MWP

Environmental Impact Assessment Report (EIAR)

Chapter 06 Land and Soil

Dernacart Wind Farm
110kV Substation and Grid Connection

Statkraft Ireland

October 2024

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6. Land and Soil

6.1 Introduction

This chapter considers the potential effects on the existing Land and Soils environment arising from the proposed development. A full description of the proposed development, development lands and all associated project elements is provided in Chapter 2 Development Description of this EIAR. The nature and probability of effects on the existing land and soils environment arising from the overall project has been assessed. The assessment comprises:

- A review of the existing receiving environment.
- Prediction and characterisation of likely impacts;
- Evaluation of effects significance; and
- Consideration of mitigation measures, where appropriate.

6.1.1 Competency of Assessor

This assessment was completed by Sally Kelly and Roman Puotkalis.

Sally is an Environmental Scientist with over 20 years post graduate experience in geo-environmental consultancy with significant experience in the management of soil and groundwater remediation projects for both public and private sector clients. Since joining MWP in 2022 Sally has worked on the co-ordination and preparation of environmental reports for a variety of project types including wind energy, solar farms and commercial developments.

Roman is an Environmental Consultant with MWP. He holds an MSc in Environmental Analytical Chemistry and BSc (Hons) Environmental Science from University College Cork. Roman has been involved in geo-environmental investigation/interpretation and hydrogeological assessment and investigations. Roman has written Land and Soils chapters for various projects such as wind farms, grid routes and power generating stations. This included assessment of environmental impact on Land, Soils, Geology, and Hydrogeology, as well as cumulative impacts with various other aspects of the environment. He has also worked on Phase 1 and 2 environmental site assessments for several projects including pharmaceutical facilities, substations, mines, and power stations.

6.1.2 Legislation

The land and soils assessment is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU. The requirements of the following legislation are complied with:

- The Planning and Development Act 2000 as amended, and the Planning and Development Regulations 2001 as amended 2001 - 2023;
- The Heritage Act 1995, as amended;
- S.I. No. 296/2018 European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2001-2018; and,
- European Communities (Environmental Impact Assessment) Regulations 1989 to 2006.

6.2 Methodology

The assessment methodology included a desk-based study, and a qualitative assessment of the potential effects. The assessment criteria for geology, land and soils are based on the following guidelines:

- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022);
- Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (Institute of Geologists of Ireland, 2013);
- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (National Roads Authority (NRA), 2009);
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Local Government and Heritage (DoHLGH), August 2018);
- Forest Road Manual – Guidelines for the Design, Construction and Management of Forest Roads (COFORD 2004);
- Forest Operations & Water Protection Guidelines (Coillte 2009); and
- Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU) (European Union, 2017).

6.2.1 Desktop Study

The methodology used for this study included desk-based research of published information along with site visits to assemble information on the local receiving environment. The desk study included the following activities:

- Review of Ordnance Survey (OS) Mapping and aerial photography to establish geomorphology, existing land use and settlement patterns within the study area.
- Geological desk study data from various on-line data sources.
- Examination of EPA / GeoHive / Teagasc online soil and subsoil maps;
- Review of Laois County Council's (LCC) and Offaly County Council's (OCC) local and regional development plans and planning policy in order to identify future development and identify any planning allocations within the study area;
- Review of LCC's and OCC's Planning Register to identify relevant development proposals currently under consideration by the Council.
- Review of EIARs and associated planning documents submitted for Dernacart Wind Farm
- Review of Peat Stability Assessment submitted for Dernacart Wind farm.

Following the desktop study and site visit, a set of geological and soil maps were generated in GIS using data acquired by Geological Survey Ireland (GSI), the Environmental Protection Agency (EPA) and GeoHive Online maps and are included as figures in this chapter.

6.2.2 Site Reconnaissance Survey

Site reconnaissance surveys were carried out to verify the features identified during the desk study and to enable an interpretation of the site in the context of the surrounding environment.

The following observations were made during the site reconnaissance:

- No evidence of historical landslides or incipient instability were noted during the site visits.
- The hydrology of the site was reviewed.

