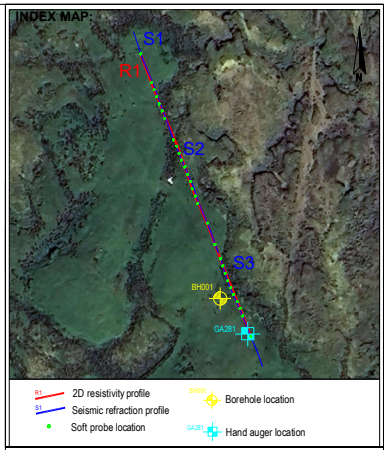
Version:	Date:	Drawn By:	Checked:
01	25-10-2024	SC	TL
02	13-12-2024	SC	TL

RESULTS & INTERPRETATION OF ERT PROFILE R1 & SEISMIC REFRACTION PROFILES S1, S2 & S3

SCALE 1:750







LEGEND:

- Seismic refraction layer with interpreted P-wave velocity (1254-1288 m/s)
- Soft ground probe
- Soft sandy gravelly SILT/CLAY/pos. PEAT pos.weathered rock towards base)
- Firm to stiff sandy gravelly SILT/CLAY / pos. weathered rock towards base)
- Dense clayey SAND/GRAVEL and/or Moderately weathered/fractured LIMESTONE
- Slightly weathered/fractured to fresh LIMESTONE
- BH001 Direct investigation logs

The information displayed here is to be used in conjunction with AGP24088_02 Report on the Geophysical Investigation at Lissinagroagh Wind Turbine, Co. Leitrim for Causeway Geotech Ltd., APEX Geophysics Ltd. 13th December 2024.

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PROJECT:	LISSINAGROAGH WIND FARM GEOPHYSICAL INVESTIGATION
CLIENT.:	CAUSEWAY GEOTECH LIMITED
DRAWING NO:	AGP24088_R1
SCALE:	AS INDICATED @ A4
DATE:	13-12-2024

Version:	Date:	Drawn By:	Checked:
01	25-10-2024	SC	TL
02	13-12-2024	SC	TL

APPENDIX I – SPT HAMMER ENERGY MEASUREMENT REPORT



SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Southern Testing
Unit 11
Charlwoods Road
East Grinstead
West Sussex
RH19 2HU

SPT Hammer Ref:	1377
Test Date:	17/02/2024
Report Date:	19/02/2024
File Name:	1377.spt
Test Operator:	RS

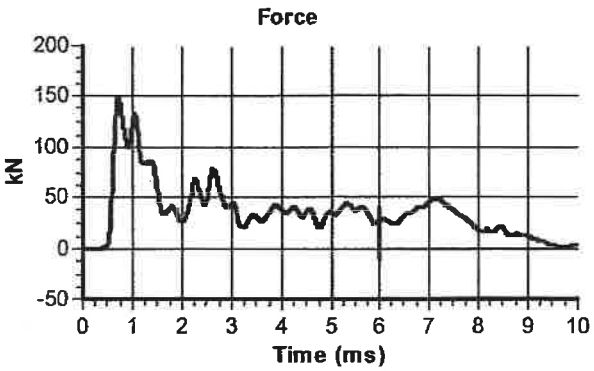
Instrumented Rod Data

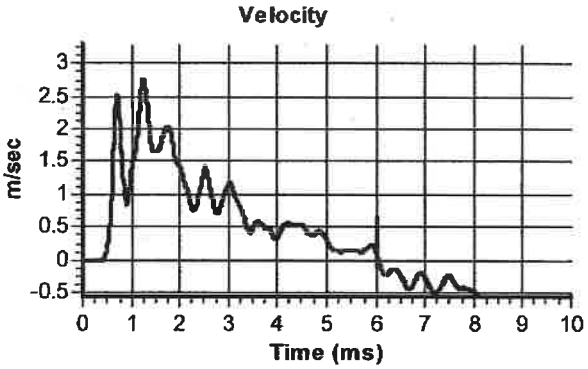
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.6
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	64786
Accelerometer No.2:	64789

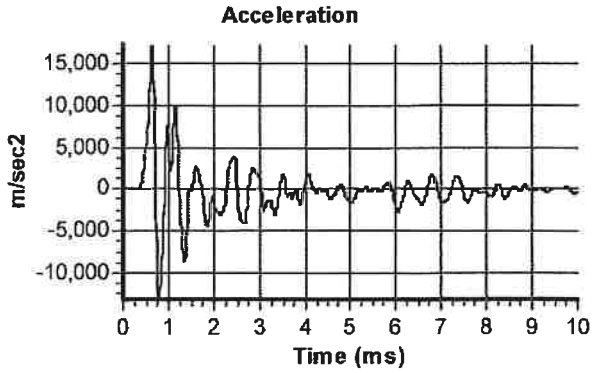
SPT Hammer Information

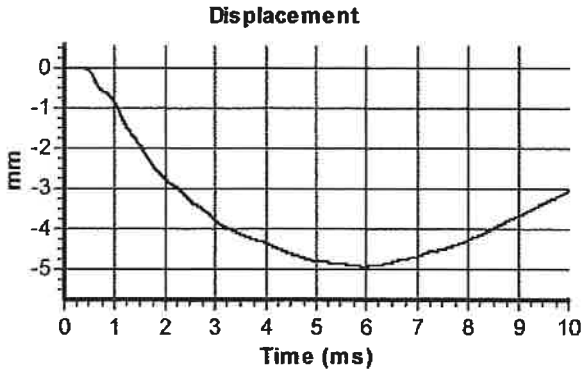
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

Comments / Location
CAUSEWAY









Calculations

Area of Rod A (mm2):	983
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	325

Energy Ratio E_r (%): **69**

Signed: Bob Stewart
Title: Technician

The recommended calibration interval is 12 months

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CAUSEWAY GEOTECH

Causeway Geotech Limited has made its commitment to health and safety of people, the environment and the quality of its services an integral part of our strategy.

Whether it be ensuring people's safety or meeting the challenges of operating in an ecologically diverse environment, we aim to act in a sustainable and responsible manner at all times.

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Whether it be ensuring people's safety or meeting the challenges of operating in an ecologically diverse environment, we aim to act in a sustainable and responsible manner at all times.

CERTIFICATIONS / ACCREDITATIONS

Constructionline Gold Member

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001 — UKAS MANAGEMENT SYSTEMS 9235

MEMBERSHIPS

AGS

BRITISH DRILLING ASSOCIATION

BGA · THE BRITISH · GEOTECHNICAL ASSOCIATION

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Appendix 2-6C

Site Investigation Report 2025

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Ground Investigations Ireland

Lissinagroagh Wind Farm

Tobin Consulting Engineers

Ground Investigation Report

April 2026

Directors:
Fergal McNamarra, Conor Finnerty, Barry Sexton, Stephen Kealy and Micheal Sutton
Ground Investigations Ireland Limited | Registered in Ireland Company Regsitration No.: 405726

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DOCUMENT CONTROL SHEET

Project Title	Lissinagroagh Wind Farm
Engineer	Tobin
Project No	15017-09-25
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
B	Final	R O'Neill	D MagLochlainn	S Kealy	Dublin	02 April 2026

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

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APPENDICES

Appendix 1 Site Location Plan
Appendix 2 Trial Pit Records
Appendix 3 Gouge Auger Records
Appendix 4 Peat Probe Records
Appendix 5 Rotary Core Records
Appendix 6 Laboratory Testing

1.0 Preamble

On the instructions of Tobin Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between November 2025 and March 2026 at the site of the proposed Wind Farm in Lissinagroagh Co. Leitrim.

2.0 Overview

2.1. Background

It is proposed to construct a new Wind Farm with associated services, access roads and borrow pits at the proposed site. The site is currently used for Coillte Forestry and is situated in the hills to the northeast of Manorhamiliton. The site covers an area of over 3.00km from North to South and over 3.00km East to West.

2.2. Purpose and Scope

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

- Visit project site to observe existing conditions
- Carry out 8 No. Trial Pits to a maximum depth of 3.20m BGL
- Carry out 17 No. Hand Augers to a maximum depth of 1.80m BGL
- Carry out 97 No. Peat Probes to determine the depth of Peat deposits
- Carry out 2 No. Rotary Core Boreholes to a maximum depth of 12.80m BGL
- Installation of 1 No. Groundwater monitoring wells
- Geotechnical & Environmental Laboratory testing
- Report with recommendations

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.
The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.2. Trial Pits

The trial pits were excavated using 8T tracked excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of this Report.

3.3. Hand Auger

The Hand Auger is a manually operated stainless-steel sampling auger. The Hand Auger consists of a corkscrew shaped sampler, 1 metre extension bars and a T shaped handle. The corkscrew shaped tip of the sampler is inserted into the ground. The operator then manually turns the T handle while using their body weight to rotate the sampler into the ground. The corkscrew sampler fills with material as it is rotated into the ground. The Hand Auger recovers a 300mm disturbed sample which is recovered from the exploratory hole, logged, sampled and photographed. The process is repeated with the extension bars used to achieve greater depths until the desired strata is sampled or the Hand Auger cannot progress any further. The Hand Auger records are provided in Appendix 3 of this Report.

3.4. Peat Probing

Manually operated peat probes were carried out at the locations shown in the location plan in Appendix 1 to determine the depth of Peat. The test consists of manually driving a cone on metre long extendible rods into the peat until a stiffer deposit or an obstruction is encountered. This process was carried out at locations determined by Tobin Consulting Engineers. Where the depth of peat was greater than 1.00m in depth, additional peat probes were carried out to determine the extent of the peat deposits. The peat probe logs are provided in Appendix 4 of this Report.

3.5. Rotary Boreholes

The rotary coring was carried out by a track mounted T44 Beretta rig at the locations shown on the location plan in Appendix 1. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring.

The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the “overshoot” recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or

water flush is passed from the surface through hollow drill rods to the drill bit and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 5 of this Report.

3.6. Surveying

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

3.7. Groundwater Monitoring Installations

Groundwater Monitoring Installation were installed upon the completion of the boreholes to enable sampling and the determination of the equilibrium groundwater level. The typical groundwater monitoring installation consists of a 50mm uPVC/HDPE slotted pipe with a pea gravel response zone and bentonite seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report.

3.8. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.
Geotechnical testing consisting of moisture content, Atterberg limits, Particle Size Distribution (PSD), and particle density are being carried out in NMTL’s Geotechnical Laboratory in Carlow.
The results of the laboratory testing will be included in Appendix 6 of this Report.

4.0 Ground Conditions

4.1. General

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

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

- Topsoil
- Made Ground
- Peat Deposits
- Cohesive Deposits
- Weathered Bedrock
- Bedrock

TOPSOIL: Topsoil was encountered in the Trial Pit and Borehole locations and was present to a maximum depth of 0.30m BGL.

PEAT: Peat was encountered from the surface of the majority of exploratory hole locations. Surface Peat deposits were generally described as *Spongy dark brown PEAT* and was present to a maximum depth of 0.20m BGL. At location GA10 Peat deposits were encountered to 1.00m BGL and were described as *dark brown slightly sandy clayey PEAT*. The maximum depth of PEAT encountered from the peat probes was between 0.68m BGL at brash line 3 to 4.50m BGL at brash line 1 at the north of the site.

MADE GROUND: Made Ground deposits were encountered beneath the Topsoil at location TP09 and was present to a depth of 0.60m BGL. These deposits were described generally as *Blueish grey slightly gravelly silty Clay with fragments of glass and fabric*

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Peat/Made Ground and were described typically as *dark brown* or *brown mottled grey slightly sandy slightly gravelly silty CLAY with low cobbles and boulders* content overlying a *dark grey* or *blueish grey slightly sandy gravelly CLAY with medium cobbles and boulders content*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the cohesive matrix. The strength of the cohesive deposits typically increased with depth and was firm becoming firm to stiff below with depth. These deposits had low (<5%), medium (5%-20%) or high (20%-50%) cobble and boulder content, where noted on the exploratory hole logs.

WEATHERED BEDROCK: At location of BH02 weathered bedrock was encountered at a depth of 2.30m BGL. This material was recovered typically as angular gravel to boulder sized fragments of SANDSTONE.

BEDROCK: At location BH01 the rotary core recovered *Strong to Medium strong dark gey thinly to thickly laminated to thicky bedded fine to medium grain SANDSTONE distinctly weathered* with some residual soil recovered. There is also a 30-50mm Clay infilled fracture running vertically through the core. At location BH02 rotary core recovered *Very strong grey fine to coarse grain thickly bedded SANDSTONE distinctly weathered interbedded with dark grey fine grained thinly bedded SILTSTONE moderately weathered* with some pyrite mineralisation. This is typical of the Meenymore Formation, which is noted on the geological mapping of the the proposed site.

The depth to rock varies from 6.10m BGL at location BH02 and to a maximum of 9.80m BGL at location BH01. The total core recovery is good, typically 100% with some of the uppermost runs dropping to 93% or 40%. The SCR and RQD both are relatively poor in the upper weathered zone, often recovered as non-intact, however both indices show an increase with depth in each of the boreholes.

4.2. Groundwater

No groundwater was noted during the investigation however we would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the time of year, rainfall, nearby construction and other factors. For this reason, a standpipe was installed in BH01 to allow the equilibrium groundwater level to be determined. The groundwater monitoring is included in Appendix 7of this Report.

4.3. Laboratory Testing

4.3.1. Geotechnical Laboratory Testing

The geotechnical testing carried out on soil samples recovered generally confirm the descriptions on the logs with the primary constituent of the cohesive deposits found to be a CLAY with intermediate plasticity. The Particle Size Distribution tests confirm that generally the cohesive deposits are well-graded/gap-graded with percentages of sands and gravels ranging between 22.10% and 70.80% generally with fines contents of 22.9% to 69%.

The results from the completed laboratory testing will be included in Appendix 6 of this report.

5.0 Recommendations & Conclusions

5.1. General

The recommendations given and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes. Limited information has been provided at the ground investigation stage and any designs based on the recommendations or conclusions should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory hole logs.

5.2. Excavations

Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry.

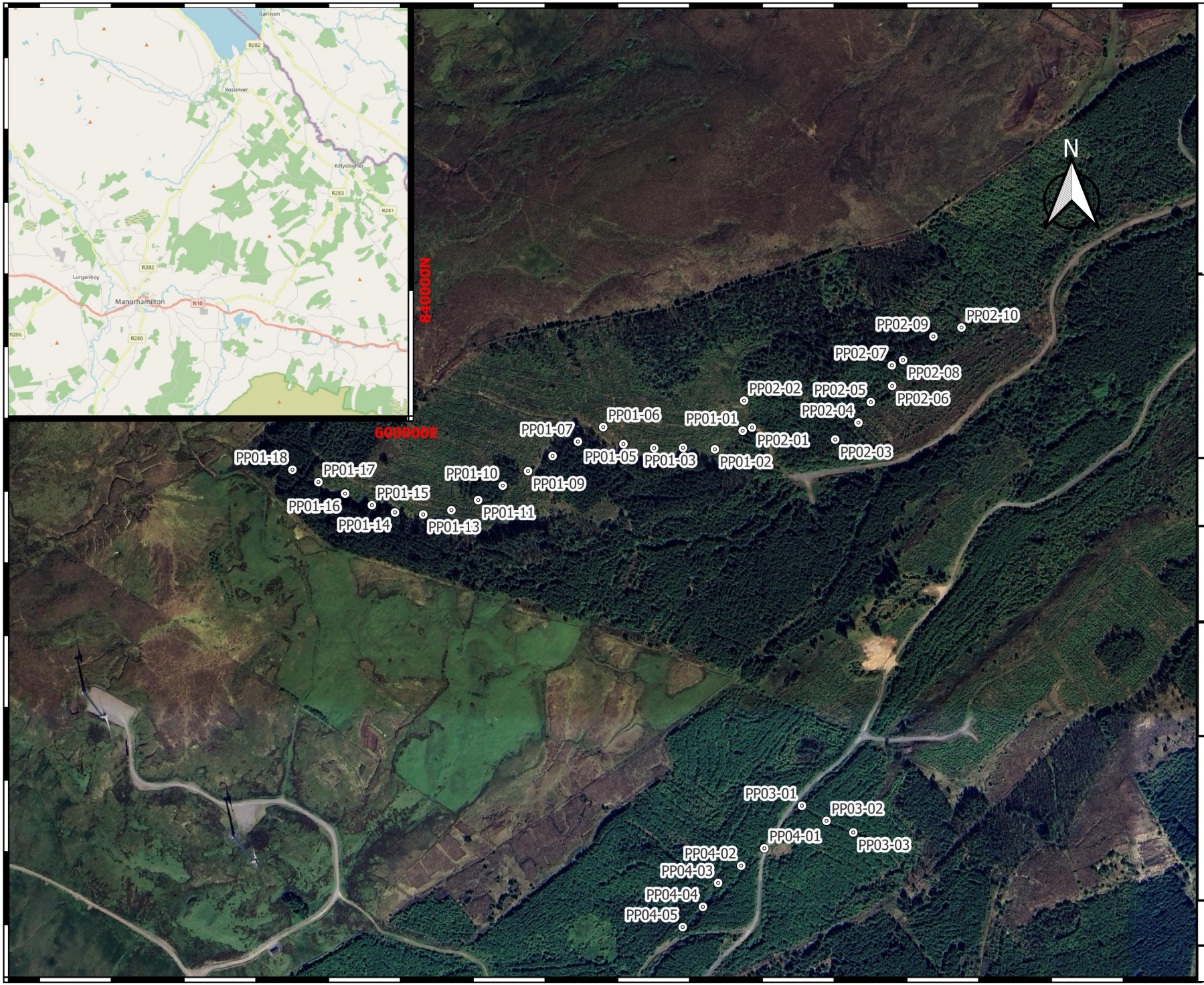
At the location of BH02 the weathered bedrock zone between 2.30m to 6.10m BGL may provide enough material to operate as a barrow pit. There is however potential for variation of this material within the vicinity of the borehole, and we would further recommend carrying out additional trial pits to determine the full extent and depth of this structure.
At the location of BH01 the bedrock is too deep to make it an economically viable option.

Excavations in the Made Ground, Peat or soft Cohesive Deposits will require to be appropriately battered or the sides supported due to the low strength of these deposits.
Any excavations which penetrate the granular deposits will require to be appropriately battered or the sides supported and are likely to require dewatering due to the groundwater seepages noted in the exploratory hole logs in the Appendices of this Report.
The groundwater and stability noted on the trial pit logs should be consulted when determining the most appropriate construction methods for excavations.

Any waste material to be removed off site should be disposed of to a suitably licenced landfill.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

APPENDIX 1 - Site Location Plan



Trial Pits

Gouge Auger

Boreholes

Peat Probes

Client:

TOBIN

Project Code:
15017-09-25

Project Title:
Lissinagroagh Wind Farm

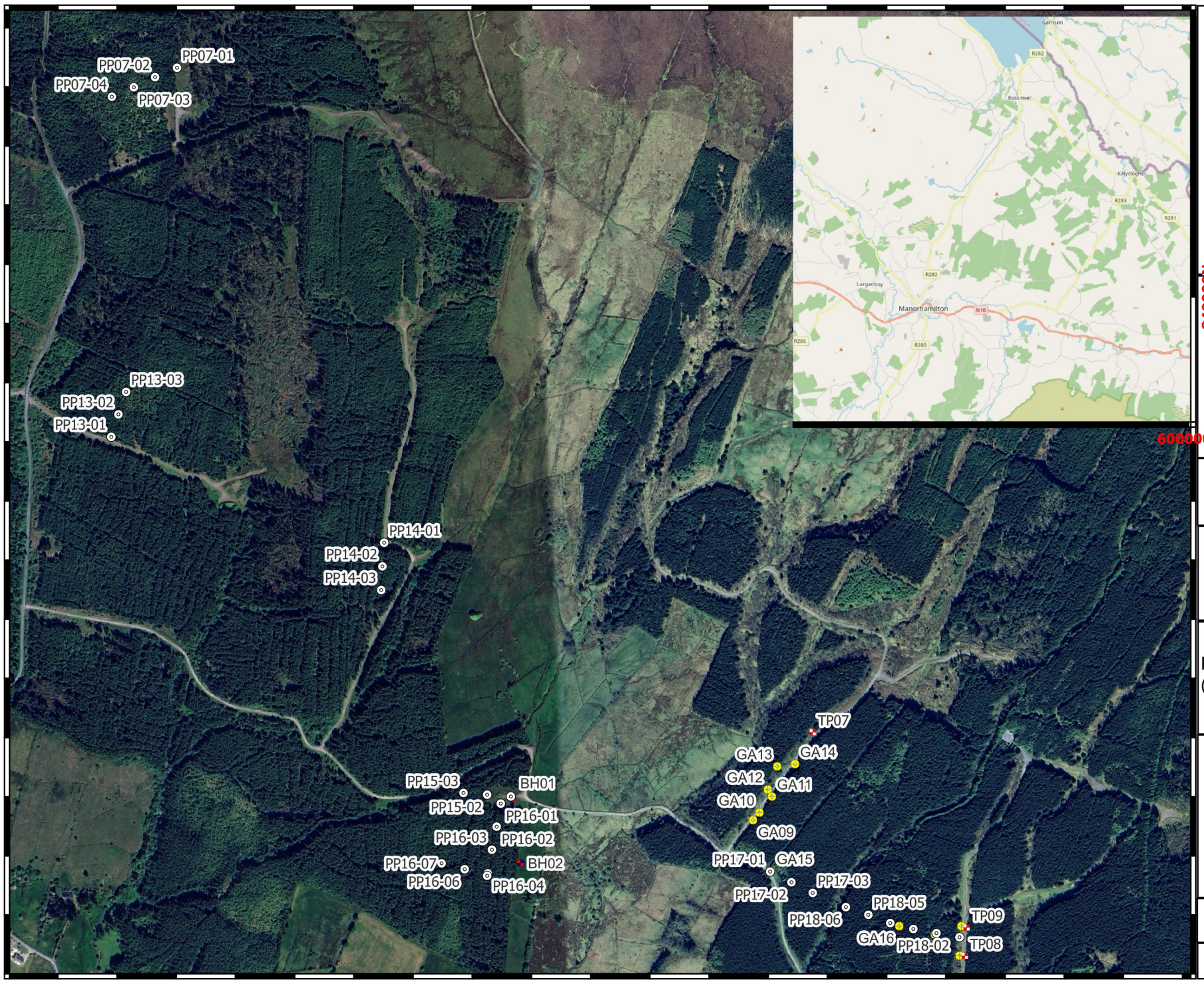
Drawing Title:
Figure 1 Site Location (North)

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

0 100 200 300 m

Drawn By: RON

Date: 12-12-2025



Trial Pits

Gouge Auger

Boreholes

Peat Probes

Client:

TOBIN

Project Code:
15017-09-25

Project Title:
Lissinagroagh Wind Farm

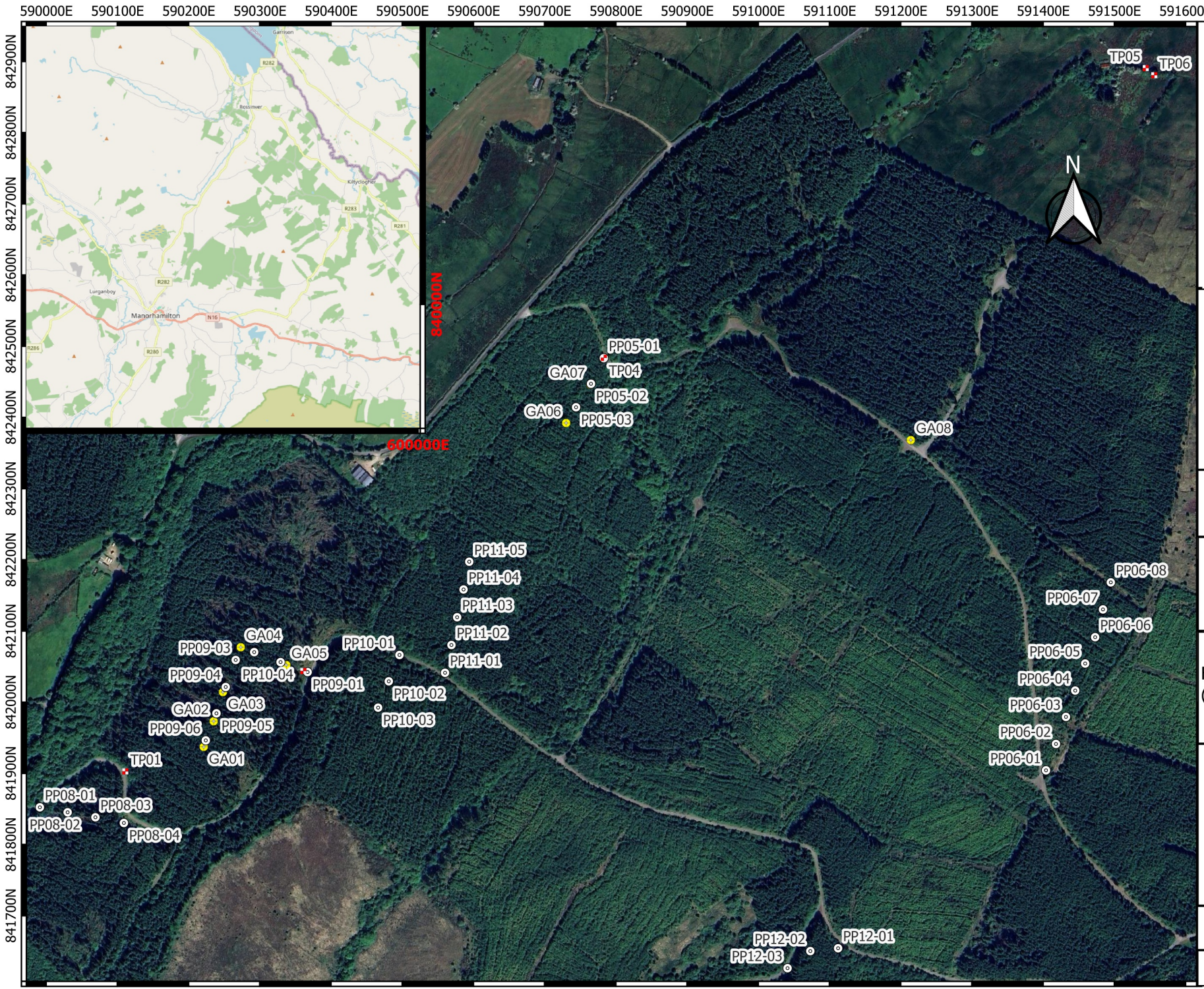
Drawing Title:
Figure 1 Site Location (South-East)

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

0 100 200 300 m

Drawn By: RON

Date: 12-12-2025



- Trial Pits
- Gouge Auger
- Boreholes
- Peat Probes

Client:

TOBIN

Project Code:
15017-09-25

Project Title:
Lissinagroagh Wind Farm

Drawing Title:
Figure 1 Site Location (South-West)

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

0 100 200 300 m

Drawn By: RON

Date: 12-12-2025

APPENDIX 2 – Trial Pit Records

www.gii.ie

Trial Pit Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 20/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E590133.00 N841906.00
Project No. : 15017-09-25	Crew Name: Tom Cull	Equipment: 8T Tracked Excavator

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP01	TP		MD	1:25	Sheet 1 of 1

Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
Depth (m)	Type	Results				
0.00	HV	HVP=42 kPa				Dark brown slightly gravelly clayey PEAT with grass and rootlets. Gravel is subangular to subrounded fine to coarse.
			0.20			Firm dark brown slightly sandy slightly gravelly peaty silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.
0.50	B		0.50			Stiff grey mottled brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.
0.50	HV	HVP=82 kPa				
			1.30			Firm to stiff grey mottled brown slightly sandy gravelly silty CLAY with low subangular to subrounded content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.
1.50	B					
						OBSTRUCTION at due to rock or boulder
			2.80			

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Dimensions		Trench Support and Comment		Termination	
Pit Length	Pit Width	Pit Stability	Shoring Used	Termination Reason	
2.30	0.90	Stable		Obstruction	

Remarks

No groundwater encountered. Trial pit backfilled upon completion.

Trial Pit Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 20/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E590374.00 N842041.60
Project No. : 15017-09-25	Crew Name: Tom Cull	Equipment: 8T Tracked Excavator

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP03	TP		MD	1:25	Sheet 1 of 1

Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.10			TOPSOIL: Dark brown slightly sandy slightly gravelly Clay with grass and rootlets.
0.50	B					Stiff greyish brown slightly sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.
0.50	HV	HVP=84 kPa				
			0.80			Firm to stiff dark greyish brown slightly sandy gravelly slightly silty CLAY with medium subrounded to rounded cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.
1.00	B					
			1.70			Stiff dark grey slightly sandy very gravelly CLAY with medium subrounded to rounded cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.
2.00	B					
			2.50			*OBSTRUCTION at due to rock or boulder*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Dimensions		Trench Support and Comment		Termination	
Pit Length	Pit Width	Pit Stability	Shoring Used	Termination Reason	
2.40	0.90	Stable		Obstruction	

Remarks

No groundwater encountered. Pit backfilled upon completion.

Trial Pit Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 21/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E590857.00 N842512.00
Project No. : 15017-09-25	Crew Name: Tom Cull	Equipment: 8T Tracked Excavator

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP04	TP		RON	1:25	Sheet 1 of 1

Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
Depth (m)	Type	Results				
0.00	HV	HVP=30 kPa				TOPSOIL: Dark brown slightly sandy slightly gravelly Clay with grass and rootlets.
			0.30			Soft light brown mottled orange slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.
0.50	B					
0.50	HV	HVP=32 kPa				
			0.80			Soft to firm light grey slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.
			1.00			Firm to stiff dark grey slightly sandy gravelly silty CLAY with medium subangular to subrounded cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.
1.50	B					
			2.50			*OBSTRUCTION at due to rock or boulder*

Dimensions		Trench Support and Comment		Termination	
Pit Length	Pit Width	Pit Stability	Shoring Used	Termination Reason	
2.40	0.90	Stable		Obstruction	

Remarks

No groundwater encountered. Pit backfilled upon completion.

Trial Pit Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 21/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E591467.00 N842872.00
Project No. : 15017-09-25	Crew Name: Tom Cull	Equipment: 8T Tracked Excavator

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP05	TP		RON	1:25	Sheet 1 of 1

Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
Depth (m)	Type	Results				
0.00	HV	HVP=30 kPa				TOPSOIL: Dark brown slightly sandy slightly gravelly Clay with grass and rootlets.
			0.20			Soft orangish brown sandy slightly gravelly silty CLAY with low subrounded to rounded cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.
0.50	B					
0.50	HV	HVP=36 kPa				
			0.70			Soft to firm brown mottled grey slightly sandy gravelly CLAY with low subrounded to rounded cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.
1.00	B		1.00			Firm grey slightly sandy gravelly CLAY with medium subangular to subrounded cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.
			2.00			*OBSTRUCTION at due to rock or boulder*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Dimensions		Trench Support and Comment		Termination	
Pit Length	Pit Width	Pit Stability	Shoring Used	Termination Reason	
2.40	0.90	Stable		Obstruction	

Remarks

No groundwater encountered. Pit backfilled upon completion.

Trial Pit Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 21/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E591654.00 N842858.00
Project No. : 15017-09-25	Crew Name: Tom Cull	Equipment: 8T Tracked Excavator

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP06	TP		RON	1:25	Sheet 1 of 1

Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
Depth (m)	Type	Results				
0.00	HV	HVP=26 kPa				TOPSOIL: Dark brown slightly sandy slightly gravelly Clay with grass and rootlets.
			0.20			Soft orangish brown sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.
0.50	HV	HVP=34 kPa				
			0.70			Firm grey slightly sandy gravelly CLAY with medium subangular to subrounded cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.
			1.30			*OBSTRUCTION at due to rock or boulder*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Dimensions		Trench Support and Comment		Termination	
Pit Length	Pit Width	Pit Stability	Shoring Used	Termination Reason	
2.10	0.90	Stable		Obstruction	

Remarks

No groundwater encountered. Pit backfilled upon completion.

Trial Pit Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 20/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E593296.60 N841200.00
Project No. : 15017-09-25	Crew Name: Tom Cull	Equipment: 8T Tracked Excavator

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP07	TP		MD	1:25	Sheet 1 of 1

Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
Depth (m)	Type	Results				
0.00	HV	HVP=42 kPa				Dark brown slightly gravelly PEAT with grass and rootlets. Gravel is subangular to subrounded fine to medium.
			0.30			
0.50	B					Stiff dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.
0.50	HV	HVP=78 kPa				
			1.00			
						Firm blueish grey slightly sandy slightly gravelly silty CLAY with medium subangular to subrounded cobble content. Sand fine to coarse. Gravel subangular to subrounded fine to coarse.
1.50	B					
			1.90			
						Firm to stiff dark blueish grey slightly sandy gravelly CLAY with low subrounded to rounded cobble content. Gravel is subangular to subrounded fine to coarse.
						OBSTRUCTION at due to rock or boulder
			3.20			

Dimensions		Trench Support and Comment		Termination	
Pit Length	Pit Width	Pit Stability	Shoring Used	Termination Reason	
2.90	0.90	Stable		Obstruction	

Remarks

No groundwater encountered. Pit backfilled upon completion.

