

7 LAND & SOILS

7.1 INTRODUCTION

Keohane Geological & Environmental Consultancy (KGEC) was commissioned by Jennings O'Donovan & Partners Ltd. (JOD) on behalf of Dreenacreenig West Wind Farm Limited (hereafter known as the Developer), to assess the potential impacts of the Proposed Development on the land, soils and the geological environment. It addresses the potential significant direct, indirect and cumulative impacts on land, soils and geology resulting from the Proposed Development at Derreenacrinnig West, Drimoleague, County Cork, including its Grid Connection to Ballylickey Electrical Substation and Turbine Delivery Route (TDR) upgrade works. The existing land use, soils and geological setting are described, potential impacts on these environmental aspects assessed and evaluated, and where appropriate, measures recommended to avoid, reduce or mitigate potential impacts. The residual impacts following mitigation are then summarised.

A full description of the Proposed Development is provided in **Chapter 2**. In summary, the Proposed Development is a wind farm consisting of three turbines, hardstands, access roads, Electrical Substation, Temporary Construction Compound, on-site cabling, biodiversity enhancement, improvement along the Turbine Delivery Route (TDR), Grid Connection to the Ballylickey Electrical Substation, all associated site works and all ancillary infrastructure. This Proposed Development will replace the wind farm permitted by planning permission PL 88.239767 (10/857), which consisted of seven turbines. A large portion of the civil works for the permitted wind farm were completed in 2017 and 2018. The work completed included construction of the access road to permitted turbines T01 to T06, craning areas for turbines T01 to T06, opening of the rock borrow pit, construction compound and platform for the Electrical Substation. Also at that time, the ESB commenced work on the Grid Connection to Ballylickey, but this work was suspended. The ESB subsequently applied separately for a Grid Connection in 2021, which included removal of the conductors and poles already erected. That application was refused permission by An Coimisiún Pleanála (planning numbers 21/737 and ACP-315059-22 refer). However, the partially constructed line will be removed by ESB in the near future.

A 40-year operational lifespan is sought for the wind farm. However, part of the Electrical Substation and the Grid Connection will be handed over to the distribution system operator (DSO) to own and operate. As part of the national grid, permission for this infrastructure is sought in perpetuity.

7.1.1 Scope & Purpose

This chapter of the EIAR provides details of the land use and geological environment in which the development is proposed. It identifies and describes the unconsolidated deposits, their land uses, geological heritage and bedrock geology underlying the Site.

The purpose of the assessment is to identify the potential direct impacts of the Proposed Development on geology and land use within the Site and potential indirect impacts beyond the Site boundary; and to assess the potential impacts in the context of other developments (proposed / completed) to determine cumulative effects. Having identified and quantified the potential impacts, to recommend measures to avoid, mitigate and/or reduce significant potential negative impacts for the completion of construction of the development and during its lifespan, where relevant. To audit the effectiveness of the mitigation measures, a construction monitoring programme is also outlined as set out in the CEMP (Construction Environmental Management Plan) – refer to **Appendix 2.1**.

7.1.2 Statement of Authority

KGEC were commissioned by JOD on behalf of the Developer to carry out an assessment of effects of the Proposed Development on land, soils and geology.

This chapter was prepared by Dan Keohane of KGEC. KGEC is a Cork-based consultancy specialising in geological, hydrological and environmental sciences. Mr. Keohane has over 25 years' experience in environmental assessment. In the past 20 years, KGEC has prepared planning applications, EIARs and/or geotechnical assessments for over 40 wind farm developments throughout Ireland and UK. He has also been involved in the construction of over 30 wind farms in Ireland.

Mr. Keohane (BSc Hons Geology; MSc Applied Geophysics) received an honors degree in Geology from UCC in 1989, and a master's degree in Applied Geophysics from UCG in 1991. Mr. Keohane has been working on EIA for wind farms for the past twenty years, having worked on over 50 projects in Ireland and the UK. Areas of expertise include geological assessment, peat landslide risk assessment, groundwater assessment, surface water, hydrology and erosion control during construction. He has practical experience in wind farm construction, performing environmental oversight and monitoring during the construction phase. He has also been involved with the environmental assessment and / or construction of several Grid Connections in Counties Cork, Kerry, Sligo, Mayo and Donegal. He has also been involved with other types of infrastructural projects, including roads, quarries, waste management facilities and residential/commercial developments.

7.1.3 Policies & Guidelines

There are several local, national and international policies and guidelines relied upon in the preparation of this chapter. In addition to the EIAR guidelines those specific to the land and soils aspect of the environment include:

- County Cork Development Plan 2022 - 2028¹.
- Department's wind farm planning guidelines, 2006².
- Department's draft revised wind farm planning guidelines, 2019³.
- Irish Wind Energy Association best practice guidelines, 2012⁴.
- Environmental Protection Agency, EIA guidelines, 2022⁵.
- Department's EIA guidelines, 2018⁶.
- European Commission EIAR guidelines^{7, 8, 9}.
- Environmental Protection Agency, advice notes on preparation of Environmental Impact Statements, 2003¹⁰.
- Institute of Geologists of Ireland, guidelines on preparing geology chapters of EISs, 2013¹¹.
- National Roads Authority (now TII) guidelines for geology, hydrology and hydrogeology assessments, 2008¹².
- Scottish Natural Heritage guidelines on wind farm Decommissioning, 2013¹³.
- Scottish Government Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, 2017²⁹.
- ESB, 2012. HV Cables – General Construction Methodology.

Wind Farm Planning Guidelines

In relation to soils / geology, the Wind Energy Guidelines recommend the following scope of assessment:

- A geological assessment of the locality.
- A geotechnical assessment of the overburden and bedrock.
- A landslide and slope stability risk assessment.
- An assessment of bog burst or landslide hazard.
- Location of geological heritage areas.
- Location of any significant mineral or aggregate potential.
- Assessment of impacts on groundwater.
- Details of borrow pits and blasting proposals.

The 2019 draft revised wind energy Guidelines largely mirror the 2006 Guidelines in terms of the scope of soils/geology assessment. In addition to the above, the draft revised

Guidelines require an assessment of peatland hydrology and carbon balance. The hydrology of the Site is addressed in **Chapter 8: Hydrology and Hydrogeology**. Carbon balance is addressed in **Chapter 9: Air and Climate**.

County Development Plan

Chapter 15 of the CDP 2022-2028 addresses biodiversity and environment, including geological heritage sites. It sets out a number of objectives and policies in relation to geology. Objective BE 15-2 Protect sites, Habitats and Species includes protection of geological sites and states:

Objective BE 15-2 (d): *'Recognise the value of protecting geological features of local and national interest'*.

Table 2.3.5 of Volume 2 of the CDP lists 103 geological heritage sites. Geological heritage is discussed in **Section 7.2.1**.

7.1.4 Sources of Baseline Data

The main sources of the Baseline data and information relating to land, soils and geology include:

1. Soils, bedrock, hydrogeology, heritage etc - Geological Survey of Ireland - www.gsi.ie
2. Archived maps and reports - Department of Communication, Climate Action & Environment - <https://secure.dccae.gov.ie/goldmine/index.html>
3. Land use - Environmental Protection Agency - www.epa.ie
4. Designated sites – National Parks & Wildlife Service www.npws.ie
5. Cork County Development Plan – list of geological heritage sites in County Cork.

The literature reviewed as part of the desk study included:

1. Geology of West Cork, Geological Survey of Ireland (GSI), 2002¹⁴.
2. Soils Association of Ireland and their Land Use Potential, M. J. Gardiner and T. Radford, National Soil Survey of Ireland, 1980¹⁵.
3. Directory of Active Quarries, Pits, and Mines in Ireland, GSI 2001¹⁶.
4. Landslides in Ireland, GSI 2006¹⁷.
5. The Bogs of Ireland, Feehan and O'Donovan¹⁸.
6. Erratic Carboniferous boulders in Bantry Bay, County Cork. Sevastopulo, G. D. and Naylor, D. 1981¹⁹.
7. 2022 Cork County Development Plan.

8. Memoir of Localities of Minerals of Economic Importance and Metalliferous Mines in Ireland, The Mining Heritage Society of Ireland, 1998²⁰.
9. Derreenacrinnig West Wind Farm Environmental Impact Statement²¹.
10. Derreenacrinnig West Wind Farm Borrow Pit Site Investigation²².
11. Derreenacrinnig Wind Farm Geophysical Investigation Report²³.
12. Wind farm at Derreenacrinnig West Site Investigation Contract Interpretative Report²⁴.
13. Derreenacrinnig West Wind Farm Grid Connection EIAR²⁵.
14. Turbine Delivery Route survey report²⁶.

7.1.5 Assessment Methodology

The assessment of land, soils and geology was carried out with reference to relevant policies, regulations and guidelines (listed above). As much of the wind farm infrastructure has already been constructed, the input in terms of geological constraints normally used during site design was not required. That input was made during the 2010 environmental assessment which informed the route and design of the access road, turbine locations, hardstand construction, etc. The geological constraints that informed the original wind farm layout included peat depth, gradients, and slope stability. The assessment methodology was therefore modified to include:

1. Consultation with agencies with an interest in the geological environment, including Geological Survey of Ireland (GSI), Department of Housing, Local Government and Heritage (DHLGH) and Environmental Health Services (EHS).
2. A literature review to determine any policies and / or guidelines to which the Proposed Development should have regard.
3. A desk-based assessment of the land use and geological setting relevant to the Proposed Development. No sensitive geological receptors were identified during the desk-based assessment.
4. A field survey to collect geological and geotechnical data on the already constructed wind farm infrastructure. The elements of the wind farm still to be constructed were inspected, including the locations for the Turbine Foundation excavations, Electrical Substation construction, extension of the crane areas and areas of the Site which will be restored. As the wind farm was partially developed, further ground investigation was deemed unnecessary.
5. The areas where upgrade to the Turbine Delivery Route, as identified in the swept path analysis drawings for the larger turbines²⁷, were also inspected.

6. The grid route was inspected to assess land use and ground conditions along the overhead sections of the Grid Connection and where excavations are required for the underground sections of the Grid Connection.
7. Review of **Chapter 6: Biodiversity**, prepared for the Project by Doherty Environmental Consultants Ltd to assess the interaction of land use and soils with ecology.
8. Findings from the desk-based study and field surveys were used to inform the construction methods for the remaining elements of the wind farm project. It is noted that the layout of the wind farm is essentially fixed, so modification to the Site design isn't a factor for the Derreenacrinnig West Wind Farm, as would be typical for most proposed wind farms at this stage of the EIA process.

The Site walkovers and collection of data were carried out on several occasions between July 2024 and March 2025. Initial data collection was used to assess the areas where further construction works are required. Embankments of constructed roads and hardstands were inspected to assess stability. This initial data was used to inform the approach to completing the wind farm earthworks, restore constructed areas no longer required, upgrade the local access road and complete construction of the Grid Connection.

The aspects considered in the assessment were soils, land use, slope stability, bedrock geology, and the interaction of these with other aspects of the Proposed Development. These are discussed in the sub-sections below.

The information collected during the desk-based assessment and site walkovers were used to establish the importance, quality and sensitivity of the receiving geological environment. This follows the NRA (2008) guidelines as summarised in **Table 7.1**.

Table 7.1: Estimation of Importance of Soil & Geology Attributes

Importance	Criteria	Typical Examples
Very High	Attribute has a high quality, significance or value on a regional or national scale Degree or extent of soil contamination is significant on a national or regional scale Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale*	Geological feature rare on a regional or national scale (NHA) Large existing quarry or pit Proven economically extractable mineral resource

Importance	Criteria	Typical Examples
High	<p>Attribute has a high quality, significance or value on a local scale</p> <p>Degree or extent of soil contamination is significant on a local scale</p> <p>Volume of peat and/or soft organic soil underlying route is significant on a local scale</p>	<p>Contaminated soil on site with previous heavy industrial usage</p> <p>Large recent landfill site for mixed wastes</p> <p>Geological feature of high value on a local scale (County Geological Site)</p> <p>Well drained and/or highly fertility soils</p> <p>Moderately sized existing quarry or pit Marginally economic extractable mineral resource</p>
Medium	<p>Attribute has a medium quality, significance or value on a local scale</p> <p>Degree or extent of soil contamination is moderate on a local scale</p> <p>Volume of peat and/or soft organic soil underlying route is moderate on a local scale</p>	<p>Contaminated soil on site with previous light industrial usage</p> <p>Small recent landfill site for mixed wastes</p> <p>Moderately drained and/or moderate fertility soils</p> <p>Small existing quarry or pit</p> <p>Sub-economic extractable mineral resource</p>
Low	<p>Attribute has a low quality, significance or value on a local scale</p> <p>Degree or extent of soil contamination is minor on a local scale</p> <p>Volume of peat and/or soft organic soil underlying route is small on a local scale.</p>	<p>Large historical and/or recent site for construction and demolition wastes</p> <p>Small historical and/or recent landfill site for construction and demolition wastes</p> <p>Poorly drained and/or low fertility soils</p> <p>Uneconomically extractable mineral resource</p>

Notes - * relative to the total volume of inert soil disposed of and/or recovered.

7.1.6 Consultation

As part of the EIA process, consultation was carried out on two occasions with organisations and individuals who might have an interest in the soils / geology and land use aspects of the Project. The consultation responses received, are provided in **Appendix 1.3** of this EIAR. The response from GSI, DHLGH, and EHS are summarised here and incorporated, where appropriate, into the avoidance, mitigation and monitoring proposals for the Proposed Development.

Geological Survey of Ireland

The GSI advised of its programmes focused on the various geological aspects, such as heritage, groundwater, flood monitoring, landslide susceptibility, aggregate potential etc. The GSI recommended use of its on-line data and information services. It noted that its landslide susceptibility viewer indicates areas of moderately high to high susceptibility within the wind farm site. It noted that the Grid Connection passes through the Bantry Drumlins, a

designated County Geological Site (CGS), but that the GSI did not envisage impacts from the Proposed Development on this CGS. GSI also requested copies of any ground investigation reports prepared for the Project.

Department of Housing, Local Government and Heritage

The DHLGH make general recommendations in relation to environmental impact assessment such as including an assessment of all aspects of the Proposed Development, any cumulative impacts with other projects and prioritising mitigation by avoidance. Most of its recommendations addressed the built and natural heritage, which are addressed in **Chapter 14: Cultural Heritage** and **Chapter 6: Biodiversity**. Specific recommendations in relation to land, soils and geology include:

1. Assessment to include loss of peatland vis-à-vis carbon emissions.
2. Preparation of a constraints map to avoid impacts on, for example, deep or intact peat deposits, and areas of wet and/or active bog, pool systems and flushes.
3. The EIAR should include sufficient project details for, among other things, borrow pit, peat storage, excavation volumes, fill volumes and surpluses, etc. This should address handling and management of materials.
4. Assessment of peat landslide risk.

Environmental Health Services

The EHS advised of the guidance documents, webinars and high court judgements to be considered in the preparation of the EIAR. Matters specific to land, soils and geology include:

1. Whether the wind farm will be decommissioned or whether it is anticipated that it will be repowered at the end of the planning permission (if granted) – i.e., future use of the Site at the end of the planning permission period.
2. Details of Turbine Foundations – size, depth and quantity of materials used.
3. Fate of materials used in the foundation of the turbines during Decommissioning.
4. Assessment of ground stability - reference is made to the Meenbog Wind Farm peat landslide in County Donegal on 13 November 2020.
5. An assessment of any likely significant cumulative impacts with all existing or proposed wind farm developments in the vicinity should be included.

7.2 RECEIVING ENVIRONMENT

Wind Farm Site

The wind farm site is located on undulating mountainous terrain which forms part of upland ridges extending from Dunmanway to Sheep's Head. The terrain is controlled by the

underlying bedrock geology, which has been folded to form southwest-northeast orientated ridges. Bedrock outcrop is frequent across the Site, generally with a thin veneer of peat developed; thicker peat deposits are developed locally in small basins, confined by bedrock ridges. The landholding extends to approximately 144 hectares (ha) and ranges in elevation from approximately 200 m to 402 mOD (Malin Head). Turbines are proposed between elevations of approximately 357 mOD and 398 mOD. Site location map is provided as **Figure 2.2**. **Plate 7.1** to **Plate 7.3** show the general topography at the three turbine locations.