- The watercourses were relatively moderate in size.
- Land drains have been installed throughout areas of the site.
- The proposed peat and spoil deposition areas were noted as being in flat areas of the site.
- Existing access tracks were noted in a number of areas of the site and were noted as being in relatively good condition.
- Areas of the site were heavily forested.

6.2.3 Peat Stability Risk Assessment (PSRA)

A Peat Stability Risk Assessment (**Appendix 5**) was completed by MWP as part of the **EIAR** for the proposed development.

The location of the proposed Dernacart 110kV Substation, Windfarm Collector Cable and Grid Connection infrastructure was designed from the outset with a constraint driven approach. This approached placed the substation in an area of low risk for peat slides and avoided environmentally sensitive areas.

MWP completed walkovers and surveys of the site. 75 peat probes were completed across the site with peat depths ranging from 0.25m to 3.68m. Shear strengths were recorded ranging from 10kPa to 78kPa.

MWP used LiDAR data to create a Digital Elevation Model (DEM) of the site. Slope analysis from the DEM was used to identify areas of the site with low ground slope. On this site, the ground slope was found to be low across the entire site.

MWP completed a two-stage peat stability risk assessment approach. Stage 1 was based on desk study information, site reconnaissance and assessment of contour data. Stage 1 concluded that further quantitative stability risk assessment was required for this site. Stage 2 involved quantitative risk assessment factor of safety analysis (Infinite Slope Stability Analysis), and application of the Peat Slide Hazard Rating System (PHRS) (Nichol, 2006). Both stages were completed for this project. This approach is in line with industry best practice guidance, as published by the Scottish Government PLHRA (Energy Consents Unit, Scottish Government, 2017).

The findings of the PHRS, carried out as part of the Stage 2 assessment, were that the risk level is Negligible.

Following on from the PHRS, MWP completed an Infinite Slope Stability Analysis (ISSA) for the site using the peat probe data and slope data from the LiDAR DEM to calculate the Factor of Safety (FoS) against peat slide for each location probed. The ISSA output found that FoS ranged from 9 to 1796.

MWP completed assessments of the risk presented using the industry best practice guidance of the Scottish Executive and Scottish Government guidelines for Peat Landslide Hazard and Risk Assessments. The outcome of the risk assessment was that the risk level is Negligible.

Design measures in the form of a peat stability monitoring programme during construction has been proposed in order to further mitigate and manage risk.

6.2.4 Scope of Assessment

'Land and Soils' is considered a geological term in current, historical, and planned land use. The subject matter of hydrogeology is addressed in **Chapter 7 Water** of this **EIAR**.

Accordingly, the scope of this assessment is made with respect to these topic areas and considers the effects of the construction, operation, and decommissioning of the proposed development in terms of how the proposal could potentially affect the local land and soil environment, without appropriate mitigation measures being implemented if required. As part of consultation, GSI – a division of the Department of the Environment, Climate and Communications (DECC) were consulted, and a written response was received. The response provided a list of GSI's publicly available datasets. Written responses from statutory and non-statutory consultees are included as **Appendix 1** of this **EIAR**.

6.2.4.1 Assessment Criteria

The method of impact assessment and prediction follows the EPA (2022) *Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIARs).* The methodology and approach outlined in the EPA Guidelines was used to determine whether the proposed development had the potential to cause significant effects, without appropriate mitigation if required, on the land and soils environment and is as set out in Table 1.2 in Chapter 1 Introduction of this EIAR.

6.2.5 Statement on Limitations and Difficulties Encountered

Limitations and difficulties have not been encountered during this assessment.

6.3 Baseline Environment

6.3.1 Topography and Land Use

The land use at the proposed development site has been mapped as shown in **Figure 6.1**. The land cover mapping was created using information from CORINE Land Cover 2018 available on the EPA online mapping system.

The following land uses have been identified within and around the site of the proposed development:

- 112 – Discontinuous urban fabric;
- 231 – Pastures;
- 312 – Coniferous forests;
- 412 – Peat bogs;
- 242 – Complex cultivation pattern;
- 211 - Non-irrigated land.