Trial Pit Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 20/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E593552.00 N840829.00
Project No. : 15017-09-25	Crew Name: Tom Cull	Equipment: 8T Tracked Excavator

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP08	TP		MD	1:25	Sheet 1 of 1

Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
Depth (m)	Type	Results				
0.00	HV	HVP=22 kPa	0.10			Dark brown Slightly sandy clayey PEAT. Sand is fine to coarse.
						Firm grey slightly sandy slightly gravelly silty CLAY with low subrounded to rounded cobble content. Sand is fine to coarse. Gravel is subrounded to rounded fine to coarse.
0.50	B					
0.50	HV	HVP=58 kPa	0.70			Firm to stiff blueish grey slightly sandy gravelly silty CLAY with low subrounded to rounded cobble content. Sand is fine to coarse. Gravel is subrounded to rounded fine to coarse.
1.00	B					
			2.70			*OBSTRUCTION at due to rock or boulder*

Dimensions		Trench Support and Comment		Termination	
Pit Length	Pit Width	Pit Stability	Shoring Used	Termination Reason	
2.50	0.90	Stable		Obstruction	

Remarks

No groundwater encountered. Pit backfilled upon completion.

Trial Pit Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 20/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E593561.00 N840875.50
Project No. : 15017-09-25	Crew Name: Tom Cull	Equipment: 8T Tracked Excavator

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP09	TP		MD	1:25	Sheet 1 of 1

Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	HV	HVP=18 kPa	0.20			Dark brown Slightly sandy clayey PEAT with rootlets. Sand is fine to coarse.
0.50	B		0.60			MADEGROUND: Firm blueish grey slightly gravelly silty CLAY with medium glass and fabric content.. Gravel is subangular to subrounded fine to coarse.
0.50	HV	HVP=62 kPa				
			1.50			Firm blueish grey medium brown slightly sandy slightly gravelly silty CLAY with low subrounded to rounded cobble content. Sand is fine to coarse. Gravel is fine to coarse.
2.00	B					Stiff blueish grey medium brown slightly sandy slightly gravelly silty CLAY with low subrounded to rounded cobble content. Sand is fine to coarse. Gravel is fine to coarse.
			2.40			*OBSTRUCTION at due to rock or boulder*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Dimensions		Trench Support and Comment		Termination	
Pit Length	Pit Width	Pit Stability	Shoring Used	Termination Reason	
2.50	0.90	Stable		Obstruction	

Remarks

No groundwater encountered. Pit backfilled upon completion.



TP01



TP01



TP01



TP03



TP03



TP03



TP04



TP04



TP04



TP05



TP05



TP05



TP06



TP06



TP06



TP07



TP07



TP07



TP08



TP08



TP08



TP09



TP09



TP09

APPENDIX 3 – Hang Auger Records

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E590273.00 N842077.00
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment: Gouge Auger

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA04	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	D			HVP=18 kPa			Spongy dark brown PEAT.		
0.00	HV					0.10			
0.30	D						Firm grey mottled brown slightly sandy slightly gravelly silty CLAY with woody rootlets. Gravel is angular to subangular fine to medium. Sand is fine to coarse.		
0.50	HV			HVP=41 kPa		0.70			
						1			
						2			
						3			
						4			
						5			

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E590337.00 N842052.00
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment: Gouge Auger

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA05	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	D			HVP=20 kPa			Spongy brown fibrous PEAT.		
0.00	HV					0.10	Firm grey mottled brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to subangular fine to medium. Sand is fine to coarse.		
0.50	HV			HVP=41 kPa		0.75			
						1			
						2			
						3			
						4			
						5			

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E590730.00 N842392.00
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment: Gouge Auger

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA06	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	D					0.10	Spongy dark brown fibrous PEAT. Organic.		
							Soft grey mottled brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to subangular fine to medium. Sand is fine to coarse.		
						0.90			
						1			
						2			
						3			
						4			
						5			

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E590764.00 N842446.00
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment: Gouge Auger

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA07	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	D					0.10	Spongy dark brown fibrous PEAT.		
							Soft grey mottled brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular to angular fine to medium. Sand is fine to coarse.		
						0.90			
						1			
						2			
						3			
						4			
						5			

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E591281.10 N842363.10
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment: Gouge Auger

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA08	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	D			HVP=25 kPa			Spongy brown fibrous PEAT.		
0.00	HV					0.15			
							Firm dark brown slightly sandy clayey PEAT. Sand is fine to coarse.		
						0.40			
0.50	HV			HVP=39 kPa			Firm grey mottled brown slightly sandy peaty silty CLAY. Sand is fine to coarse.		
						1 1.00			
						2			
						3			
						4			
						5			

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E593162.50 N841059.50
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment: Gouge Auger

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA09	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	D			HVP=39 kPa			Spongy brown fibrous PEAT.		
0.00	HV					0.10			
						0.20	Firm dark brownish grey slightly sandy clayey PEAT. Sand is fine to coarse		
0.30	D						Stiff grey mottled brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to subangular fine to coarse. Sand is fine to coarse.		
0.50	HV			HVP=90 kPa		0.50			
						1			
						2			
						3			
						4			
						5			

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E593208.10 N841068.80
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA10	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	D			HVP=60 kPa		0.10	Spongy brown fibrous PEAT.		
0.00	HV						Firm dark brown slightly sandy clayey PEAT. Sand is fine to coarse.		
1.00	D					1.00			
1.20	HV			HVP=82 kPa		1.20	Stiff grey mottled brown slightly sandy slightly gravelly silty CLAY Gravel is angular to subangular fine to medium. Sand is fine to coarse.		

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E593227.80 N841098.30
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment: Gouge Auger

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA11	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	D			HVP=29 kPa		0.10	Spongy dark brown fibrous PEAT.		
0.00	HV						Stiff grey mottled brown slightly sandy slightly gravelly silty CLAY Gravel is angular to subangular fine to medium. Sand is fine to coarse.		
0.30	HV			HVP=79 kPa		0.30			
						1			
						2			
						3			
						4			
						5			

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E593187.40 N841113.00
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment: Gouge Auger

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA12	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	D			HVP=19 kPa		0.10	Spongy dark brown fibrous PEAT.		
0.00	HV						Soft dark brown slightly sandy clayey fibrous PEAT. Sand is fine to coarse.		
						0.50	Firm grey mottled brown slightly sandy silty CLAY. Sand is fine to coarse.		
						1 1.00	Firm grey mottlled brown slightly sandy slightly gravelly silty CLAY Gravel is angular to subangular fine to coarse. Sand is fine to coarse.		
1.20	HV			HVP=65 kPa		1.20			
						2			
						3			
						4			
						5			

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E593193.60 N841149.70
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment: Gouge Auger

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA13	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)	Stratum Description	Legend	Well
Depth (m)	Type			Results				
0.00	D			HVP=41 kPa		Spongy dark brown fibrous PEAT.		
0.00	HV							
					0.15	Firm dark brown slightly sandy clayey PEAT. Very organic.		
0.50	D							
					0.50	Stiff grey mottled brown slightly sandy slightly gravelly silty CLAY Gravel is angular to subangular fine to coarse. Sand is fine to coarse.		
0.80	HV			HVP=89 kPa				
					1			
					1.20			
					2			
					3			
					4			
					5			

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E593193.60 N841150.00
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment: Gouge Auger

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA14	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	D			HVP=93 kPa			Spongy dark brown PEAT.		
0.00	HV					0.15	Stiff grey mottled brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to subangular fine to coarse. Sand is fine to coarse.		
						0.30			
						1			
						2			
						3			
						4			
						5			

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E593205.00 N840974.00
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment: Gouge Auger

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA15	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	D			HVP=58 kPa		0.10	Spongy brown fibrous PEAT.		
0.00	HV						Soft to firm dark brown to grey slightly sandy CLAY. Sand is fine to coarse.		
						0.30	Firm dark brown to grey slightly sandy peaty silty CLAY. Sand is fine to coarse.		
0.50	D					0.50	Stiff grey mottled brown slightly sandy gravelly silty CLAY Gravel is angular to subangular fine to coarse. Sand is fine to coarse.		
0.70	HV			HVP=96 kPa					
						1			
						1.20			
						2			
						3			
						4			
						5			

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E593421.00 N840881.00
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment: Gouge Auger

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA16	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	HV			HVP=29 kPa		0.10	Spongy brown fibrous PEAT.		
							Soft to firm grey mottled brown slightly sandy clayey PEAT. Sand is fine to coarse.		
0.50	HV			HVP=34 kPa		0.50			
						1			
						2			
						3			
						4			
						5			

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E593481.00 N840867.00
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA17	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	D			HVP=18 kPa		0.15	Spongy dark brown fibrous PEAT.		
0.00	HV						Stiff dark brown clayey PEAT.		
0.50	HV			HVP=80 kPa		0.70	Firm to stiff grey mottled brown slightly sandy silty CLAY Sand is fine to coarse.		
						1.80			
						1			
						2			
						3			
						4			
						5			

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E593549.00 N840837.00
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA18	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	D			HVP=62 kPa		0.05	Spongy brown fibrous PEAT.		
0.00	HV					0.20	Firm to stiff brown sandy slightly gravelly CLAY with a low angular to subangular cobble content. Gravel is subangular to subrounded fine to coarse. Sand is fine to coarse.		
						1			
						2			
						3			
						4			
						5			

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E593523.00 N840862.00
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA19	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	D			HVP=29 kPa		0.10	Spongy brown fibrous PEAT.		
0.00	HV						Firm grey mottled brown slightly sandy gravelly silty CLAY. Gravel is angular to subangular fine to coarse. Sand is fine to coarse.		
0.30	HV			HVP=55 kPa		0.30			
						1			
						2			
						3			
						4			
						5			

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

Remarks

Obstruction due to gravel

Borehole Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 17/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E593549.00 N840882.60
Project No. : 15017-09-25	Crew Name: MD&RON	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
GA20	WS		MD	1:25	Sheet 1 of 1

Sample Depth and Type		Casing Diameter	Water Strikes	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type			Results					
0.00	D			HVP=28 kPa		0.05	Spongy brown fibrous PEAT.		
0.00	HV						Firm to stiff grey mottled brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to subangular fine to coarse. Sand is fine to coarse.		
0.50	HV			HVP=68 kPa		1.30			

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

Remarks

Obstruction due to gravel

GOUGE AUGER PHOTOS LISSINAGROAGH WIND FARM



GA04



GA05

GOUGE AUGER PHOTOS LISSINAGROAGH WIND FARM



GA06



GA07

GOUGE AUGER PHOTOS LISSINAGROAGH WIND FARM



GA08

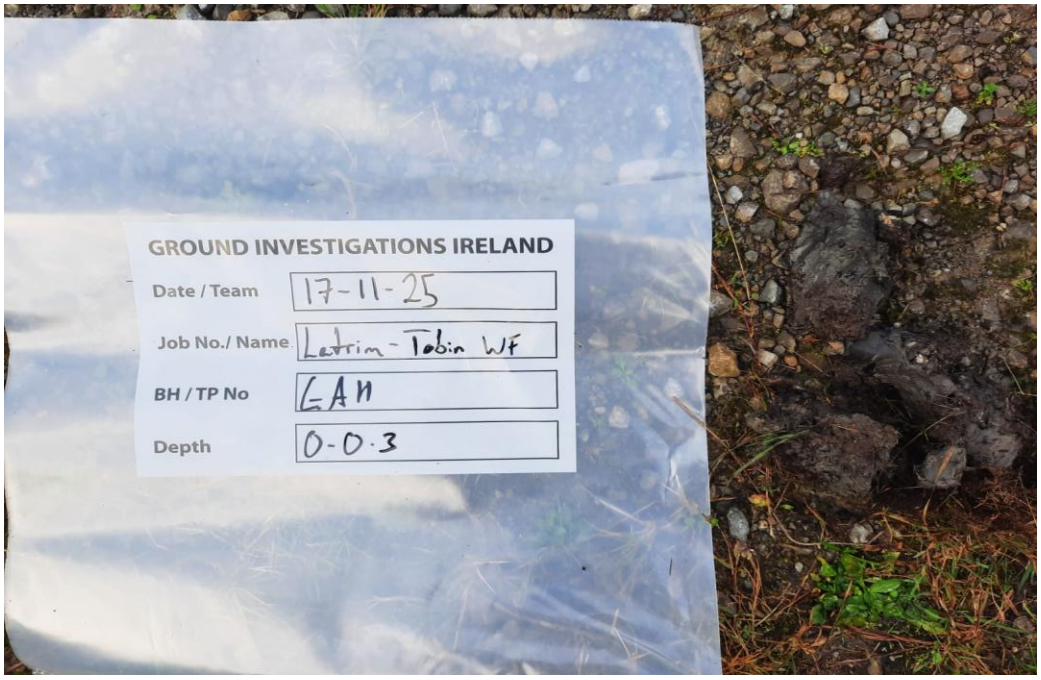


GA09

GOUGE AUGER PHOTOS LISSINAGROAGH WIND FARM



GA10

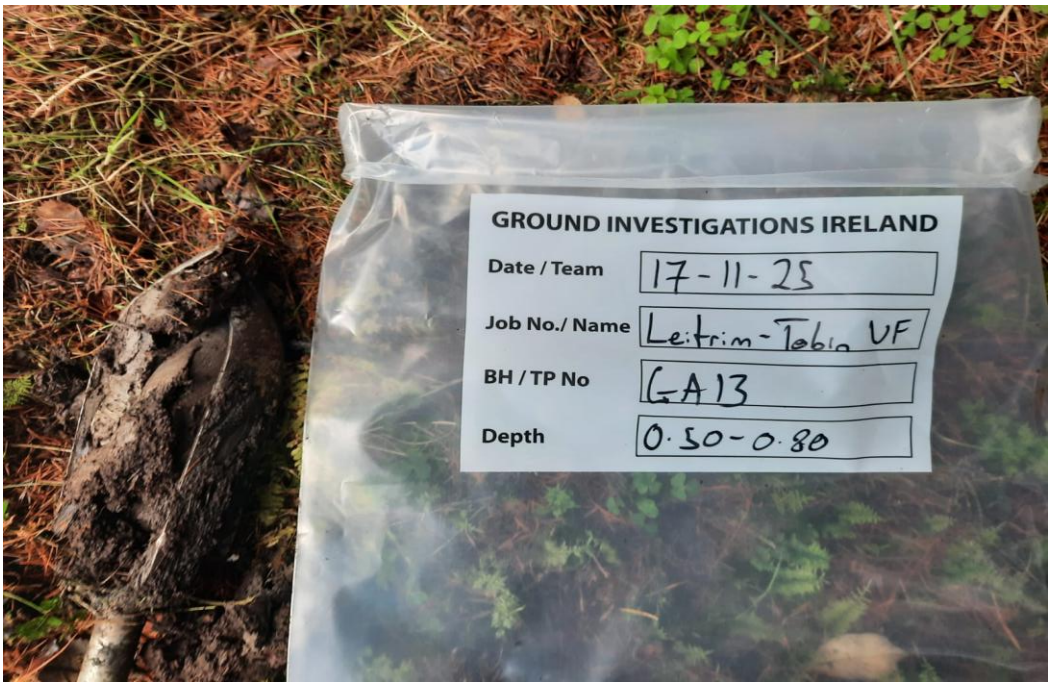


GA11

GOUGE AUGER PHOTOS LISSINAGROAGH WIND FARM



GA12

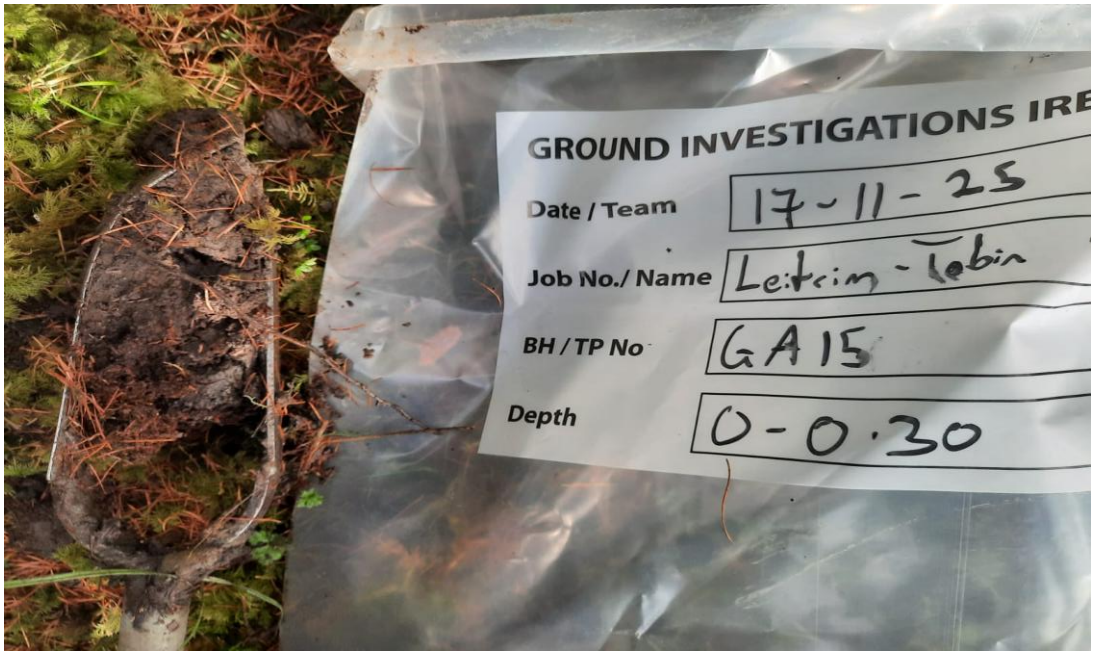


GA13

GOUGE AUGER PHOTOS LISSINAGROAGH WIND FARM



GA14



GA15

GOUGE AUGER PHOTOS LISSINAGROAGH WIND FARM



GA17



GA18

GOUGE AUGER PHOTOS LISSINAGROAGH WIND FARM



GA19



GA20

APPENDIX 4 – Peat Probe Records

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
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Newcastle,
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Peat Probes

Lissinagroagh Wind Farm - Tobin

Peat Probe No.	Depth of Peat Probe (m BGL)	Easting	Northing	No. Attempts	Date
PP01-01	0.30	592273	844183	5	13/11/2025
PP01-02	0.28	592234	844188	4	13/11/2025
PP01-03	0.24	592194	844194	5	13/11/2025
PP01-04	0.82	592154	844199	3	13/11/2025
PP01-05	0.90	592115	844205	2	13/11/2025
PP01-06	0.67	592080	844188	2	13/11/2025
PP01-07	4.50	592045	844168	3	13/11/2025
PP01-08	2.76	592010	844148	3	13/11/2025
PP01-09	2.66	591976	844127	3	13/11/2025
PP01-10	1.02	591941	844107	3	13/11/2025
PP01-11	1.56	591907	844087	3	13/11/2025
PP01-12	1.44	591870	844073	3	13/11/2025
PP01-13	1.39	591831	844067	3	13/11/2025
PP01-14	2.41	591792	844070	3	13/11/2025
PP01-15	2.41	591760	844080	3	13/11/2025
PP01-16	2.70	591723	844096	3	13/11/2025
PP01-17	2.48	591686	844112	3	13/11/2025
PP01-18	2.30	591650	844129	3	13/11/2025
PP02-01	0.10	592286	844186	3	13/11/2025
PP02-02	0.97	592275	844224	3	13/11/2025
PP02-03	0.76	592311	844238	3	13/11/2025
PP02-04	1.74	592349	844251	3	13/11/2025
PP02-05	3.33	592387	844263	3	13/11/2025
PP02-06	1.09	592425	844276	3	13/11/2025
PP02-07	2.76	592463	844289	3	13/11/2025
PP02-08	0.78	592501	844302	3	13/11/2025
PP02-09	0.31	592538	844314	4	13/11/2025
PP02-10	0.52	592576	844327	3	13/11/2025
PP03-01	0.53	592355	843664	4	13/11/2025
PP03-02	0.68	592389	843643	3	13/11/2025
PP03-03	0.43	592426	843627	3	13/11/2025
PP04-01	0.10	592303	843605	4	13/11/2025
PP04-02	0.64	592271	843581	3	13/11/2025
PP04-03	0.32	592239	843557	3	13/11/2025
PP04-04	0.54	592218	843524	3	13/11/2025
PP04-05	0.92	592190	843496	3	13/11/2025
PP05-01	0.92	590783	842483	3	13/11/2025
PP05-02	1.02	590765	842447	3	13/11/2025
PP05-03	0.19	590744	842414	3	13/11/2025
PP06-01	0.19	591404	841904	3	13/11/2025
PP06-02	1.17	591418	841941	3	13/11/2025
PP06-03	0.96	591432	841979	3	13/11/2025
PP06-04	1.02	591445	842016	3	13/11/2025
PP06-05	1.10	591459	842054	3	13/11/2025
PP06-06	0.34	591473	842091	5	13/11/2025
PP06-07	1.12	591484	842130	3	13/11/2025
PP06-08	0.76	591495	842168	4	13/11/2025
PP07-01	0.68	592201	842332	3	13/11/2025
PP07-02	1.40	592164	842316	6	13/11/2025
PP07-03	1.90	592128	842299	3	13/11/2025
PP07-04	2.80	592091	842283	3	13/11/2025
PP08-01	0.35	589991	841852	5	13/11/2025
PP08-02	1.04	590030	841845	3	13/11/2025
PP08-03	0.53	590069	841838	3	13/11/2025
PP08-04	0.27	590109	841830	3	13/11/2025
PP09-01	0.50	589991	842042	3	14/11/2025
PP09-02	0.52	590069	842070	3	14/11/2025
PP10-01	0.94	590496	842066	3	13/11/2025
PP10-02	0.82	590481	842029	3	13/11/2025
PP10-03	0.40	590466	841992	4	13/11/2025

PP10-04	0.56	590329	842056	3	13/11/2025
PP11-01	0.75	590560	842041	3	13/11/2025
PP11-02	1.12	590569	842080	2	13/11/2025
PP11-03	0.63	590577	842119	3	13/11/2025
PP11-04	0.90	590586	842158	3	13/11/2025
PP11-05	0.97	590594	842197	3	13/11/2025
PP12-01	1.22	591112	841654	3	13/11/2025
PP12-02	0.60	591073	841650	3	13/11/2025
PP12-03	0.35	591041	841626	5	13/11/2025
PP12-04	0.80	591015	841596	5	13/11/2025
PP12-05	0.72	590993	841562	3	13/11/2025
PP12-06	0.69	590988	841523	4	13/11/2025
PP13-01	0.38	592090	841708	4	14/11/2025
PP13-02	1.17	592102	841746	3	14/11/2025
PP13-03	1.23	592115	841784	3	14/11/2025
PP14-01	0.00	592551	841529	7	14/11/2025
PP14-02	1.11	592548	841489	3	14/11/2025
PP14-03	1.12	592546	841449	3	14/11/2025
PP15-01	0.42	592765	841100	4	14/11/2025
PP15-02	0.52	592725	841103	3	14/11/2025
PP15-03	0.74	592685	841106	3	14/11/2025
PP16-01	0.52	592748	841088	3	14/11/2025
PP16-02	0.61	592741	841049	4	14/11/2025
PP16-03	0.74	592733	841010	3	14/11/2025
PP16-04	0.89	592726	840970	3	14/11/2025
PP16-05	0.34	592725	840966	3	14/11/2025
PP16-06	0.57	592687	840977	3	14/11/2025
PP16-07	0.27	592648	840987	4	14/11/2025
PP17-01	0.94	593203	840973	3	14/11/2025
PP17-02	0.67	593239	840955	3	14/11/2025
PP17-03	1.16	593275	840937	3	14/11/2025
PP18-01	1.09	593523	840862	3	14/11/2025
PP18-02	0.72	593484	840869	3	14/11/2025
PP18-03	0.13	593445	840876	3	14/11/2025
PP18-04	0.38	593406	840886	5	14/11/2025
PP18-05	1.18	593369	840900	3	14/11/2025
PP18-06	0.79	593331	840913	3	14/11/2025

*PP - Peat Probe

APPENDIX 5 - Rotary Borehole Records

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Rotary Core Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 22/10/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E592767.00 N841097.00
Project No. : 15017-09-25	Crew Name: GH&PM	Drilling Equipment: Beretta T47

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH01	RC	223.77m AoD	MD	1:50	Sheet 1 of 2

Sample Depth and Type		Coring			Type / FI	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type	TCR	SCR	RQD		Results					
0.00		4	0	0			223.57	0.20	TOPSOIL Recovery consists of fragments of Gravel and Cobbles and wood. Driller Notes: Cobbles and wood fragments.		
2.30 2.30	SPT	6	0	0		N=11 (1,1/3,2,3,3)	221.47	2.30	Recovery consists of dark grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse. Drillers note Clay (Firm)		
3.80 3.80	SPT	10	0	0		N=13 (3,3/2,2,2,7)					
5.30 5.30	SPT	93	0	0		N=32 (2,3/5,5,9,13)	218.47	5.30	Stiff dark grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse.		
6.80 6.80	SPT	33	0	0		N=34 (3,5/5,9,11,9)	216.97	6.80	Recovery consists of Dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse. Driller Notes: CLay (Stiff)		
8.30 8.30	SPT	60	0	0		N=50 (4,5/50 for 265mm)					
9.80 9.80							213.97	9.80	Strong grey to dark grey thinly to thickly laminated fine to medium grained SANDSTONE with some dark grey clay infills. Distinctly weathered.		

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
12.80	96	12.80	96														

Remarks

No Groundwater encountered.
50mm plain standpipe installed from GL to 9.00m BGL. Slotted standpipe installed from 9m to 12.80m BGL. Backfilled with bentonite seal.

Rotary Core Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 22/10/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E592767.00 N841097.00
Project No. : 15017-09-25	Crew Name: GH&PM	Drilling Equipment: Beretta T47

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH01	RC	223.77m AoD	MD	1:50	Sheet 2 of 2

Sample Depth and Type		Coring			Type / FI	In Situ Testing	Level (m)	Stratum Description	Legend	Well
Depth (m)	Type	TCR	SCR	RQD		Results				
					14		213.32	9.80m to10.45m - Two fracture sets: F1: Close to medium spaced 10-20 degrees, undulating rough frequent orange staining. F2: closely spaced, 70-90 degrees undulating rough. Frequent orange staining.		
10.45					N.I					
10.70		100	93	63			213.07	10.45 10.70 Grey mottled orange residual soil of SANDSTONE.		
					4					
11.30								Medium strong yellowish brown medium to coarse grained thickly bedded SANDSTONE with light brown clay infill at 11.45m. Clay is slightly sandy.		
11.60							212.17	11.60		
		100	43	17	3			Medium strong yellowish brown medium to coarse grained thickly bedded SANDSTONE distinctly weathered with 70-90 degree infilled fracture 30-50mm thick. Infilled with light brown CLAY		
							210.97	12.80 10.70m to 12.80m - Two fracture sets: F1: widely spaced 10-20 degree undulating rough. F2: close to medium spaced 70-90 degree undulating rough with 50mm thick CLAY infill		

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
12.80	96	12.80	96														

Remarks

No Groundwater encountered.
50mm plain standpipe installed from GL to 9.00m BGL. Slotted standpipe installed from 9m to 12.80m BGL. Backfilled with bentonite seal.

Rotary Core Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 22/10/2025 - 22/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E592785.70 N841030.40
Project No. : 15017-09-25	Crew Name: GH&PM	Drilling Equipment: Beretta T47

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH02	RC	218.89m AoD	MD	1:50	Sheet 1 of 2

Sample Depth and Type		Coring			Type / FI	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type	TCR	SCR	RQD		Results					
0.00							218.69	0.20	Spongy Dark brown clayey fibrous PEAT with wooden rootlets.		
									Grey mottled brown slightly sandy CLAY. Sand is fine to coarse.		
							218.19	0.70	Recovery consists of grey slightly sandy gravelly CLAY with medium coble and boulder content		
		39	7	0				1			
								2			
2.30	SPT					N=32 (2,3/5,5,9,13)	216.59	2.30	Weathered Rock recovered as Grey GRAVEL to BOULDER sized fragments of SANDSTONE with some grey brown slightly sandy gravelly CLAY		
2.30		80	40	23				3			
3.80	SPT					50 (3,7/50 for 180mm)					
3.80		73	17	67				4			
								5			
5.30	SPT					50 (8,13/50 for 125mm)					
5.30		93	67	63				6			
6.10					10		212.79	6.10	Very strong grey fine to coarse grained thickly bedded SANDSTONE with rare calcite veins and frequent orange staining. Slightly weathered.		
6.80							212.09	6.80	No Recovery (Possible Cavity)		
6.80		40	30	30	No Rec			7			
7.90							210.99	7.90	Very strong grey fine to coarse grained thickly bedded SANDSTONE with rare calcite veins and frequent orange staining. Slightly weathered.		
8.30		100	57	38	28			8	*6.10m to 10.00m - Three fracture sets. F1: closely spaced 0-10 degrees smooth to undulating. F2: medium to widely spaced 10-30 degrees undulating. F3: widely spaced 80-90 degrees undulating rough.*		
9.80								9			
10.00							208.89	10			

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
12.80	96	12.80	96														

Remarks

No groundwater encountered. Borehole backfilled upon completion.

Rotary Core Log

Project Name: Lissinagroagh Wind Farm	Client: Tobin	Date: 22/10/2025 - 22/11/2025
Location: Co. Leitrim	Contractor: Ground Investigations Ireland	Co-ords: E592785.70 N841030.40
Project No. : 15017-09-25	Crew Name: GH&PM	Drilling Equipment: Beretta T47

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH02	RC	218.89m AoD	MD	1:50	Sheet 2 of 2

Sample Depth and Type		Coring			Type / FI	In Situ Testing	Level (m)		Stratum Description	Legend	Well
Depth (m)	Type	TCR	SCR	RQD		Results					
11.30		100	73	40	13		206.09	10.00	Very strong grey fine to medium grained thinly laminated to thickly bedded SANDSTONE interbedded with dark grey fine grained thinly bedded SILTSTONE. Rock is moderately weathered with rare orange staining and some pyrite.		
		67	43	43				12.80	*10.00m to 12.80m - Three fracture sets. F1: closely spaced 0-10 degrees undulating. F2: medium spaced 30-40. medium spaced undulating F3: medium to widely spaced 80-90 degree undulating rough*		

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
12.80	96	12.80	96														

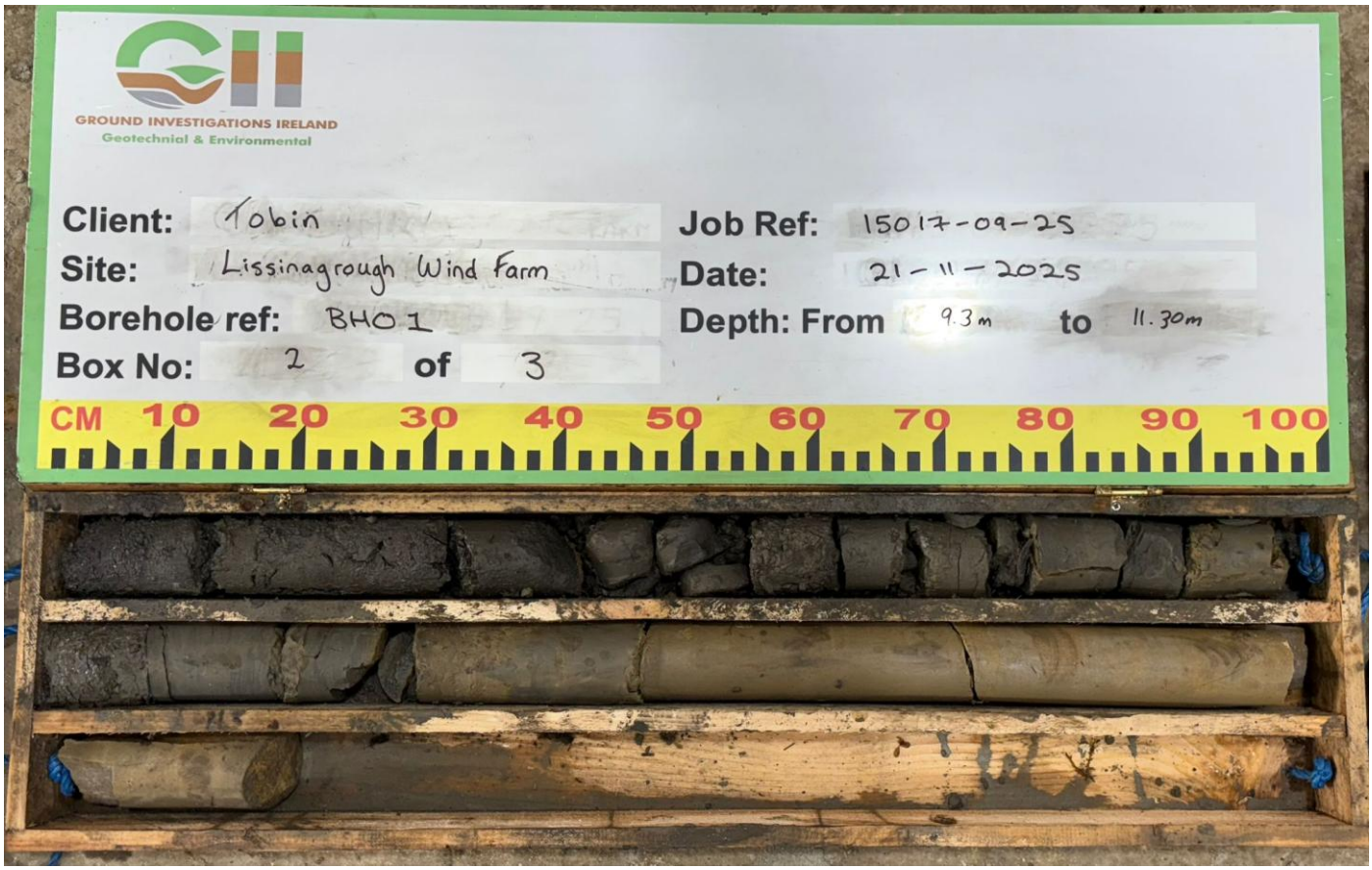
Remarks

No groundwater encountered. Borehole backfilled upon completion.