The Site is currently used for rough grazing of sheep and commercial forestry. The commercial forestry is located on the northern side of the landholding. The Site is serviced by the wind farm access road which was constructed in 2017 / 2018 as permitted by planning permission 10/857 / PL 88.239767. This road joins with forestry roads on the northern side of the Site, which extend to the rock borrow pit and also to the public road (L-8767-0).



Plate 7.1: Views of Turbine No. 1 Location Looking West & Northwest



Plate 7.2: Views of Turbine No. 2 Location Looking East & Southeast



Plate 7.3: Views of Turbine No. 3 Location Looking East

Grid Connection Route

The Grid Connection will be constructed using combined overhead line (OHL) and underground cabling. From the wind farm Electrical Substation, it heads north, passing over the mountain, then turning west along the northern slopes of Mullaghmesha. This southern section of the route is in forestry and used for rough grazing, with elevations greater than 200 mOD, and reaching approximately 380 mOD. In this higher section of the route, there are few houses. It then crosses the Mealagh River valley which generally has better agricultural land at lower elevations (typically below 180 mOD), used for grazing (dry cattle and dairy), with occasional commercial forestry and areas of scrub in poor ground. Where the Grid Connection crosses the lower elevations, there is a mixture of farmhouses and one-off housing.

Turbine Delivery Route Upgrade

Widening is required at the junction of local roads L-8767-0, L-4711-132, and L-8765-0 in Castledonovan. From that junction, road upgrades are required along the L-8767-0 to the wind farm entrance. The ground rises from the junction at Castledonovan from approximately 140 mOD to approximately 200 mOD at the wind farm site entrance. The land use along this route is largely grazing on improved grassland, transitioning to rough grazing towards the Site entrance. Areas of natural woodland and scrub of limited extent also occur near the L-8767-0.

7.2.1 Geological Heritage Sites

The GSI - Irish Geological Heritage Section (IGH) and NPWS (National Parks and Wildlife Service) has been conducting a programme since 1998 to identify and select important geological and geomorphological sites throughout the country for designation as NHAs (Natural Heritage Areas) – the Irish Geological Heritage Programme. This is being addressed under 16 different geological themes such as economic geology, karst,

Devonian, coastal, Quaternary, etc. For each theme, a larger number of sites from which to make the NHA selection are being examined, in order to identify the most significant scientifically. The criteria of designating the minimum number of sites to exemplify the theme means that many sites of national importance are not selected as the very best examples. However, a second tier of County Geological Sites (CGS) (as per the National Heritage Plan) means that many of these can be included in County Development Plans and receive a measure of recognition and protection through inclusion in the planning system. Cork County Council has developed a list of sites of geological interest for inclusion in the County Development Plans. As noted above, it is an objective of the County Development Plan to conserve these features. The GSI's audit of sites in County Cork was completed in 2024.

The County Development Plan lists 103 sites of geological interest in County Cork. The nearest sites to the Proposed Development are:

1. Bantry Drumlins - IGH7 Quaternary - drumlin swarm (local mountain glaciation). This is designated a CGS.
2. Pass of Keimaneigh - IGH7 Quaternary - glacial meltwater channel. This is designated a CGS and recommended for Geological NHA designation.
3. Relane Point - IGH8 Lower Carboniferous and IGH7 Quaternary - it exhibits easy-to-observe features relating to meso-scale structural folding in the Bantry area, and evidence of glacial erosion and deposition. This is designated a CGS and recommended for Geological NHA designation.
4. Whiddy Island (northwest coast) - IGH9 Upper Carboniferous and IGH7 Quaternary - the coastal section hosts the youngest rocks in West Cork. The understanding of their origin and formation provides important insights into the geological history of this part of southwest Ireland. This is designated a CGS and recommended for Geological NHA designation.
5. Coomhola River - IGH8 Lower Carboniferous - it displays the full stratigraphical sequence that records the transition from terrestrial red-beds to tidal and marine sediments. This is designated a CGS.
6. Reenydonagan Point - IGH8 Lower Carboniferous, IGH3 Carboniferous - Pliocene Palaeontology - it is the type-section locality for the Reenydonagan Formation and comprises all four members from within the formation. Fossil fauna found here contribute to the age-dating of the formation. This is designated a CGS and recommended for Geological NHA designation.
7. Glengarriff Harbour - IGH10 Devonian - it provides a complete stratigraphical sequence that records the environmental transition from terrestrial Old Red Sandstone red-beds to tidal and marine sediments. This is designated a CGS.

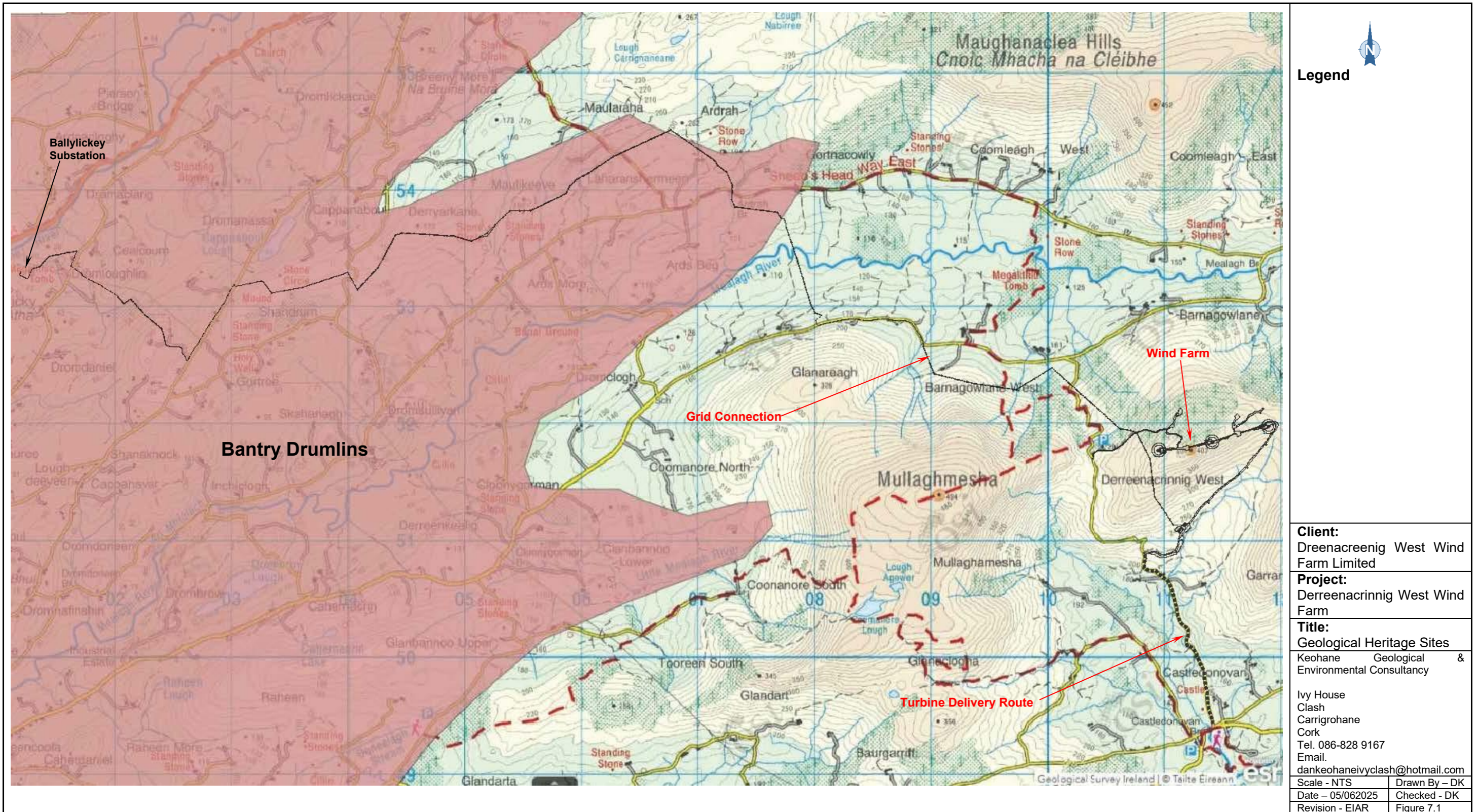


Figure 7.1: Geological Heritage Sites

These sites are shown on **Figure 7.1** with the wind farm and Grid Connection shown. The wind farm site is not listed as being an Area of Geological Interest and all of the above listed sites are greater than 2.8 km distant. As shown on **Figure 7.1**, the western part of the Grid Connection passes through the Bantry Drumlins.

7.2.2 Economic Geology

Wind Farm Site

According to the Directory of Active Quarries, Pits and Mines in Ireland, there are no quarries within the vicinity of the wind farm site. There are several historic pits and slate quarries near Drimoleague. The nearest known operational quarry is located at Coolbane, approximately 13 km to the southwest.

The GSI's aggregate potential mapping (<https://dcenr.maps.arcgis.com/apps/webappviewer>) indicates that the wind farm site has a very high potential for crushed rock aggregate across the entire site. It has no ranking for its potential for granular aggregate. Based on site walkovers, there is no commercial aggregate (sand & gravel) potential at the Site.

The wind farm site and immediate environs are not listed in the Memoir of Localities of Minerals of Economic Importance. There is no known history of mining within the Site or within the immediate vicinity of the Site.

Grid Connection Route

The alluvial deposits along the Mealagh River valley are rated as having Low to Very Low granular aggregate potential. The potential for crushed rock aggregate varies along the grid route from Very High to Very Low.

There is one exhausted sandstone quarry at Derreenkealig, approximately 2.8 km to the south of the Grid Connection route.

There are no listings in the Memoir of Localities of Minerals of Economic Importance along the Grid Connection route, nor is there is no known history of mining.

Turbine Delivery Route Upgrade

The Quaternary deposits at the Castledonovan junction mark the western extent of glacial gravel deposits. As such, the deposits at the junction are rated as having High to Very High granular aggregate potential. These only extend approximately 200 m north from the

junction along the L-8767-0. Granular aggregate potential is not mapped for the remainder of the L-8767-0 to the wind farm entrance. The potential for crushed rock aggregate along the route is mostly High, but with smaller areas of Low to Very High. There are no quarries, mines or mineral localities along the route.

7.2.3 Overburden Geology

Wind Farm Site

According to the Soils Associations of Ireland and Their Potential Land Use, the soils at the Site are Blanket Peat (High Level) belonging to the Mountain and Hill physiographical division. There are no associated soils. It accounts for approximately 5.67% of the Country (excluding major lakes and rivers), approximately 387,668 ha. These soils in their natural state are acid and poorly drained. Peat depths typically range from 1 to 2 m with an average depth of 1.2 m. These soils have a very limited use range and are best suited to extensive grazing. Their organic nature, elevation and wetness are the main limitations. Improved grass swards can be stabilised in some areas by drainage, manuring and surface seeding. It is estimated that about 25% of this peat type has been cutover mainly for fuel.

From the GSI web-mapping, the Project site is dominated by bedrock outcrop or subcrop. Blanket peat is mapped in the forestry to the northeast of the wind farm on the north-facing slopes. Till derived from Devonian sandstones cover the lower elevations at the southern side of the Site and along the valley of the streams draining to the Ilen River. **Figure 7.2** shows the overburden geology of the area.

Based on the GSI aquifer vulnerability ranking of extreme (E), the overburden thickness is less than 3 m. Extensive bedrock outcrops occur across the wind farm site – both natural outcrops and cuts associated with the construction of the wind farm roads and hardstands. Peat probing carried out across the Site indicates peat depth of up to 3.1 m.

Grid Connection Route

The southern section of the Grid Connection is within the same soils association as the wind farm – i.e., Blanket Peat (High Level). Moving north and west along the grid route, it passes through:

- Peaty Podzols (75%) of the Mountain and Hill physiographical division. Associated soils are lithosols (15%) and blanket peat (10%). The parent material mostly sandstone in West Cork. It accounts for approximately 7.31% of the Country, i.e., approximately 500,029 ha. These soils occur in Ardrah where the grid route passes through the western slopes of the Maughanaclea Hills. The use range of these soils,

as well as that of the associated peats and lithosols, is very limited. High elevation, inaccessibility, peaty surface, together with the very low lime, and nutrient status and in some cases ironpan development in the profile are the main limiting factors. They are not suitable for tillage or intensive grassland, but are confined mainly to mountain sheep grazing, amenity and forestry.

- Brown Podzolics (60%) of the Rolling Lowlands physiographical division. Associated soils are acid brown earths (20%) and gleys (20%). The parent material is sandstone and Lower Avonian shale glacial tills. It accounts for approximately 6.31% of the Country, i.e., approximately 431,349 ha. This soil occurs near Ballylickey and the western end of the Mealagh River Valley. The brown podzolic and acid brown earth soils have similar land use ranges. They have desirable structure, texture, drainage and depth features. As a result, they have a wide range of potential uses and are well suited to arable cropping and grassland. Furthermore, their occurrence mainly in the extreme south, affords a climatic advantage for crops and pasture. Although much of the area in which they occur is at elevations around 120 m they are still placed in the wide use range category since it is considered that this is offset by such a favourable climate. Large rock outcrops occur in some places imparting a somewhat broken aspect to the landscape. Generally, however, these do not interfere with farming operations. The associated gley soils can be reclaimed but are mainly suitable for grass production.
- Blanket Peat (Low Level) of the Rolling Lowlands physiographical division. There are no associated soils. It accounts for approximately 5.14% of the Country, i.e., approximately 351,651 ha. As it occurs on flatter topography than high level peat, it has a greater average depth, usually about 3 m. In some places it can reach depths of 5 to 6 m. The very limited suitability of this soil is similar to the high level type except that slopes are not as steep and altitudes not as high. As in the high level blanket bog it has been estimated that 25% of this type is cut-over mainly for fuel. The grid route passes over this soil association at two locations; Mealagh River valley and near Cappnaboul Lough on the approach to Ballylickey.