6.3.1.1 110kV Substation

The proposed substation site is located on flat land, but very wet land with poor drainage. The elevation of the site for the proposed substation is approximately 70m AOD. The site of the proposed 110kV substation currently comprises greenfield lands comprising a mix of agricultural grasslands, scrub and marginal lands with mature and semi mature trees. The site is bound on all sides by existing mature hedgerows. Immediately beyond the site to the west is a private access road and agricultural lands. A private access also flanks the eastern boundary with a conifer plantation to its east. A Coillte conifer plantation lies immediately to the north of the site while the R423 runs immediately to the south of the site. The consented Dernacart windfarm is located on lands approximately 2.3km to the northwest of the site.

6.3.1.2 Underground Wind Farm Collector Cable and Access track

The proposed Underground Windfarm Collector cable and Access Track will traverse through a commercial forestry plantation, scrub and peatland. The highest elevation within this area is approximately 80m AOD. Raised peat and slope angles greater than 2° have been identified within this site. No evidence of peat instability was noted during the scoping exercise.

6.3.1.3 Underground Grid Connection Cable

The 110kV grid connection cable is to be installed solely within the public road network. The physical environment along the majority of the route is characterised with sections of ribbon development and dispersed detached housing before entering the more urban and built-up environment of Portarlington town. The landscape along the rural sections of the route primarily consists of patchwork farmland, with fields enclosed by hedgerows, along with boglands and conifer plantations.

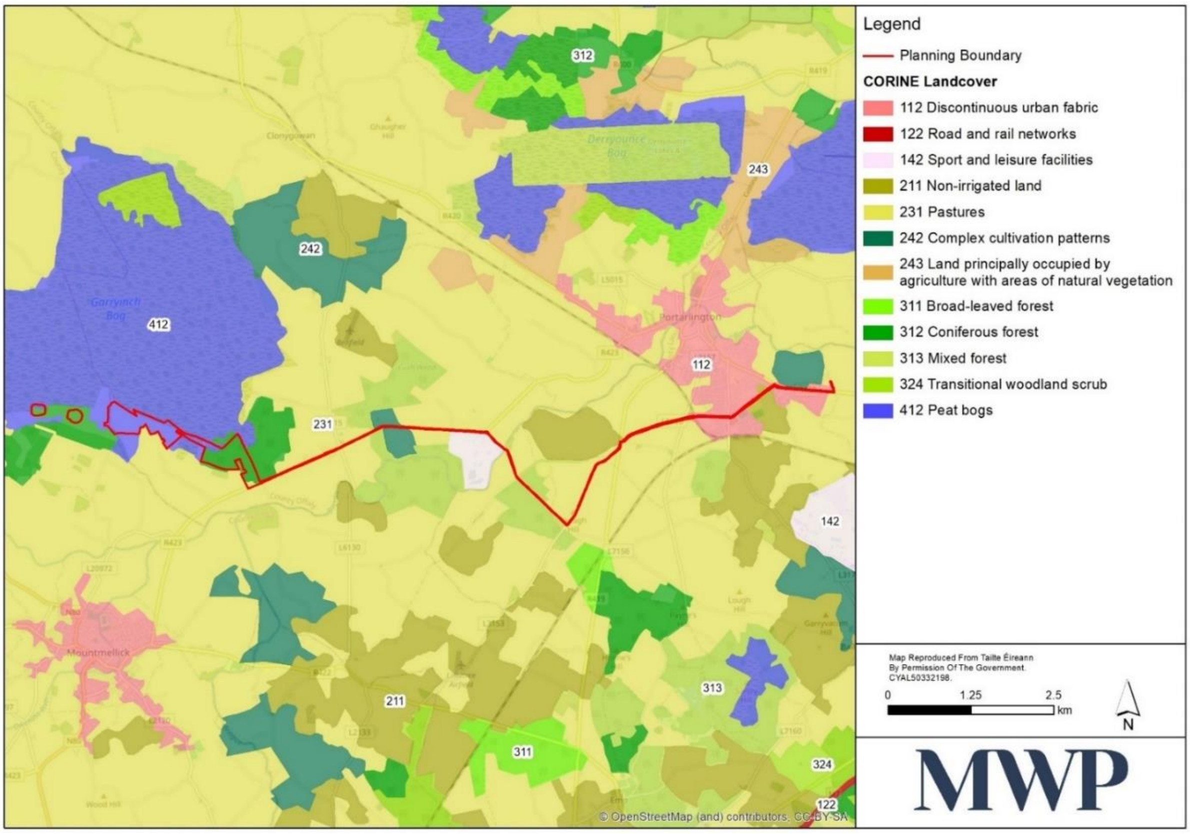

Figure 6.1: CORINE Land Cover (Source: EPA)