Lissinagroagh Rotary Core Photographs

BH01





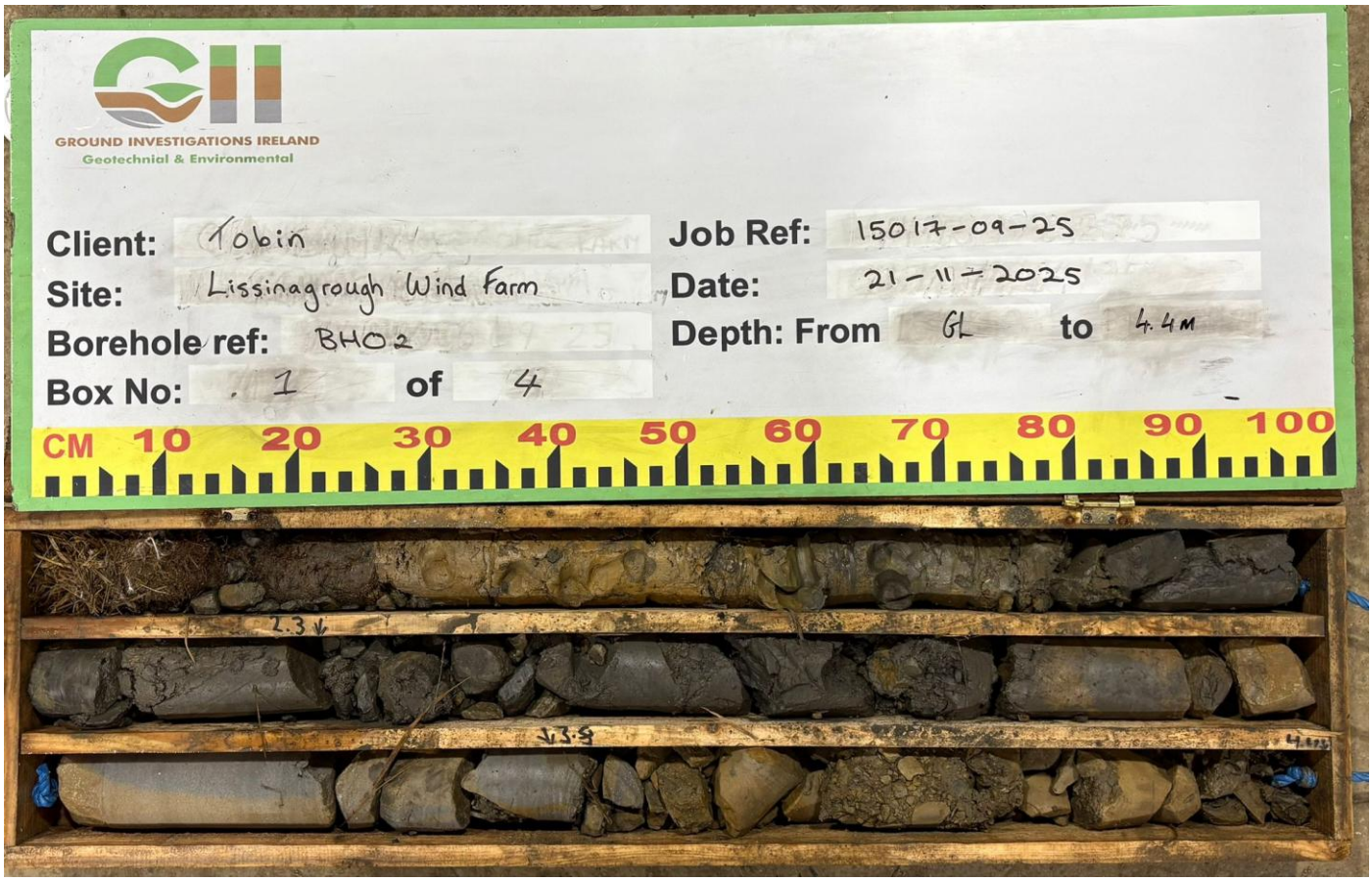
Lissinagroagh Rotary Core Photographs

BH01



Lissinagroagh Rotary Core Photographs

BH02



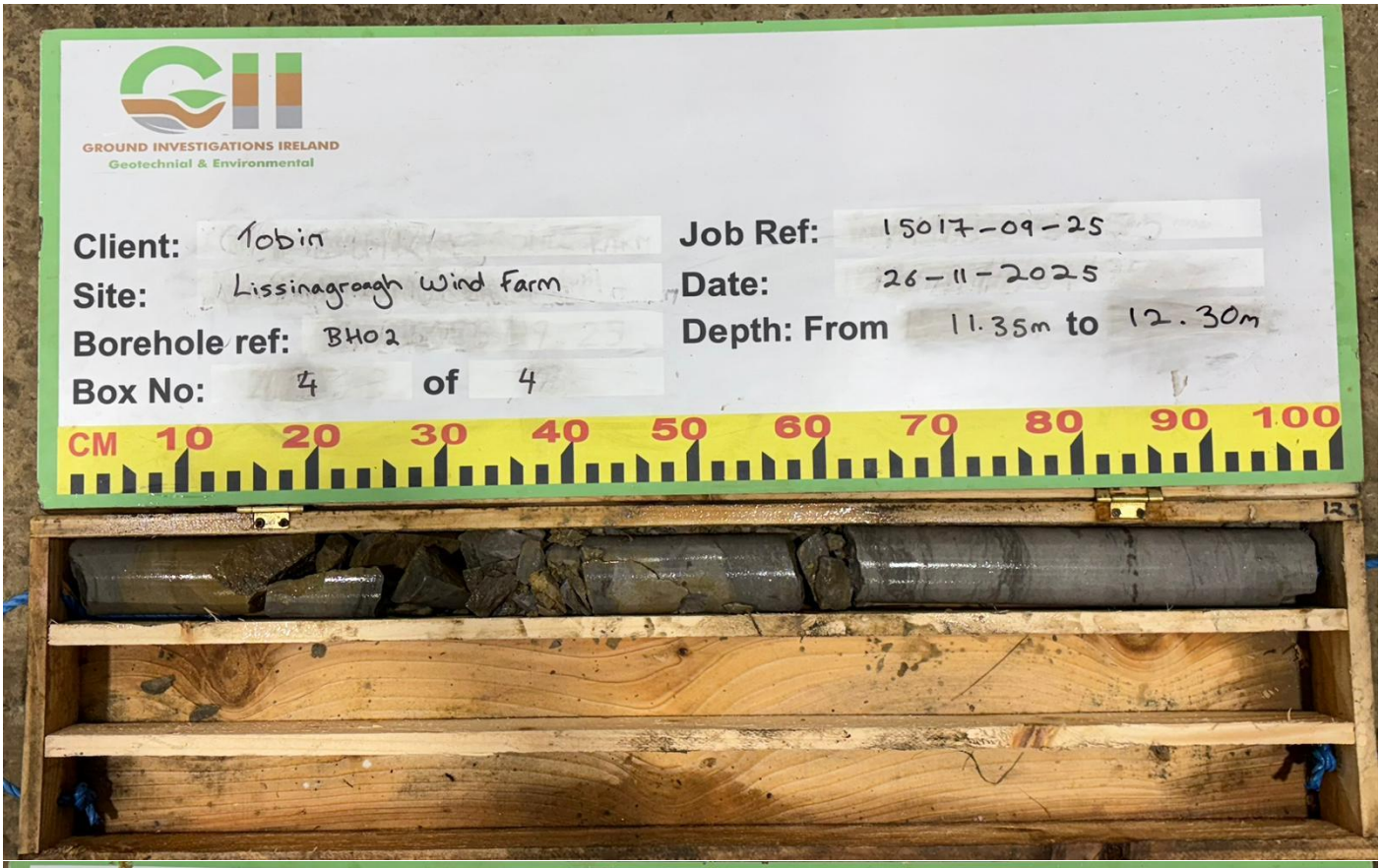


Lissinagroagh Rotary Core Photographs

BH02



Lissinagroagh Rotary Core Photographs





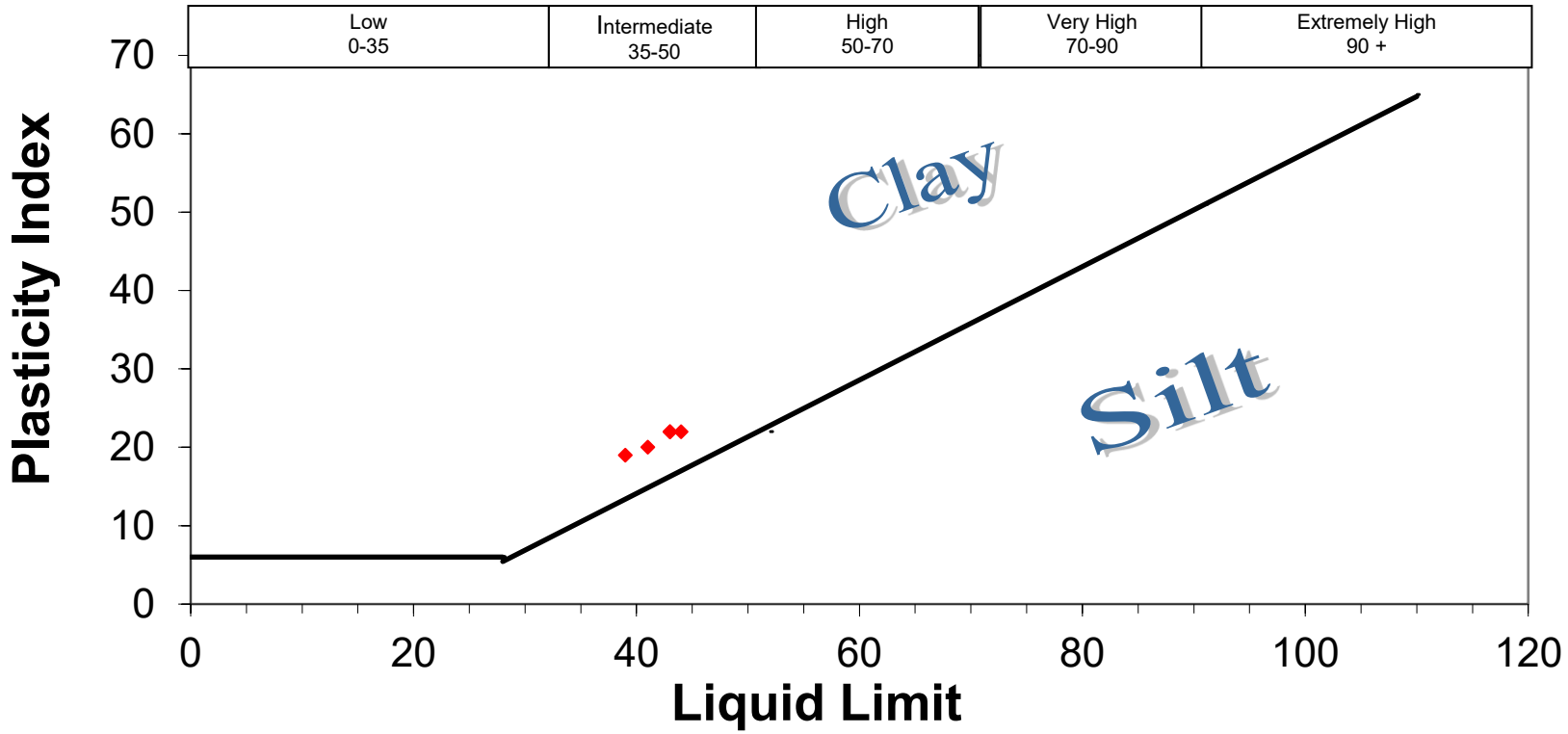
APPENDIX 6 – Laboratory Testing

National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

				Particle			Index Properties		Bulk	Cell	Undrained Triaxial Tests		Lab	
BH/TP	Depth	Sample	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Vane	Remarks
No	m	No.	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	
TP01	1.50	B	16.0		54.2	39	20	19						
TP03	1.00	B	17.0		46.7	41	21	20						
TP04	1.50	B	24.2		30.0	44	22	22						
TP07	1.50	B	14.1		57.6	43	21	22						
TP08	1.00	B	16.4		66.5	43	21	22						
GA04	0.0-0.30	D	79.6											
GA04	0.30-0.50	D	59.4											
GA06	0.0-0.30	D	109.1											
GA08	0.00-0.30	D	146.4											
GA09	0.30-0.50	D	60.6											
GA10	1.00-1.20	D	73.8											
GA12	0.00-0.30	D	161.0											
GA13	0.50-0.80	D	82.4											
NMTL		Notes :									Job ref No.	NMTL 3905	GII Project ID:	15017-09-25
		1. All BS tests carried out using preferred (definitive) method unless otherwise stated.									Location	Lissinagroagh Wind Farm		

NMTL LTD **Unit 18c, Tullow Industrial Estate** **Tullow** **County Carlow** **Tel: 00353 59 9180822** **Mob: 00353 872575508** billa@nmtl.ie	**Contract:** Lissinagroagh Wind Farm **Client:** Ground Investigations Ireland ltd **Engineer:** Diarmaid Maglochlainn **GII Project ID** 15017-09-25 **Date:** 25/02/2026 **Tested By:** Js **Checked:** Bc **Job ref No.** NMTL 3905



NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 2022: Part 2 : Clauses 10 & Part 4: BS EN ISO 17892-4-2016

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	91.1
50.000	87.7
37.500	83.8
28.000	79.0
20.000	78.0
14.000	76.9
10.000	76.5
6.300	76.1
5.000	75.9
3.350	75.7
2.000	75.4
1.180	75.1
0.600	74.7
0.425	74.4
0.300	73.8
0.212	73.0
0.150	71.9
0.063	69.0



Percentage Particle Size

Clay	Fine Silt	Medium Silt	Coarse Silt	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Medium Gravel	Coarse Gravel	Cobbles	Boulder
		69.0			6.4			15.7		8.9	0.0

Sample Description: Grey brown slighly sandy slightly gravelly SILT/CLAY.

Project: Lissinagroagh Wind Farm — GII PROJECT ID:15017-09-25

Operator	Checked	Approved	Date sample tested	Project No.	BH/TP No.	Sample No.	Depth
Js	Nc	Bc	20/02/2026	NMTL 3905	TP03	B	0.50m

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NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 2022: Part 2 : Clauses 10 & Part 4: BS EN ISO 17892-4-2016

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	95.7
37.500	89.5
28.000	82.6
20.000	79.7
14.000	76.9
10.000	73.7
6.300	68.9
5.000	65.3
3.350	62.5
2.000	57.4
1.180	53.1
0.600	48.8
0.425	46.7
0.300	44.8
0.212	42.9
0.150	40.9
0.063	37.3



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		37.3			20.1			42.6		0.0	0.0

Sample Description	Grey slightly sandy gravelly silty CLAY.					Project No.	NMTL 3905
						BH/TP No.	TP03
Project	Lissinagroagh Wind Farm			GII PROJECT ID:15017-09-25		Sample No.	B
Operator	Js	Checked	Nc	Approved	Bc	Date sample tested	20/02/2026	Depth	1.00m

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Determination of Particle Size Distribution

BS 1377 : 2022: Part 2 : Clauses 10 & Part 4: BS EN ISO 17892-4-2016

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	93.7
50.000	84.7
37.500	77.6
28.000	72.5
20.000	66.2
14.000	64.0
10.000	60.2
6.300	54.3
5.000	50.0
3.350	46.9
2.000	41.7
1.180	36.8
0.600	32.0
0.425	30.0
0.300	28.2
0.212	26.7
0.150	25.4
0.063	22.9



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		22.9			18.8			52.0		6.3	0.0

Sample Description	Brown/grey slightly sandy gravelly silty CLAY.					Project No.	NMTL 3905
						BH/TP No.	TP04
Project	Lissinagroagh Wind Farm			GII PROJECT ID:15017-09-25		Sample No.	B
Operator	Js	Checked	Nc	Approved	Bc	Date sample tested	20/02/2026	Depth	1.50m

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NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 2022: Part 2 : Clauses 10 & Part 4: BS EN ISO 17892-4-2016

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	86.2
28.000	80.0
20.000	75.8
14.000	74.7
10.000	74.0
6.300	71.8
5.000	70.1
3.350	68.3
2.000	65.3
1.180	62.0
0.600	57.7
0.425	55.2
0.300	52.2
0.212	49.3
0.150	46.8
0.063	43.0



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		43.0			22.4			34.7		0.0	0.0

Sample Description	Brown/grey slightly sandy gravelly silty CLAY.					Project No.	NMTL 3905
						BH/TP No.	TP05
Project	Lissinagroagh Wind Farm			GII PROJECT ID:15017-09-25		Sample No.	B
Operator	Js	Checked	Nc	Approved	Bc	Date sample tested	20/02/2026	Depth	1.00m

NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 2022: Part 2 : Clauses 10 & Part 4: BS EN ISO 17892-4-2016

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	95.7
20.000	91.0
14.000	89.2
10.000	86.8
6.300	81.5
5.000	77.4
3.350	74.8
2.000	69.6
1.180	65.0
0.600	59.9
0.425	57.6
0.300	55.4
0.212	53.3
0.150	51.4
0.063	47.7



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		47.7			21.9			30.4		0.0	0.0

Sample Description	Dark grey slightly sandy slightly gravelly silty CLAY.					Project No.	NMTL 3905
						BH/TP No.	TP07
Project	Lissinagroagh Wind Farm			GII PROJECT ID:15017-09-25		Sample No.	B
Operator	Js	Checked	Nc	Approved	Bc	Date sample tested	20/02/2026	Depth	1.50m

NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 2022: Part 2 : Clauses 10 & Part 4: BS EN ISO 17892-4-2016

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	95.5
20.000	92.6
14.000	89.6
10.000	85.5
6.300	82.0
5.000	80.2
3.350	78.4
2.000	74.9
1.180	71.7
0.600	68.1
0.425	66.5
0.300	64.9
0.212	63.4
0.150	61.9
0.063	59.4



Percentage Particle Size

Clay	Fine Silt	Medium Silt	Coarse Silt	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Medium Gravel	Coarse Gravel	Cobbles	Boulder
		59.4			15.5			25.1		0.0	0.0

Sample Description	Dark grey/black slightly sandy slightly gravelly silty CLAY.			Project No.	NMTL 3905
				BH/TP No.	TP08
Project	Lissinagroagh Wind Farm		GII PROJECT ID:15017-09-25	Sample No.	B
Operator Js	Checked Nc	Approved Bc	Date sample tested 20/02/2026	Depth	1.00m

NM TL Ltd

Appendix 2-7

Surface Water Management Plan

TOBIN

Lissinagroagh Wind Farm, Co. Leitrim

Appendix 2-7

Surface Water Management Plan

BUILT ON KNOWLEDGE

Document Control Sheet	
Document Reference	Lissinagroagh Wind Farm Surface Water Management Plan
Client:	FEI
Project Reference	10955

Rev	Description	Author	Date	Reviewer	Date	Approval	Date
D01	Report	PMCS	04/11/2025	JD		AM	

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Appendices

Appendix A Planning Drawings 10955-2050 to 10955-2056 and Drawings 10955-2065 & 10955-2066.

1. INTRODUCTION

This Surface Water Management Plan (SWMP) details control measures for avoiding, preventing or reducing impacts on the surface water environment during proposed construction, as identified in Chapter 8 (Hydrology and Hydrogeology) and associated technical appendices.

The objective of this SWMP is to manage the movement of surface water during the construction, operation and decommissioning of the proposed Lissinagroagh Wind Farm (proposed project). The measures implemented for the proposed construction phase will provide flow management for the operational and decommissioning phases.

The measures in the SWMP are consistent with those detailed within the Chapter 8 (Hydrology and Hydrogeology) of the Environmental Impact Assessment Report (EIAR). This is a working document and will be finalised by the appointed Contractor following appointment and prior to commencing works on the proposed project to include any additional conditions stipulated by An Coimisiún Pleanála.

All of the content provided in this SWMP will be delivered by the appointed Contractor and its finalisation by the appointed Contractor will not affect the robustness and adequacy of the information presented here and relied upon in the EIAR and Natura Impact Statement (NIS). Relevant guidelines were considered in the development of this surface water management plan.

1.1 OVERVIEW OF THE PROPOSED PROJECT

EIAR chapter 2 describes the proposed project in detail. The proposed project comprises:

- A wind farm containing fourteen (14) wind turbines, an on-site 110kV electrical substation and other ancillary infrastructure including access roads and drainage;
- A 110kV underground grid connection to connect the wind farm to the National Grid at the existing ESBN Srananagh substation in Co. Sligo;
- Works required along the public road network between Killybegs, Co. Donegal and the proposed site to facilitate turbine and construction material delivery.

The footprint of the proposed wind farm infrastructure will require 49 ha. These 49 ha are included within the wind farm planning application boundary. The planning application boundaries for the proposed grid connection route (GCR) is presented on drawings in EIAR Appendix 2-2.

The proposed wind farm site is located within the townlands of Lisdarush, Shasmore, Faughary, Boleyboy, Cashelaveela, Tawnafeacle, Lissinagroagh and Tawnylust in north County Leitrim between the villages of Kiltyclogher to the northeast and Manorhamilton to the southwest. The closest turbine is located approximately 3 km northeast of Manorhamilton and approximately 4 km southwest of Kiltyclogher.

The site is located in close proximity to the Northern Ireland border in County Fermanagh which is approximately 3 km to the north. The site ranges in elevation from 170 to 380 m AOD, with the eastern part of the site bordering Dough Mountain (462m). The northern turbines are situated within the Saddle Hill (375m) Coillte property at elevations between 280 and 310 m

AOD generally in undulating terrain. The southern turbines are located between 170 m and 380m AOD.

The land use/activities within the site are primarily commercial forestry with expanses of wet grassland in the centre, northwest and southeast and upland blanket bog/open peatland particularly in the north and northwest.

There are a number of watercourses within the site. These range from naturally occurring upland streams to modified drainage channels within forested areas at mid to lower elevations. The southeastern part of the site is characterised by a number of flashy watercourses in deep ravines, the majority of which have existing crossings in place as part of existing forest road network.

The site is located within the Killarga South Groundwater Body (GWB). The aquifers underlying the site are classified as Locally Important in the west to Regionally Important – Karstified further east and southeast. Groundwater vulnerability ranges from Low in the west of the site to Moderate and High moving eastward, with areas of Extreme vulnerability to the north and west around Saddle Hill and south of Dough Mountain. According to GSI mapping, there are no mapped karst features within the site.

The site can be accessed from the south via the L61844 Local Road diverging from the L6184 off the N16 National Road east of Manorhamilton and from the west via the L61801 diverging from the R282 Regional Road. The local roads are linked to a network of existing Coillte forestry roads, which provide good coverage, are well maintained and in good condition.

2. PROPOSED SITE DRAINAGE

2.1 DRAINAGE DESIGN OVERVIEW

The drainage measures described will be implemented for the construction phase of the proposed project and the majority of the measures will remain in place for the operational phase.

The surface water drainage system follows the recommendations of sustainable urban drainage systems (SuDS) and uses SuDS measures. The principal behind SuDS is to reduce the quantity of discharge from developments to predevelopment flows and to also improve the quality of run-off from proposed projects.

A drainage evaluation has been carried out for the proposed project using the HR Wallingford tool (https://www.hrwallingford.com/expertise/smart-data-solutions/data-modelling-mapping-and-geospatial-automation, - accessed November 2025) to identify appropriate SuDS measures for use on the proposed wind farm site.

For the proposed wind farm site the drainage design will decrease the quantity of run-off by using permeable road construction for the access roads and on the hardstanding areas and by providing surface water sedimentation/storage ponds. The following SuDS features are included in the drainage design for the proposed wind farm site:

- **Swales/Check Dams:** Sloped channels with check dams will slow down water flow, improving water quality, infiltration and reducing erosion:
- **Filter strips:** a gently sloped, vegetated area designed to treat stormwater runoff by filtering pollutants and allowing water to infiltrate into the soil. Filter strips are utilised at the level spreader locations:
- **Settlement Ponds:** Vegetated ponds designed to temporarily store surface water runoff, aiding in flood control; and
- **Hydrocarbon Interceptor:** a device designed to remove hydrocarbons, silt and other pollutants from surface water runoff before it enters the drainage system. The hydrocarbon interceptor will be located at the substation and construction compounds.

The layout of the proposed wind farm site has been designed to collect surface water runoff from hardstanding areas and discharge to settlement/infiltration ponds within the proposed wind farm site boundary. From here the water will discharge to the ground by means of finger drains in a fan arrangement at the appropriate greenfield run off rates. A drawing of the proposed settlement ponds is shown in Drawing 10955-2065, in Appendix A. Infiltration basins allow for the treatment of surface waters and provide valuable habitats.

Check dams will be provided in drainage channels to reduce the velocity of surface water run-off and are depicted in Figure 2-1. Swales will be constructed adjacent to the access road (see Appendix A) to provide drainage as depicted in Figure 2-2.

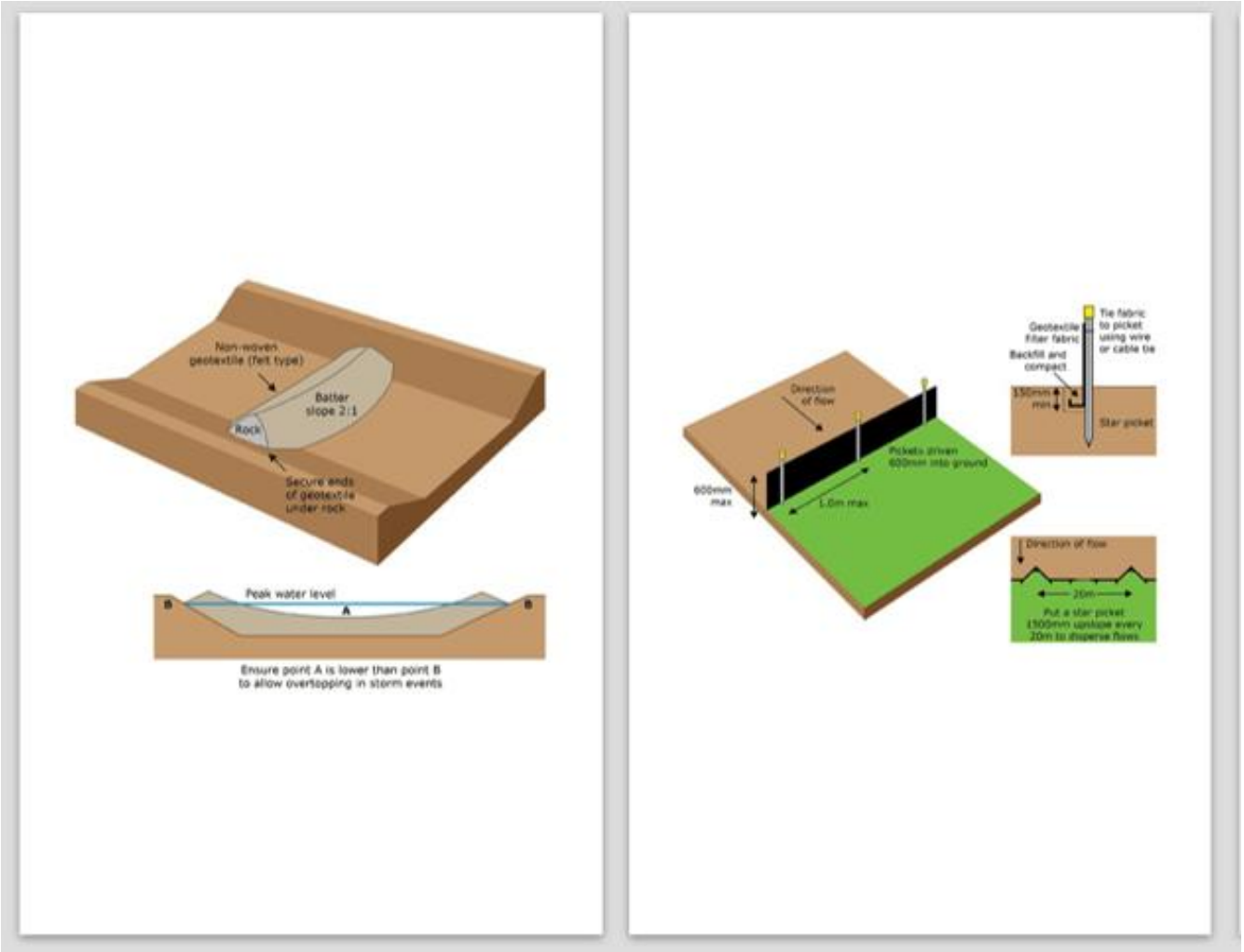


Figure 2-1 Check dam and silt fence examples (Source: Guidelines for Environmental Management, EPA Australia, 2004)



Figure 2-2 Vegetated swale

2.2 KARST AREAS

Karst is formed by the dissolution of soluble bedrock (mainly limestone/gypsum). This creates a complex subsurface of fissures, conduits, and caves. Standard drainage can result in point recharge to groundwater with limited attenuation. The primary guidance document in Ireland is HD 45/15: Design Manual for Roads and Bridges, Volume 4, Section 2, Part 2 – Design of Highway Drainage in Karst Areas. While the areas is partially karstified, the presence of extensive drainage around the site indicates that flow pathways are short with groundwater discharging to the streams over a short period of time.

The proposed drainage utilised the SuDS "treatment train," moving from source control to final discharge. The key principles of HD 45/15 Karst Drainage Design include;

- Minimise point source infiltration: Avoid concentrated flows of water into the ground, which can accelerate dissolution and cause instability.
- Attenuate and disperse runoff: Manage surface water close to its source, using shallow, dispersed systems.
- Protect groundwater quality: Prevent pollutants from entering the karst aquifer.
- Avoid concentrated discharge to ground: Infiltration, where used, must be controlled and dispersed.

The proposed drainage does not propose to directly discharge to the known shallow holes to the east of T7. Drainage is instead treated and discharged to the west of T7.

2.3 BORROW PITS

The water level in the borrow pits will be managed by a dedicated outlet and silt bag. This outlet, along with pre-installed upgradient interceptor drains, will control runoff from both the pit and

its immediate surroundings. During the construction phase, any standing water will be removed using a mobile pump to maintain dry working conditions. The pumped water will be discharged into the drainage network (silt bag, settlement ponds) that serves the outlet. To minimise sediment entering the pump, the intake will be positioned above the pit floor on a stable platform. The pump operation will be managed to maintain a stable water level, preventing turbulence that resuspends settled solids.

2.4 Forestry Drainage

Forest felling will be undertaken during the initial phase of the construction works. The Felling and Reforestation Standards describe the universal standards that apply to all felling (thinning, clear felling) and reforestation projects on all proposed wind farm sites, will be implemented under a felling licence issued by the Department of Agriculture, Food & the Marine.

All associated tree felling will be undertaken using good working practices as outlined in the Construction Environmental Management Plan (CEMP) (Appendices 2-4 of this project EIAR), the Forest Service 'Forestry Harvesting and Environment Guidelines' (2000) and the 'Forestry and Water Quality Guidelines '(2000). The latter guidelines deal with sensitive areas, erosion, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel and machine oils. Brash mats will also be used to support harvesting and forwarding machinery. The brash mats reduce erosion of the surface and will be renewed as they become used and worn over time.

Trees will be manually felled inside the 25m stream buffer. During the near stream construction work, silt traps and a double row silt fences will be placed immediately down-gradient of the construction area for the duration of the construction phase.

2.5 Flood Risk Attenuation

The creation of impermeable areas, such as hardstands, has the potential to locally increase rates of runoff and this may increase flood risk and flood severity downstream. The proposed wind farm site is relatively low permeability and will have limited potential to increase flows.

The risk of flooding associated with the proposed wind farm site is minimal based on the project specific Flood Risk Assessment carried out for the proposed project (see Appendix 8-4 of the EIAR). The layout of the proposed wind farm site will minimise the flood risk to people, property, the economy, and the environment.

It is proposed to provide temporary storage within the drainage channels by creating check dams within them at regular intervals. The spacing of the dams is every 50 metres on average but depends on the channel slope. Runoff from the impermeable areas will be directed to swales and settlement ponds. The settlement ponds limit outflows to pre-existing levels and allow any sediment to be removed through settlement. The outflow from the settlement ponds will be released in a controlled and diffuse manner onto the vegetation and existing drains.

2.6 Turbine Delivery Route and Grid Connection

There will be limited construction activities required for the grid connection and accommodation areas of the proposed Turbine Delivery Route (TDR). Further details in relation to the grid connection cable route and road/junction accommodations required for the TDR are outlined in the CEMP in Appendix 2-6 of the EIAR.