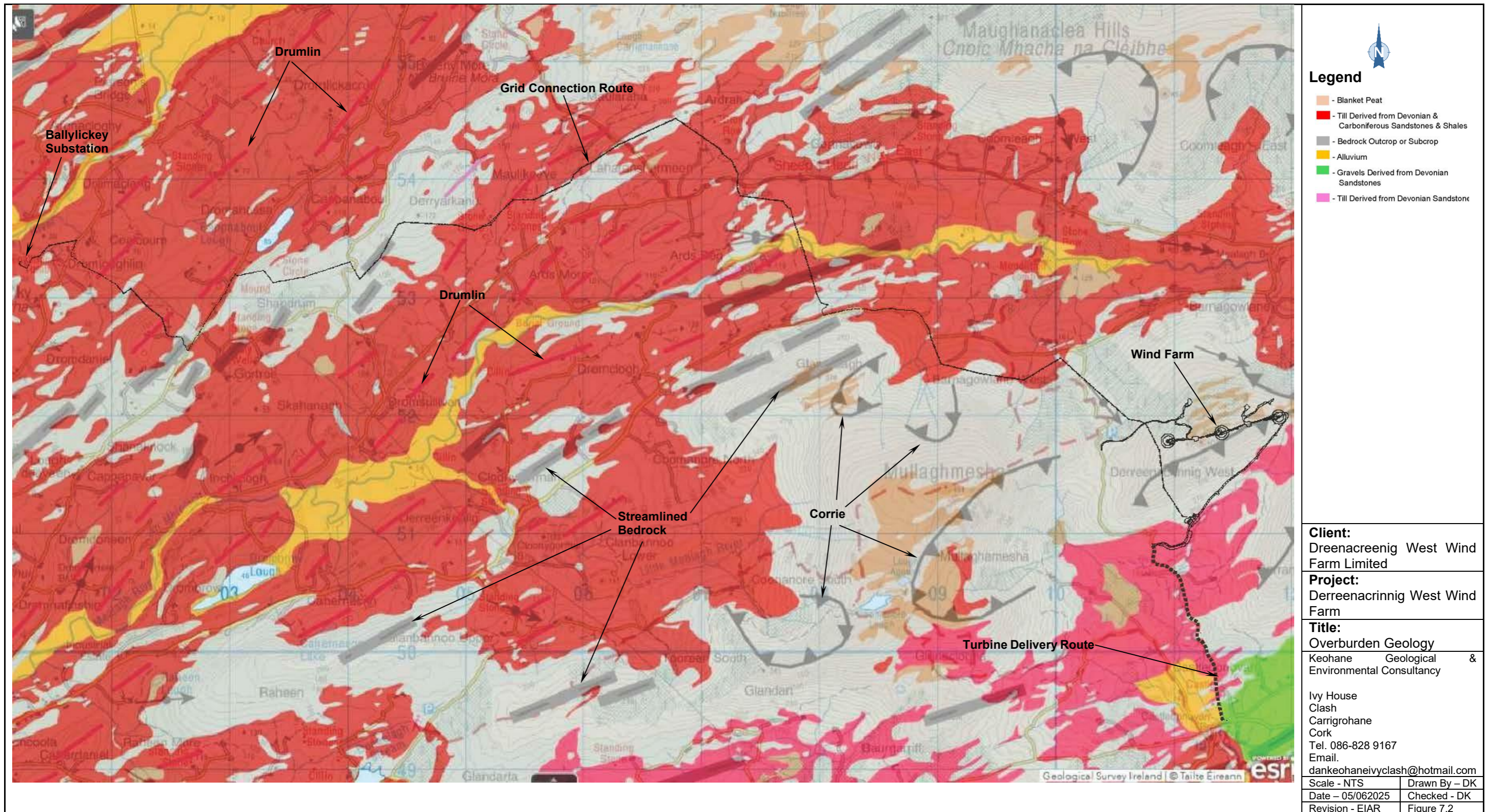


Figure 7.2: Overburden Geology Map

From the GSI web-mapping, the Grid Connection route is dominated by till derived from Devonian and Carboniferous sandstones and shales. Rock outcrop and subcrop occur on the higher elevations, and alluvial deposits occur along the river valleys. Small deposits of blanket peat also occur.

Turbine Delivery Route Upgrade

In addition to the Blanket Peat (High Level) that occurs at the wind farm site and brown podzolics that occur along part of the Grid Connection route, the southern part of the delivery route is also underlain by Brown Podzolics (80%) of the Hill physiographical division. Associated soils are gleys (15%) and podzols (5%). The parent material is mostly sandstone. It accounts for approximately 1.88% of the Country, i.e., approximately 128,585 ha. The use range of these soils depends largely on slope and altitude, but generally they have a somewhat limited use range. They can be used successfully for tillage crops, but their best use is in pasture. When managed well, including adequate lime and fertiliser use, their stock carrying capacity can be up to 185 livestock units per 100 ha. The gleys tend to occur in the depressional and low-lying areas, while the podzols are found mostly in more elevated positions. Both are limited in their use range.

From the GSI web-mapping, gravels derived from Devonian sandstones occur at the Castledonovan junction and extend east. Till derived from Devonian sandstones and bedrock outcrop / subcrop dominate the Turbine Delivery Route. Alluvium occurs along the river channels to the west of the local road.

7.2.4 Land Use

Wind Farm Site

The EPA Corine (2018) land use indicates that the Project site is moors and heathlands with scrub and/or herbaceous vegetation associations in the forest and semi-natural areas.

The current land use at the Site is agricultural, consisting of low intensity sheep grazing. Commercial forestry is located on the northern margin of the wind farm site and in the wider area. The rock borrow pits are located in the forestry. The Corine land use map is provided as **Figure 7.3**.

Grid Connection Route

The Grid Connection route passes through a mosaic of several EPA Corine land use categories. These are:

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- Agricultural Areas - Heterogeneous agricultural areas - Land principally occupied by agriculture with significant areas of natural vegetation.
 - Forest and semi-natural areas - Scrub and/or herbaceous vegetation associations - Moors and heathlands.
 - Forest and semi-natural areas – Forest - Mixed forests.
 - Wetlands - Inland wetlands - Peat bogs.
 - Forest and semi-natural areas – Forest – Coniferous forests.
 - Agricultural Areas – Pastures – Pastures.

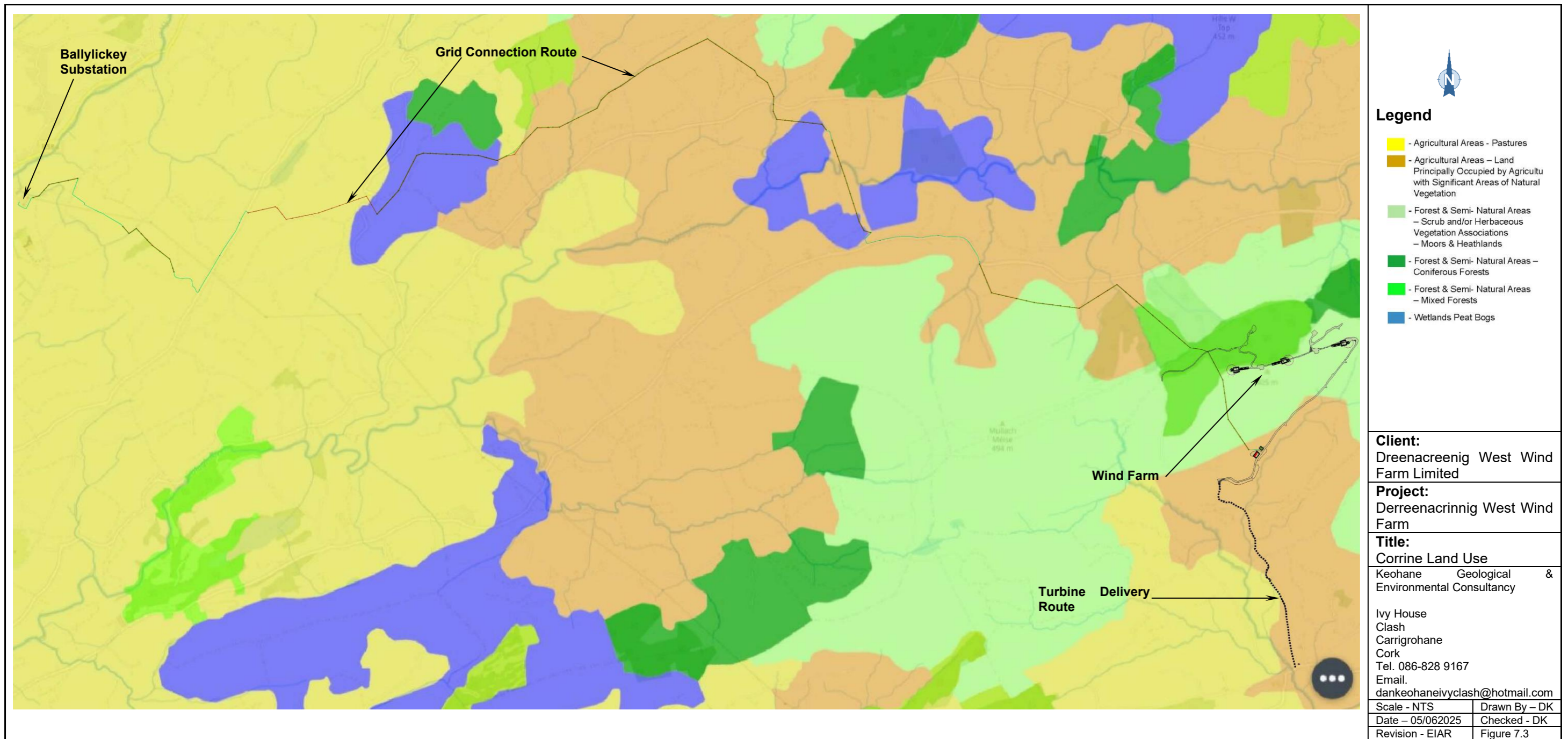


Figure 7.3: Corrine Land Use Map

Turbine Delivery Route Upgrade

The land use adjacent to the local road is mostly Agricultural Areas - Heterogeneous agricultural areas - Land principally occupied by agriculture with significant areas of natural vegetation. A small section is within Agricultural Areas – Pastures – Pastures.

7.2.5 Regional Bedrock Geology

According to the GSI – Geology of West Cork, the area is underlain by Devonian and Carboniferous-aged rocks belonging to the Old Red Sandstone Formation, the Cork Group and Namurian sediments. The rocks were deposited in the South Munster Basin and consist predominantly of clastic rocks with minor limestone deposits representing various marine and non-marine sedimentary environments. The regional bedrock geology is shown on **Figure 7.4**.

The bedrock formations represented in the Bantry-Drimoleague area are summarised in **Table 7.2**.

Table 7.2: Summary of Bedrock Geology in Bantry-Drimoleague Area

Age / Stage	Formation	Description
Namurian	Kilmore Formation (KL)	sandstone, siltstone and mudstone
	Middle Battery Formation (MB)	dark-grey mudstone and sandstone
	East Point Formation (EP)	black sooty pyrite-rich slate
Dinantian	Dinantian Limestone (DIN)	undifferentiated limestone
Dinantian / Cork Group	Reenydonagan Formation (RD)	calcareous mudstone and thin limestone
	Ardnamanagh Member (am)	dark-grey laminated mudstone
	Reenagough Member (rg)	massive and flaser-bedded sandstone
	Ardaturrish Member (at)	black mudstone and silt-lensed mudstone
	Pig's Cove Member (pc)	sand-lensed mudstone
	Narrow Cove Member (nc)	flaser-bedded sandstone and mudstone
	Castle Slate Member (cs)	grey mudstone
	Kinsale Formation (KN)	grey mudstone and subordinate sandstone
Upper Devonian / Cork Group	Bere Island Member (bi)	sandstone, bioclastic limestone lenses
	Old Head Sandstone Formation (OH)	flaser bedded sandstone and minor mudstone
Devonian / Old Red Sandstone	Toe Head Formation (TH)	cross bedded sandstone and minor mudstone
	Castlehaven Formation (CE)	purple mudstone and sandstone
	Sherkin Formation (SK)	sandstone and subsidiary mudstone
	Gun Point Formation (GP)	green-grey sandstone and purple siltstone

Age / Stage	Formation	Description
	Old Red Sandstone (ORS) undifferentiated	red conglomerate, sandstone and mudstone

The bedrock formations at the Site, from oldest to youngest are:

1. The Gun Point Formation (GP). This formation is characterised by green-grey to purple medium to coarse grained sandstones interbedded with thick sequences of purple siltstone and fine-grained purple, parallel and cross-laminated red sandstone. The formation underlies the three turbines, Electrical Substation location and most of the access road. The borrow pit also exploited this formation, which will be reinstated as part of the Proposed Development. It also underlies the southern/eastern section of the Grid Connection route.
2. The Castlehaven Formation (CE). This formation is characterised by purple coloured and minor green coloured mudstones and siltstones with interbedded fine-grained sandstone. Various sedimentary depositional features are common. The formation varies in thickness from 200 m to 1,500 m. It underlies the south-western section of the access road between the Site entrance and the Electrical Substation, and a section of the Grid Connection where it crosses the Mealagh River.
3. Toe Head Formation (TH). This formation is characterised by large-scale cross-bedded green and purple sandstone, rippled fine-grained grey sandstone and interbedded sandstone and mudstone sequences. The formation varies in thickness from 200 m (on Sheep's Head Peninsula) to 1,040 m (Mizen Peninsula). It underlies the central section of the TDR upgrade and parts of the Grid Connection, including the underground section at Glanareagh.
4. Old Head Sandstone Formation (OH). This formation is characterised by grey flaser-bedded sandstone, fine-grained sandstone and minor mudstone and lenticular bedded mudstone. It underlies two sections of OHL of the Grid Connection.
5. Ardaturrish Member (at) of the Kinsale Formation. This member of the Kinsale Formation is characterised by black mudstones and silt-lensed mudstones showing various sedimentary depositional features. It underlies two sections of OHL and a short section of underground (at Glanareagh) of the Grid Connection.
6. Ardnamanagh Member (am) of the Kinsale Formation. This member of the Kinsale Formation is characterised by dark grey mudstone with thin alternating laminae of black shale and siltstone. It underlies the western end of the Grid Connection route at Ballylickey Electrical Substation, including two underground sections.
7. Reenydonagan Formation (RD). This formation is characterised by medium to thin-bedded calcareous mudrock with laminated and linsen non-calcareous mudrock and rarer medium-bedded argillaceous, dolomitised bioclastic fine-grained carbonates and

black, pyritic, carbonaceous mudrock with small phosphatic nodules. This formation occurs towards the western end of the Grid Connection route, underlying OHL and underground sections near Cappnaboul Lough.

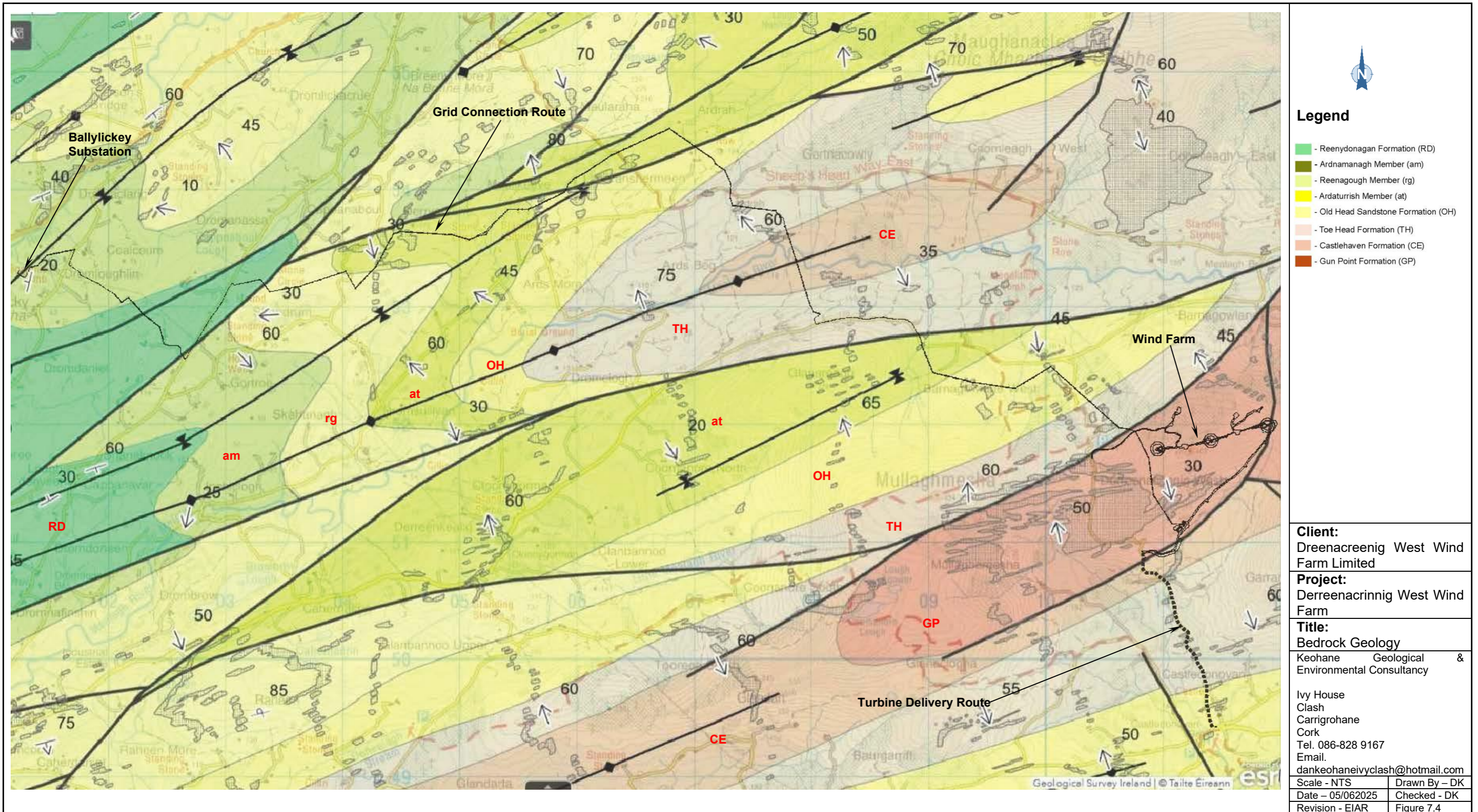


Figure 7.4: Bedrock Geology Map

Following deposition, the bedrock was uplifted and compressed during the Variscan Orogeny resulting in the folding and faulting seen today. This is dominated by northeast-southwest trending anticlines and synclines. The Gun Point and Castlehaven formations are in faulted contact at the wind farm site. These faults are inactive.