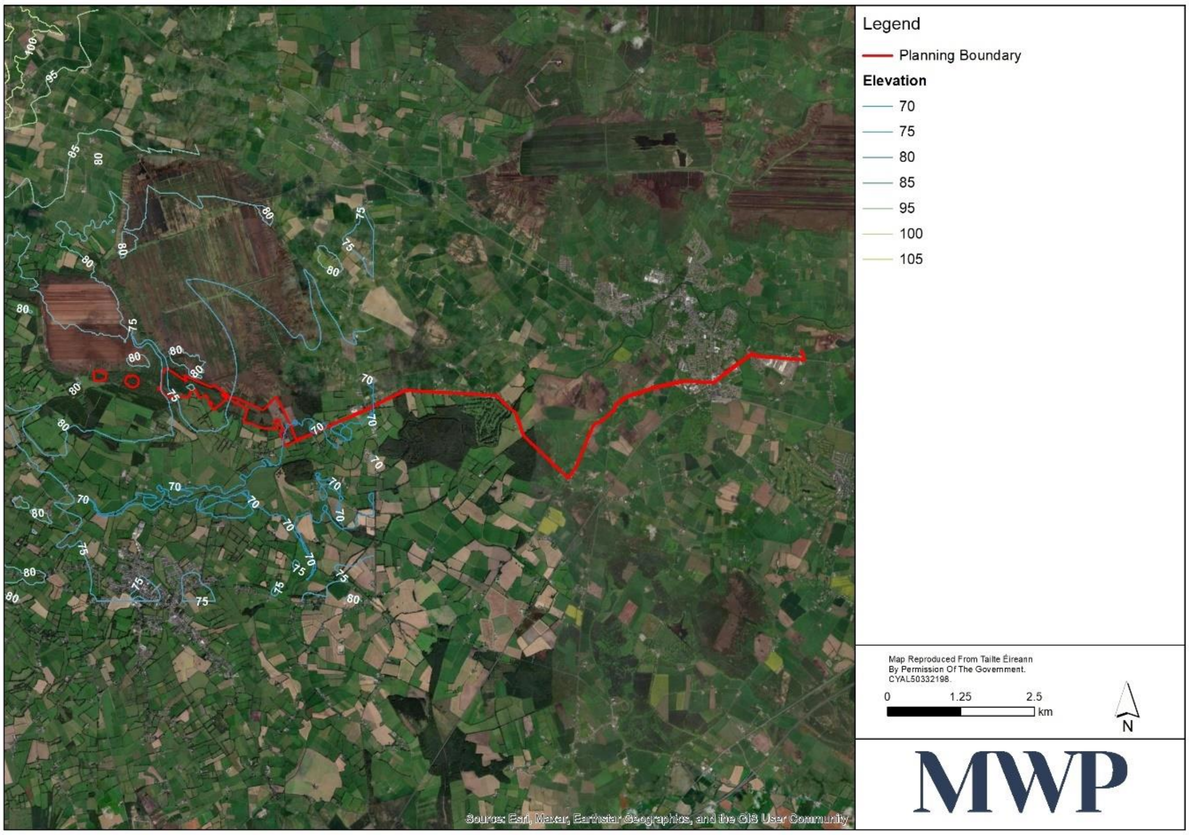

Figure 6.2: Topography of the proposed development site

6.3.2 Bedrock Geology

The GSI Map Viewer shows the proposed development site to be underlain by a combination of limestone and shale. Commencing in the west, where the underground collector cable and 110kV substation are proposed, with the dark muddy limestone and shale of the Ballysteen Formation. The 10.85km long underground 110kV cable connection is then underlain by the massive un-bedded lime mudstone of the Waulsortian Limestones, the thick bedded limestone of the Allenwood Formation and, at the far eastern end of the proposed route, the dark limestone and shale of the Lucan Formation.