No refuelling of machinery will take place within 50 m of a watercourse. Excavated material will not be stockpiled or side-cast within 50 m of a watercourse. Appropriate steps will be taken to prevent soil/dirt generated during the temporary accommodations required for the TDR from being transported on the public road. Road sweeping vehicles will be used as required, to ensure that the public road network remains free of soil/dirt from the location of the TDR accommodations when required. This will reduce the potential for sedimentation of surface watercourses locally.

Silt fencing will be erected at the location of all stream crossings along the grid connection. Where existing drainage ditches need to be realigned (e.g., around substation), new ditches will match profile of existing ditch in relation to width, existing side slope profile (or lower) and material at base of channel will be reused. The sizing of any new culverts will be designed to maintain existing flow characteristics and depth of flow. Culverts will be assessed to ensure no barriers to fish migration occur. Where barriers occur, such culverts will be improved to increase fisheries potential.

3. WATER QUALITY MEASURES

The drainage design measures outlined in Section 2 will manage flow and quality within the proposed wind farm site and near the works areas of the proposed grid connection and TDR accommodation areas. Specific water quality measures in relation to sediment, concrete and fuel management are detailed below.

3.1 CONCRETE

During the construction phase, concrete will primarily be supplied as ready-mixed material from local batching plants, delivered in sealed concrete trucks. On-site mixing will be limited to minor tasks, such as substation blockwork. The use of ready-mixed deliveries significantly reduces environmental risks associated with large-scale on-site batching.

Upon delivery, only the truck chute will be rinsed on site using the minimum necessary volume of water. Full washout of trucks will occur at the batching plant, where appropriate facilities are already in place. Water from chute rinsing will be directed into a temporary lined, impermeable containment area. These areas will be excavated and lined with an impermeable membrane to prevent ground contamination. Residual solids and liquids will be collected and removed by a licensed waste contractor.

Concrete washout areas will be located near site entrances and at key concrete pour locations—such as turbine hardstands—to ensure accessibility.

Although surplus concrete following a pour is unlikely, any excess will be returned and disposed of off-site at the concrete production facility. Localised mixing for minor works, such as blockwork, will be conducted only as required. Any small volumes of leftover concrete from these tasks will be disposed of in the designated on-site concrete washout area.

Further details on best practices and environmental controls related to concrete delivery and pouring are provided in the Construction Environmental Management Plan (CEMP) (see Appendix 2-4). A hydrocarbon interceptor will be located at the substation and construction compound.

3.2 FUELS, OILS AND CHEMICALS – SPILL CONTROL

The following will be employed on the proposed wind farm site:

- Fuels and chemicals will be stored within bunded areas as appropriate to guard against potential accidental spills or leakages. The bund area will have a volume of at least 110% of the volume of such materials stored;
- Store all containers of oil and fuel in a secure, bunded area.
- Regularly check tanks, containers and bunds for damage and leaks.
- Supervise all fuel and oil deliveries.
- Lock containers and tanks when not in use.
- Seek advice from a line manager before disposing of waste fuel or oil, or contaminated spill granules or absorbent mats – all contaminated materials to be disposed of shall be disposed of by an appropriately licenced waste management facility.
- Liaise with a line manager to organise removal of contaminated water from bunds and trays by an appropriate contractor.
- Do not store fuel and oil, or carry out refuelling, within 50 m of a watercourse.

- All on-site refuelling will be carried out by a trained competent operative. Use a funnel when refuelling small plant. Use an automatic shut off or pistol grip delivery system when refuelling plant.
- Clear up and report all spillages immediately.
- Place a drip tray or absorbent mat under all static plant and mobile plant during fuelling.
- Mobile measures such as drip trays and fuel absorbent mats kept with all plant and bowsers and will be used as required during all refuelling operations;
- A spill kit will be stored with the bowser and the person operating the bowser will be trained in their use;
- All equipment and machinery will have regular checking for leakages and quality of performance and will carry spill kits;
- Any servicing of vehicles will be confined to designated and suitably protected areas such as construction compounds; and
- Additional drip trays and spill kits will be kept available on the proposed wind farm site, to ensure that any spills from vehicles are contained and removed off-site.

4. EROSION AND SEDIMENT CONTROL MEASURES

It is proposed, that during the ground clearance of the proposed project, the contractor will implement water control measures to limit the impact on water quality using standards measures. Suspended solid (silt) removal features will be implemented in accordance with the Construction Industry Research and Information Association (CIRIA) C697 SuDS Manual, and CIRIA C648 Control of water pollution from linear construction projects.

Interceptor drains will be installed up-gradient of all proposed infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. These flows will discharge diffusely overland, within the buffer zone before entering any watercourse. Regular cross flow and energy dissipation devices will be installed to divert overland flows and prevent these flows from entering the construction area.

All drainage from the proposed wind farm site shall be designed to have as a minimum three stages of treatment, as defined in the SuDS Manual. Management of runoff will include the following:

- Filtration of water through filter media (sand/stone check dam, silt fence);
- Detention/settlement in settlement ponds or behind check dam in swales; and
- Conveyance of shallow depths of water in vegetated swale.

All surface water run-off from the proposed wind farm site will pass through settlement ponds. It is proposed to locate settlement ponds downstream of borrow pits and associated stockpile areas, each hardstand and along all the proposed wind farm site access tracks.

Drainage drawings are presented in Drawing 10955-2050 to 10955-2056, in Appendix A.

4.1 CHECK DAMS/SILT FENCES

Track edge drainage/swales are required to control run-off from the running surface to lower water levels in the subgrade, to control surface water and to carry this flow to outlet points. Swales will be re-vegetated by hydro-seeding with indigenous seed mix as soon as is practicable following excavation. This will reduce the flow velocity, treat potential pollutants, increase filtration and silt retention.

Swales will be installed in advance of the main construction phase. Check dam details are presented in Drawing 10955-2065. On sections of track where there is significant longitudinal gradient, regular surface water interception channels will be employed – these will typically be at 20m intervals to collect any surface water that is discharging as sheet flow along the track and discharge the flow into the trackside swale.

Check dams will have a minimum 0.2 m freeboard (from top of check dam) to top of swale level, to prevent overtopping of flows onto the access track. All check dams, etc to be checked at least once weekly via a walkover survey during the period of construction. All excess silts will be removed. Where check dams have become fully blocked with silt, they will be replaced. The following measures will be implemented:

All stockpiled material will be battered back (Slope of 1:2 or less) to reduce the rainfall erosion potential. Silt fencing will be utilised at the base of stockpiles.

Silt fencing is to be installed in the path of sheet flow runoff to filter our heavy sediments. Silt fences are to be located at the toe of stockpiled areas to reduce sediment transport. Additional

silt fencing and emergency spill kits will be kept on the proposed wind farm site for use in emergencies. All silt fencing on the proposed wind farm site will also require regular cleaning and maintenance in accordance with manufactures guidelines.

Silt build ups, within settlement ponds, check dams, silt fences will be removed as required to ensure no carryover/breakthrough of suspended matter downstream in the drainage system. Any sediment removed will be disposed of so as to prevent any reintroduction into the drainage system.

4.2 SETTLEMENT PONDS

Settlement ponds will be located downstream of road swale sections and at turbine/hardstand locations, to manage/buffer volumes of runoff discharging from the drainage system during periods of high rainfall, thereby reducing the hydraulic loading to watercourses. Settlement ponds are designed in consideration of the greenfield runoff rates. A longitudinal cross-section and plan of a settlement pond is presented in Drawing 10955-2065, in Appendix A.

The attenuation pond is designed following the guidance in the CIRIA SuDS Manual (C697) to attenuate runoff to existing greenfield runoff rates. The attenuated runoff volume for the 1 in 100-year 6-hour event (plus 20% climate change allowance) is limited to the greenfield runoff volume. Each of the turbine and hardstand (0.9 hectare) areas drain to a constructed settlement pond with a length of 25m and 10m in width (capacity of 250 m^3), providing more than sufficient volume to cater for this runoff (with additional storage capacity for 1:100 yr extreme events plus climate change). Flows will discharge from the pond via a hydrobrake or similar hydraulic control that is designed to cap the discharge to existing greenfield runoff rates. The proposed conservative drainage design is considered appropriate for the proposed site. It should be noted that the calculations are highly conservative. The existing runoff characteristics is for 95% runoff from the agricultural and forestry lands. Due to the design of the hardstand areas, the runoff co-efficient based on empirical evidence is 85-90% due to the gravel surface (increased storage) and shallower slopes (<1 degree).

The proposed settlement pond design consists of a sediment forebay, which removes the majority of suspended solids from the inflow water. Inflow water enters the sediment forebay via an energy break, which removes energy from the incoming water resulting in a decrease in the incoming waters capacity to transport suspended solids and the deposition of material in the sediment forebay. The water then flows over a section of elevated channel bed into the flow control bay. Here the flow is controlled by a weir constructed of tightly fixed straw bales (or silt fence or equivalent). The straw acts as an effective silt trap for any remaining suspended solids while allowing the water to filter through its medium. Once the water has been filtered by the flow control device it then outfalls to an area of intact vegetation, which acts as a secondary filter. The outflow control from the settlement device is designed such that in an extreme event the device can overflow into adjacent vegetated areas.

Settlement ponds will be installed concurrently with the formation of the road. Settlement ponds are to be located as close to the source of sediment as possible with a buffer zone between the settlement pond outfall and any existing watercourse.

The settlement pond design (Drawing 10955-2065, Appendix A) is based on primary settling out of suspended solids from aqueous suspension. The theory behind the design of the settlement ponds is the application of Stoke's Law. The settlement ponds will be designed to provide sufficient retention time and a low velocity environment to allow suspended solids of small

particle size to fall out of suspension prior to allowing the water to outfall to the receiving environment. Settlement ponds will be constructed on even ground and not on steeply sloping ground and will discharge into vegetation areas to aid dispersion.

Runoff will be maintained at Greenfield (pre-development) runoff rates. The layout of the development has been designed to collect surface water runoff from hardstanding areas within the development and discharge to associated surface water attenuation lagoons adjacent to the proposed infrastructure. It will then be managed by gravity flow at Greenfield runoff rates.

4.3 Works near Watercourses

As mentioned above, where main drain crossings and stream crossings occur (i.e., access tracks), it is proposed to use a clear-span design bridge or bottomless culverts. Installation of such features will take place during dry periods to reduce the risk of sediment entering the watercourse. Smaller drains with be crossed using normal culverts.

Ten (10) new clear-span bridges are required to cross the EPA streams. Clear span bridges are required for all watercourse crossings, with the exception of the EPA watercourse segment code 35_2909, as illustrated in Table 8-20 of Chapter 8 (Hydrology and Hydrogeology). A Section 50 Consent application will be prepared and submitted to the OPW prior to construction. No instream works are proposed for any of the proposed clear span bridge crossings.

As a further precaution, near-stream construction work will only be carried out during the period permitted by Inland Fisheries Ireland in accordance with in-stream works guidance document *"Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites"*.

Culverts will be designed to be of a size adequate to carry expected peak flows in accordance with CIRIA Culvert design and operation guide (C689). Culverts will be installed to conform, wherever possible, to the natural slope and alignment of the drainage line. Where required, culverts will be buried at an appropriate depth below the channel bed and the original bed material placed at the bottom of the culvert. The sizing of any new internal drainage crossings will at a minimum maintain existing depth of flow and channel characteristics.

Culverts will be required at drain crossings along the access roads and to allow for cross drainage on the proposed windfarm. Precast concrete culverts or uPVC drainage pipes shall be provided for drain culverts, detail of which is shown in Drawing 10955-2066, in Appendix A. Earth embankments constructed for bridge approaches will be protected against erosion e.g., by re-vegetation or rock surfacing etc.

4.4 Grid Connection

Management of surface water is set out in Appendix 2-3 Substation and Grid Connection Construction Methodology Report. Cable trenches are typically developed in short sections, thereby minimising the amount of ground disturbed at any one time and minimising the potential for drainage runoff to pick up silt or suspended solids. Each short section of trench is excavated, ducting installed and bedded, and backfilled with the appropriate materials, before work on the next section commences.

5. SURFACE WATER MONITORING

Details of the proposed surface water monitoring and maintenance activities are provided in this section of the SWMP. Operational phase monitoring is not required, as the risk of contamination during this phase is considered low. However, drainage features will be checked and maintained as required as part of regular maintenance inspections.

The Contractor will retain records of all monitoring and maintenance activities carried out during the construction phase.

5.1 RECORDING AND REPORTING

Inspections will be recorded for the proposed project. In the event that pollution indicators are observed, works will cease, and sampling will immediately be undertaken as described for the weekly monitoring, and an investigation of the potential cause will be undertaken by the appointed Contractor.

Where the construction works are identified as the source causing the exceedance, the following details will be recorded;

- Nature of the impacts and mechanism of pollution;
- Details of the activity identified as causing the incident or, in the event no clear pathway still exists, activities capable of causing the incident and an assessment undertaken as to the most likely source;
- Immediate steps taken to remove or isolate the pollution source (e.g., stopping works, containing runoff) and mitigate potential impacts (e.g., deploying silt fences); and
- Details of measures proposed and implemented to ensure that such an incident does not re-occur.

This information will be shared with the Employer and the regulators. Through monitoring and this open and transparent reporting, there is a much-reduced likelihood of a small incident becoming a serious one that may require regulator action; proactively providing this information gives the regulator and the Client comfort that these issues are taken seriously on the proposed wind farm site, GCR work areas and TDR accommodation areas and addressed in a professional manner.

5.2 DETAILS OF MONITORING LOCATIONS ON SITE

There are 6 no. surface water monitoring locations (see Figure 5-1) to monitor surface water quality. These points are focussed on potential receiving areas where turbines are located close to streams/rivers. The proposed monitoring schedule is robust and sufficient for the scale of the proposed wind farm site and in line with the relevant guidance.

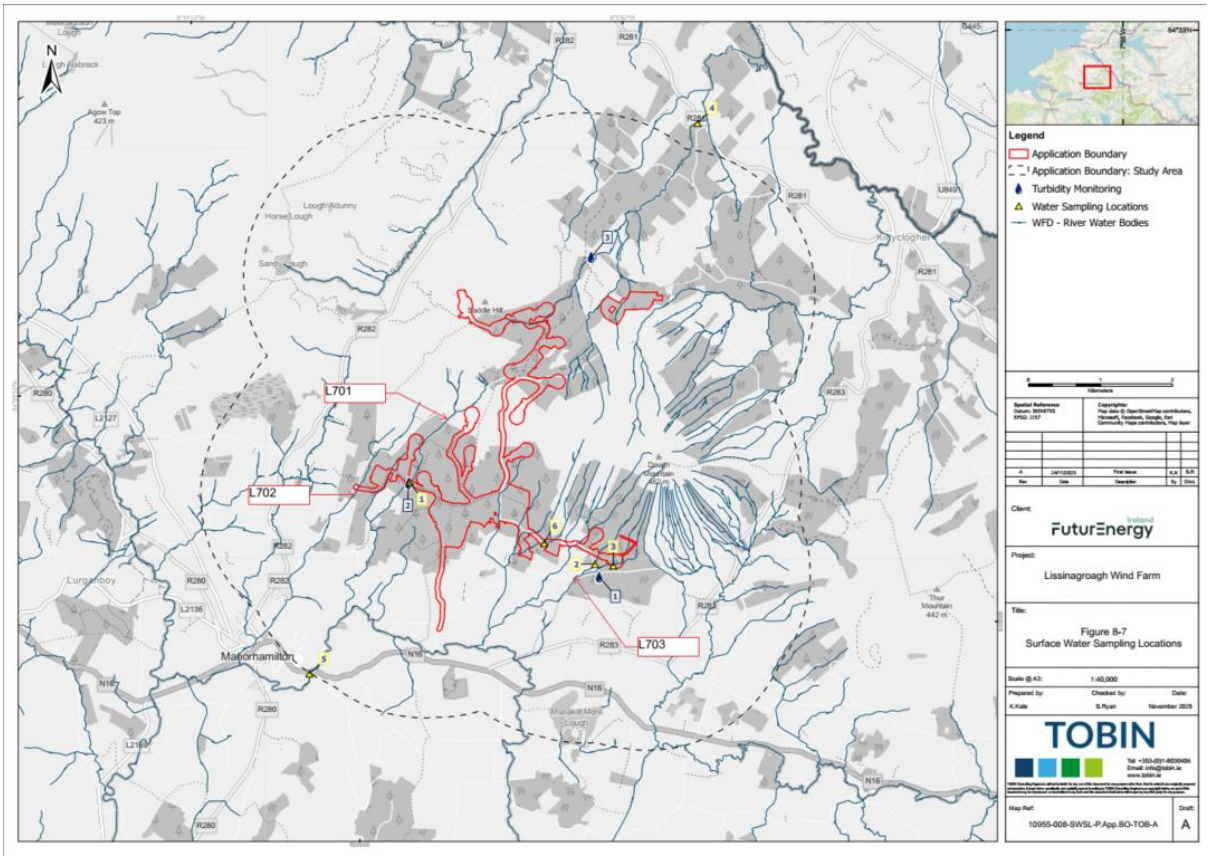


Figure 5-1 Surface water monitoring locations for the SWMP

5.2.1 Surface Water Monitoring Schedule

All surface water control measures for the proposed project will be implemented in accordance with the Construction Environmental Management Plan (CEMP) (Appendix 2-4 of the EIAR). A surface water monitoring schedule for the construction phase has been developed (see Table 5-1). Parameters and associated trigger limits are illustrated in Table 5-2. The schedule also specifies the frequency of monitoring to be undertaken before, during, and after construction. Further details of the proposed surface water monitoring locations are provided in Table 5-3.

5.2.2 Schedule of Monitoring

The critical water parameters in terms of their potential to cause damage to aquatic life, ecosystems, human health and water quality in the receiving waters are outlined in the surface water monitoring schedule (see Table 5-1).

Table 5-1: Surface Water Monitoring Schedule for Lissinagroagh Wind Farm

Phase	Preconstruction	Construction	Post construction
Monitoring Period	3 Months	24 Months	3 Months
Frequency	Continuous		
Parameters	Turbidity	Turbidity	Turbidity
Frequency	Daily		
Surface Water Parameters	N/A	Turbidity and visual checks (examination of surface drainage/sediment control measures/watercourses)	Turbidity and visual checks (examination of surface drainage/sediment control measures/watercourses)
Frequency	Weekly (Handheld Meter)		

Surface Water Parameters	pH, Electrical Conductivity, Turbidity, Temperature	pH, Electrical Conductivity, Turbidity, Temperature (Monitoring during clearance phase and construction works at Turbines)	N/A
Frequency	Monthly (Grab samples)		
Surface Water Parameters	Conductivity, Chloride, Dissolved Oxygen, Molybdate Reactive Phosphorus, Mineral Oil, pH, Turbidity, Total Ammonia, Total Phosphorus, Total Suspended Solids	Conductivity, Chloride, Dissolved Oxygen, Molybdate Reactive Phosphorus, Mineral Oil, pH, Turbidity, Total Ammonia, Total Phosphorus, Total Suspended Solids	Conductivity, Chloride, Dissolved Oxygen, Molybdate Reactive Phosphorus, Mineral Oil, pH, Turbidity, Total Ammonia, Total Phosphorus, Total Suspended Solids
Frequency	Quarterly (Grab Samples)		
Surface Water Parameters	N/A	Conductivity, Chloride, Dissolved Oxygen, Molybdate Reactive Phosphorus, Mineral Oil, pH, Turbidity, Nitrate, Total Ammonia, Total Phosphorus, Total Suspended Solids	N/A
Frequency	Pre-Construction Report	Monthly and Quarterly Monitoring Report	Final Monitoring Report
Surface Water Parameters	Upgrade limits/trigger values for construction phase water monitoring	Results screened against construction phase surface water monitoring trigger levels	Results screened against construction phase surface water monitoring trigger levels

5.2.3 Surface water Monitoring Trigger Values

Surface Water Quality Monitoring (SWQM) will be conducted by the appointed Contractor in accordance with the monitoring schedule proposed in Table 5-1. Prior to the commencement of construction, baseline preconstruction monitoring will be carried out. The results of this monitoring suite will determine the baseline and trigger values for the construction monitoring phase of the development. This will be completed in order to establish if local trigger values are required due to existing water quality exceedances.

The final details of the monitoring schedule will be agreed with the relevant authorities, prior to the commencement of construction. Construction and post construction sampling results will be screened against the agreed trigger values as proposed in Table 5-2, except where local triggers are required.

Table 5-2: Analysis and Proposed Trigger Values (Pre-Construction)

Parameter	Proposed Limits	Units
Conductivity	700 µS/cm or within preconstruction values	µS/cm
Chloride	200 mg/l or lower i.e. within trigger values established by preconstruction monitoring	mg/l
Dissolved Oxygen	80% to 120%	% Saturation
Biochemical Oxygen Demand	1.5 mg/l annual average or within preconstruction values	
Molybdate Reactive Phosphorus	0.035 mg/l annual average or within preconstruction values	mg/l
Mineral Oil	10 µg/l or within preconstruction values	µg/l
pH	6.0-9.0	pH units
Turbidity	50 NTU or within preconstruction values	Nephelometric Turbidity Unit (NTU)
Total Ammonia	0.14 mg/l (95%ile) or within preconstruction values	mg/l
Total Phosphorus	0.1 mg/l or within preconstruction values	mg/l
Total Suspended Solids	25 mg/l or within preconstruction values	mg/l

Field measurements will be taken by the contractor on a weekly basis, as per the schedule in Table 5-1, during the main earthworks stage of the construction period. In addition, daily visual inspections of the surface drainage and sediment control measurements and the watercourses will be completed. Daily turbidity monitoring will also be undertaken on the proposed wind farm site. Indicators that show evidence of water quality issues include the following and will be noted.

- Changes in water quality; and
- Changes in water transparency.

In-situ field monitoring will also be conducted during major rainfall events i.e., 15 mm in a 6-hour period. The clerk of works will undertake monitoring during the rainfall events.

5.2.4 Surface Water Quality Monitoring Locations

Monitoring will be carried out at six locations surrounding the proposed wind farm site (see Figure 5-1). Construction-phase surface water monitoring will take place at the stream locations listed in the table below (Table 5-3). The sampling point labels are consistent with those used during site investigations to allow for comparison.

Table 5-3: Surface Water Monitoring locations details

Name	Easting	Northing	River / Stream Name	Notes
SW 1	590698	841946	Skreeny	Segment Code 35_4030
SW 2	593259	840785	Null	Segment Code 35_4203
SW 3	593529	840796	Lissinagroagh_35	Segment Code 35_4210
SW 4	594698	846931	Lattone_35	Segment Code 36_6324
SW 5	589304	839304	Owenmore [Manorhamilton]	Segment Code 35_3550
SW 6	592626	841104	Mt Dough	Segment Code 35_3841

Monitoring records will include the date and time of the monitoring period and relate to the relevant consent conditions, where applicable. A written log of the environmental performance of the works will be maintained. A monthly monitoring report on the findings of the monitoring exercises will be prepared within two weeks of receipt of analytical results. The monthly monitoring reports will cover the construction works and a final monitoring report will be completed post construction.

5.2.5 Proposed Monitoring Frequency and Parameters

5.2.5.1 Pre-Construction Monitoring

It is proposed that the surface water monitoring will be scheduled together with the pre-construction stage. Continuous turbidity monitoring will be undertaken upgradient and downgradient on the Lisdarush, Skreeny and Lissinagroagh Rivers, as illustrated in Figure 5-1, both preconstruction and during construction.

5.2.5.2 Construction Stage Monitoring

Surface water monitoring will be undertaken daily during the construction stage of the proposed project. The daily monitoring will include a walk around the proposed wind farm site, visual inspection of the watercourses and field measurements for turbidity to be undertaken as required and, as a minimum, on a weekly basis. Weekly surface water monitoring will take place as per the daily surface water inspection and will include for a routine weekly measurement of turbidity at the surface water locations.

Monthly surface water samples will be collected during the construction stage of the proposed project and laboratory analysis will be undertaken for those monitoring parameters included in Table 5-2 of this SWMP.

5.2.5.3 Post-Construction

Immediately post-construction for three months, surface water samples will be collected, and laboratory analysis will be undertaken for those monitoring parameters included in Table 5-1 of this SWMP.

5.2.6 Trigger Values

The trigger values for the surface water monitoring programme are those listed in Table 5-4 of this SWMP and where relevant Surface Water Quality standards given in the Surface Water (Environmental Objectives) Regulations S.I. 272 of 2009, or as otherwise agreed with the Planning Authority in consultation with Inland Fisheries Ireland where required.

An Environmental Manager will be engaged for construction stage monitoring. Should the trigger values not be met, the Environmental Manager will have 'Stop Works Authority' to direct the contractor's construction manager to cease all works and activities on the proposed wind farm site pending further instruction, in order to address any potential water quality issues.

Table 5-4: Proposed Surface Water Parameters and Trigger Values

Parameter	Units	Proposed Trigger Values	SI No. 272 of 2009 EU Surface Water Environmental Objective Regulations (as amended)	SI No. 293 of 1988 EC Regulations (Quality of Salmonid Waters)
Electrical Conductivity (EC)	µS/cm	700		
pH	pH units	>4.5 and <9	Soft Water 4.5< pH < 9.0	>6 and <9
MRP	mg/l	0.025 (mean – high status) 0.035 (mean- good status)	0.025 (mean – high status) 0.035 (mean- good status)	
Dissolved Inorganic Nitrogen as N	mg/l	2.6	2.6	
Total Suspended Solids	mg/l	25 (annual average)		25 (annual average)
BOD	mg/l	<5	<2.6 (95%ile) good status <2.2 (95%ile) high status	<5
COD	mg/l	40		
Dissolved Iron	ug/l	200		
Sulphate	mg/l	200		
Total Alkalinity as $CaCO_3$	mg/l	No abnormal change		No abnormal change
Hydroxide Alkalinity as $CaCO_3$	mg/l	No abnormal change		No abnormal change

6. MAINTENANCE ACTIVITIES

6.1 CONSTRUCTION PHASE

Settlement ponds will be regularly cleaned/maintained to provide effective and successful operation throughout the works. Outfalls and ditches will be cleaned, when required, starting up stream with the outfalls blocked temporarily prior to cleaning. Settlement pond management will also include the following:

Sediment/silt removed via the contractor from ponds is to be disposed of at suitable locations on the proposed wind farm site, away from watercourses. Machine access is required to enable the accumulated sediment to be excavated.

Settlement pond maintenance and/or cleaning will not take place during periods of extended heavy rain. Settlement ponds will be clearly marked and fenced off for safety.

The settlement ponds will be monitored closely for key parameters listed in Section 5, over the construction timeframe to ensure effective operation and compliance with discharge limits.

6.2 OPERATION PHASE

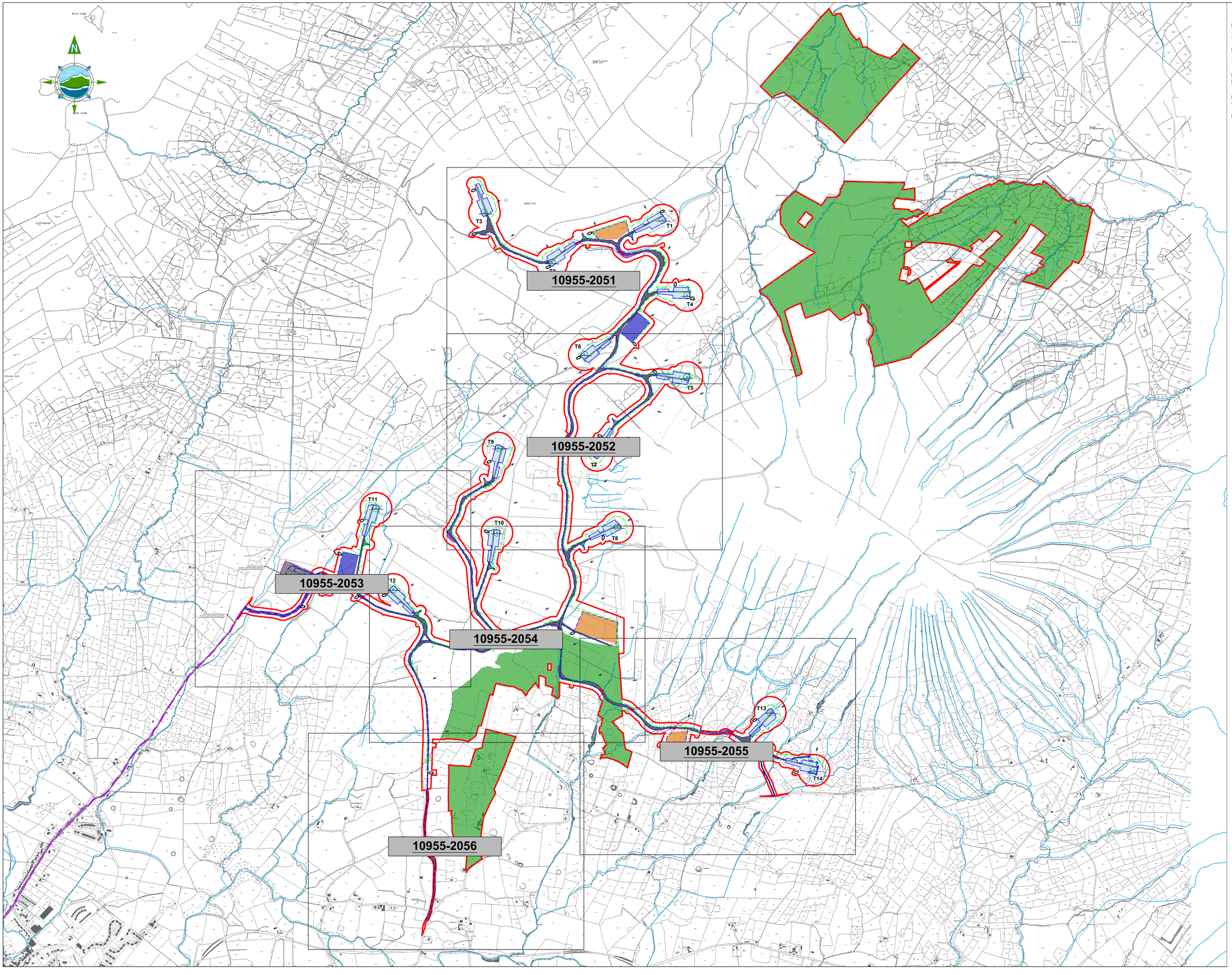
During the operational phase impediments to flows can generally occur as a result of blockages to watercourse crossings, ditches and watercourses themselves, resulting from vegetation and erosion debris. The surface water infrastructure will be regularly inspected and maintained by the operator through the lifetime of the project.

6.3 DECOMMISSIONING PHASE

A review of the relevant guidelines will be undertaken prior to the decommissioning phase. The operational phase surface water management infrastructure will be utilised for the decommissioning phase. The operational road layout will remain in place and therefore limit the potential for siltation during the decommissioning phase. Water quality measures as outlined in Section 3 will be implemented.

APPENDIX A

PLANNING DRAWINGS 10955-2050 TO 10955-2056 AND DRAWINGS 10955-2065 & 10955-2066.



GENERAL LEGEND

PLANNING APPLICATION BOUNDARY

PROPOSED PERMANENT ACCESS ROAD

EXISTING LOCAL RIVERS / STREAMS

PROPOSED TURBINE HARDSTAND

PROPOSED TURBINE LOCATION

PROPOSED TEMPORARY COMPOUND LOCATION

PROPOSED SUBSTATION & GRID ROUTE (Submitted Separately)

PROPOSED BORROW PIT

VEHICLE OVERRUN AREA

VEHICLE TURNING AREA

PROPOSED SURFACE WATER DRAINAGE

SURFACE WATER SETTLEMENT POND

INTERCEPTOR DITCH

NOTES:

1. DRAWINGS FOR PLANNING PURPOSES ONLY.
2. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING.
3. GRID REFERENCES TO ITM.
4. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Co. Leitrim

Tailte Éireann 1:5,000 Sheet No's: 0812, 0813, 0854, 0855, 0902, 0903, 0958 & 0959.

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Rev	Date	Description	By	Chkd.
A	10.04.26	ISSUED FOR PLANNING	MN	SR

Client: Ireland FuturEnergy

Project: LISSINAGROAGH WIND FARM

Title: DRAINAGE LAYOUT MASTER PLAN

Scale @ A1: 1:10,000

Prepared by:	Checked by:	Date:
M. Nolan	S. Ryan	April 2026

Drawing Status: Planning

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Drawing No.: 10955-2050

Revision: A

PROPOSED BORROW PIT 1
(Refer to Drg. No: 10955-2090 for details).

PROPOSED VEHICLE TURNING HEAD
(For turbine delivery)

PROPOSED TURBINE HARDSTAND
(Refer to Drg. No: 10955-2031 for details).

PROPOSED TURBINE LOCATION
(Refer to Drg. No: 10955-2032 for details).