7.2.6 Existing Slope Stability

Based on available data from the GSI, there are no records of slope failure within the Site. GSI records indicate that the nearest occurrence was in 2001 on a road in the townland Goulacullin, approximately 3.8 km to the northeast of the Site.

Landslide susceptibility mapping has been carried out by GSI (refer to GSI online web-mapping), based on slope and soil cover. Eight classifications for landslide susceptibility are mapped, ranging from Low to High. The Derreenacrinnig West wind farm site ranges from 'low' to 'high', with most of the Site mapped as 'moderately high' or 'high'. The southern section of the Grid Connection is also in areas mapped as having 'moderately high' or 'high' landslide susceptibility. Most of the remainder of the route is mapped as having 'low' to 'moderately low' landslide susceptibility. Most of the delivery route upgrade is mapped as having 'low' landslide susceptibility, with the central part of the route mapped as having 'moderately high' to 'high' landslide susceptibility. The landslide susceptibility is shown on **Figure 7.5**. This topic is discussed further in **Section 7.4.3**.

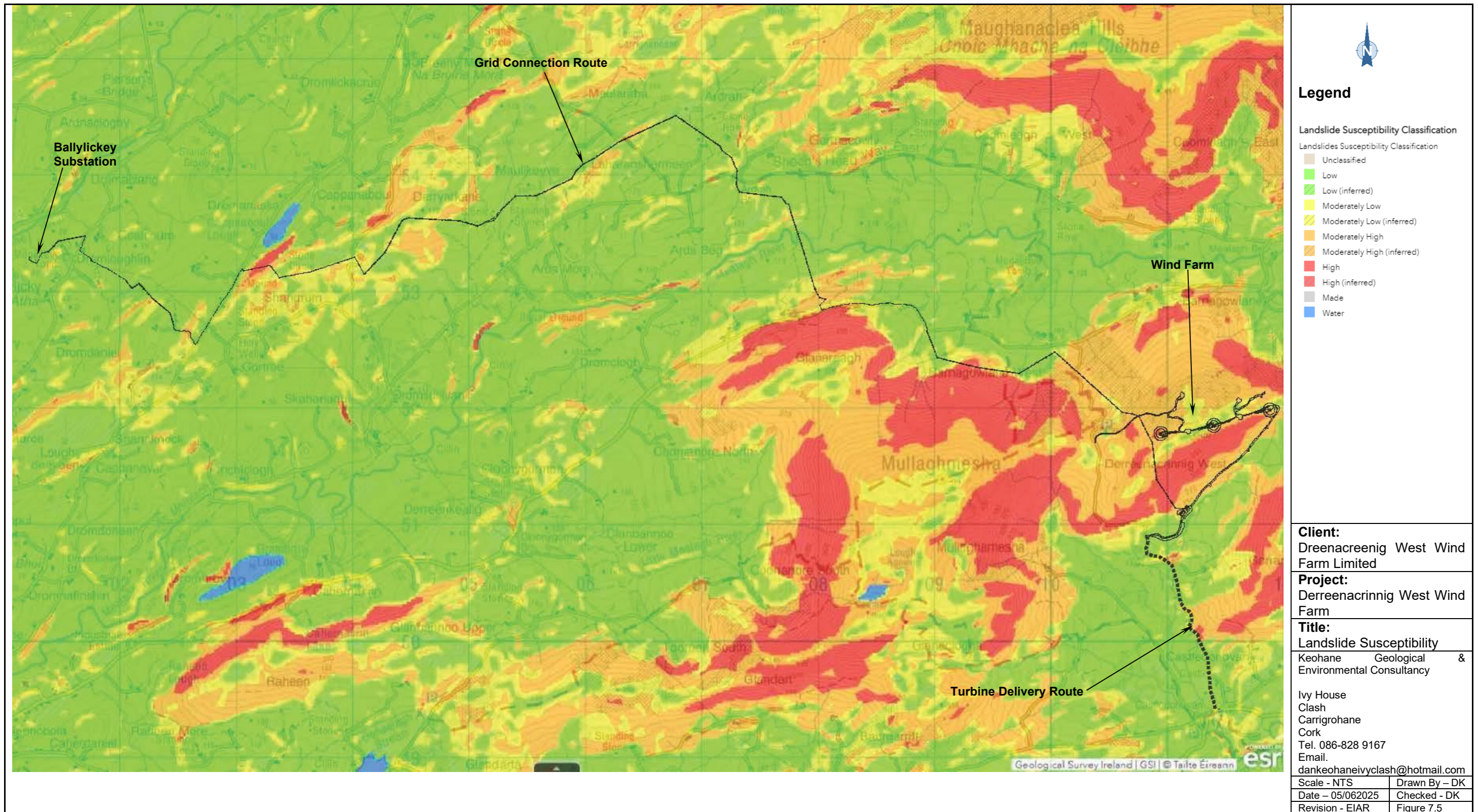


Figure 7.5: Landslide Susceptibility Map

Minerex Environmental Limited (MEL) were commissioned by JOD in May 2010 to undertake a soil / peat stability assessment for the original wind farm environmental impact assessment. This assessment included peat depth probing, gouge coring, shear vane testing and slope measurements. In its assessment, MEL noted that there were no visual indicators of significant slope instability at the Site. The assessment concluded that there was low risk of peat instability during the construction phase and so, adopting the precautionary principle, site-specific mitigation measures were proposed. Mitigation by design (i.e., the avoidance of areas with steep gradient and deeper peat) was used to minimise risk of peat landslide. The construction of the wind farm roads and hardstands was largely completed in 2017 / 2018 with no incidents of peat / soil / rock instability.

Minor settlement was observed on the Site where hardstands were constructed with fill material – i.e., at permitted turbines T02 and T03 (see **Plate 7.4**). However, this settlement is of no consequence in relation to slope stability. No landslide risk issues were noted during the walkovers of the Site between July 2024 and March 2025.



Plate 7.4: Settlement Cracks in Hardstands of Permitted Turbines T02 & T03

No stability issues were experienced during the construction of the OHL sections of the Grid Connection route in 2017 / 2018.

During walkover survey of the TDR upgrade route a small section of the road verge (L-8767-0) approximately 150 m north of the castle had collapsed following heavy rainfall on 18 November 2024. During site visits in March 2025, it was noted that the road had not been repaired.

7.2.7 Contaminated Land

According to EPA web-mapping, there are no land uses within or adjacent to the Site that could give rise to contaminated land. There were no potential contaminated land issues identified during the Site walkovers.

7.2.8 Radon

Radon is a radioactive element which occurs naturally in earth materials. It can accumulate in buildings where elevated concentrations can increase risk of lung cancer. The EPA has produced a radon risk map for the country, indicating areas of high, medium and low risk. The risk levels for high, medium and low risk equate to 1 in 5, 1 in 10 and 1 in 20 houses that are likely to have high radon levels, respectively. The map is based on an analysis of indoor radon measurements plus geological information including, bedrock type, quaternary geology, soil permeability and aquifer type. The entire wind farm site is in a high-risk area (i.e., 1 in 5 homes in this area is likely to have high radon levels). The Grid Connection route and TDR upgrade pass through areas mapped high risk and medium risk. As personnel would only be occasionally in the turbines and Electrical Substation, this is a minimal health risk. In addition, the Electrical Substation will be constructed with a radon barrier and the turbines are ventilated, so build-up of radon gas in these structures is unlikely.

7.2.9 Ground Investigations

Walkover surveys of the Project site and surrounding area were carried out on several occasions between July 2024 and March 2025. Observations in relation to soils, land use and geology are summarised as follows:

- The wind farm is used for low intensity sheep grazing, with commercial forestry on the northern side of the landholding.
- Much of the wind farm infrastructure for the permitted wind farm layout (of seven turbines) has been completed, including roads to turbines T01 through T06. The road to turbine T07 is not completed. The route is cleared, and rock breaking has been carried out.
- The foundations for turbines T01 to T05 have been partially excavated. The bearing stratum at each is bedrock.
- Two rock borrow pits are opened at the north-sloping part of the wind farm site.
- Natural bedrock outcrops occur frequently across the Site.
- Thin peat cover is noted in cuts for drainage channels. The peat lies directly on bedrock or on tills.
- Many of the single wooden poles for the Grid Connection were erected in 2017 / 2018 and conductors strung in parts.

In June and November 2010, Minerex Environmental Limited (MEL) carried out an assessment of the ground conditions at the wind farm.

The work included:

- Bedrock outcrop and mineral soils logging and characterisation.
- Peat depth probing.
- Gouge coring at 76 locations to characterise peat (Von Post humification scale) and subsoil logging.
- Measurement of undrained shear strength of peat and clay.
- Slope measurement.

The findings from this fieldwork are summarised as follows:

- Peat depth ranges from 0.15 m to 3.15 m, with Von Post humification generally ranging from H3 to H7.
- The southern-facing slopes of the Site generally have peat depths less than 0.5 m, with rock outcrop frequent.
- Approximately half of the north-facing slopes have peat depths less than 0.5 m. Where peat is found greater than 0.5 m, it occurs in narrow basins, of limited extent, confined by bedrock ridges.
- The majority of the route of the access road traverses areas with bedrock outcrop or peat less than 0.5 m deep. Turbines T03, T05, T06, and T07 are sited on exposed bedrock while Turbines T01, T02, and T04 are sited on peat <0.5 m deep.
- No signs of slope instability were observed during the field surveys carried out in 2010.

This information was used to inform the Site layout, where the steepest slopes and areas with deep peat were avoided.

In April 2011, Whiteford Geoservices Ltd carried out ground investigation and geophysical survey of the borrow pit location. This consisted of trial pit excavation, rock sample collection and analysis, and seismic survey. The findings of the investigation were that the borrow pit could provide sufficient aggregate for the wind farm construction, however it was recommended that imported aggregate be used for surface dressing of roads as it was considered that the on-site product would be susceptible to degradation under cyclical loading. Whiteford considered that the risk of peat instability would be insignificant at the borrow pit location.

In 2016 Priority Geotechnical Ltd carried out a ground investigation at the wind farm. It consisted of 32 No. trial pits, 32 No TRL dynamic probes, four rotary boreholes, four standard penetration tests, eight dynamic probes (DPH), monitoring well installation,

laboratory testing of soil and rock samples, and geophysical survey (resistivity soundings and seismic refraction at the seven permitted turbine locations). The ground conditions at the seven permitted turbine locations were characterised:

'...by dark brown to black PEAT and peaty CLAY 0.22 m to 0.6 m thick and slightly sandy gravelly SILT with Cobble content deposits 0.7 m thick to 1.1 m thick overlying bedrock BHTP01 to BHTP04 (T01 – T04). Based on tactile assessment, the Silt was described as soft. Medium strong to strong SILTSTONE was encountered 1.55 m bgl (BHT03) to 1.65 m bgl (BHT01). Sandstone was found to underlie the Siltstone at BHT01 and BHT04, below 4.5 m bgl to 5.05 m bgl. Strong SANDSTONE was encountered at 1.55 m bgl (BHT02). Peaty CLAY 0.8 m thick was encountered at TP05A (T05) overlying 0.7 m of firm slightly sandy gravelly SILT with Cobble content to a depth 1.5 m bgl. Peaty CLAY 0.17 m thick was encountered at TP06A (T06) overlying 0.63 m of firm slightly sandy slightly gravelly SILT with Cobble content to a depth 0.8 m bgl. PEAT 0.28 m thick was encountered at TP07A (T07) overlying 0.92 m of firm to stiff slightly sandy gravelly SILT with Cobble content to a depth 1.2 m bgl.

The access road was characterised by:

'...mixed deposits. Topsoil; slightly sandy slightly gravelly SILT, 180 mm to 300 mm thick; PEAT 170 mm to 600 mm thick and peaty CLAY 150 mm to 900 mm overlay silty sandy GRAVEL (TP01, TP02, TP03 and TPS1) with varied Cobble content deposits 600 mm to 1.55 m thick and soft becoming firm to stiff, slightly sandy slightly gravelly SILT with varied Cobble content, 650 mm to 2.7 m thick. The Gravels and Silts were underlain by shallow bedrock 0.75 m bgl to 2.3 m bgl. Clayey PEAT was encountered 2.0 m deep at TP12'.

Ground investigation locations are shown on **Figures 7.6 to 7.8**.

The construction of the wind farm infrastructure has been largely completed. The roads and hardstands have bedrock at surface or bedrock covered with compacted engineered fill. The proposed three turbines are at locations of the permitted turbines (proposed turbine T01 is located at permitted turbine T01; proposed turbine T02 is located at permitted turbine T03; and proposed turbine T03 is located at permitted turbine T05). As such further intrusive ground investigation is considered unnecessary at the wind farm site for this assessment.

7.2.10 Importance of Soils & Geology Attributes

Based on the NRA Guidelines, the importance of the Site in terms of soils and geology is rated as low for the wind farm, eastern section of the Grid Connection route and the TDR

upgrade; and high for the western section of the Grid Connection route. For most of the Proposed Development, the soil quality is poor; there are no pits or quarries and the potential for developing same is low; there is no soil contamination identified and given the historic land use, the potential of encountering soil contamination is low; and there are no landfills on the Site.

For the western section of the Grid Connection route, the importance is rated as high as it passes over the Bantry Drumlins which are designated a CGS and the soils are more fertile with a wider use range on a local scale.