There is a fault underlying the route of the proposed grid connection, trending northeast –southwest, separating the Waulsortian and the Allenwood Formations. These faults are no longer active and do not present a hazard for construction of the proposed development

The bedrock geology in this area is dominated by Ballysteen Formation which is described as *Dark muddy limestone, shale*. The bedrock geology of the site and surrounding area is presented in Figure 6.3.

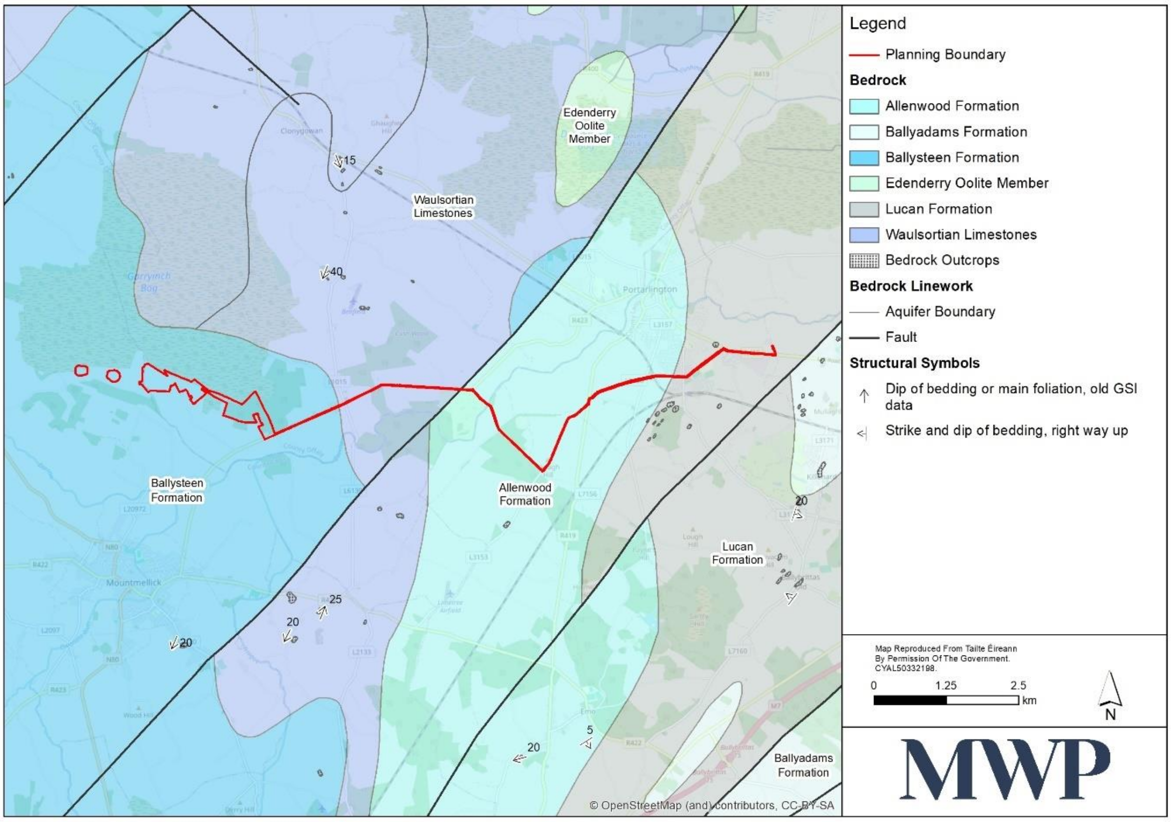

Figure 6.3: Local Bedrock Geology

6.3.3 Soil and Subsoil

The geology and soils at the site have been reviewed using the GSI database.

6.3.3.1 110kV Substation and Underground Wind Farm Collector Cable and Access Track

The proposed route of the collector cable and the proposed 110kV substation are underlain predominantly by Cutover/cutaway peat according to Teagasc soil data. A review of the digital geological maps on the GSI website and the quaternary sediment map, both showed the presence of Cut-Over Raised Peat within the site. This was confirmed on the ground via initial site reconnaissance and subsequent peat probing.