PROPOSED SITE ACCESS ROAD
(Refer to Drg. No: 10955-2033 for details)

Saddle Hill

T1

T2

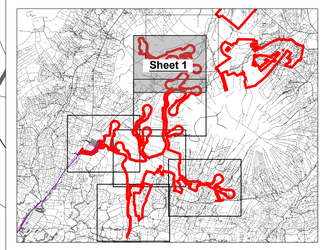
T3

T4

T6

GENERAL LEGEND

- PLANNING APPLICATION BOUNDARY
- PROPOSED PERMANENT ACCESS ROAD
- EXISTING LOCAL RIVERS / STREAMS
- PROPOSED TURBINE HARDSTAND
- PROPOSED TURBINE LOCATION
- PROPOSED TEMPORARY COMPOUND LOCATION
- PROPOSED SUBSTATION & GRID ROUTE (Submitted Separately)
- PROPOSED BORROW PIT
- VEHICLE OVERRUN AREA
- VEHICLE TURNING AREA
- PROPOSED SURFACE WATER DRAINAGE
- SURFACE WATER SETTLEMENT POND
- INTERCEPTOR DITCH



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A	10.04.26	ISSUED FOR PLANNING	MN	SR

Client: Ireland FuturEnergy

Project: LISSINAGROAGH WIND FARM

Title: DRAINAGE LAYOUT PLAN
Sheet 1 of 6

Scale @ A1: 1:2,500

Prepared by:	Checked by:	Date:
M. Nolan	S. Ryan	April 2026

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Drawing No.: 10955-2051

Revision: A

T6

T5

T9

T7

T10

T8

PROPOSED SITE ACCESS ROAD
(Refer to Drg. No: 10955-2033 for details)

PROPOSED VEHICLE TURNING HEAD
(For turbine delivery)

PROPOSED TURBINE HARDSTAND
(Refer to Drg. No: 10955-2031 for details).

PROPOSED TURBINE LOCATION
(Refer to Drg. No: 10955-2032 for details).

GENERAL LEGEND

PLANNING APPLICATION BOUNDARY

PROPOSED PERMANENT ACCESS ROAD

EXISTING LOCAL RIVERS / STREAMS

PROPOSED TURBINE HARDSTAND

PROPOSED TURBINE LOCATION

PROPOSED TEMPORARY COMPOUND LOCATION

PROPOSED SUBSTATION & GRID ROUTE (Submitted Separately)

PROPOSED BORROW PIT

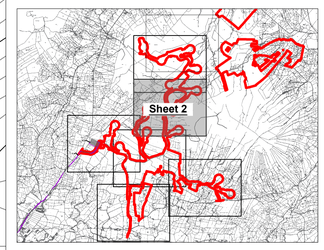
VEHICLE OVERRUN AREA

VEHICLE TURNING AREA

PROPOSED SURFACE WATER DRAINAGE

SURFACE WATER SETTLEMENT POND

INTERCEPTOR DITCH



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Rev	Date	Description	By	Chkd.
A	10.04.26	ISSUED FOR PLANNING	MN	SR

Client: Ireland FuturEnergy

Project: LISSINAGROAGH WIND FARM

Title: DRAINAGE LAYOUT PLAN
Sheet 2 of 6

Scale @ A1: 1:2,500

Prepared by:	Checked by:	Date:
M. Nolan	S. Ryan	April 2026

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Drawing No.: 10955-2052

Revision: A

T11

T12

PROPOSED TURBINE LOCATION
(Refer to Drg. No: 10955-2032 for details).

PROPOSED TURBINE HARDSTAND
(Refer to Drg. No: 10955-2031 for details).

PROPOSED TEMPORARY
CONSTRUCTION COMPOUND
(Refer to Drg. No: 10955-2030 for details).

PROPOSED PERMANENT MET MAST
(Refer to Drg. No: 10955-2036 for details).

PROPOSED VEHICLE TURNING HEAD
(For turbine delivery)

SUBSTATION LOCATION
(Subject to separate planning application
to be submitted to An Coimisúin Pleanála)

PERMANENT SITE ACCESS 1
(Refer to Drg. No: 10955-2071 for details).

PROPOSED GRID CONNECTION
(Subject to separate planning application
to be submitted to An Coimisúin Pleanála)

PROPOSED SITE ACCESS ROAD
(Refer to Drg. No: 10955-2033 for details)

175.00

200.00

150.00

125.00

Ringfort

GENERAL LEGEND

PLANNING APPLICATION BOUNDARY

PROPOSED PERMANENT ACCESS ROAD

EXISTING LOCAL RIVERS / STREAMS

PROPOSED TURBINE HARDSTAND

PROPOSED TURBINE LOCATION

PROPOSED TEMPORARY COMPOUND LOCATION

PROPOSED SUBSTATION & GRID ROUTE (Submitted Separately)

PROPOSED BORROW PIT

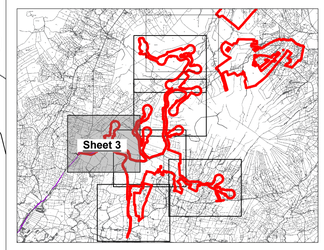
VEHICLE OVERRUN AREA

VEHICLE TURNING AREA

PROPOSED SURFACE WATER DRAINAGE

SURFACE WATER SETTLEMENT POND

INTERCEPTOR DITCH



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Rev	Date	Description	By	Chkd.
A	10.04.26	ISSUED FOR PLANNING	MN	SR

Client: Ireland FuturEnergy

Project: LISSINAGROAGH WIND FARM

Title: DRAINAGE LAYOUT PLAN
Sheet 3 of 6

Scale @ A1: 1:2,500

Prepared by:	Checked by:	Date:
M. Nolan	S. Ryan	April 2026

Drawing Status: Planning

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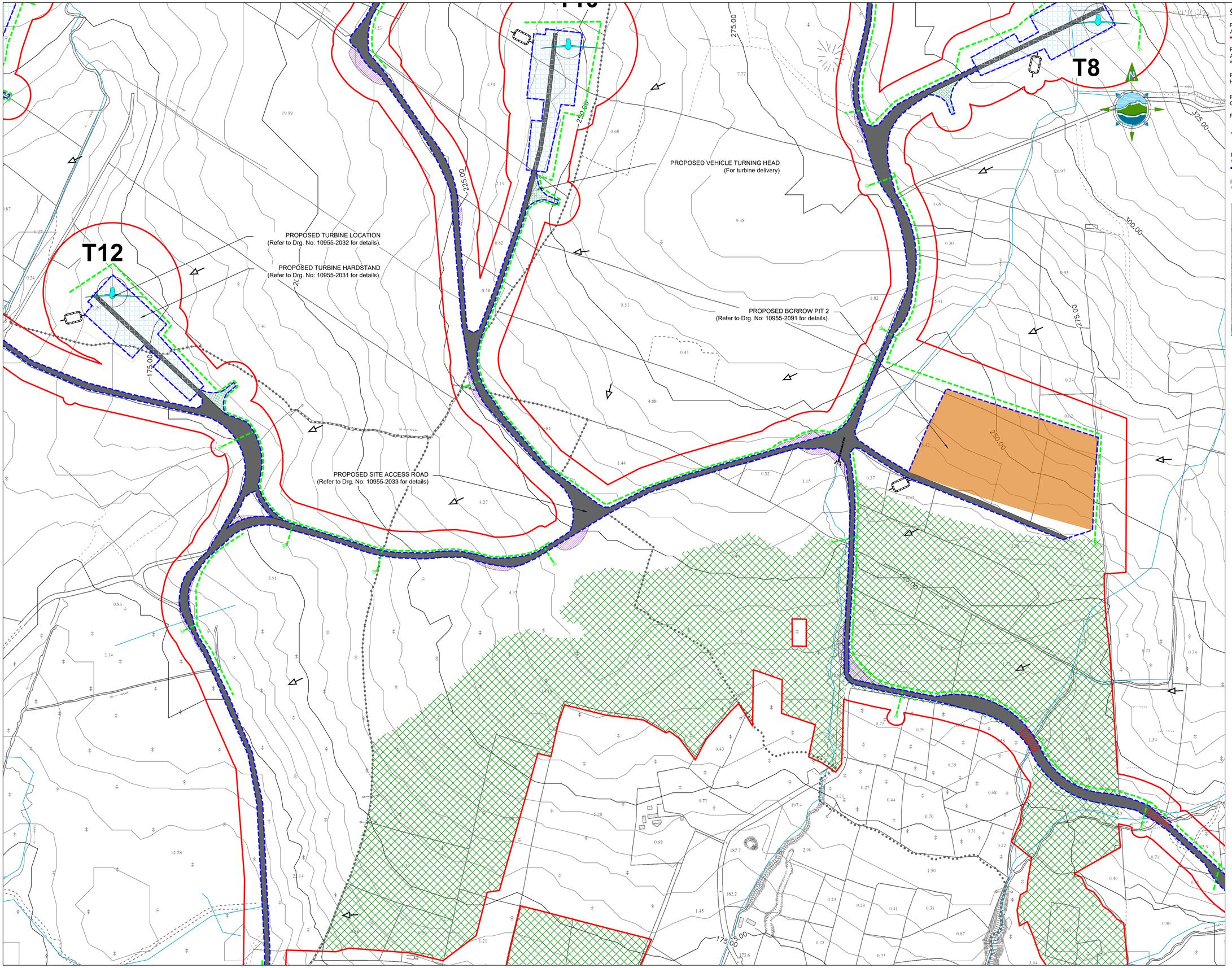
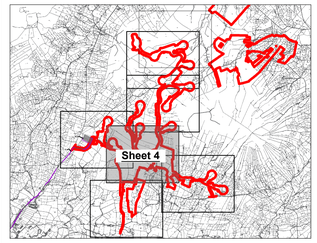
Revision: A



GENERAL LEGEND

- PLANNING APPLICATION BOUNDARY
- PROPOSED PERMANENT ACCESS ROAD
- EXISTING LOCAL RIVERS / STREAMS
- PROPOSED TURBINE HARDSTAND
- PROPOSED TURBINE LOCATION
- PROPOSED TEMPORARY COMPOUND LOCATION
- PROPOSED SUBSTATION & GRID ROUTE (Submitted Separately)
- PROPOSED BORROW PIT
- VEHICLE OVERRUN AREA
- VEHICLE TURNING AREA
- PROPOSED SURFACE WATER DRAINAGE
- SURFACE WATER SETTLEMENT POND
- INTERCEPTOR DITCH



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A	10.04.26	ISSUED FOR PLANNING	MN	SR

Client: FuturEnergy Ireland

Project: LISSINAGROAGH WIND FARM

Title: DRAINAGE LAYOUT PLAN
Sheet 4 of 6

Scale @ A1: 1:2,500

Prepared by:	Checked by:	Date:
M. Nolan	S. Ryan	April 2026

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Drawing No.: 10955-2054

Revision: A

T13

T14

PROPOSED BORROW PIT 3
(Refer to Drg. No: 10955-2092 for details).

PROPOSED SITE ACCESS ROAD
(Refer to Drg. No: 10955-2033 for details)

TEMPORARY SITE ACCESS 2
(Construction Stage Only)

PROPOSED VEHICLE TURNING HEAD
(For turbine delivery)

Mast

Waterfall

200.00

175.00

150.00

225.00

GENERAL LEGEND

PLANNING APPLICATION BOUNDARY

PROPOSED PERMANENT ACCESS ROAD

EXISTING LOCAL RIVERS / STREAMS

PROPOSED TURBINE HARDSTAND

PROPOSED TURBINE LOCATION

PROPOSED TEMPORARY COMPOUND LOCATION

PROPOSED SUBSTATION & GRID ROUTE (Submitted Separately)

PROPOSED BORROW PIT

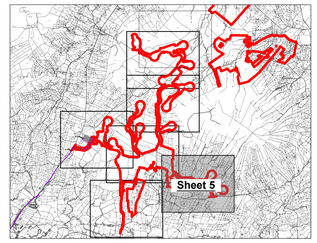
VEHICLE OVERRUN AREA

VEHICLE TURNING AREA

PROPOSED SURFACE WATER DRAINAGE

SURFACE WATER SETTLEMENT POND

INTERCEPTOR DITCH



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Rev	Date	Description	By	Chkd.
A	10.04.26	ISSUED FOR PLANNING	MN	SR

Client: Ireland FuturEnergy

Project: LISSINAGROAGH WIND FARM

Title: DRAINAGE LAYOUT PLAN
Sheet 5 of 6

Scale @ A1: 1:2,500

Prepared by:	Checked by:	Date:
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PROPOSED SITE ACCESS ROAD
(Refer to Drg. No: 10955-2033 for details)

TEMPORARY SITE ACCESS 1
(For turbine component delivery only)

Castlemoyle House

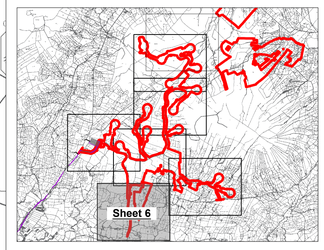
Brookfield House

Waterfall

Spring

GENERAL LEGEND

- PLANNING APPLICATION BOUNDARY
- PROPOSED PERMANENT ACCESS ROAD
- EXISTING LOCAL RIVERS / STREAMS
- PROPOSED TURBINE HARDSTAND
- PROPOSED TURBINE LOCATION
- PROPOSED TEMPORARY COMPOUND LOCATION
- PROPOSED SUBSTATION & GRID ROUTE (Submitted Separately)
- PROPOSED BORROW PIT
- VEHICLE OVERRUN AREA
- VEHICLE TURNING AREA
- PROPOSED SURFACE WATER DRAINAGE
- SURFACE WATER SETTLEMENT POND
- INTERCEPTOR DITCH



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A	10.04.26	ISSUED FOR PLANNING	MN	SR

Client: Future Energy Ireland

Project: LISSINAGROAGH WIND FARM

Title: DRAINAGE LAYOUT PLAN
Sheet 6 of 6

Scale @ A1: 1:2,500

Prepared by:	Checked by:	Date:
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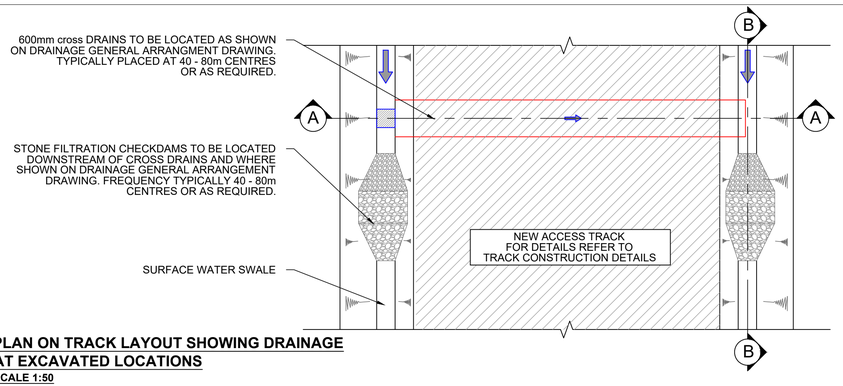
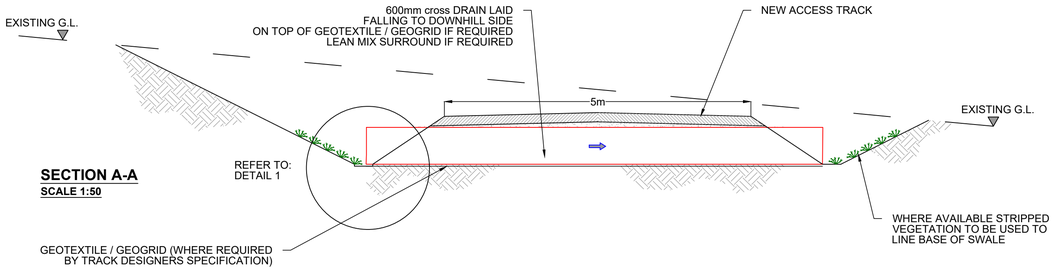
Revision: A



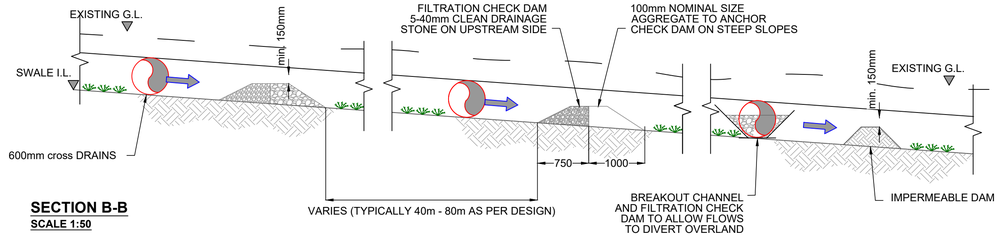
PLAN ON TRACK LAYOUT SHOWING DRAINAGE AT EXCAVATED LOCATIONS

SCALE 1:50



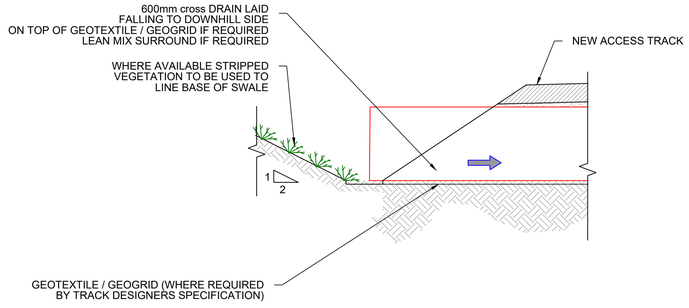
SECTION A-A

SCALE 1:50



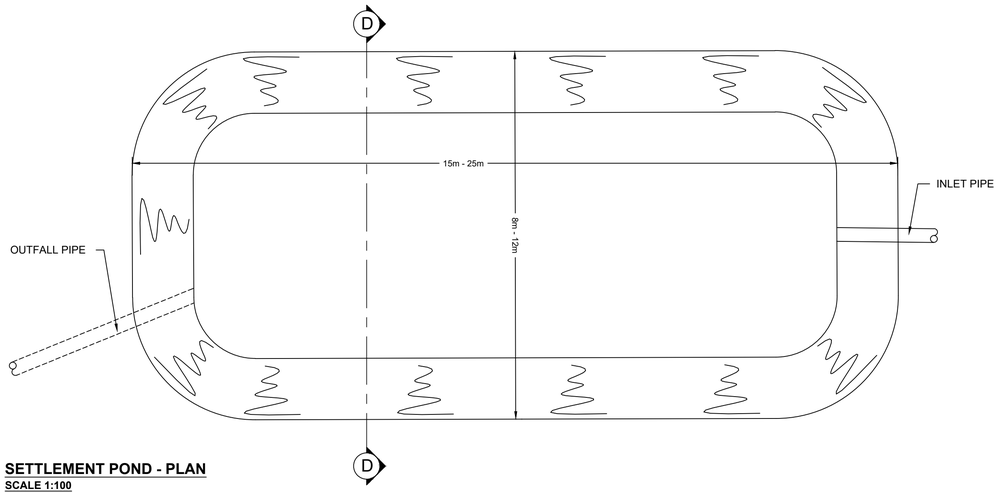
SECTION B-B

SCALE 1:50



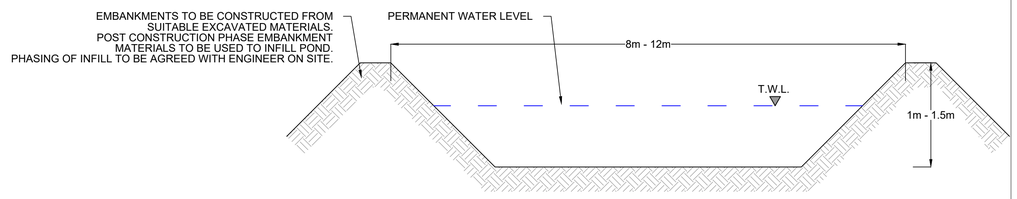
DETAIL 1

SCALE 1:25



SETTLEMENT POND - PLAN

SCALE 1:100



SECTION D-D

SCALE 1:50

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Rev	Date	Description	By	Chkd.
A	10.04.26	ISSUED FOR PLANNING	MN	SR

Client: Ireland FuturEnergy

Project: LISSINAGROAGH WIND FARM

Title: PROPOSED SURFACE WATER DETAILS

Scale @ A1: As Shown

Prepared by:	Checked by:	Date:
M. Nolan	S. Ryan	April 2026

Drawing Status: Planning

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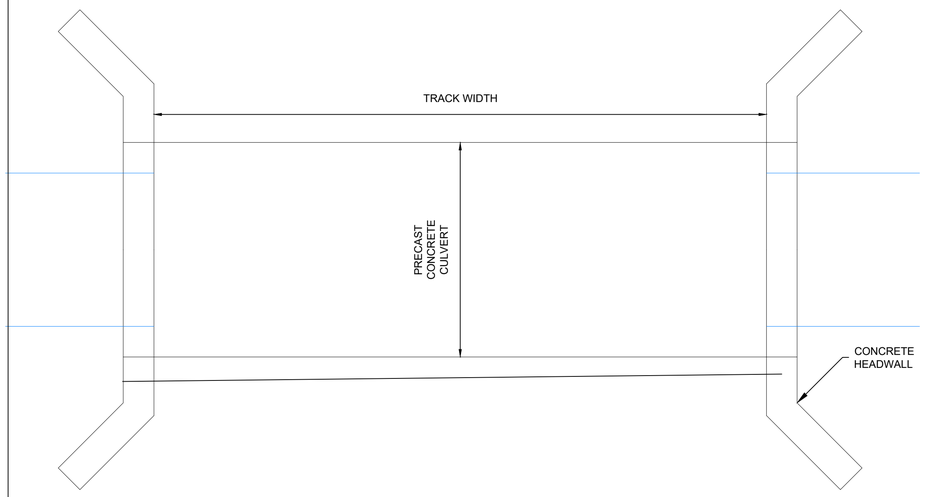
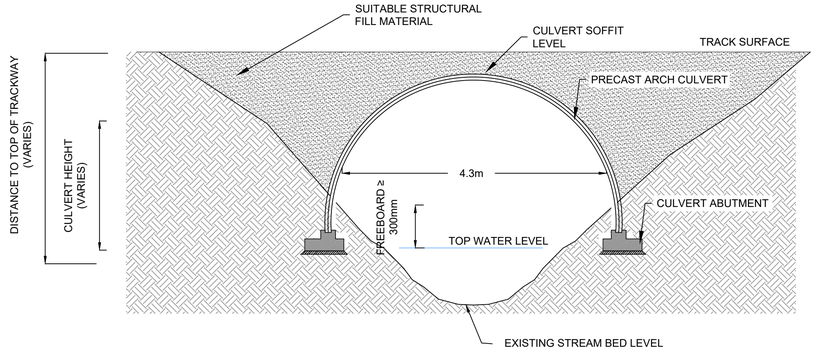
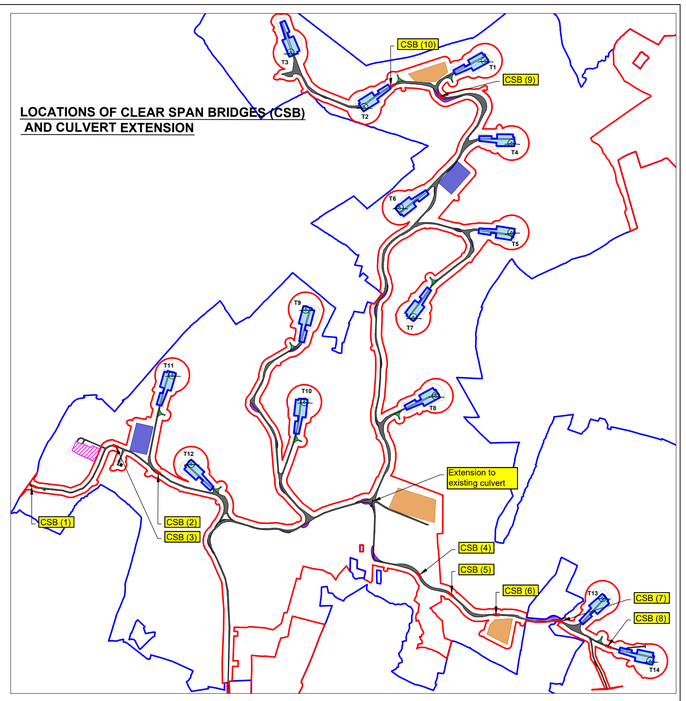
10955-2065	A

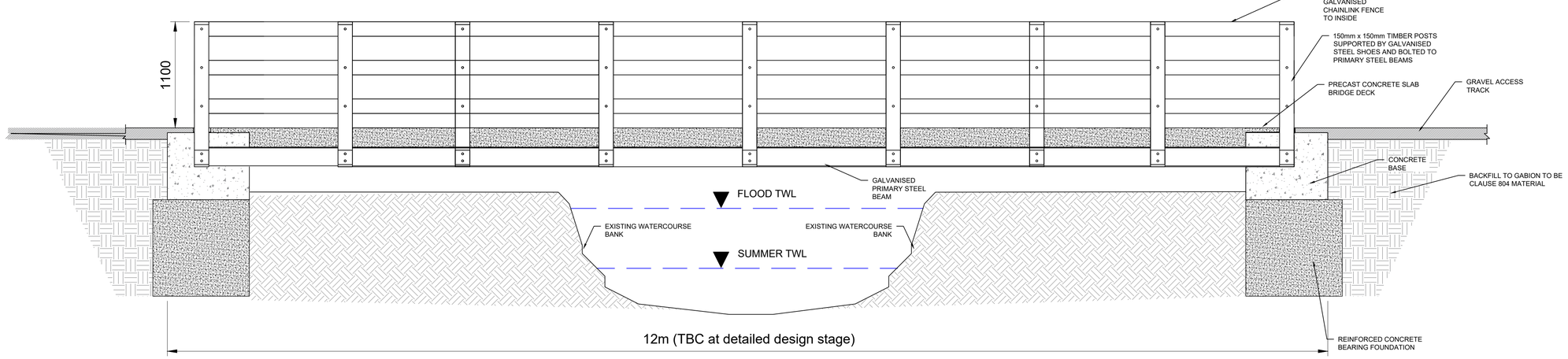


BOTTOMLESS CULVERT
PLAN 1:50

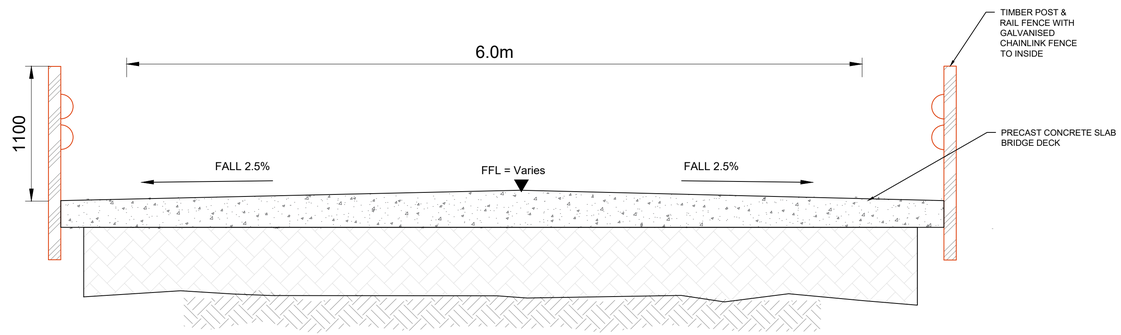


BOTTOMLESS CULVERT
ELEVATION 1:50





CLEAR SPAN BRIDGE SIDE ELEVATION
1:25



CLEAR SPAN BRIDGE FRONT ELEVATION
1:25

NOTE:
Orientation varies as multiple instances on site, north point can be seen on Drg. No: 10955-2010.

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Rev	Date	Description	By	Chkd.
A	10.04.26	ISSUED FOR PLANNING	MN	SR

Client: Ireland FuturEnergy

Project: LISSINAGROAGH WIND FARM

Title: PROPOSED CLEAR SPAN BRIDGE & BOTTOMLESS CULVERT DETAILS

Scale @ A1: As Shown

Prepared by: M. Nolan | Checked by: S. Ryan | Date: April 2026

Drawing Status: Planning

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Drawing No.: 10955-2066

Revision: A



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Appendix 2-8

Approach to Afforestation

Consideration of Afforestation

Statutory Overview

The United Nations Framework Convention on Climate Change, the Kyoto Protocol, the Paris Agreement and the recent Glasgow Climate Pact have as their ultimate objective the stabilisation of greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system, in a time frame which allows ecosystems to adapt naturally and enables sustainable development.

The Forest Service of the Department of Agriculture, Food & the Marine is Ireland's national forest authority. It is responsible for national forest policy, the promotion of private forestry, the administration of the forest consent system and forestry support schemes, forest health and protection, the control of felling, and the promotion of research in forestry and forest products.

The strategic goal of Ireland's forest policy is: "To develop an internationally competitive and sustainable forest sector that provides a full range of economic, environmental and social benefits to society and which accords with the Forest Europe definition of sustainable forest management."[1] Benefits accruing from this policy are an increase in the sustainable production of forest biomass for use in domestic markets and for renewable energy production, and an increase in levels of carbon sequestration contributing towards climate change mitigation.

The level of forest cover in Ireland is at 11% which is well below the European average of 38%. National forest policy has a goal of increasing Ireland's forest cover to 18% of total land area. Further policies underpinning this goal are a national afforestation programme of at least 8,000 hectares per annum and a requirement to replant areas following final harvesting of tree crops ("clearfelling")[2]. Where areas are being permanently clearfelled arising from a change in land use (for example, during wind farm construction), forest policy dictates that these must be replaced by afforestation of an alternative site on a hectare-per-hectare basis anywhere in the State (see Section 5.3 of the Forest Service Felling and Reforestation Policy[3] as shown in Appendix 1 - note only Infrastructure or Construction felling proposed for this project).

Areas of forestry proposed to be permanently clearfelled for this wind farm are located in upland, marginal land locations. Some of these areas are of low forest productivity due to the nature of the environment and will be replaced by alternative afforestation which will be of higher forest productivity, corresponding to the latest afforestation guidelines, thus providing increased carbon sequestration.

The clearfelling of trees in the State requires a felling licence. The legislative provisions governing such licences are set out in the Forestry Act 2014 (as amended) and the Forestry Regulations 2017 (as amended).

The associated afforestation of alternative lands equivalent in area to lands being permanently clearfelled (in this case, for wind farm construction) can occur anywhere in the State and is also subject to licencing by the Forest Service ('afforestation licencing').

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1 https://www.agriculture.gov.ie/media/migration/forestry/forestpolicyreviewforestsproductsandpeople/00487%20Forestry%20Review%20-%20web%2022.7.14.pdf

2 https://www.irishstatutebook.ie/eli/2014/act/31/section/17/enacted/en/html#sec17

3 https://assets.gov.ie/96814/4830fc08-0227-4504-83fa-2fd90a7942f2.pdf

Section 11(d) of the Forestry Act requires the Minister, in the performance of his functions, to determine whether screening for EIA or AA is required and whether EIA or AA are required and, if so, to ensure that they are carried out. This obligation applies to both forestry felling and afforestation licencing.

As the Board is aware section 34(13) and section 37H(6) of the Planning and Development Act 2000 (as amended) make clear that a person is not entitled to carry out a development merely because they have obtained planning permission, i.e. the planning permission does not obviate the need to have all other statutory and legal consents required to carry out the proposed development.

Afforestation Licence

The requirements for afforestation licencing are set out in the Forestry Regulations 2017 - this includes consideration of EIA and AA as set out in parts 7 and 8 respectively. Further detail is set out in the Environmental Requirements for Afforestation (DAFM, 2016)[4], copy included in Appendix 2. This ensures that afforestation takes place in a way that complies with environmental legislation and enhances the contribution new woodlands and forests can make to the environment and to the provision of ecosystem services, such as water protection and landscape enhancement.

The typical environmental effects of afforestation include potential effects on biodiversity, soils and geology, hydrology and hydrogeology, cultural heritage, landscape and visual, and air and climate.

In regard to biodiversity there are potential effects on existing habitats and species present at and in the vicinity of the site. In regard to soils and geology there are potential effects on the existing soil environment resulting from ground preparation, the construction of drains and tree planting. In relation to hydrology and hydrogeology there are potential effects on existing drainage patterns and water quality during site preparation. In relation to cultural heritage there are potential effects on the known and unknown cultural heritage features in the environment. In relation to landscape and visual there are potential effects on visual amenity and the landscape character of the area. In relation to air and climate there are potential effects on atmospheric carbon balances. There are also potential effects on the existing land use.

As part of the comprehensive environmental review and documentation to support any licence application, any potential negative effects arising are fully considered and avoided where possible or reduced where appropriate to an acceptable standard through mitigation measures. With careful management, and mitigation measures such as careful site selection, set-back from streams, careful drainage design and management, etc. afforestation can be carried out at appropriate locations without significant effects on the environment or adverse effects on the integrity of European sites. Before a license is granted the Minister as competent authority will carry out an EIA, if required, for the purposes of the EIA Directive and an appropriate assessment, if required, for the purposes of the Habitats Directive.

The Environmental Requirements for Afforestation sets out the typical sequence of tasks to be undertaken in order to proceed with afforestation activities (pre-application design, Forest Service licencing, site works and on-going management). It identifies key environmental issues namely water, biodiversity, archaeology, and landscape and sets objectives for their protection during design as follows:

[4] https://www.gov.ie/en/publication/642e6-forestry/#environmental-requirements

Water Objective:	To protect water and aquatic habitats and species, during afforestation and throughout the remainder of the forest rotation.
Biodiversity Objectives:	To ensure that afforestation does not adversely impact designated conservation areas, protected habitats, or protected species of fauna or flora and their habitat. To enhance the biodiversity value of the new forest throughout its rotation.
Archaeology and built heritage objective:	To seek to ensure that proposed afforestation development projects do not adversely impact directly or indirectly on known or suspected archaeological sites and monuments or on other important built heritage structures or features. This includes protecting their amenities and where relevant, their wider landscape setting, in particular, their relationship with other roughly contemporary or determinably linked sites, monuments, structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features, to seek to ensure that: (i) appropriate exclusion zones, fencing, access paths and other relevant measures are incorporated into the project design; (ii) there is an appropriate response should any previously unrecorded archaeological site, monument, object, structure or feature be discovered during site work; and (iii) any approved design is sympathetic to and provides an appropriate visual setting for such sites, monuments, structures or features.
Landscape Objective:	To ensure that the proposed forest is designed so that it is visually acceptable and in keeping with landscape and amenity sensitivities.