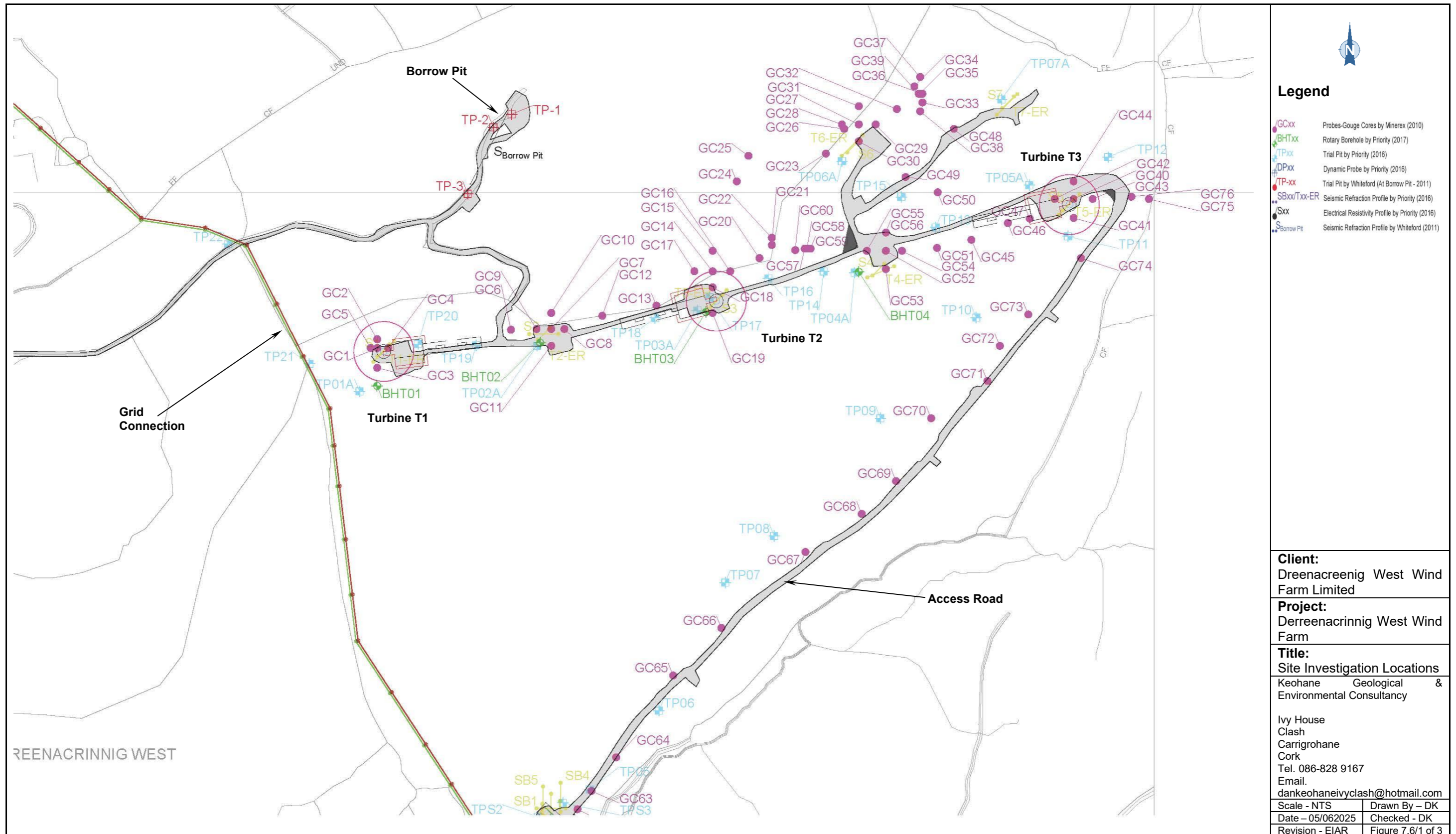


Figure 7.6: Site Investigation Locations (Sheet 1 of 3)

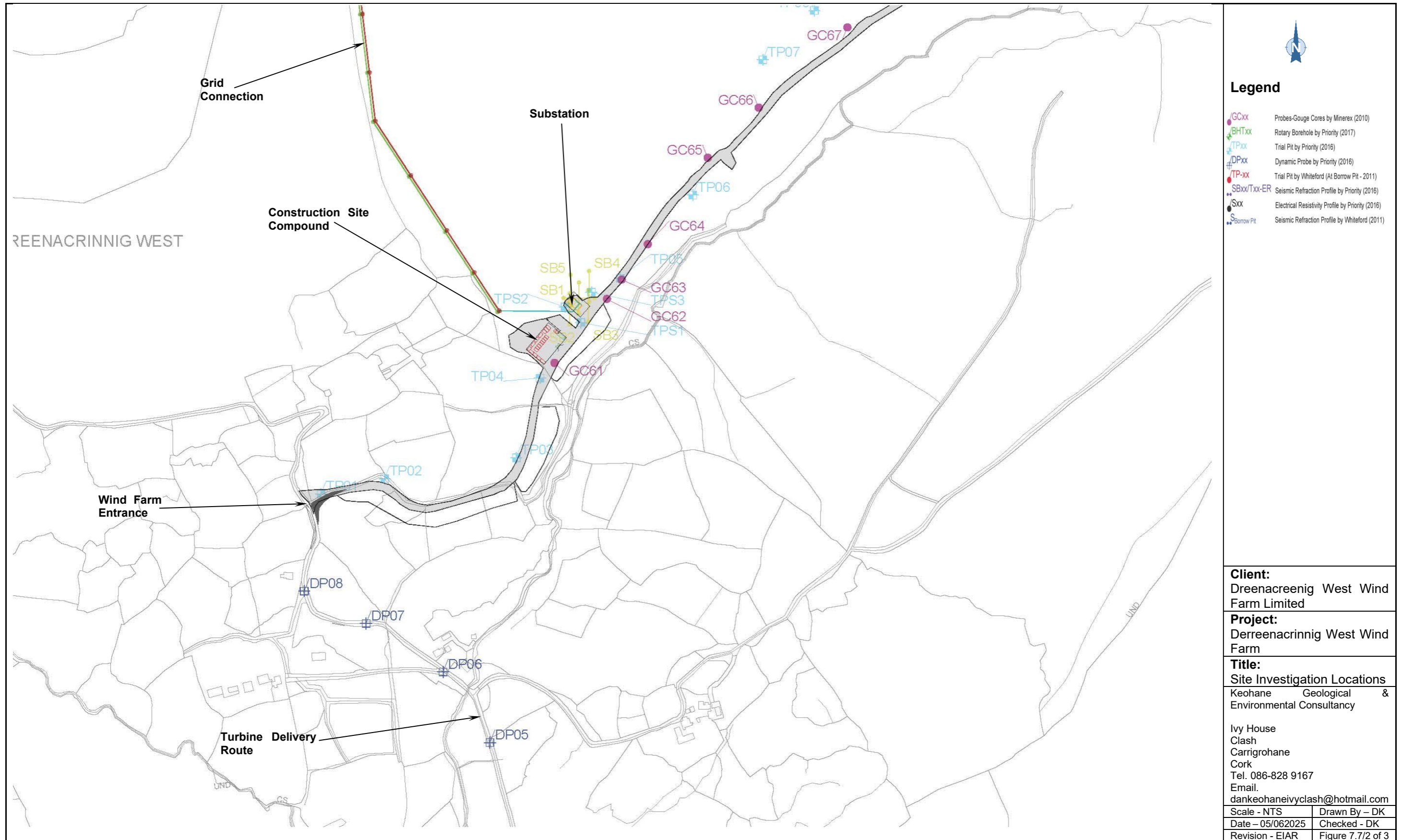


Figure 7.7: Site Investigation Locations (Sheet 2 of 3)

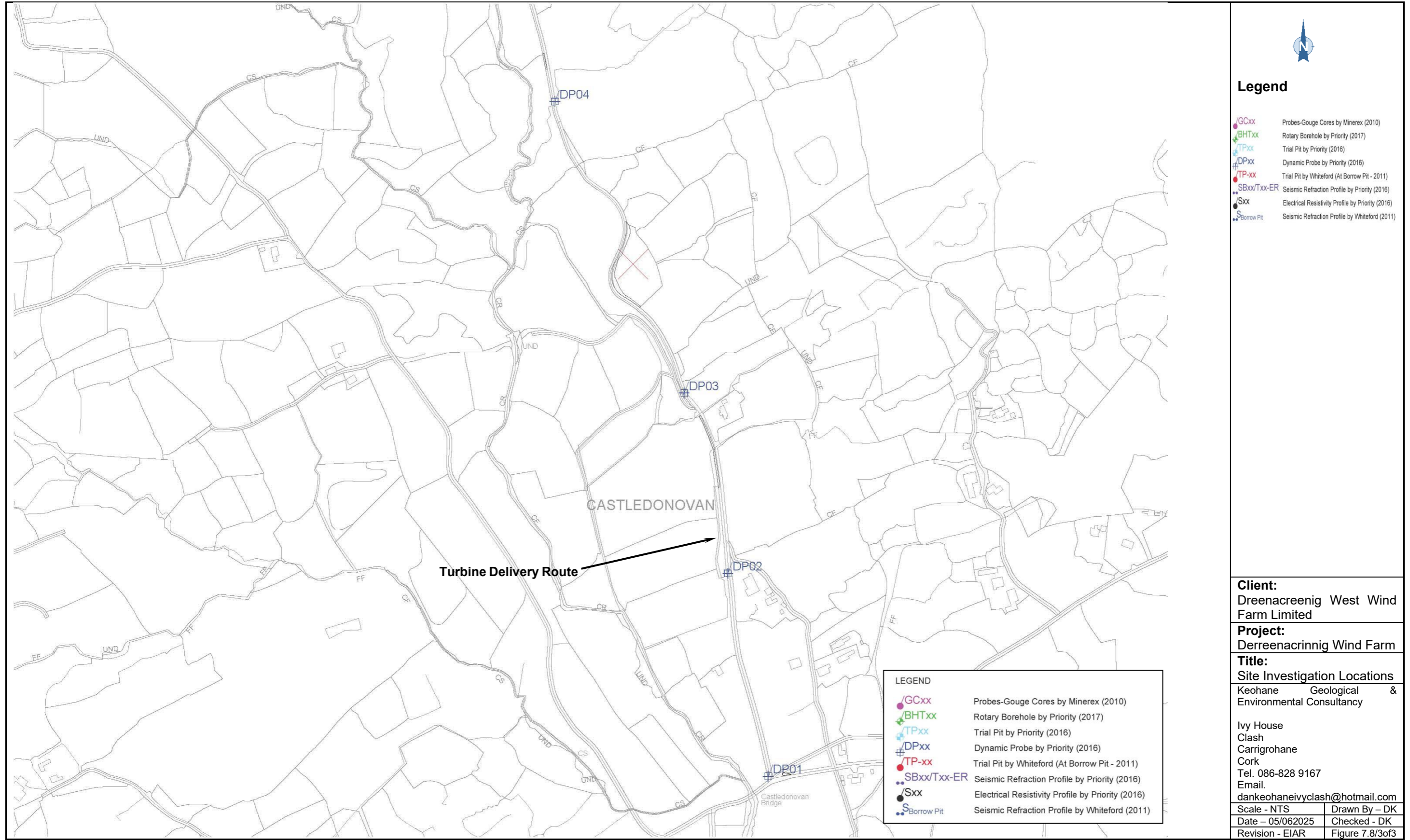


Figure 7.8 Site Investigation Locations (Sheet 3 of 3)

Legend

- GCxx Probes-Gouge Cores by Minerex (2010)
- BHTxx Rotary Borehole by Priority (2017)
- TPxx Trial Pit by Priority (2016)
- # DPxx Dynamic Probe by Priority (2016)
- TP-xx Trial Pit by Whiteford (At Borrow Pit - 2011)
- SBxx/Txx-ER Seismic Refraction Profile by Priority (2016)
- Sxx Electrical Resistivity Profile by Priority (2016)
- Borrow Pit Seismic Refraction Profile by Whiteford (2011)

Client: Dreenacreenig West Wind Farm Limited	
Project: Derreenacrinnig Wind Farm	
Title: Site Investigation Locations	
Keohane Geological & Environmental Consultancy	
Ivy House Clash Carrigrohane Cork Tel. 086-828 9167 Email. dankeohaneivy clash@hotmail.com	
Scale - NTS	Drawn By - DK
Date - 05/062025	Checked - DK
Revision - EIAR	Figure 7.8/3of3

7.3 CHARACTERISTICS OF THE DEVELOPMENT

As the infrastructure for the wind farm is largely completed, the impacts typically associated with wind farm construction are less relevant for the Derreenacrinnig West Wind Farm. The main characteristics for the completion of the Proposed Development (wind farm, Grid Connection and TDR upgrade) and its operation that could impact on land use, soils, and geology are:

1. Restoration of partially completed roads and hardstands associated with permitted turbines T06 and T07, and hardstands for turbines T02 and T04: This will involve regrading of current ground profiles to their original profiles, or as close as is practical. Coarser rock would be placed first, followed by finer crushed rock and till. Peat and peaty topsoil will then be spread across the reprofiled surfaces with heath and acid grasslands.
2. Turbine Delivery Route upgrade: Widening is required at the junction of local roads L-8767-0, L-4711-132, and L-8765-0 in Castledonovan. From that junction, several locations requiring road upgrades have been identified along the L-8767-0 to the wind farm entrance. This upgrade, strengthening or widening work will take place within the existing roadway but also in lands adjacent to the road. Works conducted in the roadway will generally involve widening into the soft margin with the removal of vegetation and soils and widening of the carriageway using geogrid and engineered fill. Works in adjacent lands will require either reducing ground levels to road grade with the removal of soil and rock, or the raising of ground levels with the placement of engineered fill using aggregate won on site or imported from local quarries.
3. Enlarging hardstand areas and turbine assemblage areas: The proposed turbines are larger than the permitted ones, so the hardstand and assemblage area requirements are greater. This work will involve the excavation and reuse of rock. Any peat or soil excavated will be reused in restoration works needed around the Site.
4. Excavation for Turbine Foundations: For the size of turbine proposed (rotor diameter 82 m with 78.3 m hub height), foundation excavations will be approximately 19 m across to accommodate the foundation with a diameter of 16.7 m. The foundations currently excavated will therefore need to be enlarged. Excavated soil and rock will be reused as ballast on the foundation and any peat will be reused in landscaping.
5. Construction of Turbine Foundations: This will require large volumes of concrete (528 m³ per turbine typical, for blinding layer and foundation, subject to detail design), placing demand on local concrete batching plants / quarries. It is anticipated that shallow foundations without buoyancy effects will be used at the Derreenacrinnig West site.

6. Cabling between turbines and to the on-site Electrical Substation: This will involve the excavation of trenches approximately 0.95 m deep and approximately 0.35 m wide. The cable route will follow the existing wind farm access road, with a total length of approximately 2.4 km.
7. Construction of the on-site Electrical Substation and associated parking area: The location of the proposed Electrical Substation has been reduced to the desired ground level and blinded with compacted engineered fill. Construction of the Electrical Substation will involve the excavation into this level platform for cable trenches and the earthing grid. Large volumes of concrete and concrete products will be used in its construction.
8. Land use change: The Proposed Development will diversify the existing land use (low intensity grazing and forestry) with the introduction of renewable electricity generation. The wind farm will not displace the current land uses.
9. Pre-construction site investigation works for the Grid Connection. To inform detail design of the trenching operations, ground investigations will need to be undertaken such as trial pit excavation. These works will expose soil to erosion from rainfall.
10. Construction of the Grid Connection to the existing ESB-owned 110 kV Ballylickey Electrical Substation. This will require excavation of trenches at six locations with a total combined length of approximately 3.3 km on the public road and off-road locations, installation of cable jointing bays, and the construction of approximately 10.75 km of OHL. The underground sections will involve the use of bedding sand, CBM (cement bound material) and aggregate in its construction and the disposal of excavated material that has no on-site reuse potential. It will also involve the Reinstatement of the road surface to County Council specifications. Jointing bay construction will require excavation of soils / rock, and placement of precast concrete jointing bays. Construction of the OHL sections will involve the excavation of holes (typically 2.2 m deep) for the installation of approximately 157 wooden poles (ranging from 11 m to 15 m in length).

7.4 IMPACT ASSESSMENT

7.4.1 Impact Assessment Methodology

The criteria in the EPA Guidelines (2022) are used to evaluate and describe the potential impacts in terms of quality, significance, extent, probability and duration as summarised in **Table 7.3**.

Table 7.3: Description of Potential Effects

<p>Quality of Effects</p> <p>It is important to inform the non-specialist reader whether an effect is positive, negative or neutral</p>	<p>Positive Effects</p> <p>A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).</p>
	<p>Neutral Effects</p> <p>No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error</p>
	<p>Negative/adverse Effects</p> <p>A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).</p>
<p>Describing the Significance of Effects</p> <p>‘Significance’ is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful (also see <i>Determining Significance</i> below.).</p>	<p>Imperceptible</p> <p>An effect capable of measurement but without significant consequences.</p>
	<p>Not significant</p> <p>An effect which causes noticeable changes in the character of the environment but without significant consequences.</p>
	<p>Slight Effects</p> <p>An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.</p>
	<p>Moderate Effects</p> <p>An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.</p>
	<p>Significant Effects</p> <p>An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.</p>
	<p>Very Significant</p> <p>An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.</p>
	<p>Profound Effects</p> <p>An effect which obliterates sensitive characteristics.</p>
<p>Describing the Extent and Context of Effects</p> <p>Context can affect the perception of significance. It is important to establish if the effect is unique or, perhaps, commonly or increasingly experienced</p>	<p>Extent</p> <p>Describe the size of the area, the number of sites, and the proportion of a population affected by an effect.</p>
	<p>Context</p> <p>Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?).</p>
<p>Describing the Probability of Effects</p>	<p>Likely Effects</p> <p>The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.</p>

<p>Descriptions of effects should establish how likely it is that the predicted effects will occur – so that the CA can take a view of the balance of risk over advantage when making a decision.</p>	<p>Unlikely Effects The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.</p>
<p>Describing the Duration and Frequency of Effects 'Duration' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful.</p>	<p>Momentary Effects Effects lasting from seconds to minutes.</p>
	<p>Brief Effects Effects lasting less than a day.</p>
	<p>Temporary Effects Effects lasting less than a year.</p>
	<p>Short-term Effects Effects lasting one to seven years.</p>
	<p>Medium-term Effects Effects lasting seven to fifteen years.</p>
	<p>Long-term Effects Effects lasting fifteen to sixty years.</p>
	<p>Permanent Effects Effects lasting over sixty years.</p>
	<p>Reversible Effects Effects that can be undone, for example through remediation or restoration.</p>
	<p>Frequency of Effects Describe how often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).</p>

The NRA guidelines are used to further rate the magnitude of the impact - these are set out in **Table 7.4**. Determining the significance of the impact on the feature (geology attribute) based on the Importance of the feature and the magnitude of the impact is given in **Table 7.5**.