6.3.3.2 Underground Grid Connection Cable

The proposed grid connection route is also underlain by a mosaic of soil and subsoil with an area of Cut-Over Raised Peat in the southern most part of the route at Sleigh Hill, along with strains of BminSRPT - shallow, rocky, peaty/non-peaty mineral complexes, BminPDPT - peaty poorly drained mineral, BminPD - mineral poorly drained, BminSP - Shallow poorly drained mineral and AlluvMIN - Alluvial. The presence of Alluvium soils can be an initial indicator of an area which has been subject to flooding in the geological past but cannot be used to determine flood risk to an area (see **Figure 6.4**).

The quaternary sediment map also indicates the presence of *Cut over raised peat*, *Gravels derived from Limestones, Till derived from limestones* and *Alluvium* (see **Figure 6.5**).

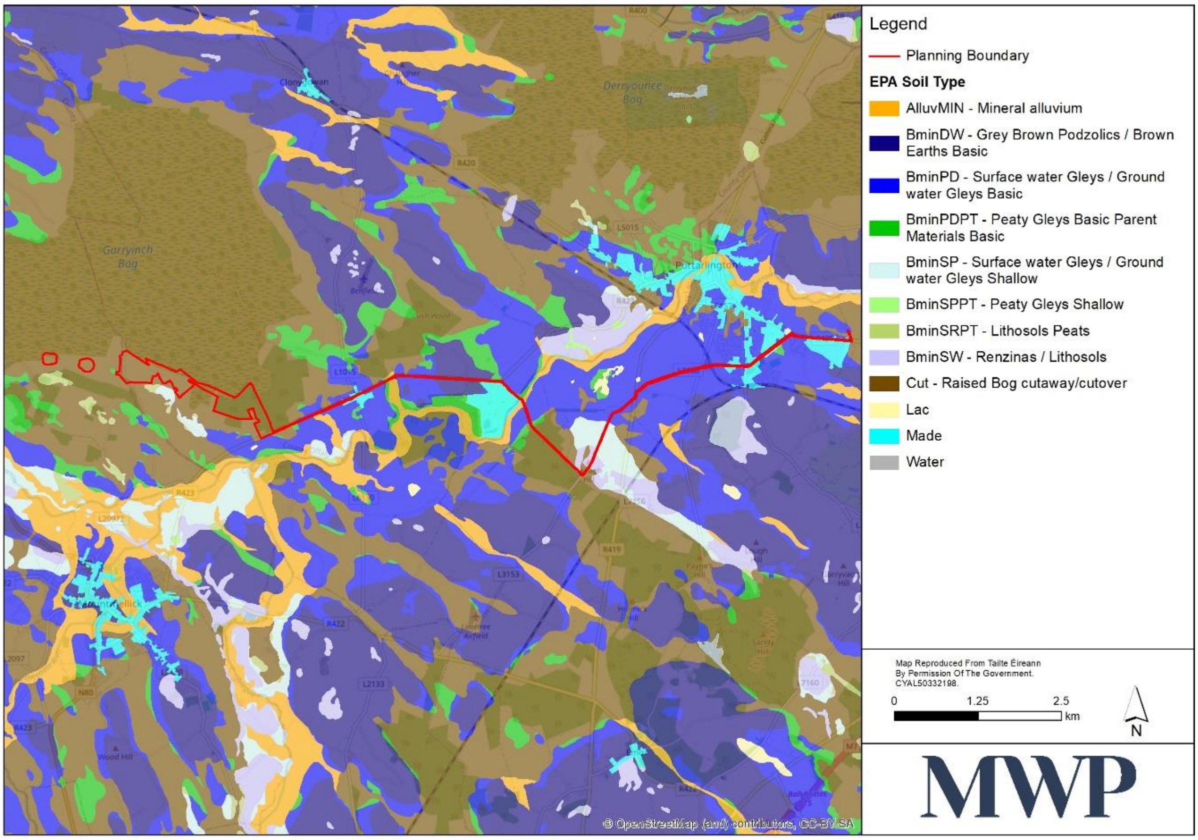

Figure 6.4: Teagasc Soil Map (Source: EPA)