Design considerations and parameters are also set out in the document and include for example:

- Examination of the proximity and connectivity of the lands to Designated Conservation Areas or Priority 8 Freshwater Pearl Mussel Catchment areas
- Examination for the presence of Protected Habitats or Protected Species of fauna or flora and their habitat
- Retention of Protected Areas as well as other notable biodiversity features such as existing hedgerows, existing broadleaf scrub/woodland, veteran trees or other ecologically important features such as water flushes, etc.
- Provision of water setbacks, appropriate site drainage design and acceptable ground cultivation techniques to protect aquatic zones both during afforestation and throughout the remainder of the forest rotation
- Provision of other environmental setbacks (unplanted/undisturbed open spaces) to buffer retained habitats, archaeological features, public roads or ROWs, cultural features or utilised buildings
- Identification and protection of any existing (or later discovered) archaeological or cultural features, including setbacks, provision for future access to/protection of the site by fencing
- Sensitive planting design so that the proposed forest is visually acceptable and in keeping with the local landscape and local amenities

It should be noted that the granting of all afforestation licences is subject to conditions, including environmental conditions, that must be adhered to.

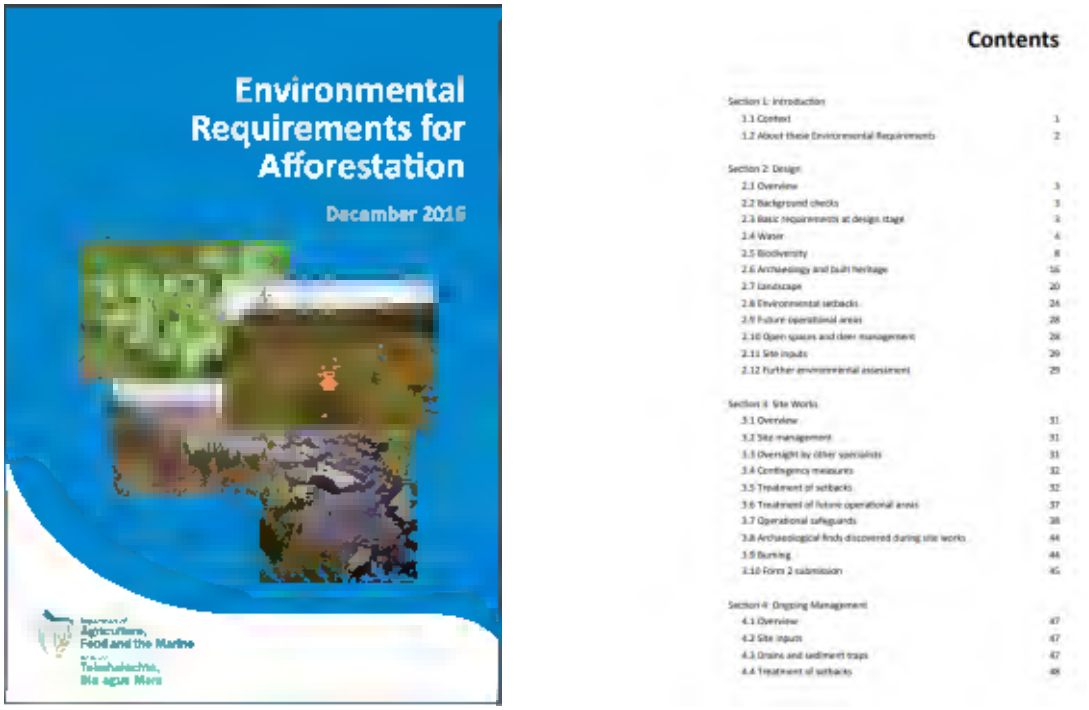

Figure 1: Forest Standards Manual Nov. 2015; Environmental Requirements for Afforestation Dec 2016.

Consideration of Afforestation in the Context of Planning Submissions

The developer is seeking a ten-year planning permission which incorporates time to secure a grid connection agreement, a route to market (RESS or equivalent Power Purchase Agreement), select the preferred equipment suppliers and put the necessary capital funding in place to allow construction and delivery to commence. This application for planning permission considers the environmental impacts of the felling activities required to deliver the project infrastructure and operate the proposed wind farm.

While the environmental impacts of the felling activities are considered at this application stage it is noted the felling of trees at the site for the purposes of the wind farm is subject to and can only occur following the grant of a felling licence by the Forest Service. Planning permission for the project may not be granted or, if granted, may have amendments introduced by condition(s). Therefore, the extent of felling required to be licensed for the purpose of giving effect to the windfarm project can only be determined once planning permission for the windfarm project has been granted. Furthermore, it will be a condition of the felling licence that an equivalent area of land required to be felled shall be replanted as per Forest Service Felling and Reforestation Policy. Thus, the extent of the lands required for afforestation can also only be known once planning permission has been granted for the windfarm project. In these circumstances, the application for the licence can, in practical terms, only be made once planning permission has been granted.

It is, in any event, environmentally prudent to progress the felling and afforestation licences closest to the time when the proposed felling activities are required, rather than long in advance during the wind farm planning submission stage, when the project programme remains uncertain and the exact areas cannot be fully confirmed.

If a licence was obtained prior to seeking and/or obtaining planning permission, it is highly likely that any licencing approvals sought from the Forest Service would have expired before it could be taken up due to the time required for the planning processes and post-planning delivery preparations. The Forest Service Afforestation Licences expire after 3 years from when they are consented.

Critically given the dynamic nature of the receiving environment, the identification and licensing of alternative afforestation lands at a later point in time (post planning consent) has the added benefit of ensuring that the licensing process fully reflects current legislative requirements, and, more importantly, the most up-to-date environmental information and that the cumulative / in-combination assessment considers the wider environmental impacts at that point in time

As mentioned above, key environmental issues relating to afforestation include water, soils, biodiversity, archaeology, landscape and climate. Each is subject to regular updates in terms of best practice, guidelines, standards and national policies. For example, the EPA regularly update the water quality status of rivers across the country, and planning authorities review their landscape strategies in line with their review of County Development Plans every six years. Delaying the identification of alternative afforestation lands until such time as they are required enables identification of optimum lands available (from an environmental) perspective for afforestation at that time.

In light of the foregoing and for the purposes of this project, the developer commits that the location of any replanting (alternative afforestation) associated with the project will be greater than 10km from the wind farm site and also outside any potential hydrological pathways of connectivity i.e. outside the catchment within which the proposed project is located. On this basis, it is reasonable to conclude that there will be no more than imperceptible indirect or in-combination effects associated with the replanting.

In addition, the developer commits to not commencing the project until both a felling and afforestation licence(s) is in place and therefore (as discussed above) this ensures the afforested lands are identified, assessed and licenced appropriately by the relevant consenting authority.

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Appendix 1

Section 5.3 of the Felling and Reforestation Policy (DAFM, 2017)

5.3 Supporting renewable energy and energy security

5.3.1 Overview

The development of renewables is at the heart of the Government's energy policy, as laid out in the document *Strategy for Renewable Energy: 2012-2020* (Department of Communications, Energy & Natural Resources, 2012). Under Directive 2009/28/EC, Ireland is legally obliged to ensure that by 2020 at least 16% of all energy consumed in the State is from renewable sources. Ireland must ensure that there is a steady, progressive and measurable increase between now and the year 2020, in the amount of renewable energy consumed in the electricity, heat and transport sectors, commensurate with the achievement of the national target.

Underpinning the Government's energy and economic policy objectives are five Strategic Goals reflecting the key dimensions of the renewable energy challenge to 2020. The first Strategic Goal refers to wind and aims to have "*Progressively more renewable electricity from onshore and offshore wind power for the domestic and export markets.*"

It is Forest Service policy to facilitate wind energy as much as possible within the context of sustainable forest management and efforts to expand the national forest estate.

5.3.2 Policy on felling licences for wind farm development

Where a developer intends to construct a wind farm that is within or partially within a forest or that will require tree felling, it is extremely important that the developer consults the Forest Service at the *earliest possible stage* of the project. This may help to develop a collaborative approach that will ensure that all forestry issues are identified and mitigated at the earliest opportunity.

In line with general Forest Service policy, where grant-aided forestry is to be used for wind farm development, any grants and premiums already paid out by the Forest Service in relation to the areas felled for the turbine bases, roads and infrastructure must be repaid where the forest is still in receipt of afforestation premiums and / or still in contract under the Afforestation Scheme.



Photo 8 *A wind farm within a forest plantation. Forest Service policy is to facilitate wind energy within the context of SFM and the expansion of the national forest estate.*

Wind farm construction typically encompasses three categories of tree felling: infrastructure; construction; and turbulence. Each category requires a felling licence. Table 6 and the following sections detail the specific requirements regarding each category. Also, Case Study 2 provides for three worked examples of wind farm development, and associated licensing issues.

5.3.2.1 General requirements

Notwithstanding any requirement for the wind farm developer to produce an Environmental Impact Statement (EIS) in respect of the development and the requirement to assess the impact of tree felling / reforestation proposals in an EIS, when felling licence applications are made, the Forest Service may require the developer to report on the potential loss of soil and biomass CO_2, and the reduction in productivity of the forest area associated with different wind farm forest management and landscape plans. Potential impacts to be reported on and assessed may also include site stability, water quality, habitats and species, landscape, archaeology, and other issues that may be deemed appropriate by the Forest Service.

If Planning Permission has been granted for the development by the local authority or by an Bord Pleanála, a copy of the full Planning Permission should be submitted to support the felling licence application. Also, if an EIS or a Natura Impact Statement have been prepared, these need to be submitted to support the felling licence application.

Table 6 Requirements for each category of felling associated with wind farm development, regarding reforestation, alternative afforestation, and the refunding of grant and premiums.

Category of tree felling		Reforestation of felled area required?	Alternative afforestation required? (See Note 1)	Refunding of grant & premiums required? (See Note 2)
Infrastructure felling		No	Yes	Yes
Construction felling		Yes	No	No
Turbulence felling	≤20 ha	Yes	No	No
	>20 ha	Yes	Yes, 10% turbulence fell area – see Section 5.3.2.4	No

Note 1 If 'YES', the alternative site must be of an area equivalent in size. Section 5.7 sets out the procedures required. If the forest area proposed for permanent removal is still in receipt of premiums and / or is still in contract under the Afforestation Grant & Premium Scheme, the alternative site may be eligible under the Afforestation Grant & Premium Scheme.

Note 2 If 'YES', the refunding of any afforestation grants and premiums already paid out by the Forest Service is required if the forest area proposed for permanent removal is still in receipt of premiums and / or is still in contract under the Afforestation Grant & Premium Scheme. Also, if 'YES' or 'NO', if premiums are still being paid, premium payments on the area will cease.

5.3.2.2 Infrastructure felling

Infrastructural felling relates to trees that are permanently removed from the site in order to make way for infrastructure associated with the wind farm, such as access roads and turbine bases.

For infrastructure felling, the afforestation of alternative land and the repayment of grant and premium payments are required – see Table 6 and Section 5.7 for details. In addition, where the infrastructure fell area is still in receipt of premiums, then premium payments will cease, i.e. the felled area will not continue to receive premium payments.

5.3.2.3 Construction felling

During the construction phase of the wind farm development, there are forest areas that require the temporary removal of tree cover to facilitate construction, e.g. 'borrow pits' for stone. Once construction is completed, the land is reforested.

For construction felling, the afforestation of alternative land and the repayment of grant and premium payments are not required – see Table 6. In addition, where the construction fell area is still in receipt of premiums, then premium payments will cease, i.e. the felled area will not continue to receive premium payments.

5.3.2.4 Turbulence felling

Turbulence felling is deemed to be felling in the vicinity of turbines for the purpose of avoiding air turbulence that can be created by the forest canopy. It is carried out in order to increase the efficiency of the turbine by reducing turbulence in the airflow, and to reduce vibrations through the turbine blades, thereby lowering stress on the turbine components.

Turbine manufacturers assess the forest layout, age profile and management plans for the forest along with topography and wind mast data. Based on that assessment, some manufacturers will require turbulence felling as part of the terms of supplying turbines for a particular site. In the case of many wind farms, the manufacturer's requirements are therefore not known until late in the planning of the project, as no turbine will have been selected. In general, manufacturers recommend that tree height is restricted within 300 metres, in the dominant wind direction.

Turbulence felling may be allowed in certain cases, and subject to reforestation requirements. For completeness and to ensure that the EIS itself is valid, it is important that the EIS takes into account the maximum turbulence felling that could potentially occur under the project.

Felling Licence requirements in relation to turbulence felling include the following:

1. The repayment of afforestation grants and premiums already paid out by the Forest Service is not required. In addition, where the turbulence fell area is still in receipt of premiums, then premium payments will cease, i.e. the felled area will not continue to receive premium payments.
2. The granting of a licence for a turbulence felling will be subject to the normal checks carried out by the Forest Service in respect of silvicultural, environmental and landscape considerations, etc. A felling coupe is defined for this purpose as a contiguous or adjacent area, any part of which is felled in a 2 (calendar) year period.
3. A distinction is made between turbulence felling ≤20 ha and >20 ha. Excluding the area

for the turbine bases, etc. from the limit, the 20 ha limit specified in this section is a total limit for the entire wind farm development. The limit is not interpreted as 20 ha per turbine or any other interpretation that is deemed by the Minister to be in excess of a total of 20 ha per wind farm development. In terms of reforestation, the following applies:

- Where the felling coupe area for turbulence felling is less than or equal to 20 ha, this is considered consistent with sustainable forest management. Where the cumulative total area of 20 ha or less is adjacent to one or more turbines and it is proposed to fell this area in accordance with normal good forest practice, such felling will not be considered turbulence felling. There is no requirement to afforest additional land. The area where the trees are being felled must be reforested.

Case Study 2: Windfarm development

The following tables provide examples of typical windfarm applications.

Site 1 Sitka spruce, 10 yrs. Reforest with North Coastal Lodgepole pine.

Felling type	Area (ha)	Reforest felled site	Alternative afforestation	Refund Afforestation Grant & Premium
Infrastructure	10	No	Yes (10 ha)	Yes
Construction	2	Yes	No	No
Turbulence	35	Yes	Yes (3.5 ha)	No

Site 2 Sitka spruce, 25 yrs. Reforest with Sitka spruce.

Felling type	Area (ha)	Reforest felled site	Alternative afforestation	Refund Afforestation Grant & Premium
Infrastructure	5	No	Yes (5 ha)	No
Construction	0.5	Yes	No	No
Turbulence	16	Yes	No	No

Site 3 Sitka spruce, 14 yrs. Reforest with Sitka spruce.

Felling type	Area (ha)	Reforest felled site	Alternative afforestation	Refund Afforestation Grant & Premium
Infrastructure	5	No	Yes (5ha)	Yes
Construction	0.5	Yes	No	No
Turbulence	16	Yes	No	No

- Where the felling coupe area for turbulence felling is greater than 20 ha, the applicant is required to reforest the area. In addition, 10% of the turbulence felling coupe area must be afforested on an alternative site to allow for the increase in soil carbon emissions at afforestation and the loss of potential carbon sequestration due to the proposed method of forest management. See Section 5.7 for details regarding the afforestation procedure.
- Subsequent to a licence being granted for 20 ha or less, any cumulative felling applied for above the 20 ha limit will be considered to be turbulence felling. Therefore, the original area of 20 hectares or less that was licensed will also then be regarded as turbulence felling. For example, if 20 hectares are felled in the first year and a further 12 hectares of felling is applied for in (e.g.) Year 3, then the additional 12 ha (if granted) and the original 20 ha will be treated as 32 ha of turbulence felling. The rules for turbulence felling will then apply to all 32 ha.

Appendix 2

Environmental Requirements for Afforestation (DAFM, 2016)

Environmental Requirements for Afforestation

December 2016



Department of
Agriculture,
Food and the Marine
An Roinn
Talmhaíochta,
Bia agus Mara

The Forest Service of the Department of Agriculture, Food and the Marine is responsible for ensuring the development of forestry within Ireland in a manner and to a scale that maximises its contribution to national socio-economic well-being on a sustainable basis that is compatible with the protection of the environment. Its strategic objectives are:

1. To foster the efficient and sustainable development of forestry
2. To increase quality planting
3. To promote the planting of diverse tree species
4. To improve the level of farmer participation in forestry
5. To promote research and training in the sector
6. To encourage increased employment in the sector

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December 2016

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Section 1
Introduction

1.1 Context

National forest policy - as set out in *Forests, Products and People* (2014) - is to increase the forest area in accordance with sustainable forest management (SFM) principles, in order to support a long-term sustainable roundwood supply, and associated employment and economic activity. As the consenting authority for afforestation, the Forest Service of the Department of Agriculture, Food & the Marine must ensure that this increase takes place in a way that complies with environmental legislation and that enhances the contribution new woodlands and forests can make to the environment and to the provision of ecosystem services, such as water protection and landscape enhancement.

The overall aim of these *Environmental Requirements for Afforestation* is to ensure that the establishment of new woodlands and forests is carried out in a way that is compatible with the protection and enhancement of our environment, including water quality, biodiversity, archaeology and landscape. (Sites proposed for afforestation must also meet the minimum timber productivity requirement set out in the Forest Service *Land Types for Afforestation* document, and this assessment should be carried out by the Registered Forester before advancing to application stage.)

In assessing an application for afforestation, the Forest Service is required to consider potential impacts across a range of issues and sensitivities. This includes in-combination impacts regarding water, biodiversity, landscape, social issues, etc. The following lists the primary components of the legal, regulatory and funding framework that apply:

- European Communities (Forest Consent & Assessment) Regulations 2010 (S.I.558 of 2010), as amended
- European Union rules governing the Forestry Programme



Sensitively sited, designed and established plantations adding to Ireland's expanding forest resource.

- Forestry Programme
- Legally protected species and habitats and associated designations (e.g. Special Areas of Conservation, Special Protection Areas, Natural Heritage Areas) and procedures (e.g. Appropriate Assessment)
- Water Framework Directive
- Legislation regarding archaeology and built heritage, including the National Monuments Acts 1930 to 2014
- Forest Service requirements, procedures and protocols, e.g. the terms and conditions of the Afforestation Scheme (if grant aid is being sought), the *Forestry Standards Manual*; the *Forestry & Freshwater Pearl Mussel Requirements*; the *Forestry & Kerry Slug Guidelines*; the *Forestry & Otter Guidelines*; and the *Forest Protection Guidelines*.

(For further details, refer to the **SUPPORTING DOCUMENT** on the Forest Service website - see below for details.)

Any statutory approval (with or without grant aid) for afforestation is conditional on adherence to the measures set out in these *Environmental Requirements for Afforestation*, to the conditions of approval, and to the standards and procedures set out in the *Forestry Standards Manual*. Where a parallel approval for grant aid has been issued, the Afforestation Scheme Terms & Conditions also apply.

Any divergence from the measures set out in these Requirements must be fully described in the initial application and depicted clearly on the Biodiversity Map, for consideration by the Forest Service.

1.2 About these Environmental Requirements

The *Environmental Requirements for Afforestation* replace those measures relating to afforestation contained within the following Forest Service Environmental Guidelines: *Forestry & Water Quality Guidelines*, *Forestry & Archaeology Guidelines*, *Forestry & the Landscape Guidelines*, and *Forest Biodiversity Guidelines*. (Note, however, that these guidelines still apply to other Forest Service regulated activities, as specified in any approval, consent or licence issued.)

The *Environmental Requirements for Afforestation* are set out in three stages. These reflect the typical sequence of activities undertaken by an Applicant and her / his Registered Forester and the corresponding environmental requirements that apply, throughout afforestation and up to the end of the premium period (or 15 years, for non-grant aided forests). These three stages are as follows:

1. Pre-Application Design
2. Site Works
3. Ongoing Management

This document is accompanied by a web-based document entitled *Environmental Requirements for Afforestation: SUPPORTING DOCUMENT* (see www.agriculture.gov.ie/forestservice/grantsandpremiumschemes2015-2016/). This web-based document is an integral part of the Requirements and is referred to throughout, as the '**SUPPORTING DOCUMENT**'.

Section 2
Design

2.1 Overview

During Stage 1: Pre-Application Design, the Registered Forester assesses the site and carries out various checks, and subsequently designs the afforestation proposal in a way that addresses the various environmental features and sensitivities identified. This design is then reflected in the subsequent application (Form 1) for technical approval (and financial approval, if sought) submitted to the Forest Service for assessment. Please note, it is the responsibility of the Applicant to provide the relevant information needed to enable the Forest Service to make a full assessment of the application.

2.2 Background checks

Various sources of information can be checked by the Registered Forester early in the pre-application design stage, to identify environmental features and sensitivities. Relevant safeguards can then be incorporated into the design to avoid possible negative impacts and to enhance positive impacts. Potentially, this may also shorten and streamline the assessment process.

iNET provides the primary source of information and provides a platform for mandatory Form 1 checks regarding water, designated sites, archaeology, etc. However, other important sources of environmental information are available - see the **SUPPORTING DOCUMENT**. Dialogue with the Applicant may also reveal more subtle sensitivities that might exist.

2.3 Basic requirements at design stage

The basic design-stage requirements in relation to water, biodiversity, archaeology and landscape are set out below. Note the following:

- If faced with a particularly sensitive and complex site in relation to a particular environmental feature or sensitivity, a Registered Forester may propose measures above and beyond the minimum requirements set out in this document. Examples include wider-than-normal water setbacks due to a downstream Special Area of Conservation (SAC).
- Furthermore, a relevant expert (e.g. hydrologist, ecologist, archaeologist, landscape architect) may be engaged early in the process, to assess the feature / sensitivity and to propose appropriate measures. This may result in a more refined application and may avoid complexities and delays in the application process. For example, it may avoid the need for the Forest Service to seek further information, and may allay the concerns of local people and statutory consultees.
- An individual site or part of a site may be deemed eligible from a productivity perspective (following the Land Types for Afforestation assessment process) but unsuitable from an environmental perspective. These sites may become apparent to Registered Foresters at the early design stage, following his / her onsite assessment and background checks, and *should not be advanced to application stage*.

2.4 Water

OBJECTIVE: TO PROTECT WATER AND AQUATIC HABITATS AND SPECIES, DURING AFFORESTATION AND THROUGHOUT THE REMAINDER OF THE FOREST ROTATION.

The Registered Forester must assess the potential risk of sedimentation and nutrient runoff entering into 'receiving waters' (streams, rivers, lakes), both during afforestation and throughout the remainder of the rotation, and adapt the forest design and planned operations accordingly. Key factors include soil type, slope, available pathways for water, the erodibility of the soil and subsoil, downstream SACs, and the status objective of the waterbody itself. Regarding the latter, particular regard is needed if the proposed afforestation site is within the catchment area of a high status objective waterbody or a waterbody at risk of decline in status.

For guidance, the **SUPPORTING DOCUMENT** gives examples of scenarios that (alone or in combination) can heighten the risk to water.

During site assessment, identify and map (on the required Biodiversity Map) the water features defined in Table 1, each of which require a water setback.

2.4.1 Water setback

A water setback(*) is an area of a defined width, positioned adjoining the water features defined in Table 1, and left largely undisturbed during afforestation and throughout the remainder of the rotation, specifically for the protection of water. All new drains installed as part of the afforestation project must terminate in sediment traps *outside* the water setback. The relevant setback for each water feature is set out in Section 2.8.

(* Formerly referred to as 'aquatic buffer zone'.)



The protection of water quality and aquatic habitats and species is a key requirement for all new afforestation projects.

Table 1 Water features requiring water setbacks.

Type of water feature	**Definition**
Aquatic zone	A permanent or seasonal river, stream or lake shown on an Ordnance Survey 6 inch map. (Note, the EPA water layer on iNET may not capture all aquatic zones onsite.)
Relevant watercourse	A watercourse that is not shown on an OS 6 inch map but which: ➢ is connected to an aquatic zone onsite, adjoining the site or elsewhere; and ➢ has the potential to carry significant amounts of sediments / nutrients, or shows evidence of erosion / deposition. Relevant watercourses are often artificial, and include existing drains and channels and other potential pathways that may contain flowing water during and immediately after rainfall. Note, not every watercourse may be a 'relevant watercourse'. For example, a well-vegetated agricultural drain on moderately sloping ground may not be a relevant watercourse.
Hotspot	An area (often localised) that is a potential source for sediment / nutrient loss during afforestation and / or future forestry operations. Examples include soft wet ground, flushes and springs, and pockets where machine access is difficult due to low ground-bearing capacity.
Water abstraction point	Abstraction point of any surface waters, borehole, spring or well used for the abstraction of water for human consumption in a water scheme.

2.4.2 Drainage and cultivation

Drainage and cultivation are necessary on most afforestation sites, to enable establishment. Typical methods include conventional mounding (with mound drains), ripping, inverted mounding and scrap mounding. Key factors are as follows:

- It is critical that water collected within drains flows slowly, both during afforestation and throughout the remainder of the forest rotation. This minimises the potential for erosion and the transport of sediments and nutrients to receiving waters. This requires an assessment of soil, slope and likely rainfall, and the selection and refinement of the most appropriate option(s), incorporating correct drain alignment, spacing and depth, and the proper deployment of sediment traps. Refer to the *Forestry Standards Manual* for specifications regarding drains, sediment traps, mounding, ripping, etc. Additional information is contained in the *Forest Road Manual* and *Forest Drainage Engineering: A Design Manual*. For details on operational safeguards (e.g. sediment trap distribution), see Section 3.7.1.
- All new drains must terminate in an appropriately-sized sediment trap located *outside* the water setback. New drains *must not* enter into or traverse the water setback itself (an exception exists for flat difficult-to-drain sites – see Section 3.7.1 for details.)

A well-defined water setback early in the afforestation process, with natural ground vegetation emerging.



- Match drainage and cultivation to the specific conditions that exist in different parts of the site, selecting the least intensive options and specifications needed to successfully establish and grow the forest. Where site conditions allow (e.g. on naturally free-draining sites), consideration should first be given to the least impacting techniques, such as ripping and inverted mounding. In water-sensitive parts of the site, inverted mounding or simple pit planting should be considered.
- The drainage and cultivation proposed for different plots must be determined during the design stage and accurately depicted on the submitted Biodiversity Map. Also depict any additional safeguards deemed necessary (see Section 3.7.1).
- Of particular concern are peat soils, steep slopes capable of generating higher water velocities, and old land drains and other possible pathways that may become reactivated. Also of particular concern is the capacity of the new drainage network to withstand high rainfall events, without the failure of sediment traps and water setbacks.

2.4.3 Water crossings

Water features may need to be crossed for site development works and ongoing site management. Crossings may be temporary in nature or may comprise permanent structures intended to link in with a future forest road.

The following requirements apply:

- Any work in an aquatic zone should be limited to the period May to September, inclusive.
- Crossings should be designed so that:
  - the number of crossings over a given aquatic zone is minimised;
  - disruption to the bank, bed and adjacent water setback is minimised;
  - the water flow is crossed at a right angle;
  - cement or uncured concrete is kept out of the aquatic zone, with 'cast-in-place' concrete isolated from any water which might enter the aquatic zone, until the

concrete is cured;

- local stone is used for bridge kerbs and end treatments for culverts;
- all timber treatment is carried out off-site.

- Consult with the Inland Fisheries Ireland at least 6 weeks prior to constructing any crossing of an aquatic zone.
- If planning a permanent structure intended to link in with a future forest road, consider whether or not the location of the crossing is environmentally appropriate for that future use.
- Bridge construction is necessary where culverts may restrict fish migration.
    - All supports and buttresses should be completely out of the stream.
    - Do not create shallow or shooting flow at the bridge aprons, to ensure that water velocities do not impede fish movement.
- Fords are not desirable and should only be used where the design is approved by Inland Fisheries Ireland.
- All culverts should be well-bedded and of sufficient size to carry normal flow, to accommodate 25-year storm events, and to avoid blockages and washouts. Ends should be tapered to match the embankment slope. If greater than 1.0 metre in diameter, culverts should be buried to a depth of 30 cm or 20% of their height (whichever is greater) below the streambed, and the original bed material placed in the culvert.

If proposing a crossing, submit full design details with the afforestation application, and clearly indicate the proposed location on the Biodiversity Map. Also provide details regarding removal and site restoration, where the proposed crossing is temporary in nature.

2.5 Biodiversity

OBJECTIVES:

- **TO ENSURE THAT AFFORESTATION DOES NOT ADVERSELY IMPACT DESIGNATED CONSERVATION AREAS, PROTECTED HABITATS, OR PROTECTED SPECIES OF FAUNA OR FLORA AND THEIR HABITAT.**
- **TO ENHANCE THE BIODIVERSITY VALUE OF THE NEW FOREST THROUGHOUT ITS ROTATION.**

Biodiversity is the variety of living organisms, including: (i) the diversity of species; (ii) the genetic diversity or variation within the species; and (iii) the ecosystems in which species live. Conifer, broadleaf and mixed woodlands and forests can contribute greatly to biodiversity, both within their boundaries and as wildlife corridors and refuges in the wider landscape.

2.5.1 Protected habitats and species

Afforestation can impact of a range of habitats and species protected under various legislation. Table 2 sets out various scenarios that may apply, and the likely outcome regarding any proposed afforestation application. Applicants are encouraged to seek ecological input early in the design stage in situations where one or more of these scenarios apply, and to tailor any subsequent application accordingly before submission to the Forest Service.



Yellow brimstone. Sensitive design at afforestation will enhance the forest's biodiversity value throughout the entire rotation.

Table 2 Various scenarios that may apply regarding protected habitats and species, and the likely outcome regarding the proposed afforestation application. (Note, the use of the term 'the project' below relates to afforestation and management of the forest rotation.)

1. Is the plot(s) within a Special Area of Conservation (SAC), Special Protection Area (SPA), a Natural Heritage Area (NHA) or proposed NHA, a Nature Reserve, a National Park, or a Refuge for Flora and Fauna? These sites are designated for the conservation of habitats and species. For example, SACs are designated under the Habitats Directive to create a coherent European ecological network in order to ensure the restoration or maintenance of habitats (Annex I) and animal and plant species (Annex II) of Community interest at a favourable conservation status. *Relevant legislation:* EU Habitats Directive; EU Birds Directive; Wildlife Act 1976; Wildlife (Amendments) Act 2000; European Communities (Birds and Natural Habitats) Regulations 2011 (S.I.477 of 2011)	If '*Yes*', the Forest Service may require an ecological report demonstrating how the project can take place in a manner compatible with the ecological objectives of the designation. ➢ In relation to NATURA sites (SACs and SPAs), the Forest Service will undertake screening and where necessary, appropriate assessment, and can only approve the project if it is satisfied that it will not adversely affect the integrity of the NATURA site, either alone or in combination with other plans or projects. See the Forest Service *Forestry Standards Manual* for details of this Appropriate Assessment Procedure. ➢ *Do not submit any area of a habitat listed as a qualifying interest of the SAC*. ➢ The Forest Service is not in a position to approve afforestation applications within Hen Harrier SPAs, pending the completion of the Threat Response Plan. ➢ In relation to proposed afforestation within NHAs, the Forest Service requires the submission of a completed Notifiable Action Form (which documents National Parks & Wildlife Service consent) with the initial Afforestation Application (Form 1).
2. In non-designated areas, is there a habitat listed in Annex I of the Habitats Directive, known to be present or observed within the plot(s)? See **SUPPORTING DOCUMENT** for a list of Annex I habitats (and the corresponding Fossitt (2000) habitat classification) that may occur on afforestation sites. *Relevant legislation:* Habitats Directive.	If '*Yes*', the Forest Service may require an ecological report assessing the habitat and its extent and identifying mitigation measures capable of ensuring that the project can take place in a manner compatible with the maintenance or restoration to a favourable conservation status of that habitat. NOTE, at a site level, the Forest Service will not approve the afforestation of a non-designated Annex I habitat that is deemed to be a favourable condition, based on an assessment of its area, structure and function, and future prospects. Such habitat must be excluded from the application or incorporated as a retained habitat. In both cases, an appropriate habitat setback will also be required so as not to impact on future prospects.