Table 7.4: Estimation of Magnitude of Impact on Soil / Geology Attribute

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute	Loss of high proportion of future quarry or pit reserves. Irreversible loss of high proportion of local high fertility soils. Removal of entirety of geological heritage feature. Requirement to excavate / remediate entire waste site. Requirement to excavate and replace high proportion of peat, organic soils and/or soft mineral soils beneath alignment.
Moderate Adverse	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Loss of moderate proportion of future quarry or pit reserves. Removal of part of geological heritage feature Irreversible loss of moderate proportion of local high fertility soils. Requirement to excavate / remediate significant proportion of waste site. Requirement to excavate and replace moderate proportion of peat, organic soils and/or soft mineral soils beneath alignment.
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Loss of small proportion of future quarry or pit reserves. Removal of small part of geological heritage feature. Irreversible loss of small proportion of local high fertility soils and/or high proportion of local low fertility soils. Requirement to excavate / remediate small proportion of waste site. Requirement to excavate and replace small proportion of peat, organic soils and/or soft mineral soils beneath alignment.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	No measurable changes in attributes.
Minor Beneficial	Results in minor improvement of attribute quality	Minor enhancement of geological heritage feature.
Moderate Beneficial	Results in moderate improvement of attribute quality	Moderate enhancement of geological heritage feature.
Major Beneficial	Results in major improvement of attribute quality	Major enhancement of geological heritage feature.

For the Derreenacrinnig West site, the magnitude of impact on the soils / geology attribute is rated as Negligible - No measurable changes in attributes.

Table 7.5: Rating of Significant Environmental Impacts

Importance of Attribute ↓	Magnitude of Impact →			
	Negligible	Small	Moderate	Large
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
High	Imperceptible	Moderate / Slight	Significant / Moderate	Severe / Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

As noted in **Section 7.2.10**, the importance of the geological attributes of the Site vary from low to high; low at the wind farm site, TDR upgrade and eastern end of the Grid Connection; and high at the western end of the Grid Connection where it passes through the Bantry Drumlins (designated CGS) and the soils are more fertile with a wider use range on a local scale. Using **Table 7.5**, the significance of environmental impacts on land / soils / geology is Imperceptible.

The following sections detail the potential impacts, prior to mitigation, which have been identified from the assessment methodology presented above.

7.4.2 Do Nothing Scenario

In the ‘do-nothing’ scenario, the lands would continue in agricultural use (mostly grazing), commercial forestry and more natural scrub habitats. Over-working of the lands could lead to erosion of peat and changes in floral assemblages. The application of fertilizers and agricultural chemicals could impact on soil quality (and water quality in the runoff). However, with good farm management, the continued farming of the lands will have a neutral imperceptible effect on land use, soils and geology. It is possible that more of the landbank, or lands adjacent to the grid route, will be planted with commercial forestry.

The 2010 planning permission, used for the partial construction of the wind farm, conditions the removal of site infrastructure. As such, the Site would be restored to pre-2017 conditions (i.e., grazing lands) unless planning to retain site roads for forestry or agricultural use is secured.

7.4.3 Construction Phase

The potential impacts of the Proposed Development on land, soils / geology and slope stability during the construction phase are discussed below.

Peat Stability

Slope stability during wind farm construction was highlighted following a bog burst at the Derrybrien Wind Farm in County Galway in 2003, and later in the Stack's Mountains near Tralee County Kerry, Drumkeeran County Leitrim and more recently in 2021 at Meenbog Wind Farm County Donegal. As many wind farms are proposed in upland areas, typically with blanket bog, the assessment of slope stability has become an important factor in their siting and design; peat landslides can have medium term profound negative impacts on the environment.

Peat and/or subsoil on sloping ground can become unstable when the gravity forces acting on the soil mass exceed the shear strength of the material. This failure can occur as landslides or flows. Slides are distinguished from flows in that slides are the movement of large continuous masses of soil/peat along a slip surface. Flows are the movement of material softened and lubricated by water, such as bog bursts. Slip planes are less evident in the latter.

The factors that could influence the failure of slopes during the construction of wind farms include:

1. Nature of peat; very wet, degraded blanket bog or excessively worked / harvested with machinery such as 'sausage cutter'. There is no evidence of historic peat harvesting at the Derreenacrinnig West Wind Farm site.
2. Interference with site drainage, resulting in changes in the hydrological regime of the peat. The Site is drained by man-made drains associated with forestry, land improvement, and the partially constructed wind farm infrastructure. The natural drainage of the Site is already altered and the current site drainage has proven its capacity with the many extreme rainfall events since its installation in 2017 / 2018.
3. Stockpiling of material on peat, creating loads in excess of bearing capacities. This could include imposition of floating roads or stockpiling of excavated material on weak peat. As the Site infrastructure is largely complete, stockpiling of material on peat is not required. All the roads and hardstands at the Site have been constructed on tills or rock and there are no floating roads. The modifications of roads and hardstands does not require working near deep peat.

4. Inappropriate disposal of water from dewatering operations. The discharge of pumped water could lead to slope failures. The Turbine Foundation excavations are unlikely to require dewatering. Ponding is noted in the excavation of turbine T02, however, this is trapped surface water, which can be released slowly with the removal of the berm at the eastern side of the excavation.
5. Excavation of roads through areas of weak peat thus removing support for the upslope peat. No additional road construction is required at the Derreenacrinnig West Wind Farm site. Roads are constructed on tills or rock and there were no stability issues noted during site walkovers or reported during construction works.
6. Triggering events such as traffic movements (or blasting and breaking out of rock). Blasting is not required to complete the wind farm construction. There are no deep peat deposits near the wind farm roads / hardstands that could be affected by traffic vibrations.
7. Working on steep slopes with deep peat for the installation of the Grid Connection. Much of the OHL sections were previously erected without stability issues. Safe ingress / egress routes to and from pole positions have been established. Underground sections are mostly on public road or offroad in areas underlain by tills.
8. Sections of the local road L-8767-0 are higher than the adjacent fields. Grade difference of up to approximately 5 m occur, with steep embankments on the road verge. As noted in **Section 7.2.6**, a minor slippage on the road verge occurred in November 2024. Use of the road with heavy vehicles (crane, turbine components and ready-mix trucks) could cause further failures along the road verge.

There has been 1 documented bog burst in County Cork, according to the Bogs of Ireland, which documents 38 occurrences throughout the country. This occurred at Kanturk in 1840. Eleven additional landslides are documented in the GSI's Landslides in Ireland, of which two were in bogs. These were located at Ballyhoolahan (1900) and Fuhiry (1997). None of these are located near the Site. As noted in **Section 7.2.6**, the nearest recorded landslide event is distant from the Site. It is however probable that bog bursts have occurred in other areas of County Cork but are undocumented due to their remoteness. No evidence of landslides was identified in the review of the aerial photography of the Site, or during the Site walkovers. No stability issues were reported during the partial construction of the wind farm in 2017 / 2018. Minor settlement cracks were noted at the perimeter stone berms of two hardstands, but these do not present any stability risk.

Bog bursts are naturally occurring events and can occur without anthropogenic influence. In blanket bogs, they tend to be more frequent in areas with high rainfall, occurring at times

of the year when rainfall is highest (autumn and winter months). Analysis of the occurrence of landslides in Ireland between 2003 and 2010 indicates at least two causal factors – intense rainfall and human activity (such as turf cutting and road construction)²⁸. For example, intense rainfall in August 2018 caused a landslide on the steep slopes on the mountains east of Buncrana without human interference (see **Plate 7.5**), while the peat landslide at Ballincollig Hill near Tralee in 2008 is associated with intense rainfall during wind farm road construction (floating road) on blanket bog extensively worked by sausage cutter (see **Plate 7.5**).



Plate 7.5: Landslide at Eskaheen Mt, Buncrana & Ballincollig Hill, Tralee

(note sausage cutting at Ballincollig Hill site)

The causes of naturally occurring bog bursts have been attributed to prolonged periods of drought followed by heavy rainfall events; the drought causing drying and cracking of the peat, followed by the influx of large volumes of water. The water weakens and lubricates the peat causing it to liquefy. Another cause is attributed to the blockage or restriction of underground streams, resulting in the build-up of water within the peat. The bog bursts have been recorded on shallow slopes as low as 2° (i.e., approximately 1V:35H).

Natural triggering events could include earthquakes. The Irish National Seismic Network (<https://www.insn.ie/>) operates several seismic monitoring stations in an expanding network around Ireland. The British Geological Survey also monitors and reports on seismic activity. Earthquakes have been recorded in recent years in Ireland; the most recent occurred in November 2024 with its epicentre near Bandon and a magnitude of 1.6. There are multiple earthquakes recorded in Ireland each year, but with low magnitudes, typically less than 2.5. The largest recorded event occurred off the coast of Wales on 19 July 1984, measuring 5.4 on the Richter Scale, and was felt on the east coast of Ireland and the Midlands.

One of the more recent construction-related peat landslides occurred during the construction of the Meenbog Wind Farm, County Donegal on 12 November 2020. This event is specifically mentioned in the EHS consultation response – refer to **Section 7.1.6**.

A review of the publicly available information is provided to assist in the understand of the triggering events, the ground conditions that are susceptible to peat slippage and how these compare to the Derreenacrinnig West site. **Plate 7.6** illustrates the location of peat slippage and works being undertaken.

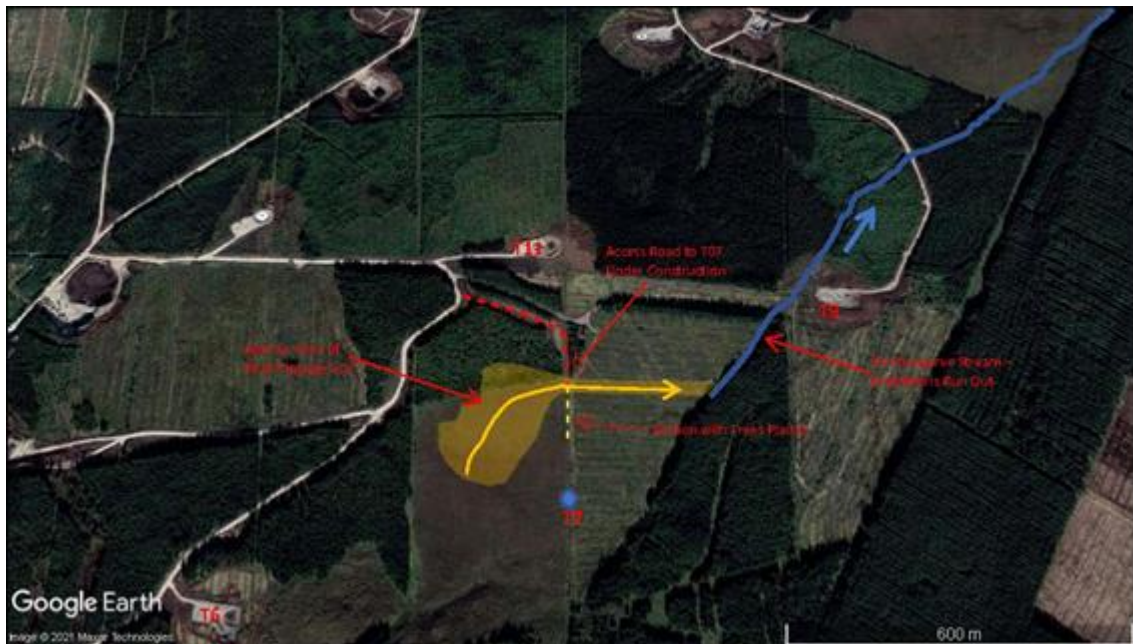


Plate 7.6: Aerial View of Meenbog Peat Slippage

The slippage occurred during the construction of a floating road to turbine T7. The works were progressing from north to south. The floating road consisted of forestry brash and felled trees laid on the bog surface; a layer of geogrid/geomembrane rolled out across the trees followed by the placement of engineered fill / aggregate. The placement of brash and trees was approximately 100 m ahead of the placement of aggregate. It is reported that during the placement of aggregate, peat movement was observed beneath the road by the machine operators.

Peat movement was initiated, possibly by the static loading from trees (forming the base of the floating road), but more likely from dynamic loading from machinery movement on the logs and perhaps by the discharging of aggregate from lorries. The failure propagated upslope and fanned out as support for peat was progressively removed.

The ground conditions at the failure site were:

1. The floating road to T7 followed a convex break-in-slope, roughly following the 260 mOD contour. The upgradient slope was approximately 1°, while the down gradient slope was approximately 4°. The upslope area formed a plateau with deep soft wet peat, which extends to an area of approximately 15 ha. The unplanted areas extend to

- approximately 9.5 ha. Approximately 3 ha of this area was affected by the slippage, with up to 75,000 m³ of peat mobilised.
2. Peat depths were in the range of 2.5 m to 3.5 m where the failure occurred, and peat thicknesses of up to 4 m upslope near the road to T06. The failure propagated into the flat area towards this area of known deeper peat. The flat basin was not probed during EIA, but peat depth is likely to have been in the 4 m range.
 3. The in-situ shear strength of the peat as measured pre-construction ranged from 7 kPa to 12 kPa.

The area was in commercial forestry or was drained for planting. The area into which most of the failure propagated was not planted – see **Plate 7.6**. While it is not known why this area wasn't planted, it is often because the ground conditions are wet, with soft deep peat and unsuitable for tree growth.

The ground conditions found at the Meenbog Wind Farm peat slippage site do not occur within or near the Proposed Development footprint of the Derreenacrinnig West Wind Farm project site.

- Extensive areas of deep peat do not occur at the Derreenacrinnig West development as they do at Meenbog. As noted above, a floating road was being constructed across an area of deep peat which extends upslope for up to approximately 15 ha. Deep peat does not occur at the Derreenacrinnig West site. As such, the peat slippage that occurred at Meenbog in terms of size, extent and negative effects of the environment can't occur at the Derreenacrinnig West site.
- Floating roads were not used at the Derreenacrinnig West site. It is the works associated with the construction of a floating road across deep peat that triggered the peat failure at Meenbog.
- Most importantly, the construction works that are associated with peat landslide at wind farm sites have been completed at Derreenacrinnig West without incident.

Peat Landslide Risk Assessment

The GSI report of landslides in Ireland represents a case study for the landslide susceptibility in County Mayo (one was not conducted for County Cork). This is a desk-based assessment using data on the land cover, soil type and slope. The study used the following parameters to identify areas susceptible to landslide:

- Peat cover
- Slopes greater than 15 degrees (1V:3.73H)

The study was extended across the Country to provide an indication of landslide susceptibility based on slope and soil cover – see GSI web-mapping and **Section 7.2.6**. Eight classifications for landslide susceptibility are mapped, ranging from Low to High. The Derreenacrinnig West site ranges from 'low' to 'high', with most of the Site mapped as 'moderately high' or 'high'. The southern section of the Grid Connection is also in areas mapped as having 'moderately high' or 'high' landslide susceptibility. Most of the remainder of the route is mapped as having 'low' to 'moderately low' landslide susceptibility. Most of the TDR upgrade is mapped as having 'low' landslide susceptibility, with the central part of the route mapped as having 'moderately high' to 'high' landslide susceptibility. The landslide susceptibility is shown on **Figure 7.5**. The areas mapped as 'high' and 'moderately high' coincide with the steepest slopes and not necessarily with the occurrence of peat. It should be noted that the landslide susceptibility classifications combine several factors including material type, slope / topography and historical occurrence of landslides. Therefore, a rating of 'moderately high' would typically be assigned where rock is close to the surface and slope angles range from 10 to 20°. Hence the rating of 'moderately high' does not necessarily relate to the risk of peat landslide.