3. Is the plot(s) within one of the Priority 8 Freshwater Pearl Mussel (FPM) Catchments (as listed in the SUPPORTING DOCUMENT)? FPM is a freshwater shellfish that is highly vulnerable to siltation and nutrient runoff and other water impacts, and is a highly threatened species of European importance. The *Strategy for Conservation of the Freshwater Pearl Mussel* (September 2011) prioritises the conservation of FPM populations within 8 sub-basin catchments. See the **SUPPORTING DOCUMENT** for details. *Relevant legislation:* Habitats Directive; European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (S.I.296 of 2009)	If '*Yes*', afforestation approval is dependent *inter alia* upon the submission and subsequent evaluation by the Forest Service, of a Form A (Site Assessment) and Form B (Mitigation Measures) from the *Forestry & Freshwater Pearl Mussel Requirements*. The Forest Service may also request a NATURA Impact Statement (NIS). Note that, if approved, afforestation within these catchments is likely to be limited to native woodland establishment under GPC9 and GPC10.
4. Is the plot(s) within the 6 km zone of any other Freshwater Pearl Mussel Catchment listed in the SUPPORTING DOCUMENT? For details of FPM, see above. *Relevant legislation:* Habitats Directive; European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.	If '*Yes*', afforestation approval is dependent *inter alia* upon the submission and subsequent evaluation by the Forest Service, of a Form A (Site Assessment) and Form B (Mitigation Measures) from the *Forestry & Freshwater Pearl Mussel Requirements*. The Forest Service may also request a NIS.
5. Is there an Annex IV species or its habitat (if in the species range) known to be present or observed within the plot(s)? Species listed in Annex IV of the Habitats Directive are strictly protected. It is an offence to deliberately disturb the species or damage or destroy its breeding or resting places wherever it occurs, whether inside or outside designated areas. Annex IV species include otter, Kerry slug and bats. *Relevant legislation:* Habitats Directive.	➢ If *'Yes'* for otter, follow the requirements set out in the Forest Service *Forestry & Otter Guidelines*. ➢ If *'Yes'* for Kerry slug, follow the requirements set out in the Forest Service *Forestry & Kerry Slug Guidelines* ➢ If *'Yes'* for any other Annex IV species, the Forest Service may require an ecological report demonstrating how the project can and will be designed and implemented in a manner compatible with the protection of the species and its habitat.

6. Is there an Annex II species and / or its habitat known to be present or observed within the plot(s)? Species listed in Annex II of the Habitats Directive are animal and plant species of Community interest whose conservation requires the designation of SACs. Outside of SACs, these species are protected against damage that impacts their favourable conservation status (or ability to achieve that status) (for example, damage that reduces the natural range of the species). There are a number of Annex II species, included the Killarney Fern, Yellow Marsh Saxifrage and River Lamprey. *Relevant legislation:* Habitats Directive; Environmental Liability Directive; European Communities (Environmental Liability) Regulations 2008 (S.I.547 of 2008).	If '*Yes*', the Forest Service may require an ecological report confirming the presence of the species or its known habitat, a determination regarding whether or not the project would impact on the species' favourable conservation status (or its ability to achieve that status), and if so, required mitigation.
7. Is the application located on sandstone geology in West Cork or Kerry, as illustrated in Figure 1 of the Forest Service *Forestry & Kerry Slug Guidelines*? As an Annex IV species under the Habitats Directive, the Kerry slug (*Geomalacus maculosus*) is strictly protected wherever it occurs. It is an offence to deliberately disturb the species or damage or destroy its breeding or resting places wherever it occurs, whether inside or outside designated areas. It is also an offence under national legislation (Wildlife Act 1976, Wildlife (Amendment) Act 2000) to deliberately destroy or damage the slug or its habitat. *Relevant legislation:* Habitats Directive; Wildlife Act 1976; Wildlife (Amendment) Act 2000.	If '*Yes*', follow the decision path set out in the Forest Service *Forestry & Kerry Slug Guidelines*. Detail both the outcome of this process and any resulting amendments to forestry operations required (as set out in these Guidelines) in the proposed application for afforestation.
8. Is there a population of a species protected under the Flora (Protection) Order 2015 (S.I.356 of 2015) known to be present or observed within the plot(s)? The Flora (Protection) Order 2015 protects various plants (see **SUPPORTING DOCUMENT**). It is an offence (save under a licence granted under Section 21 of the Wildlife Act 1976) to (*inter alia*) wilfully alter, damage, destroy or interfere with the habitat or environment of these plants. This applies to wherever the plants are found, whether inside or outside designated areas. See SUPPORTING DOCUMENT for relevant sources of information. *Relevant legislation:* Wildlife Act 1976; Wildlife (Amendment) Act 2000; Flora (Protection) Order 2015 (S.I.356 of 2015).	If '*Yes*', the Forest Service may request the submission of an ecological report confirming the presence (or otherwise) of the species, and required mitigation.
Note regarding species of animal protected under the Wildlife Act 1976 and the Wildlife (Amendment) Act 2000 Mammal, amphibian, reptile and invertebrate species protected under the Wildlife Act 1976 and the Wildlife (Amendment) Act 2000 (see **SUPPORTING DOCUMENT** for list) are protected from injury, or from disturbance / damage to their breeding or resting place, wherever these occur. The majority of these species are considered by other scenarios listed above. Further cover is provided by specific Forest Service requirements for Kerry slug and otter and guidance for bat species, Therefore, to avoid duplication, the above does not contain a specific question dealing directly with the Wildlife Act 1976 and the Wildlife (Amendment) Act 2000.	

2.5.2 Areas for Biodiversity Enhancement

During onsite assessment, identify Areas for Biodiversity Enhancement, or ABEs. Their function is (*inter alia*) to conserve existing habitats and biodiversity features onsite and to promote the development of biodiversity generally within the new forest.

ABEs comprise environmental setbacks, future operational areas and retained habitats, as described below.

- An **environmental setback** is a (largely) unplanted and undisturbed open space of a defined width (as set out in Section 2.8) installed to protect a particular environmental feature or sensitivity. Different types apply (as listed below) depending on the feature or sensitivity involved:
    - water setback
    - retained habitat setback
    - archaeological setback
    - public road setback
    - utilised building setback
    - landscape setback

  In addition to their main protective role, these environmental setbacks are important biodiversity features in their own right, providing open and edge habitats along the forest margin. As described later, this role can be enhanced further through simple design and additional planting.
- A **future operational area** is an open space left unplanted in order to facilitate the future management of the plantation (e.g. a rideline) or to accommodate future infrastructure (e.g. a forest road or landing bay). In addition to their primary management function, these operational areas are also important biodiversity features in their own right, and this value can be enhanced further through simple design and additional planting.
- A **retained habitats** is an existing onsite habitat selected for retention within the future forest. These can be area-based features (e.g. a localised flush), linear features (e.g. a hedgerow) or point features (e.g. a veteran tree). Design must aim to protect and enhance these habitats throughout the forest rotation, and to allow associated native flora and fauna to develop. This may involve the addition of a habitat setback, to prevent future impacts (e.g. overshadowing) from the growing forest canopy – see Section 2.8 for details.

  (Note, it may be necessary to exclude from the afforestation application, areas containing certain habitats or species that require grazing to persist. Otherwise, these areas will become overgrown as the result of fencing.)

Ensure that future operational areas for future forest roads do not overlap with environmental setbacks for water, archaeology and retained habitats.

Tables 3 and 4 list the various features that are eligible as ABEs for the purpose of grant and premium calculation.

Table 3 Site features and their eligibility as ABEs. (Also see Table 4 regarding woody habitats.)

Site features	**Eligible as ABE?**
Water setback	Yes
Retained habitat setback	Yes
Archaeological setback	Yes
Public road setback	Yes
Utilised building setback	Yes
Landscape setback	Yes
Hedgerows and other woody habitats	See Table 4
Created lakes / reservoirs	Yes
Railway setbacks	Yes
Drains	Yes
Future operational areas left for planned forest roads, turning bays, ridelines, etc.	Yes
Unplantable areas	No
Areas of shallow, rocky soil	No
Rock and scree	No
Aquatic zones (as defined in Table 1)	No
Rights-of-way held by 3rd parties	No
Areas with turbary or grazing rights held by 3rd parties	No
Major water mains	No
Power line corridors	No
Gas pipeline corridors	No
Public roads	No
Other features	If deemed appropriate by the Forest Service

Table 4 Woody habitat types, their eligibility as ABEs, and available options.

Type of woody habitat	Eligibility as ABE and available options(*)	Comment
Area of scrub (e.g. elder) and non-high forest species (e.g. blackthorn, hawthorn, willow)	Eligible as ABE. Therefore, either: ➢ include as retained habitat; OR ➢ clear(**) and plant; OR ➢ exclude from the application.	Non-high forest species often have a high biodiversity value.
Individual high forest trees (e.g. oak, ash, beech, hazel(***), birch, pine)	Eligible as ABE. Therefore, include as retained habitat (i.e. point features).	Individual trees such as these can have a high biodiversity value.
Areas of high forest trees (see above examples) less than 0.1 ha in size	Eligible as ABE. Therefore, either: ➢ include as retained habitat; OR ➢ exclude from the application.	Groups comprising trees such as these can have a high biodiversity value.
Areas of high forest trees (see above examples) 0.1 ha or greater in size	Not eligible as ABE. Therefore, exclude from the application.	Such areas meet the definition of a forest, and existing forests cannot receive afforestation payments.
Hedgerows	Eligible as ABE. Therefore, either: ➢ include as retained habitat *plus* setback; OR ➢ include as retained habitat.	Apply habitat setback as per Section 2.5.4. Otherwise, no habitat setback required.
Rhododendron / laurel	Not eligible as ABE. Therefore, either: ➢ clear and plant, OR ➢ exclude from the application.	These are non-native invasive species and must not be retained as ABE.

* Each relevant option can be applied to all of the corresponding woody habitat type onsite, or to different sections of it.

** Under a Felling Licence, if required. Note, the retention of alluvial woodland comprising willow may require prioritisation within the wider landscape, due to ecological considerations and water protection.

*** Hazel may be classed as 'scrub' where it has encroached in the last 5 years.

2.5.3 ABE criteria

ABE eligibility criteria are as follows:

- Between 10-15% of the afforestation site must be treated with particular regard to biodiversity, comprising a combination of open spaces (i.e. environmental setbacks and future operation areas) and retained habitats. Where ABEs add up to more than 15% of the total area, the claim area must be reduced accordingly, as set out in the *Forestry Standards Manual*.
- ABEs must comprise areas suitable for planting, but where the potential for a commercial forest crop is foregone for the purpose of retaining habitats and creating open spaces in order to (*inter alia*) promote biodiversity within the future forest. Areas that are unsuitable for planting are not eligible as ABEs.
- ABEs must be an integral part of the site. For example, an ABE plot cannot be in an adjoining field / land parcel or in a separate plot away from the main area of the plantation.

- Generally, identify ABEs using the following sequence:
  - Step 1: Identify environmental setbacks (for water, archaeology, landscape, etc.) and future operational areas, to allow for the environmental features / sensitivities identified and management needs envisaged.
  - Step 2: Select the 'best quality' habitats(*) onsite for retention, together with any habitat setbacks deemed necessary to prevent future impacts (e.g. overshadowing) from the growing forest canopy.
- Applicants must not remove habitats prior to submission of the afforestation application. Otherwise, the application may be refused.
- The submitted Biodiversity Map must show any proposed ABEs (i.e. environmental setbacks, future operational areas and retained habitats) as Bio Plots and as linear or point features, and state the equivalent area. The *Forestry Standards Manual* sets out the mapping requirements. It is critical that the Biodiversity Map accurately depicts all relevant environmental features and sensitivities (including biodiversity features), proposed cultivation and drainage, and the location of setbacks and other protective measures.

  (* A basic level of ecological assessment by the Registered Forester will help to identify which habitats will have the greatest biodiversity value. When identifying and mapping retained habitats, use the Level 2 (or Level 3, if possible) habitat classification in Fossitt's *A Guide to Habitats in Ireland* (2000) (PDF available at www.heritagecouncil.ie).)

2.5.4 Hedgerows

Hedgerow networks are one of the most widespread semi-natural habitats in the countryside, due to their extent, connectivity, structure and composition. In addition to their biodiversity value, hedgerows form part of the cultural and historic heritage of the country, and are important landscape features. As such, they must be regarded carefully during pre-application design and subsequent site works.

All hedgerows must be retained. In general, do not break through hedgerows during afforestation. Similarly, do not use hedgerow trees as makeshift straining posts for fencelines.

A habitat setback (5 metres minimum) should also be considered in relation to particular hedgerows onsite, to ensure their continued presence as the surrounding canopy develops. This decision should be informed by the quality of the hedgerow (in terms of its age, species composition and structure), its landscape importance, and other attributes (e.g. whether or not the hedgerow represents a townland boundary or if it is associated with another habitat such as a stream).

Other situations can arise where a hedgerow setback is desirable, e.g. to create a future wind-firm edge to enable staggered felling later, or to realise the potential role of a hedgerow as part of water management onsite.

Hedgerows with setbacks will also act as links and corridors for many species of flora and fauna between other areas of semi-natural habitat within the wider landscape. Therefore, consider applying setbacks to one or more contiguous lengths of hedgerow that run from one side of the afforestation site to the other, to promote this habitat connectivity.

2.6 Archaeology and built heritage

OBJECTIVES:

- **TO SEEK TO ENSURE THAT PROPOSED AFFORESTATION DEVELOPMENT PROJECTS DO NOT ADVERSELY IMPACT DIRECTLY OR INDIRECTLY ON KNOWN OR SUSPECTED ARCHAEOLOGICAL SITES AND MONUMENTS OR ON OTHER IMPORTANT BUILT HERITAGE STRUCTURES OR FEATURES. THIS INCLUDES PROTECTING THEIR AMENITIES AND WHERE RELEVANT, THEIR WIDER LANDSCAPE SETTING, IN PARTICULAR, THEIR RELATIONSHIP WITH OTHER ROUGHLY CONTEMPORARY OR DETERMINABLY LINKED SITES, MONUMENTS, STRUCTURES OR FEATURES.**
- **WHERE AFFORESTATION IS APPROVED NEAR KNOWN OR SUSPECTED ARCHAEOLOGICAL SITES AND MONUMENTS OR OTHER IMPORTANT BUILT HERITAGE STRUCTURES OR FEATURES, TO SEEK TO ENSURE THAT: (I) APPROPRIATE EXCLUSION ZONES, FENCING, ACCESS PATHS AND OTHER RELEVANT MEASURES ARE INCORPORATED INTO THE PROJECT DESIGN; (II) THERE IS AN APPROPRIATE RESPONSE SHOULD ANY PREVIOUSLY UNRECORDED ARCHAEOLOGICAL SITE, MONUMENT, OBJECT, STRUCTURE OR FEATURE BE DISCOVERED DURING SITE WORK; AND (III) ANY APPROVED DESIGN IS SYMPATHETIC TO AND PROVIDES AN APPROPRIATE VISUAL SETTING FOR SUCH SITES, MONUMENTS, STRUCTURES OR FEATURES.**

2.6.1 Potential impacts

The Irish countryside is rich in the physical remains of human activity stretching back over the millennia. These vary from the more obvious and iconic monument types such as megalithic tombs, standing stones, ringforts, crannógs, churches and graveyards, burial grounds and medieval castles, to the less well-known and less visible or entirely below-ground surface monument types such as ancient timber and gravel roadways (toghers), cooking places (fulachta fiadh) and settlement sites. All archaeological sites and monuments can have or may survive solely as associated artefacts and features. Examples include stone or metal tools, pottery sherds, post holes or refuse pits. These are often only uncovered during ploughing, drainage works, construction or turf cutting.

Archaeological sites and monuments and other important built heritage structures and features are part



A central court tomb, Magheraghanrush or Deerpark, Co. Sligo (Coillte property). (Illustration Aislinn Adams)

of our national heritage. There is a wealth of information to be gathered from such sites, monuments, structures and features, both from those which are visible above the ground and from those which have little or no surface expression. In addition to their educational value in terms of informing current and future generations and visitors about the history and development of our culture and society, they are also important recreational and tourism resources at local, regional and national levels.

2.6.2 Procedures

Land proposed for afforestation may contain or be located adjacent to archaeological sites and monuments and built heritage structures and features. For the purpose of these Requirements, these are grouped into three categories:

- **'Designated' archaeological sites and monuments**, which include those: entered onto the Record of Monuments and Places (RMP) or the Register of Historic Monuments (RHM); National Monuments in the ownership or the guardianship of the Minister for Arts, Heritage, Regional, Rural & Gaeltacht Affairs or a Local Authority; or those subject to a Preservation Order (PO) or a Temporary Preservation Order (TPO). Also included are sites and monuments newly discovered at the pre-application design stage or during the site works stage, post-approval. Examples include megalithic tombs, cairns, barrows, mounds, ringforts, enclosures, churches and graveyards, castles, tower houses and children's burial grounds.
- **'Designated' buildings and structures or parts of structures which form part of the architectural heritage and which are of special interest**, i.e. those entered onto the Record of Protected Structures (RPS) in the relevant County Development Plan or those entered into the National Inventory of Architectural Heritage (NIAH). Examples include vernacular cottages and houses, country houses and lodges, designed gardens and parklands, parish churches, historic creameries, military fortifications, mine engine houses, water mills, canals, locks and lock houses, and old school houses.
- **'Non-designated' built heritage structures**, e.g. lime kilns, sheep folds, creamery stands, stiles, townland boundaries, pumps and pump houses, mill ponds, and derelict dwellings / farm buildings.

Given the nature of afforestation (site selection, ground preparation operations, canopy development, and making provisions for future management operations), the potential for damage to our archaeological and built heritage clearly exists. For example, soil cultivation and drainage works can directly or indirectly disturb or impact both upstanding and sub-surface archaeological sites and monuments and associated features and artefacts. Even the digging of drains and sediment traps near such sites or monuments may cause organic deposits and artefacts (e.g. structural timbers, wooden artefacts or leather) preserved by anaerobic conditions to decay quicker as the soil deposit dries out. Similarly, changes caused to soil chemistry (e.g. from needle fall) may cause metal artefacts or ceramics to decay quicker.

The early identification of the nature, extent, setting, visual envelope and linkages of archaeological sites and monuments or other important built heritage structures or features, and the incorporation of these considerations both at the pre-application design stage and during site works (where afforestation is approved near known or suspected archaeological sites and monuments) will help to avoid or minimise the risk of damage.

Examples of measures to avoid, reduce or mitigate adverse impacts include:

- avoidance of areas of known or suspected elevated archaeological potential;
- incorporation of appropriate archaeological setbacks;

- access routes;
- unplanted lines of sight;
- arranging for in-works supervisory safeguards such as archaeological monitoring; and
- the sensitive design of the forest edge adjoining archaeological setbacks, to provide an appropriate setting.

The Registered Forester must identify known archaeological sites and monuments or other important built heritage structures or features, on and adjoining a site proposed for afforestation, through review of the relevant layers on iNET, and through a thorough onsite assessment.

The Forester should also utilise readily accessible sources of information. For example, the online digital service - the Historic Environment Viewer - provided by the Department of Arts, Heritage, Regional, Rural & Gaeltacht Affairs, facilitates access to the databases of the National Monuments Service (NMS) Sites and Monuments Record (SMR) and the NIAH. In addition, the RPS for each county is normally accessible on-line, and can usually be found as an appendix to the published County Development Plan. See the *Forestry Standards Manual* for further details.

Where possible, include all reference numbers (e.g. RMP number) on the Biodiversity Map submitted with the application. Doing so may expedite the Forest Service assessment of the application.

Once the various archaeological sites and monuments and other important built heritage structures or features (including those both 'designated' and 'non-designated') have been identified, the relevant minimum archaeological setbacks detailed in Section 2.8 apply, as well as any other measures proposed to address considerations such as the nature, extent, setting, visual envelope and linkages of these sites, monuments, structures or features.

2.6.3 Conditions attached to or further information required in approvals

As a general rule, the archaeological conditions that may be attached to any approval for afforestation will be taken from, but are not limited to, one or more of a tiered hierarchy of archaeological mitigation responses. These include:

- archaeological setbacks (including fenced-off exclusion zones);
- access routes;
- unplanted lines of sight;
- increasing the size of the archaeological setbacks;
- the exclusion of a larger area or areas of archaeological potential;
- archaeological monitoring of specified areas by an independent archaeological consultant retained by the Applicant or the Registered Forester;
- refusal of either part or all of the development, pending the consideration by the Forest Service and NMS of an archaeological assessment and an archaeological impact statement prepared by an independent archaeological consultant retained by the Applicant or the Registered Forester; or
- refusal after submission, where warranted due to significant adverse impacts that are evident at the very outset of the Forest Service assessment, or which become so as the assessment continues.

Note, as explained above, where it is evident to the Forest Service at the outset or where it becomes

Ogham Stone, Knickeen, Co. Wicklow (Coillte property).



evident as the assessment progresses, that a proposed development is likely to have significant adverse impacts on archaeological, historical or cultural sites or features, and which in its opinion cannot be adequately addressed by conditions based on the tiered hierarchy of archaeological mitigation responses listed above, the application may be refused entirely.

2.6.4 Archaeological finds at the pre-application design stage

Note that, during the onsite assessment or with local knowledge, the Registered Forester may also encounter a previously unrecorded archaeological site or monument at the pre-application design stage. If discovered, the location of any new or suspected new archaeological site or monument must be included on the Biodiversity Map, and a clear reference included in the map's table legend. Furthermore, a clear description must be provided in the 'Other Environmental Considerations' section of the Afforestation Application Form 1.

The Forest Service will consider such reports as part of its assessment of the application. Following referral to the NMS, it may impose one or more relevant archaeological conditions, with a default position being to favour preservation *in situ* of any new archaeological site or monument so identified (in accordance with the principles and approach as set out in Part III of *Framework and Principles for the Protection of the Archaeological Heritage* (Department of Arts, Heritage, Gaeltacht and the Islands, 1999)).

Where an archaeological object is discovered at this stage, it must by law be reported within a reasonable time period (and not longer than 96 hours) to the Garda Síochána or the National Museum of Ireland. Also, unless there is reasonable cause to believe that removal or interference is necessary to preserve it or to keep it safe, it must not be disturbed. The unsupervised recovery of archaeological objects by untrained persons can greatly diminish or entirely eliminate any knowledge or research value that might be gained from a particular discovery. It is important that, wherever possible, archaeological objects are recovered in a structured scientific manner, with careful recording made of their association with other objects, structures, features and soil layers.

(Note, see Section 3.8 for details regarding archaeological finds discovered during site works.)

2.7 Landscape

Objective: To ensure that the proposed forest is designed so that it is visually acceptable and in keeping with landscape and amenity sensitivities.

The predominantly open landscape of Ireland is a result of the progressive clearance of the natural woodland cover through the centuries, primarily for agriculture. In such an open landscape, afforestation is a major change. Registered Foresters should therefore apply attention to shape, scale, species diversity, margins, open spaces and views, to ensure that the new forest complements the character of the landscape, and to avoid intrusive and monotonous plantations. Careful design of forests at the pre-application design stage is important, as only limited improvements can be made later on.

The Registered Forester should consult with the relevant County Development Plan (both Draft and Final Plans), which will identify areas of particular landscape sensitivity and important views. The Registered Forester should also view the site from various vantage points and approaches, to identify how best to design the forest(*).

(* Within sensitive landscapes, it may be advisable for Registered Foresters to submit a series of photographs of the site, as viewed from various approach roads and local vantage points, together with an OS Discovery map indicating where each photo was taken. This will enable to Forest Service to assess how the afforestation will fit into the landscape, as viewed from these positions. Some digital cameras and smartphones have a function to take panoramic photographs, which are ideally suited for this purpose.)

Achieving an acceptable landscape design can be a subjective exercise. However, the following measures can be applied as required, taking account of the size of the proposed plantation, its position in the landscape, and its visibility from key vantage points, near and far. For example, a plantation on a visible hillside within a sensitive landscape will require a greater degree of design compared to a plantation within a lowland area with hedgerows, where measures may be limited to well-designed setbacks adjoining dwellings and public roads.

It is important that any measure applied is done so at an appropriate scale, in order to have the desired impact.



When appropriately sited and with sensitive layout and design, new woodlands and forests make a significant contribution to the landscape. (Photo Gillian Mills)

Shape, margins and diversity are key considerations in forest landscape design. (Illustration Aislinn Adams)



2.7.1 Shape

- Shape is the dominant landscape feature. It refers to the forest outline and also to the pattern of different species within it.
- Overall straight or horizontal lines and geometric or regular shapes should be avoided, where possible. These are often imposed by property boundaries, but can be mitigated by landscape setbacks (see Section 2.8).
- The planting of single, small groups and irregular belts of native species (e.g. birch, rowan, oak and Scots pine, as site conditions allow) along the forest edge or within any environmental setback will also add visual interest – see Sections 3.5.3 and 3.5.4.
- On hillsides, planting should conform to the overall pattern in the landscape, whether natural landforms or field patterns, and follow the same rounded or irregular shapes.
- Large open landscapes are more suited to relatively large forested areas, while smaller and more regular shapes fit in better within a lowland pattern of fields and hedgerows.

2.7.2 Margins

- Avoid abrupt margins between the forest and open ground, between different species and between different Grant & Premium Category (GPC) plots.
- On sites approaching the skyline, the upper margin should be in line with the predominant landscape characteristics, be they irregular or smooth. Avoid leaving a narrow parallel band of open ground near the skyline. The open ground should reflect the scale of the hill or ridge. At lower points, planting can be carried right over the skyline.
- In upland areas, long straight vertical boundaries should be avoided. Instead, a diagonal trend should be maintained.
- Along highly visible forest margins, localised areas of spruce and pine trees towards the outer 10-15 metres of the forest can be planted at wider and irregular spacing. This measure, when

used in conjunction with forest edge planting, can promote the sense of a natural tree line, therefore softening the external margin.

- In lowland areas, straight boundaries can be acceptable where they reflect the agricultural field pattern.
- On lower margins, plantations can be blended into the agricultural landscape by introducing and extending broadleaf plots and additional broadleaves upwards in amongst conifer plots, especially following hollows in the landform.

2.7.3 Diversity

- Diversity can be promoted by using a variety of species and by incorporated and reinforcing open spaces and retained habitats.
- Too much variety, however, should be avoided. It is usually desirable that one species dominates by about two-thirds.
- To be considered eligible under the Afforestation Scheme, the proposed plantation must have a minimum of 10% broadleaves, either as plots of minimum width and / or as single, small groups and irregular belts of additional broadleaves. Furthermore, each plot must comply with one of the GPCs described in the *Forestry Standards Manual*, and its corresponding requirements, including species composition.
- Promote an interlocking pattern along the margin between plots of different species. This can be achieved by extending groups and single trees of one species into the other, within the scope allowed under the GPCs involved.
- Avoid creating long rows of single species or rows or blocks of alternate species.
- Avoid species boundaries crossing the skyline.
- Plot outlines and group planting should follow ground vegetation patterns – this will help maintain a natural appearance.
- Reinforce the outline of retained woody habitats, by planting broadleaves in adjoining tongues or groups.
- The planting of single, small groups and irregular belts of native species (e.g. birch, rowan, oak and Scots pine, as site conditions allow) along the forest edge or within any environmental setback will add visual interest – see Sections 3.5.3 and 3.5.4.

2.7.4 Environmental setbacks and future operational areas

Within the overall plantation boundary, the pattern created by environmental setbacks and future operation areas must be taken into account. The layout and design of these open spaces is set out elsewhere in this document. As an overall measure, where these features intersect with each other, introduce appropriately-scaled bell mouths in order to eliminate stark junctions and corners that may be visible from outside the plantation. The use of forest edge planting and environmental setback planting (see Sections 3.5.3 and 3.5.4) can also soften harsh angles.



Integrate environmental setbacks and future operational areas, to create a more natural landscape design. (Illustration Aislinn Adams)

2.7.5 Other considerations

- Where possible, ridelines and firebreaks through forests should follow landform and make use of natural features. They should follow an irregular route that avoids dividing a plantation into equal parts, and they should not be sited at right angles or parallel to contours.
- Landscape setbacks and appropriate edge design for public roads and dwellings are important – see Section 2.8 for requirements.

2.8 Environmental setbacks

An environmental setback is a (largely) unplanted and undisturbed open space of a defined width, installed to protect a particular environmental feature or sensitivity. Different types apply, depending on the feature or sensitivity involved, i.e.

- water setback
- retained habitat setback
- archaeological setback
- public road setback
- utilised building setback
- landscape setback

Table 5 describes the minimum setback width (as measured horizontally) and setback treatment for each of the above. Note, the Forest Service may stipulate, on a site-specific basis, greater setback widths than those prescribed, or setbacks in relation to other types of features or sensitivities (e.g. swallow holes).

In all cases:

- Where different setbacks overlap, the greater setback width applies.
- The setbacks described in Table 5 are eligible as ABEs.
- In general, setbacks are to remain undisturbed at afforestation and throughout the remainder of the rotation, and allowed to develop naturally. Setbacks will typically develop a sward of natural ground vegetation accompanied over time by (potentially) pockets of native woody growth.
- The ongoing treatment of setbacks during Site Works and Ongoing Site Management are detailed in those chapters.



Water setbacks and setbacks from other environmental features and sensitivities are a key part of forest design. (Illustration Aislinn Adams)

Table 5 Environmental setback type and purpose, and corresponding minimum setback distance and additional design requirements.
Note, all setbacks are measured in metres *horizontally*.

WATER SETBACK

Purpose: To create at the outset, a buffer of natural ground vegetation positioned between defined water features and the forest crop and associated operations, in order to protect water quality and aquatic ecosystems from possible sediment and nutrient runoff from the site at afforestation and throughout the remainder of the forest rotation.

Minimum setback width, as measured from the nearest bank / edge of the water feature, as observed on-the-ground (setback applies to each side of the water feature, e.g. to both banks of an aquatic zone):

Aquatic zone (as per Table 1):

Slope leading to the aquatic zone (apply as appropriate, where slope varies over the site)	**Setback width**	**Setback width for peat soils and for sites within the catchment area of high status objective waterbodies (see note opposite)**
Moderate (even to 1-in-7 / 0-15%)	10 metre	20 metre
Steep (1-in-7 to 1-in-3 / 15-30%)	15 metre	25 metre
Very steep (1-in-3 / >30%)	20 metre	25 metre

Relevant watercourse: 5 metre

Hotspot: 5 metre

Drinking water abstraction point: 20 metre

Additional design:

- Widen the water setback at various points along its length, to include adjoining wet hollows and other low-lying areas where water gravitates towards as it drains from the land.
- Based on the immediate landform / topography, vary the setback to avoid artificial lines and to create a naturally undulating forest edge.

NOTE, if the afforestation site is within the catchment area of a high status objective waterbody, the required setback width (as per the 3rd column opposite) can be reduced by 10 metres (from the landward side) if an appropriate GPC9 or GPC10 plot is included instead of this 10 m strip. For example, where a 25 m setback applies, this can be reduced to 15 m by applying the following sequence: aquatic zone → 15 m unplanted water setback → GPC9 or GPC10 plot. Standard requirements for GPC9 & GPC10 plots apply, as per *NWS Establishment GPC9 & GPC 10: Silvicultural Standards.*

HABITAT SETBACK

Purpose: To create adequate space adjoining a retained habitat to avoid or reduce any impacts arising from the emerging forest and its canopy.

Different habitats identified as retained habitats (either as biodiversity plots or as linear or point biodiversity features) may require an unplanted habitat setback to prevent undue impact (such as shading) from the emerging forest. Setback width depends on the habitat and the potential impact(s). Apply careful design, e.g. focus the habitat setback mainly on the south-western, southern and south-eastern side of the habitat, to minimise the blockage of sunlight as the adjoining forest canopy grows. Note that the retained habitat itself must remain undisturbed (unless otherwise agreed or prescribed).

ARCHAEOLOGICAL SETBACK

Purpose: To physically separate the archaeological site or monument or other important built heritage structures or features from afforestation works, the emerging forest, and future forest operations.

Site, monument, building, structure	Minimum setback from the outermost extent of the archaeological site, monument, important built heritage structures or features, as evident onsite
'Designated' archaeological sites and monuments (see note opposite)	20 metre exclusion zone
'Designated' buildings and structures or parts thereof which form part of the architectural heritage and which are of special interest (see note opposite)	30 metre exclusion zone for upstanding structures (e.g. building) Otherwise, 20 metre exclusion zone
Non-designated built heritage structures, e.g. lime kilns, sheep folds, creamery stands, stiles, pumps and pump houses, mill ponds, and derelict dwellings / farm buildings	10 metre unplanted setback (demarcating fencing not required) Where there is a cluster of such structures (e.g. a ruined dwelling and a number of out-buildings, often enclosed in a yard or by a boundary wall), the 10 metre unplanted setback to be measured from the enclosing boundary wall, or edges of the outermost buildings. Where there are associated features such as boundary walls, mill races, or historic foot paths, 5 metre unplanted setbacks may also be applied to those features. Similarly for townland boundaries.

NOTE, for designated archaeological sites and monuments and for designated buildings and structures (as defined in Section 2.6), the following applies:

- It is essential that the full extent (i.e. the outermost extent) of these features is known, so that the exclusion zone can be correctly identified. Where there is any doubt, the Registered Forester should seek advice from the relevant designating authority or the Forest Service Archaeologist.
- The boundary of the exclusion zone must be clearly demarcated by fencing, and pedestrian access routes must also be maintained or established (see Section 3.5.1 for details).

PUBLIC ROAD SETBACK

Purpose: To ensure adequate clearance to prevent tunnelling along the public road, to retain sightlines, and to create visual diversity for road users.

Minimum setback, as measured from the surfaced edge of the public road:

10 metre (average, within any one application) (For conifer plots, note the additional requirement regarding edge planting – see Section 3.5.3.)

Additional design:

- Based on the immediate landform / topography, vary the setback to avoid artificial lines and to create a naturally undulating forest edge.
- Provisions for future extractions should be planned and associated open spaces retained along the forest edge. Retain locally important views from the public road, by introducing open spaces through the forest. Also introduce open spaces that highlight natural features visible along the roadside.
- Increase setback, where appropriate, to allow for greater visibility at bends in the road.