The ground conditions of the Site consist of a thin peat cover on steep slopes with slightly thicker peat deposits on shallower slopes. The Wind Farm Planning Guidelines (Appendix 4 – Best Practice for Wind Energy Development in Peatlands) requires that a geotechnical and landslide risk assessment '*is be carried out where depth of peat is in excess of 50cm*'. As the Site is largely developed and no works are required in areas with peat, a peat landslide risk assessment is therefore not required. One was completed by MEL for the original EIA. It concluded that there was low risk of peat instability during the construction phase and so, adopting the precautionary principle, site-specific mitigation measures were proposed. Mitigation by design (i.e., the avoidance of areas with steep gradient and deeper peat) was used to minimise risk of peat landslide. The construction of the wind farm roads and hardstands was largely completed in 2017 / 2018 with no incidents of peat / soil / rock landslide.

For the Grid Connection, most of the trenching for the underground sections are along public roads, with some offroad sections which are underlain by tills or rock near surface. The extent of trenching within peat is at the southern end of the Grid Connection at the approach to the on-site Electrical Substation. As the peat there is shallow overlying bedrock, peat landslide risk is negligible. Some of the OHL sections are in areas with steep topography and blanket peat. The poles for these OHL sections were installed previously without any peat stability issues. Also, as noted safe ingress / egress routes to and from pole positions have been established.

For the TDR upgrade, the local road is narrow and not originally designed for heavy vehicles. As noted, a minor failure was identified on this road. Delivery of turbine components and construction material could result in road failure and slippage of roadside embankments. Without mitigation, failure of the road would have a likely direct significant negative local temporary reversible effect. The extent of indirect effects would depend on the exact location and the goods being transported – for example, if a tanker carrying diesel to the Site overturned near a watercourse, up to 18 m³ of diesel could be released into the aquatic environment, resulting in a likely indirect significant negative local temporary reversible effect on the water quality, public drinking water abstractions and aquatic fauna.

Rock Stability

In addition to peat/soil failures, rock slopes can also be unstable or made unstable due to construction works. The erosion and failure of rock slopes is a natural process. Failure of rock slopes generally occur following a triggering event, along planes of discontinuity or weakness. Stability issues are a particular concern in limestone regions where subsidence may occur due to the presence of karst features. Rocks susceptible to karstification are not present at the Site.

Rockslides generally occur along bedding planes, joints, cleavage or faults which are inclined toward the slope (i.e., their lower surface is exposed). There are many types of failure mechanisms, such as planar slide, wedge failure, rotations, rock topple, rock falls etc. Triggering events include a rise in groundwater level (water can weaken soils, provide buoyancy and can also lubricate joints in bedrock), toe removal (i.e., undercutting of slope), head loading (e.g., turbine too close to edge of rock slope, or stockpiling of material too close to the rock edge), and vibration (e.g., earthquake, blasting or rock breaking). There are extensive areas of rock outcrop, some areas having steep aspects, so rock stability is an issue for consideration at the Site, both on the wind farm and along parts of the Grid Connection.

There are steep rocky slopes at the Site, but these are avoided by site layout design. The risk of rock toppling or instability is therefore negligible for the completion of the construction works. While unlikely, unmitigated, failure of a rock slope could have a significant local negative temporary effect. Effects could be reversible with remediation and restoration of effected areas. Indirect effects could also arise depending on the location and infrastructure / material assets impacted.

Geological Heritage

No impact on geological heritage sites is predicted at the wind farm site. The western part of the Grid Connection passes through the Bantry Drumlins geological heritage site – a CGS. This drumlin field extends to an area of 15 km x 5 km. The subglacial bedforms features range from small, individual drumlins around 300 m in length and 15 m in height, to high, composite circular bedforms up to 1 km long and 50 m high, and long streamlined bedrock forms up to 2 km long. The installation of poles and cabling within this landscape will have likely imperceptible localised long-term effects. The effects could be reversible with the Decommissioning of the Grid Connection. As noted in **Section 7.1.6**, the GSI does not envisage impacts from the Proposed Development on this CGS.

Road, Hardstand & Foundation Construction

The access roads serving the wind farm have been constructed using conventional road construction methods. The roads are in good condition but may require redressing prior to turbine delivery; the delivery of concrete during foundation construction may result in deterioration of the road surface. **Plate 7.7** shows examples of the existing wind farm access road.



Plate 7.7: Wind Farm Access Roads

Excavations for five of the then permitted Turbine Foundations were commenced in 2017 / 2018. These were sized for a smaller turbine to the ones now being proposed. The excavations at the three proposed locations are approximately 17 m, 8 m and 6 m in diameter (but irregularly shaped) for turbines T01, T02 and T03, respectively. They will need to be enlarged to approximately 19 m diameter for the proposed turbines. This will require the further excavations of mostly rock, with lesser amount of till subsoils. The excavated material will be stockpiled on the adjacent hardstand for later reuse as ballast on the Turbine Foundation. The foundation excavations at the three turbine locations are shown in **Plate 7.8** to **Plate 7.10** for turbines T01, T02 and T03, respectively.



Plate 7.8: Turbine T01 Foundation Excavation



Plate 7.9: Turbine T02 Foundation Excavation



Plate 7.10: Turbine T03 Foundation Excavation

Minor re-sizing works are required for Turbine Hardstands, Turbine Foundations and road alignments. The areas and excavation volumes involved for the key wind farm infrastructure are summarised in **Table 7.6**.

Table 7.6: Summary of Wind Farm Excavation Volumes

Description	Length [m]	Width [m]	Depth [m]	No.	Area [m ²]	Volume of Excavation [m ³]
Additional Site Access Track Area	N/A	N/A	0.9 m	N/A	622.28 m ²	560.05 m ³
Internal Cabling (power & communications)	2400 m	Single 435 mm	0.9 m	N/A	1044 m ²	939.6 m ³
Turbine Hardstands – Blade Fingers	12	4	0.9 m	6	240 m ²	216 m ³
Additional Turbine Hardstand Areas	N/A	N/A	0.9 m	3	771.3 m ²	694.2 m ³
Turning Head Additional Road Widening	N/A	N/A	0.9 m	N/A	97.44 m ²	87.7 m ³
Turbine Foundations (19 m diameter)	N/A	N/A	3 m	3	850.59 m ²	2,551.77 m ³
Electrical Substation	N/A	N/A	1.5 m	1	20.26 m ²	30.25 m ³
TDR Road Widening Overrun Area	N/A	N/A	0.9 m	N/A	4,112.71 m ²	3,701.4 m ³
Site Compound	45 m	30 m	N/A	1	N/A	N/A
Grid Connection	3,095.3 m	0.4 m	1.25 m	6	1,282.12 m ²	1,457.7 m ³

The northwest corner of the handstand at turbine T02, extending to an area of approximately 115 m², will need to be raised. The rock excavated at the southwest corner of the T02 handstand will be used for filling this area. Most of the remaining excavated rock / soil can be reused as ballast on the Turbine Foundations. Each foundation will require approximately 400 m³ of suitable ballast. Excess material will be used for restoring areas of the Site.

Road, Hardstand & Foundation Restoration

Approximately 450 m of partially constructed access road, three crane areas, extending to approximately 475 m², and the borrow pits will be restored: total area to be restored extending to approximately 8,500 m². This will involve spreading of excavated material (rock, subsoil and peat) to the pre-development levels and reseeded. This is likely to have an imperceptible permanent positive local effect on land use and geology.

Electrical Substation Construction

The platform for the Electrical Substation was constructed in 2017 / 2018. The construction of the Electrical Substation control building will require excavation for reinforced concrete foundations and cable trenches. The volume of excavated material is estimated at 41.15 m³. The volume of concrete and quarry products needed for the Electrical Substation construction is estimated at 60 m³. The excavations and use of quarry products is likely to have an imperceptible permanent negative effect on land use and geology.

Grid Connection

The construction of the Grid Connection will involve the excavation of peat, soils, rock and road paving for installation of poles, trenching for cable ducts and installation of cable jointing bays. The total volume of excavated material will be approximately 1,460 m³ – refer to **Appendix 7.1** for breakdown of excavated materials and volumes. Of the 1,460 m³ of excavated material, approximately 860 m³ will be reused as backfill and the remaining 600 m³, approximately, will be surplus. This will be a likely direct, permanent slight localised negative effect on land, soils and geology. Individual excavations for the poles and trenches will be relatively small, so the stockpiling and handling of this material would have a likely imperceptible temporary negative effect at multiple isolated locations along the route.

The transport of poles to their position will involve the use of track-mounted excavators traversing blanket bog, steep rocky terrain and agricultural lands. This could result in rutting the magnitude of which would depend on ground conditions. In soft, wet ground conditions, this would result in likely short-term moderate negative localised negative reversible effects on land, soils and geology.

TDR Upgrade

The L-8767-0 local road will need to be upgraded for the Turbine Delivery Route and mobilisation of the cranes to the wind farm site. This will include widening of the junction at Castledonovan, strengthening of sections of the road, and improvements to horizontal and vertical alignments. Improvement works will largely take place between the roadside ditches but where horizontal alignments dictate, works will take place on lands adjacent to the road. The extent of works required has been informed by the auto-track (swept path) analysis of the route using the E82 turbine blade. The area of road widening within the carriageway extends to approximately 3,140 m², while the area to be upgraded outside the road carriageway extends to approximately 975 m².

Works outside the roadway will preferentially take place on the east side of the road where the ground level tends to be above road grade. Ground level in the fields on the west side of the road are variable, but up to 5 m below road grade in places. Works conducted in the roadway will generally involve widening into the soft margin with the removal of vegetation and soils and widening of the carriageway using engineered fill and geogrid / geotextile. Works in adjacent lands will require either reducing ground levels to road grade with the removal of soil and rock, or the raising of ground levels with the placement of geogrid / geotextile and engineered fill using aggregate won on site or imported from local quarries.

Internal Cabling

The Wind Farm Internal Cabling will consist of a single circuit joining each turbine and from turbine T03 to the on-site Electrical Substation. As shown on **Figure 2.1**, the route of the cabling be placed within the internal site track carriageway. The trench will be approximately 2,400 m long, 900 mm deep and 425 mm wide (similar to the underground sections of the Grid Connection). Its excavation will generate approximately 936 m³ of spoil, consisting of road construction aggregate. Imported quarry aggregate will be used to bed the ducting and earthing cable. Lean-mix concrete will be used as backfill at trafficked locations. Approximately half of the excavated material will be reused to complete the backfilling of the trench, with surplus material used for landscaping and restoration of the Site. Being placed in the road carriageway, trenching for cabling will have likely direct, imperceptible, permanent, neutral local effects on soils. It will likely have no effects on land use.

Soil Contamination

Hydrocarbons will be stored and used at the Site for construction machinery. There is potential for leaks and spillages which would impact on soil (and water) quality. The potential impact would depend on the volume and location of a fuel spill / leak. Fuel storage tanks on construction sites are typically no larger than 1,300 litres. Unmitigated, this would have a likely short-term, not significant, negative, local effect on soils.

Demand on Quarries

There will be an indirect impact on local quarries which will be used to provide concrete and aggregate for the construction phase. Approximately 1,200 m³ of concrete will be used for Turbine Foundations and the Electrical Substation. This is likely to have an imperceptible brief positive local effect. The completion of the wind farm construction or the upgrade of the TDR is not expected to require the import of large volumes of aggregate from local quarries. Much of the aggregate requirements will be sourced from within the Site. Aggregate is unlikely to be required for the OHL sections of the Grid Connection but will be

required for the underground sections on the public road. For the 3.3 km of underground cabling, the volume of aggregate (concrete, clause 804, sand, etc) required for backfill is estimated at approximately 1,020 m³.

Land Use Change

The Proposed Development of the Site will result in a likely, permanent, imperceptible, negative effect in terms of the loss of agricultural lands. Approximately 0.155 ha of additional roads and hardstands will be developed, and approximately 0.85 ha, already developed, will be restored.

7.4.4 Operational Phase

There are no likely significant potential impacts on land, soils and geology during the operational phase of the wind farm and Grid Connection. No works on the TDR upgrade is envisaged during the operational phase of the Project. Some traffic will be associated with the maintenance of turbines and these maintenance vehicles and activities could result in minor accidental leaks or spills of fuel/oil. Unmitigated this would be a localised, imperceptible, temporary negative effect on soil quality.

Maintenance of access roads will also require the occasional use of plant or machinery which could result in minor contamination as a result of leaks or spills due to an accident, breakdown or poor maintenance. Unmitigated this would be a localised, imperceptible, temporary negative effect on soil quality.

A small amount of imported granular material may be required to maintain access roads during the operational phase which could impact the source quarry. This would be a likely localised, imperceptible, permanent positive effect.

It is possible that during the lifespan of the Grid Connection, faults in the cable would necessitate repair or replacement of sections of the cable, but this would likely be done at the jointing bay locations. The fault location would be identified using non-intrusive techniques and the cable section replaced by accessing it at the two jointing bays either side. There would be a temporary localised imperceptible neutral impact on soils / geology as the materials excavated would be reused as backfill. No significant impact on soils / geology is envisaged for repair works on the OHL sections of the Grid Connection, if for example a pole needed to be replaced.

The impacts on land use will have already been realised with the construction of the wind farm. The operation of the wind farm will represent a diversification of land use, a long-term positive effect. The other uses (farming and forestry) can continue on the lands.

7.4.5 Decommissioning

The potential impacts associated with Decommissioning will be similar to those associated with construction but of reduced magnitude.

During Decommissioning, it may be possible to reverse or at least reduce some of the impacts caused during construction by rehabilitating some construction areas. This will be done by covering developed areas with locally sourced tills and peat to encourage vegetation growth. Other impacts such as possible soil compaction and contamination by fuel leaks will remain during site restoration but will be of reduced magnitude.

In relation to the Grid Connection, it is noted that upon commissioning, this asset is transferred to the DSO (Distribution System Operator – ESB Networks) and so would become a permanent part of the distribution network. As such, Decommissioning may not occur for many decades. As recommended by the Scottish Natural Heritage (SNH, 2013)¹³, it is '*best practice not to limit options too far in advance of actual Decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm*'.

If decommissioned, the conductors will be removed and recycled. The poles of the OHL would be pulled up and taken for recycling. The holes would be backfilled with clean soil. No significant impact is predicted on soils / geology.

For the underground sections, the potential impacts associated with Decommissioning would depend on the approach taken – i.e. whether the ducting is left in place or removed. If only the cable is removed and the ducting left in place for other uses, the cables would be cut at the jointing bays and pulled from the ducts and taken for recycling. If an alternative immediate use is not identified, the ducting will be plugged / sealed at the jointing bays after the cable is removed. As such, there would be no significant impact on soils / geology.

7.5 AVOIDANCE, REMEDIAL OR REDUCTIVE MEASURES

The avoidance and mitigation measures for the construction, operational and Decommissioning phases are presented in the subsection below. Most relate to the construction phase.

7.5.1 Construction Phase

General

The mitigation measures to be employed during the completion of the Project to avoid, reduce and minimise the potential impacts on land, soil and geology are set out below. These measures cover the three main components of the Project (wind farm, Grid Connection and TDR upgrade). Measures specific to each component are provided below.

1. A CEMP has been prepared for the Proposed Development. This will be updated and finalised prior to remobilising to site to complete construction. The CEMP will reflect the mitigation measures detailed in this EIAR.
2. A Construction Manager will be appointed to oversee construction. The Construction Manager will have overall responsibility to ensure the environmental protection measures and commitments given in the CEMP / EIAR are implemented
3. The Developer will appoint an Environmental/Ecological clerk of works (ECoW) for the duration of the construction project. The ECoW will have an ecological and environmental management background with practical experience of wind farm construction projects. The ECoW will monitor the environmental aspects of construction (soil storage, stability, day-to-day excavation works, etc.). The ECoW will have the authority to instruct the contractor to implement additional mitigation measures, if deemed appropriate. The ECoW will maintain a written record of all environmental issues on site, including incidents and monitoring results. This file will be made available to the relevant Authorities upon request. The ECoW will be responsible for notifying the relevant Authorities of any environmental incident.
4. In addition to the day-to-day monitoring of excavation works by the ECoW, inspections of the excavation works (rock cuts, soil storage, etc) will be carried out by suitably qualified and experienced geotechnical personnel.
5. To minimise soil erosion, earthworks will be suspended during extreme weather conditions. An extreme rainfall event will be classified as an event that corresponds to the Met Éireann Orange – Weather Alert for rainfall. The ECoW will monitor the weather forecast to make preparations ahead of adverse weather conditions.

Met Éireann Orange – Weather Alert for Rainfall
50 mm – 80 mm in 24 hrs
40 mm – 60 mm in 12 hrs or less
30 mm – 50 mm in 6 hrs or less

6. Concrete, concrete products and aggregates needed for the construction will only be sourced from authorised quarries, at which appropriate environmental controls are implemented per planning conditions.

7. Rock imported into site will be sourced from a quarry with similar geochemistry to the bedrock on site, i.e., siliceous rocks - limestone quarries will not be used.
8. Surface water management infrastructure will be installed as detailed in **Chapter 8: Hydrology and Hydrogeology**, which will avoid / reduce soil erosion.
9. Hydrocarbons (oils, diesel and chemicals) will be stored and managed in an appropriate manner to ensure no negative impacts on land, soils, and geology. Specific measures will include:
 - a. Toolbox talks on storage and management of hydrocarbon and refuelling of vehicles will be given to delivery drivers in addition to plant operatives.
 - b. Any storage of oils and diesel will be in steel or plastic tanks of good integrity and bunded to 110% of tank capacity. All fuel and hydraulic fluids will be stored in the Site COSHH store located in the Site compound.
 - c. Refuelling will be at discrete 'fuel stations', to be designated for the purpose of safe fuel storage and fuel transfer to vehicles.
 - d. Refuelling may be carried out directly from delivery vehicles or from bunded fuel bowsers. Refuelling of mobile plant will not take place within 50 m of any sensitive receptor, such as a drinking water supply well or watercourse.
 - e. The plant used during construction will be regularly inspected for leaks and fitness for purpose.
 - f. Fuels, lubricants and hydraulic fluids for equipment used on the construction site will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to best codes of practice.
 - g. Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the Site and properly disposed of.
 - h. Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the Site for disposal or re-cycling.
 - i. Appropriate spill control equipment, such as oil soakage pads, will be kept in the Site plant to deal with any accidental spillage. Spare spill kits will be kept at the construction site compound. Spill kits will be at hand during refuelling of vehicles.
 - j. Only emergency repairs to machinery will be permitted on site. Machinery requiring maintenance will be taken back to a garage or contractor's yard.

Wind Farm Construction

The Site was originally designed to avoid the risk of slope instability and other potential impacts on soils and geology as far as possible. Avoidance of risk / impact was achieved by using the existing site roads / tracks. Turbine locations and road alignments were

changed to avoid deep peat and steep slopes during the assessment process. The construction of the wind farm was subsequently started in 2017 with most of the larger elements of the wind farm completed in 2018. The mitigation measures specific to completion of the wind farm construction to be employed to avoid, reduce and mitigate potential impacts on soils and geology are:

- The civil engineering contractor engaged to construct Turbine Foundations will provide a method statement for all earthworks which will include the measures detailed in the CEMP. This will be reviewed and approved by a suitably qualified and experienced geotechnical engineer or engineering geologist, and hydrologist or drainage engineer.
- Turbines are located a sufficient distance from the edge of steep slopes to avoid risk of triggering rock slope failure.
- Soil / rock will not be stockpiled on areas with slopes $>5^\circ$. Areas to be used for temporary stockpiles will be approved by the Project geotechnical personnel.
- Dewatering of excavations, if required will be to the drainage channels (via silt traps). Dewatering of excavations down slope of excavations in an uncontrolled overland flow fashion will not be permitted as this may lead to erosion of peat and overburden and silting of streams. The excavations for Turbine Foundations will be shallow (circa 3 m, typically), so dewatering is not anticipated.
- Underground cabling will be placed with the wind farm road carriageway. The excavated material will be reused to backfill the trench. Any surplus material from trenching will be put to beneficial reused on site. Duct installation and trench restoration will follow closely behind excavation.
- Where backfill around the ducting is sand, clay plugs will be installed at intervals along the length of the cable trenches to eliminate trenches acting as preferential pathways. Clay plugs will be more frequent on steeper sections of the cabling routes.

Grid Connection

The mitigation measures specific to the Grid Connection to be employed to avoid, reduce and mitigate potential impacts on soils and geology are:

- Pre-construction ground investigation for the trenching along six sections of the route will include:
 - Prior to mobilising to site for ground investigation works, the sequencing and route between locations will be designed to minimise trafficking. Egress routes for machinery will follow ingress routes where feasible.
 - A wide-track excavator will be used to minimise compaction of vegetation and rutting of soils along the route where wet soft ground occurs.

- The material excavated from trial pits (and cuttings from boreholes) will be replaced back into the excavation/borehole in reverse sequence. Trial pits/boreholes will be restored immediately after completion once all the necessary data and samples are collected. The surface vegetative layer will be placed right-way-up to restore the works area to original ground condition to avoid soil erosion.
- Absorbent pads/spill kits will be kept in the machines to immediately clean any spills or leaks.
- Mitigation by avoidance was employed for the section of the Grid Connection route and its design. Most of the Grid Connection will be by OHL with installation of poles having minimal impact on soils and geology. The underground sections are mostly (approximately 2,157 m of the 3,180 m of underground) in public roads or verges. The remaining sections (1,023 m) are in areas underlain by shallow peat or farmland underlain by tills. As such, stability issues do not arise.
- Trench boxes will be used if necessary to support and stabilise jointing bay excavations to prevent sidewall collapse.
- Water ponding in trenches will be removed to reduce porewater pressure, the buildup of which could increase risk of sidewall instability. Appropriate dewatering of trenches, which doesn't result in soil erosion or impact surface water quality, will be undertaken.
- Prior to mobilising to site for accessing pole locations, the sequencing and route between locations will be designed to minimise trafficking. This will be informed by the experience gained during the construction of the OHL previously. Existing forestry roads and farm tracks will be used as far as possible to minimise trafficking on lands. Egress routes for machinery will follow ingress routes where feasible.
- Road pavement excavated from sections of the grid route within the roadway will be loaded directly into trailers and transported to a suitably authorised waste facility. Road subgrade material, subsoils and rock will be loaded directly into trailers and transported to the wind farm site if uncontaminated and a beneficial use is identified. Otherwise, it will be taken to a suitably authorised waste facility. Soils excavated in the off-road sections will be placed on the high side of the excavation and reused as backfill and restoration of the ground surface. This will include soils excavated for pole installation. Any excavated material to be taken to a suitably authorised waste facility will be done by a contractor with a waste collection permit. The ECoW will document each load taken off site and will confirm its delivery to a suitably authorised waste facility using a docket system. The ECoW will also confirm delivery with periodic audits of the destination facility, including following haulage vehicles.

- Where backfill around the ducting is sand, clay plugs will be installed at intervals along the length of the cable trenches to eliminate trenches acting as preferential pathways. Clay plugs will be more frequent on steeper sections of the cabling routes.
- Bog mats will be used to support vehicles on soft ground, reducing soil erosion and avoiding the formation of rutted areas, in which surface water ponding can occur.

7.5.2 Operational Phase

The mitigation measures for the operation phase of the wind farm, Grid Connection and TDR upgrade are:

1. A geotechnical engineer will inspect the earthworks within 6 months of the commissioning the wind farm to ensure there are no stability issues – peat or rock cuts. An ecologist will inspect the restored / landscaped areas of the Site to ensure vegetation is established. Remedial works (additional planting or seeding) will be carried out as required.
2. Aggregate used for road maintenance will be sourced from an authorised quarry with similar geochemistry to the bedrock on site; limestone quarries will not be used.
3. If repairs are required to the underground sections of the Grid Connection, the cables will be accessed at the two jointing bays either side of the fault. The material excavated would be reused to backfill and to restore those excavations. Soils will be protected from erosion with silt fences or covered.
4. If repairs are needed to the OHL sections of the Grid Connection, similar mitigation will be used to those employed during its construction.

7.5.3 Decommissioning

Mitigation measures employed during Decommissioning activities will be similar to those used during construction. On Decommissioning of the wind farm, cranes will be used to disassemble and remove the turbines. The foundations will be covered over with soil and peat and allowed to re-vegetate naturally. Leaving the foundation in place (rather than breaking out the concrete) is considered the most environmental benign approach. The Wind Energy Ireland (WEI) guidance states that when Decommissioning a wind farm *'the concrete bases could be removed, but it may be better to leave them under the ground, as this causes less disturbance'*.

The roads will be left in place and used to access the farmland and forestry of the landholding. The on-site Electrical Substation is also likely to be left in place and become part of the National grid. Otherwise, it would be removed, and the Site restored to peatlands.

7.5.4 Monitoring

Monitoring of the works will be carried out by the ECoW, project engineer and geotechnical engineer. This will involve visual inspection of the works for soil storage, restoration of parts of the Site, etc. Inspections and testing of roads and crane areas will be carried out prior to mobilising the cranes to site for turbine installation. This is to ensure that they can accommodate the design loadings. Formation levels for the Turbine Foundation will also be inspected, tested and certified prior to constructing the Turbine Foundations. Rock cuts will be inspected to ensure no slope stability issues arise. Remedial measures, if required, will be implemented as appropriate.

7.5.5 Worst-Case Scenario

Typically, the worst-case scenario associated with wind farm construction would be a peat landslide. As construction at the Project site is largely completed, this scenario is unlikely. The worst-case scenario would therefore be a slippage of stockpiled soil / rock, or an excavation cut that could impact on worker safety, property and potentially water quality in the Ilen or Mealagh catchments. However, with appropriate design solutions, management of stockpiles, monitoring and inspections, and good construction practices this scenario is unlikely to occur.

7.6 CUMULATIVE IMPACTS

The Projects that are considered for cumulative assessment of the potential impacts on land, soils and geology are the wind farms in the area, both operational and proposed. The closest wind farms to the Derreenacrinnig West Wind Farm site are:

1. Ballybane (Glanta Commons) Wind Farm: operational wind farm consisting of 21 No. turbines located approximately 9.8 km to the southwest. This wind farm is connected to the national grid at Ballylickey 110 kV Electrical Substation via an underground cable. This cable route approaches the Ballylickey Electrical Substation along the N71.
2. Milane Hill Wind Farm: operational wind farm consisting of 9 No. turbines located approximately 5.4 km to the southeast. This wind farm is connected to the national grid via an OHL with a looped connection into the ESB OHL located just north of Milane Hill.
3. Lahanaght Hill Wind Farm: operational wind farm consisting of 5 No. turbines located approximately 7.7 km to the southeast. This wind farm is connected to the national grid at Skibbereen Electrical Substation.
4. Killaveenoge Wind Farm: operational wind farm consisting of 10 No. turbines located approximately 8.3 km to the southeast. This wind farm is connected to the national grid at Dunmanway 110 kV Electrical Substation via an underground cable.

5. Dromleena Wind Farm: permitted wind farm consisting of 1 No. turbines located approximately 7.4 km to the east. It is proposed to connect this wind farm to the Dunmanway 110 kV Electrical Substation. This permission has lapsed since 21 December 2024.

The planning documentation for these developments was reviewed as part of the cumulative impact assessment. With the separation distances involved, the mitigation measures employed during their construction, or that proposed, no significant cumulative impacts are likely in relation to land, soils and geology.

7.7 DIFFICULTIES ENCOUNTERED IN COMPILING

No difficulties were encountered during the preparation of this EIAR chapter.

7.8 INTERACTIONS

Interactions associated with land and soils with other aspects of the environment include:

1. Ecology - there is a close association and interaction between soils and the habitats that the various soil types support. The removal of soils has resulted in a loss of habitat within the Proposed Development footprint for these flora and fauna that depend on them for food and shelter. This will be reversed in those parts of the Proposed Development that are to be restored.
For blanket bogs, there is an important interaction between flora, fauna, soil and hydrology. This is discussed in **Section 8.2.5**.
2. Water (Hydrology & Hydrogeology) - management of soil (excavation and storage) will interact with surface water quality in terms of potential soil erosion and siltation of the receiving surface water environment. The risk of soil contamination from hydrocarbons also presents a risk to the groundwater and surface water environments.
3. Air Quality - fugitive dust emissions from the management of soils (excavations and storage) could affect air quality locally. Removal of excess soils and importation of quarry products will increase emissions from HGVs, affecting air quality locally.
4. Traffic - the transport of turbine components to site and the importation of concrete and aggregate will increase HGV traffic and noise locally. This increase will be of short duration. For example, the concrete needed to complete one foundation will require approximately 42 loads, but this will be completed in one day. Use of site-won stone will reduce the volume of HGV traffic but increase noise levels on site in their excavation.

5. Noise – construction works at the Site using large plant will increase noise levels. Much of this work will be completed with excavators and rock breaker. This increase will be of short duration.
6. Socio-economic – the completion of the construction works, use of quarry-won aggregate and concrete will provide employment at local quarries and batching plants over the construction period of 16 to 18 months.

7.9 RESIDUAL EFFECTS

The residual effects following implementation of the avoidance and mitigation measures for each phase of the Proposed Development are set out below.

7.9.1 Construction Phase

The residual effects on the land will be the permanent loss of low intensity grazing land. This is an imperceptible negative effect on a regional scale for this land use type. It is balanced by the positive effects of the restoration of the already (partially) developed areas of the Site and by the diversification of land use by the renewable energy project.

The residual effects on soils and geology during the construction phase are:

1. The completion of excavations (mostly rock) for foundations and hardstands, which cannot be avoided. The Proposed Development will utilise already constructed roads and hardstand as far as possible, as well as the use of already partially excavated Turbine Foundations. The remaining excavation works will have imperceptible effects on a local scale.
2. The use of concrete and aggregate from local quarries. This is unavoidable. The quantities are not significant, but using unauthorised quarries has a positive imperceptible effect.

With the construction of the main elements of the wind farm largely complete, peat and rock instability at the Site is not predicted. Nonetheless, monitoring of the remaining construction works will be conducted to ensure safe work methods are employed.

Impacts on the Bantry Drumlin County Geological Site (CGS) are not predicted.

7.9.2 Operational Phase

As noted above, the residual effect on land use is its diversification with the operation of a renewable energy project. Low intensity grazing can continue at the wind farm site. Further

forestry plantation would be curtailed in the vicinity of the turbines as it could interfere with wind flow.

No significant impacts are identified for the operational phase of the Proposed Development, so no residual effects are predicted on soils and geology.

7.9.3 Decommissioning Phase

It is intended to leave site roads and hardstands after removal of the turbines' superstructure. As such, the residual effects on land use with respect to loss of low intensity grazing lands will remain unchanged. Land use will return to single use with the removal of the turbines. Any TDR upgrade (widening and strengthening) will remain as a permanent improvement to the local road, with the agreement of the Local Authority. The area upgraded at the Castledonovan junction will be returned to agricultural use, an imperceptible positive effect on land use.

Leaving the Turbine Foundations in place will avoid the breaking out of approximately 1,000 m³ of concrete. The foundations will be covered over and the areas restored to agricultural grazing.

No significant impacts are identified for the Decommissioning of the Grid Connection, so no residual effects are predicted on soils and geology.

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