UTILISED BUILDING SETBACK

Purpose: To prevent encroachment and isolation, the blocking of light and the curtailment of views in relation to dwellings, associated buildings, and roofed farm buildings.

Minimum setback, as measured from the outer wall of the roofed building:

Dwelling houses:

- 60 metre minimum
- Smaller setback allowable (to a minimum of 30 metre), if written agreement of the neighbouring dweller is provided at Form 1 stage

Roofed farm buildings: 10 m

Temporary buildings (e.g. timber sheds, kennels & buildings less than 25 m^2): No setback required

Additional design:

- Setback distance is most critical when a building is surrounded by forest on two or more sides.
- Based on the immediate landform / topography, vary the setback to avoid artificial lines and to create a naturally undulating forest edge.
- Consider retaining locally important views from the dwelling, by introducing open spaces through the forest. Also introduce open spaces that highlight natural features visible from the dwelling.
- In relation to setbacks from dwellings, setback planting is encouraged within the 30 m to 60 m zone, if agreed to by the neighbouring dweller.

LANDSCAPE SETBACK

Purpose: To disrupt artificially straight lines and sharp angles along other visible sections of the plantation's outer perimeter, and to create stronger visual 'tie-in' with adjoining hedgerows and other semi-natural / natural features.

Setback and design as appropriate. Will vary, depending on site details – see Section 2.7.

Appropriate setbacks from dwellings, designed with appropriate edge planting with native broadleaf species, will avoid overshadowing and a sense of isolation. (Illustration Aislinn Adams)



2.9 Future operational areas

Future operational areas are areas left unplanted in order to facilitate the future management of the plantation (e.g. a rideline) or to accommodate future infrastructure (e.g. a forest road or landing bay). In addition to their primary management function, these operational areas are also important biodiversity features in their own right, and this value can be enhanced further through simple design and additional planting. The following applies:

- Edge design should take account of good landscaping practices and the local topography. Avoid creating an unnaturally straight forest edge. Instead, taking account of the immediate landform, create a more naturally undulating edge.
- Where possible, orientate in an east-west direction, to maximise sunlight throughout the day and the seasons.

2.10 Open spaces and deer management

Forest design at afforestation should incorporate measures to facilitate future deer management. Environment setbacks and future operational areas may provide suitable open spaces to apply control, complete with appropriate shooting positions and safe back stops. However, these may need to be augmented by additional future operational areas, specifically for this purpose. Also, in the case of open spaces likely to be used for deer management purposes, avoid landscape and biodiversity planting within these spaces and along the adjoining forest edge, in order to retain clear lines of sight.

A deer hide overlooking an open space. During afforestation, incorporate features that will facilitate deer management in the future.



2.11 Site inputs

At design stage, planned site inputs such as fertilisers and herbicides should be tailored to the specific requirements of each plot. Aim to achieve successful establishment with the minimal level of artificial inputs possible.

Regarding fertilisers, phosphorus (P) is the main nutrient fertiliser applied at afforestation, with nitrogen (N) and potassium (K) occasionally applied as remedial fertilisation. Note that peaty soils have a very low capacity to bind phosphorus. Slow-release formulations may be appropriate on more sensitive parts of the site.

The afforestation application must detail:

- the proposed fertiliser type and application rate; and
- the proposed method of vegetation control (including herbicide type and application rate, if applicable).

Note that further operational safeguards regarding fertiliser and herbicide application are set out in Section 3.7.

2.12 Further environmental assessment

Stage 1: Design culminates in the submission of a Form 1 for afforestation approval. This triggers the Forest Service assessment of the proposal. In some situations, the Forest Service may seek specific environmental information regarding the proposal, before it can continue with its assessment. In such cases, a request for further information will be sent to the Applicant and his / her Registered Forester.

In a minority of cases, the information sought may entail the following, which typically involve the input of a specialist:

- Ecological Report

- Archaeological Assessment / Archaeological Impact Statement
- Water Management Plan
- Visual Impact Assessment
- NATURA Impact Statement (NIS)
- Environmental Impact Statement (EIS)

See the **SUPPORTING DOCUMENT** for further details.

Section 3
Site Works

3.1 Overview

Stage 2: Site Works spans the period between the receipt of the technical approval for afforestation up to the completion of initial site works and (where grant-aided) Form 2 submission.

The technical approval will set out conditions that must be adhered to. If uncertainty exists regarding any condition, contact the Forest Service for clarity before proceeding with any work.

Note the following:

- Site works can only commence after receipt of the technical approval (note, in order to be eligible for grant aid, projects submitted under the Afforestation Scheme must await financial approval, before commencing.)
- The Registered Forester must secure written Forest Service agreement before pursing any material change to a project post-approval. Not doing so may invalidate the technical approval and the financial approval (where relevant) issued.

3.2 Site management

The Registered Forester must ensure that all operators are fully aware of, and properly implement, all relevant measures set out in these Requirements and all environmental conditions attached to the technical approval issued. This should be carried out *via* onsite management and supervision. 'Tool box' meetings are encouraged, whereby the Registered Forester reviews the various sensitivities and safeguards during an onsite meeting with the operators before operations commence.

Onsite activities should also be reviewed periodically during the site works, to ensure that related safeguards are in place and that contingency planning (see below) is functioning.

3.3 Oversight by other specialists

Conditions attached to the technical approval may stipulate the onsite presence of a specialist during site works. For example, a condition may stipulate the archaeological monitoring of specified areas. Archaeological monitoring involves having a suitably qualified archaeologist present during certain operations, or during the course of the carrying out of certain parts of approved development works, in order to identify and protect archaeological deposits, features or objects that may be uncovered or otherwise impacted by those operations. In such cases:

- an independent archaeological consultant must be retained by the Applicant or Registered Forester to carry out the monitoring;
- as set out in Section 3.8, the archaeologist will be empowered by the approval conditions to stop any works in the immediate area of any new discoveries *inter alia*, so as to ensure the timely notification of the relevant authorities, the proper recording of any exposed archaeological material, and the preservation by record or preservation *in situ* of the

elements of the archaeological heritage, as appropriate;

- there will be a condition requiring the archaeological consultant to submit a full report on the results of the archaeological monitoring (including any discoveries made and any subsequent archaeological work undertaken) to the Forest Service, the NMS and the National Museum of Ireland; and
- failure to ensure that the archaeological monitoring is undertaken during the course of the carrying out of the specified parts of approved development or to submit the required report on this monitoring before or at latest at Form 2 stage, may be deemed to be:
  - a breach of the statutory approval for afforestation; and / or
  - a breach of the specific environmental conditions attached to the approval for grant aid and may: (i) delay the progress of the Form 2 (Application for 1st Grant Instalment); and (ii) be subject to a penalty.

Sanctions may also applied, as set out in the *Terms & Conditions for the Registration of Foresters and Forestry Companies*.

3.4 Contingency measures

Ensure that an adequate contingency plan is prepared. This plan must clearly inform operators how to react and who to contact, should an unexpected event arise that may create a risk to the environment, e.g. a period of intense rainfall, an accidental spillage of chemicals, the discovery of an unidentified archaeological site, monument or object. The plan should be readily available onsite and all operators should be made familiar with its content.

The **SUPPORTING DOCUMENT** contains a template contingency plan, to be completed as relevant.

3.5 Treatment of setbacks

As set out in Stage 1: Design, the following setbacks, comprising (largely) unplanted and undisturbed open spaces of a defined width, are required to protect different environmental features and sensitivities:

- water setbacks
- retained habitat setbacks
- archaeological setbacks
- public road setbacks
- utilised building setbacks
- landscape setbacks

See Table 5 for setback widths and design details. The treatment of these setbacks during Stage 2: Site Works is set out below.

The Registered Forester must ensure that all operators are aware of the importance of any environmental setbacks required onsite, their location and extent, and what is and is not permitted within them (as per Table 6 below). An environmental setback must not be used for any forest operation or for any other purpose which could compromise its protective function or which could

damage the environmental feature or sensitivity being protected.

Under the* Forestry Schemes Penalty Schedules*, failure to adhere to the required environmental setbacks can incur significant penalties.

3.5.1 Installing environmental setbacks

It is good forest practice to mark out environmental setbacks *before* operations commence, to avoid incursions. The following guidance applies:

- Mark off the setback using temporary markers, e.g. posts or bamboos with hi-vis tape, securely driven into the soil with approximately 1.5 metres remaining visible above ground.
- Marker spacing will vary depending on setback shape, e.g. 10 metre spacing for setbacks which vary in width; 30 metre spacing for long linear setbacks.
- Linear setbacks (e.g. archaeological sight lines) can be demarcated by markers set along the centre line.
- Also use markers to indicate the position of any additional enhancement planting proposed along the forest edge or within the setback itself (see below).

Note that specific requirements apply regarding 'designated' archaeological sites and monuments and 'designated' buildings and structures or parts of structures which form part of the architectural heritage and which are of special interest:

- Unless the conditions attached to the technical approval specify otherwise, erect a permanent fence comprising two strands of plain wire on the outer edge of the archaeological / built heritage exclusion zone. Adhere to the standard Forest Service fencing specifications, including the use of IS 436 stakes (see the *Forestry Standards Manual*)(*). Note, where the outer edge of an archaeological monument / built heritage structure or feature is not evident on-the-ground, the advice of the Forest Service Archaeologist or a consultant archaeologist retained by the Applicant or her / his Registered Forester should be sought. (*This fence must be stock proof, if it represents an external boundary of the plantation.)
- Existing access routes to an archaeological site must be left unplanted and undisturbed, and must be left open for pedestrian access by archaeological officials throughout the rotation. If there is no existing access route, leave an unplanted 4 metre wide route suitable for pedestrian access from the direction of the nearest public road, forest road or track.

3.5.2 Subsequent treatment

Table 6 details what is and is not permitted within the various environmental setbacks.

Table 6 Treatment of environmental setbacks during site works. Note, if setbacks overlap, the more environmentally stringent set of requirements apply.

	Operation						
Setback type	***Forest edge planting***	***Environmental setback planting***	***Demarcation fencing with stakes and wire***	***Machine traffic***	***Cultivation / Drainage***	***Fertiliser application / Vegetation management***	***Temporary onsite storage of fertiliser, fuel, etc. associated with afforestation***
Water setback	Encouraged – see Section 3.5.3.	Encouraged – see Section 3.5.4.	Not required	Exclude	Exclude. New drains must not enter into or traverse the water setback, or discharge directly into the aquatic zone or into an existing drain (with an exception detailed in Section 3.7.1).	Permitted if required to establish setback planting, based on the following requirements: ➢ Fertiliser application limited to the manual application of an appropriate slow-release formulation into the planting pit. ➢ Regarding vegetation management, herbicide use is prohibited. Use non-herbicide methods instead, such as trampling, mulches and mats.	Exclude
Habitat setback	Encouraged – see Section 3.5.3.	Exclude	Not required	Exclude	Exclude	Exclude	Exclude
Archaeological setback	Encouraged – see Section 3.5.3.	Exclude	Required for designated archaeological features – see Section 3.5.1 for details.	Exclude	Exclude	Exclude	Exclude

Setback type	*Forest edge planting*	*Environmental setback planting*	*Demarcation fencing with stakes and wire*	*Machine traffic*	*Cultivation / Drainage*	*Fertiliser application / Vegetation management*	*Temporary onsite storage of fertiliser, fuel, etc. associated with afforestation*
Public road setback	Mandatory for roadside conifer plots – see Section 3.5.3.	Exclude	Not required	Permitted	Exlude	Exclude	Permitted, subject to safeguards under Section 3.7.5.
Utilised building setback	Mandatory for setbacks from dwellings – see Section 3.5.3.	In relation to setbacks from dwellings, setback planting is encouraged within the 30 m to 60 m zone, if agreed to by the neighbouring dweller. See Section 3.5.4.	Not required	Permitted	Exclude	Permitted if required to establish setback planting, based on the following requirements: ➢ Fertiliser application limited to the manual application of an appropriate slow-release formulation into the planting pit. ➢ Regarding vegetation management, herbicide use is prohibited. Use non-herbicide methods instead, such as trampling, mulches and mats.	Permitted, subject to safeguards under Section 3.7.5. However, if within a setback from a dwelling, exclude the preparation and storage of herbicides (and other pesticides, if used).
Landscape setback	Encouraged – see Section 3.5.3.	Encouraged – see Section 3.5.4.	Not required	Permitted	Permitted, for setback planting.	Permitted, for setback planting.	Permitted, subject to safeguards under Section 3.7.5.

3.5.3 Forest edge planting

- Forest edge planting comprises the planting of single, small groups and irregular belts of native species (e.g. birch, rowan, oak and Scots pine, as site conditions allow) along the outer edge of conifer GPC plots, typically those adjoining environmental setbacks.
- This measure enhances the landscape and biodiversity value of the forest edge.
- Forest edge planting is mandatory within conifer plots adjoining:
  - utilised building setbacks created for dwellings; and
  - public road setbacks, where the strip 10 metres to 20 metres from the road must be planted with broadleaf trees, to give a minimum two-thirds coverage within this strip.
- Forest edge planting is encouraged in relation to all other environmental setbacks, as site conditions allow - see Table 6.
- Where applied, forest edge planting must not encroach into the environmental setback itself, in order to maintain the necessary setback width. Forest edge planting forms part of the GPC plot.
- Where applied as single trees, ensure that the tree is adequately protected against grazing, using a standard tree shelter or a deer guard, as necessary.
- Where applied as groups, adopt a robust planting design using trees with compatible growth rates, planted with necessary protection against grazing. Group size may vary from 5-10 trees to 50 trees and over, depending on landscape scale. In deer-prone areas, wider spacing and the use of deer guards may be appropriate - specify details on the Certified Species Map.

3.5.4 Environmental setback planting

- Environmental setback planting comprises the planting of single, small groups and irregular belts of native species (e.g. birch, rowan, oak and Scots pine, as site conditions allow) ***within*** an environmental setback.



Forest edge planting, using deer shelters.

- This measure enhances the environmental role of the setback itself, e.g. planting within a landscape setback will create better visual 'tie-in' between the surrounding landscape and the forest edge.
- Apply environmental setback planting as per Table 6 and as site conditions allow.
- Where applied as single trees, ensure that the tree is adequately protected against grazing, using a standard tree shelter or a deer guard, as necessary.
- Where applied as groups, adopt a robust planting design using trees with compatible growth rates, planted with necessary protection against grazing. Group size may vary from 5-10 trees to 50 trees and over, depending on landscape scale. In deer-prone areas, wider spacing and the use of deer guards may be appropriate - specify details on the Certified Species Map.
- Environmental setback planting should not exceed 20% of the area of the setback.
- Note, setback planting may be counter-productive within setbacks likely to be important for deer management, as it may obstruct sight lines.
- The following applies specifically in relation to planting within water setbacks:
    - Strategic planting within water setbacks may help to deliver direct in-stream ecosystem services such as bank stabilisation, cooling / shading, and food drop into the aquatic ecosystem.
    - Pursue water setback planting only where agreed in advance with Inland Fisheries Ireland and (where relevant) NPWS.
    - Limit to single or small groups (5-10 trees) of native riparian species (birch, willow, and occasional alder and pedunculate oak) at strategic points within the water setback.
    - Such trees should be pit-planted and protected from grazing, as necessary.

3.6 Treatment of future operational areas

Treat future operational areas (as described in Section 2.5.2) as follows, to enhance their landscape and biodiversity value:

- As per good practice, mark out these areas *before* operations commence (see Section 3.5.1).
- Based on the immediate topography, vary their width to avoid artificially straight lines and to create a naturally undulating forest edge.
- Consider forest edge planting (see Section 3.5.3).

3.7 Operational safeguards

Mandatory measures to protect the environment during operations are set out below. Conditions attached to the technical approval may also contain additional measures to be adhered to. Also note Section 3.1 (regarding material changes post-approval) and Section 3.4 (regarding contingency planning).

3.7.1 Drainage and cultivation

A key requirement regarding drainage and cultivation is the protection of aquatic zones (streams, rivers and lakes) from any sediment and nutrients contained in water draining off the site, both during afforestation and throughout the remainder of the forest rotation. The following measures apply.

- Review Section 2.4.2 regarding key factors dictating selection and design.
- It is critical that water collected in drains flows slowly, both during afforestation and throughout the remainder of the rotation.
- Adhere to the overall drainage and cultivation plan approved for the project, and to the specifications set out in the *Forestry Standards Manual*.
- Select machinery based on soil, drainage and slope, to minimise the risk of rutting.
- In relation to water setbacks for aquatic zones and other water features (see Section 2.8):
    - Ensure that all new drains end in an appropriately-sized sediment trap or an interceptor drain(*) positioned ***outside*** of the water setback. This will allow discharged water to seep through the water setback, enabling ground vegetation to filter out sediments and nutrients.
    - Do not carry out any cultivation within the water setback itself.
    - New drains must not enter into or traverse the water setback, or discharge directly into the aquatic zone or into an existing drain(**).

  (* Interceptor drains are constructed along the outer edge of the water setback. They collect the discharge from the drained area and allow it to overflow into the water setback. See *Forestry Standards Manual* for details.)

  (** An exception applies to flat difficult-to-drain sites, where it may be necessary to link drains directly into the aquatic zone or an existing drain, provided it can be assured (based on site factors and / or sediment traps and other safeguards) that sediment and nutrients will not enter the aquatic zone. (If linking into an existing drain, the following applies: Existing drains may be 'greened over' to varying degrees, and this vegetation plays an important role in filtering out sediments and nutrients. Therefore, if the existing drain needed to be cleaned out, consider doing so in sections over several years, as opposed to a single operation.) Note, no linkage into aquatic zones and existing drains is permitted where the *Forestry & Freshwater Pearl Mussel Requirements* apply or anywhere within the Priority 8 Freshwater Pearl Mussel Catchments. This restriction may result in the site falling under the category 'Unsuitable Land Type' (see FS-DAFM *Land Types for Afforestation*) and therefore ineligible for funding under the Afforestation Scheme.)
- In general, do not carry out any drainage or cultivation within any other environmental setback. See Table 6 for details.
- Collector drains that receive water from mound drains should be no more than 80 metres apart. The angle of descent within these collector drains, as measured within the channel of the drain itself, should be no greater than 2 degrees (1-in-30). Collector drains should be excavated to a depth no more than 15 cm below the depth of the mound drains. The

Conventional mounding (left) and invert mounding for more sensitive sites (right).





intersection between mound drains and collector drains must be offset along the length of the collector drains, to ensure that individual mound drains do not continue in long unbroken runs down the slope.

- Regarding sediment traps:
  - The number, design and size of sediment traps must be sufficient to protect against the sedimentation of any receiving aquatic zone during afforestation and throughout the remainder of the forest rotation.
  - In order to capture sediment as close to the source as possible, sediment traps must be installed *throughout* the drainage network. The number of sediment traps installed must reflect the risk of sediment becoming mobilised.
  - Sediment traps are required at the end of all new drains leading to the water setback. These sediment traps must be located ***outside*** the water setback.
  - Sediment traps should be located on level ground (where possible) and should be rectangular in nature, with the longer side orientated parallel to the flow.
  - Sediment traps can represent a site hazard and may require specific health and safety measures such as fencing.
  - Monitor sediment traps throughout operations. If sediment traps are filling up, clear out the built-up sediment and deposit it on level ground several meters away.
- Stop all drainage and cultivation operations during periods of rainfall, in situations where rainfall level and site conditions create the risk of sediment becoming mobilised onsite. Operations can only recommence once an adequate period of time has elapsed for the risk to abate. This safeguard is triggered by tracking weather forecasts and by contingency planning.
- Where the drainage network and sediment traps are under pressure and signs of failure are evident, additional measures will be required, often in the form of additional sediment traps. In complex situations, the input of a hydrologist or an engineer may be required.

In-drain sediment trap (left) and a sediment trap adjoining a water setback (foreground) (right).



Additional safeguards include the following:

- Small dams positioned within drains and comprising timber, stone or staked geotexile, can be used to slow water flow and to encourage sediment deposition. These should have a 'V'-shape in their centre, to control the overflow of water and to prevent the scouring out of the sides of the channel during flood events.
- It may be necessary to install large settling ponds into which site drains flow. These settling ponds must be appropriately sized (i.e. sufficient to contain flow from high rainfall events), strategically located within the main body of the plantation and away from aquatic zones, and properly maintained.
- Favour plots of more species-diverse GPCs in areas adjoining water setbacks, where site conditions allow.
- Design the drainage network in a way that will eliminate or reduce water-related risks during operations later in the forest rotation, e.g. roading, thinning.
- Develop windfirm edges within the forest (e.g. using ridelines or retained hedgerows with habitat setbacks) to enable the future harvesting of smaller coupe sizes over staggered periods of time.

3.7.2 Fertiliser application

A key consideration regarding fertiliser application during site works is to eliminate the risk of run-off into receiving waters. The following apply:

- Match fertiliser type and application rate to specific plots – aim to achieve successful establishment with the minimal level of fertiliser input possible. Do not apply fertiliser if it is not needed.
- Where available, granular formulations should be used to reduce the potential for drift and wash-off into receiving waters.
- Fertiliser application is not permitted within the water setback (some exceptions apply - see Table 6) or within 20 metres of the aquatic zone, whichever is greatest. Manual fertiliser application only is permitted from this point back to 50 metres from the aquatic zone.
- In general, fertiliser application is not permitted within water setbacks or other environmental setbacks. However, some exceptions apply - see Table 6.
- Do not apply fertiliser if heavy rainfall is predicted, or during heavy rainfall and / or high winds. Following heavy rainfall, commence application only after the site has dried out sufficiently for runoff not to pose a risk.
- Apply fertiliser manually, where possible.
- Consider using alternative slow-release fertilisers in more sensitive parts of the site.

3.7.3 Vegetation management using herbicides and other methods

Vegetation management during afforestation typically involves the use of herbicide. Regarding the use of pesticides, including herbicides:

- The use of pesticides is governed by the European Communities (Sustainable Use of Pesticides) Regulations 2012 (S.I.155/2012). Users of pesticides should familiarise themselves with these Regulations and adhere to them.
- Only a registered professional user can apply pesticides authorised for professional use. A professional user is any person who applies / sprays professional use products (regardless of the quantity or method of application), including operators, technicians, employees and self-employed people, both in the farming and other sectors.
- All users of pesticide products registered for professional use must follow the principles of Good Plant Protection Practice, available for download at www.pcs.agriculture.gov.ie/sud/professionalusersprayeroperators/
- Appendix I to the above Good Plant Protection Practice document sets out general principles of integrated pest management, which all professional users are required to follow. Appendix II sets out other legal requirements relating to the safe use of plant protection products.
- Any pesticide to be used in forestry must be approved for use in Ireland. Details of approved products can be checked on the Pesticide Control Service section of the DAFM website (see www.pcs.agriculture.gov.ie).

Herbicide application within the forestry context must foll must follow the principles of Good Plant Protection Practice.



A key consideration regarding herbicide application during site works is to eliminate the risk of runoff into receiving waters. The following apply:

- Aim to achieve successful establishment with the minimal level of herbicide input possible. Do not apply herbicides if they are not required.
- Do not apply herbicide if heavy rainfall is predicted, or during heavy rainfall and / or high winds. Following heavy rainfall, only recommence application after the site has dried out sufficiently for runoff not to pose a risk.
- Fully adhere to the manufacturer's instructions and also measures set out in the Forest Service *Forest Protection Guidelines* and *Guidelines for the Use of Herbicides in Forestry*.
- Do not apply herbicides within the following areas, relying instead on non-herbicide methods such as trampling, mulches and mats:
    - within the water setback or within 20 metres of the aquatic zone, whichever is greatest;
    - within the water setback of a relevant watercourse or hotspot;
    - within specified distances from different types of water abstraction points, as prescribed by S.I.155/2012 - see Table 7;
    - within 15 metres of a landscape feature known to be a groundwater vulnerable area, including karst areas, sinkholes and collapse features; or
    - within a utilised building setback created for a dwelling.
- Herbicides are not permitted in sites within SACs and SPAs without completing a risk assessment (this may form part of a NIS, where sought). Preference should be given to low risk plant protection products or biological and cultural control measures in cases where their use is unavoidable.

Table 7 Distances from different types of water abstraction points, within which pesticide (including herbicide) application is prohibited under Schedule 2 of S.I.155/2012.

Type of abstraction point	***Prohibited distance***
Abstraction point of any surface waters, borehole, spring or well used for the abstraction of water for human consumption in a water scheme supplying 1 m^3 or less of water per day or serving 10 or less persons	5 metres
Abstraction point of any surface waters, borehole, spring or well used for the abstraction of water for human consumption in a water scheme 25 m supplying 1 - 10 m^3 of water per day or serving 10 - 50 persons	25 metres
Abstraction point of any surface waters, borehole, spring or well used for the abstraction of water for human consumption in a water scheme 100 m supplying 10 m^3 or more of water per day or serving 50 - 500 persons	100 metres
Abstraction point of any surface waters, borehole, spring or well used for the abstraction of water for human consumption in a water scheme supplying 100 m^3 or more of water per day or serving 500 or more persons	200 metres

3.7.4 Other pesticide use

Other pesticides may be needed on rare occasions within the context of afforestation. In such cases, the above requirements regarding herbicides apply at a minimum, and more stringent measures may also be required. Regarding the risk of Pine Weevil outbreak (e.g. an afforestation site adjoining a recent conifer clearfell), any necessary dipping of planting stock must be carried out off-site in the forest nursery, with onsite application permitted only in response to an ongoing outbreak. Alternative control measures are encouraged, e.g. the use of larger planting stock.

3.7.5 Preparation, storage and use of potentially hazardous material

Spillage or leakage of fertilisers, herbicides (and other pesticides), fuel and machine oils can be highly damaging to the environment, especially water. The following apply regarding these materials:

- Minimise onsite storage and preparation.
- If unavoidable, store and prepare (if relevant) at a dry, elevated location at least 50 metres from any aquatic zone and at least 20 metres from all other water features (as listed in Table 1). This also applies to all machine refuelling, maintenance and repair work.
- Do not discharge any substance into an aquatic zone, relevant watercourse or hotspot, or into any drain or sediment trap.
- Do not rinse out containers onsite.
- Do not clean equipment within 50 metre of any aquatic zone or within 20 metres of any other water feature (as listed in Table 1). All wash waters must be disposed of carefully.
- Collect and retain spent machine oil for appropriate disposal off-site.
- Remove all empty fertiliser bags, pesticide and oil containers, and all general refuse, from the site during and after site works, for appropriate disposal off-site.
- Regarding pesticides (including herbicides), adhere to the principles of Good Plant Protection Practice (see Section 3.7.3) and to relevant sections of the *Forest Protection Guidelines* and *Guidelines for the Use of Herbicides in Forestry*.

3.8 Archaeological finds discovered during site works

Previously unidentified archaeological sites or artefacts may be exposed during the course of site work, particularly during cultivation and drainage. These include artefact scatters, objects such as pottery, flint and other stone artefacts, bronze or iron tools and quern stones, as well as burials and structural features such as the foundations of buried structures or trackways. For example, the presence of a spread of black soil or charcoal and burnt and heat-shattered stone is likely to indicate the presence of a levelled cooking place (i.e. a fulacht fiadh) or other human activity in the past.

If an archaeological find is discovered, the following applies:

- The Garda Síochána, the National Museum of Ireland or the National Monuments Service must be notified immediately.
- The archaeological object(s) or feature(s) must be left undisturbed. A minimum exclusion zone 20 metres in radius centred on its location, and preferably larger, must be immediately created until the site of the find has been investigated.
- Where an archaeological object is discovered other than by a qualified archaeologist operating under an excavation licence issued by the NMS, it must be reported in the same way as described in the Section 2.6.4.
- Where feasible, all operations should be switched to some other part of the afforestation site, as far away as practically possible, until the investigation is complete.

As outlined above, clear contingency planning must be in place covering the possibility whereby an unidentified archaeological site or object is discovered during site works.

3.9 Burning

The burning of woody vegetation may occasionally be necessary to facilitate afforestation. This is normally carried out during the season prior to planting.

Note that, under the Wildlife (Amendment) Act 2000, it is an offence to cut, grub, burn or otherwise destroy, during the period 1st March to the 31st August inclusive, any vegetation growing on any land not then cultivated.

Furthermore, under no circumstances should such material be burned on or near a known or suspected archaeological site or monument or other important built heritage structure or feature or within the archaeological setback / exclusion zone, as this could cause damage to the site, monument, structure or feature as well as to underlying archaeological deposits.

For details, see the Forest Service *Prescribed Burning: Code of Practice - Ireland* (www.agriculture.gov.ie/forestservice/firemanagement/)

3.10 Form 2 submission

Where the project has received financial approval and the 1st grant instalment is being sought, the Registered Forester must walk the site within 2 months prior to submitting the relevant Form 2, and satisfy her- / himself that the plantation is compliant (*inter alia*) with all relevant measures set out in these Requirements and with all environmental conditions attached to the technical approval issued. If not, rectify any outstanding issue(s) before submitting the Form 2.

As set out in the *Forestry Standards Manual*, a subsequent Forest Service inspection may stipulate remedial works is cases where the plantation is not compliant.

Section 4
Ongoing Management

4.1 Overview

Stage 3: Ongoing Management spans the period from the completion of initial site works (and payment of the 1st grant instalment, if grant-aided) up to Year 15 (i.e. the end of the premium period, if applicable).

During this part of the forest rotation, there are generally no major site inputs required. However, basic environmental measures apply, in addition to any specific conditions attached to the original approval. Other silvicultural requirements also apply during the premium payment period, as set out in the *Forestry Standards Manual* (e.g. the maintenance of stocking levels, fence lines and fire breaks, fertiliser application) all of which must be carried out appropriately to prevent environmental impacts.

Key will be the ongoing monitoring of the site, to ensure compliance with silvicultural and environmental standards, requirements and conditions and also to check that potential threats to the environment do not emerge (particularly in relation to drains and sediment traps) and that various protective measures (principally setbacks) are functioning as intended.

4.2 Site inputs

Site inputs during Stage 3 are generally limited to the first 4 years up to submission of the Form 3 (if grant-aided). At this point, the forest should be fully established(*), with all plots having at least 90% of the original stocking spread evenly throughout the plot, with originally approved species represented proportionately, and with trees free from competing vegetation and free-growing (see the *Forestry Standards Manual*). Such inputs include herbicide application and possible fertiliser application, if nutrient deficiencies arise. Both inputs must adhere to measures set out in Sections 3.7.2 and 3.7.3 of these Requirements. (*Note, establishment may take longer on some sites.)

Regarding fertiliser application, assess exact requirements through a foliage analysis, following the procedures set out in the *Forestry Standards Manual*.

(Over larger areas, aerial fertilisation may be required. No aerial fertilisation can be undertaken unless an Aerial Fertilisation Licence as been obtained from the Forest Service. Refer to the separate *Aerial Fertilisation Requirements* for details.)

Ensure that any necessary filling-in prior to Form 3 submission reflects the diversity of the original planting, in relation to biodiversity and landscape.

4.3 Drains and sediment traps

Check drains and sediment traps regularly up to Year 4 and periodically thereafter, particularly during and after heavy rainfall, in order to assess how effectively they are working.

If sediment traps are filling up, clear out the built-up sediment and dispose of it on level ground several meters away. Where the drainage network and sediment traps are under pressure and signs of failure are evident, additional measures will be required, often in the form of additional sediment

traps. In complex situations, the input of a hydrologist or an engineer may be required.

In most cases, drains will stabilise and 'green-up' with colonising vegetation over time.

4.4 Treatment of setbacks

As set out in Stage 1: Design and Stage 2: Site Works, the following setbacks, comprising (largely) unplanted and undisturbed open spaces of a defined width, are required to protect different environmental features and sensitivities:

- water setbacks
- retained habitat setbacks
- archaeological setbacks
- public road setbacks
- utilised building setbacks
- landscape setbacks

The treatment of these setbacks during Stage 3: Ongoing Management is as follows:

1. The intended protective function of these setbacks must be maintained throughout this stage of the forest's development. This generally entails leaving these areas undisturbed and allowing natural ground vegetation to develop. Management may be required in some cases, e.g. to control woody growth within a setback adjoining a dwelling, to retain an important view or to prevent fire risk.
2. Monitor the development of forest edge planting and environmental setback planting (where undertaken) and maintain trees as appropriate (e.g. vegetation management, replacement of mortalities, adjustment and eventual removal of tree shelters) until the trees are established and free of grazing pressure.



A well-established water setback adjoining a broadleaf plot.

3. Adhere to the specifications set out in Table 6 regarding permitted operations within setbacks.
4. The type of natural vegetation that will emerge within the various setbacks will vary according to soil, elevation, aspect, grazing pressure, etc. On most sites, a mosaic of natural ground vegetation and pockets of woody growth will typically emerge throughout this stage.
5. Monitor and apply appropriate control to prevent the colonisation of setbacks by rhododendron and other exotic invasives. This requirement also applies to paths required in relation to 'designated' archaeological sites and monuments and 'designated' buildings and structures, to maintain access by archaeological officials.
6. The colonisation of the water setback with exotic invasives, in particular, Japanese knotweed, Himalayan balsam and rhododendron, is of significant concern regarding water quality. Where best practice involves herbicide use, consult with Inland Fisheries Ireland and other relevant bodies in advance. Controlling such species is difficult and expensive, and often requires a wider catchment approach for progress to be sustained.

Note, 2 and 5 above also apply to the treatment of future operational areas (see Section 2.9) during this stage of the rotation.