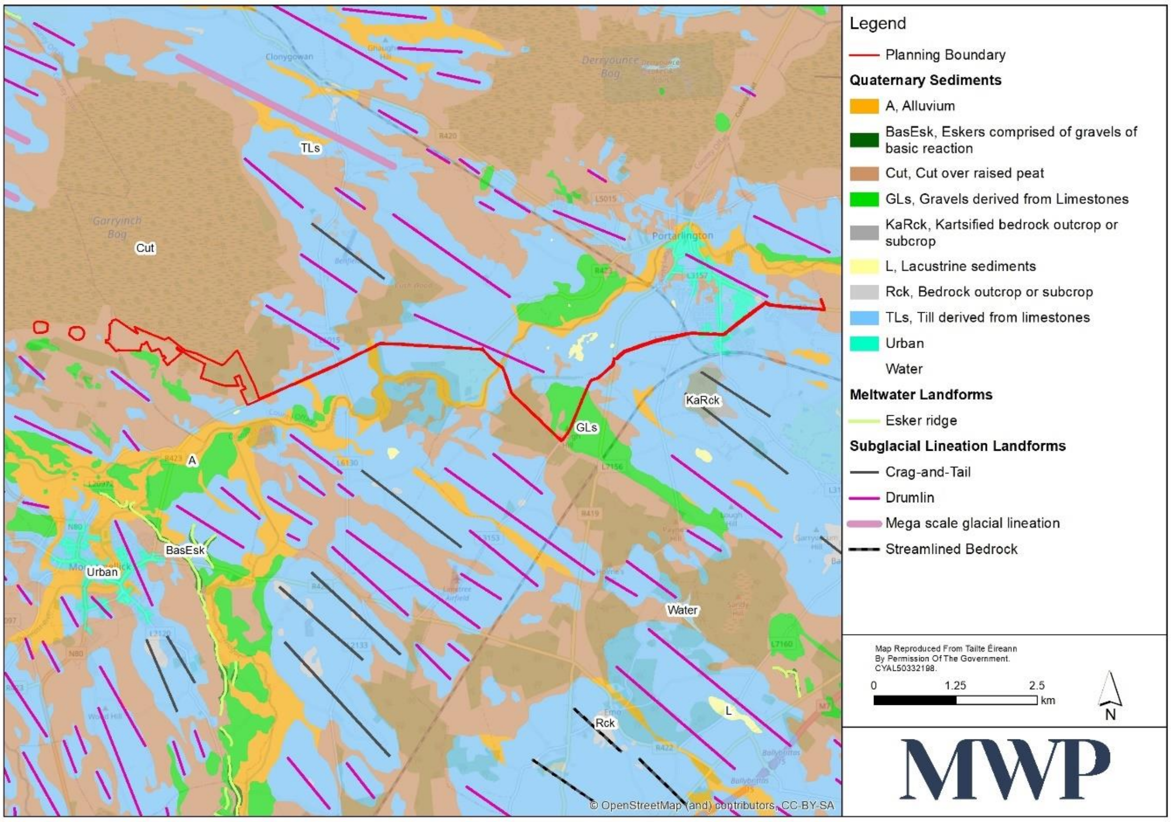

Figure 6.5: Quaternary Sediment Map (Source: GSI)

Peat probing was carried out by Ground Investigations Ireland to verify the presence of peat and gain an understanding of the depth and extents of the peat. 75 peat probes were carried out as part of the assessment. 75 Hand Shear Vane Readings. Infinite Slope Stability Analysis was also carried out at all locations where peat depths were established. The peat depths ranged from 0.25m to 3.68m (See EIAR Volume 3 Appendix 5 for further detail).

6.3.4 Geological Heritage

There are no mapped geological heritage sites within the proposed development site. The geological heritage site at Kilcormac Esker (GSI Site Code: OY018) is located approximately 8km to north of the proposed development site and forms part of the much larger Killimor-Birr-Fivealley-Kilcormac Esker System. This is a good example of a deglacial, meltwater-deposited complex, deposited under the ice or at the margin. The Ridge of Portlaoise (GSI Site Code: OY018), a long, sinuous accumulation of sands and gravels deposited under the ice sheet and at its margins, is located 7.7km to the south of the proposed development and is a high, striking example of a dry sand and gravel ridge. See Figure 6.6 for Audited Geological Heritage Sites in the vicinity of the proposed development site.

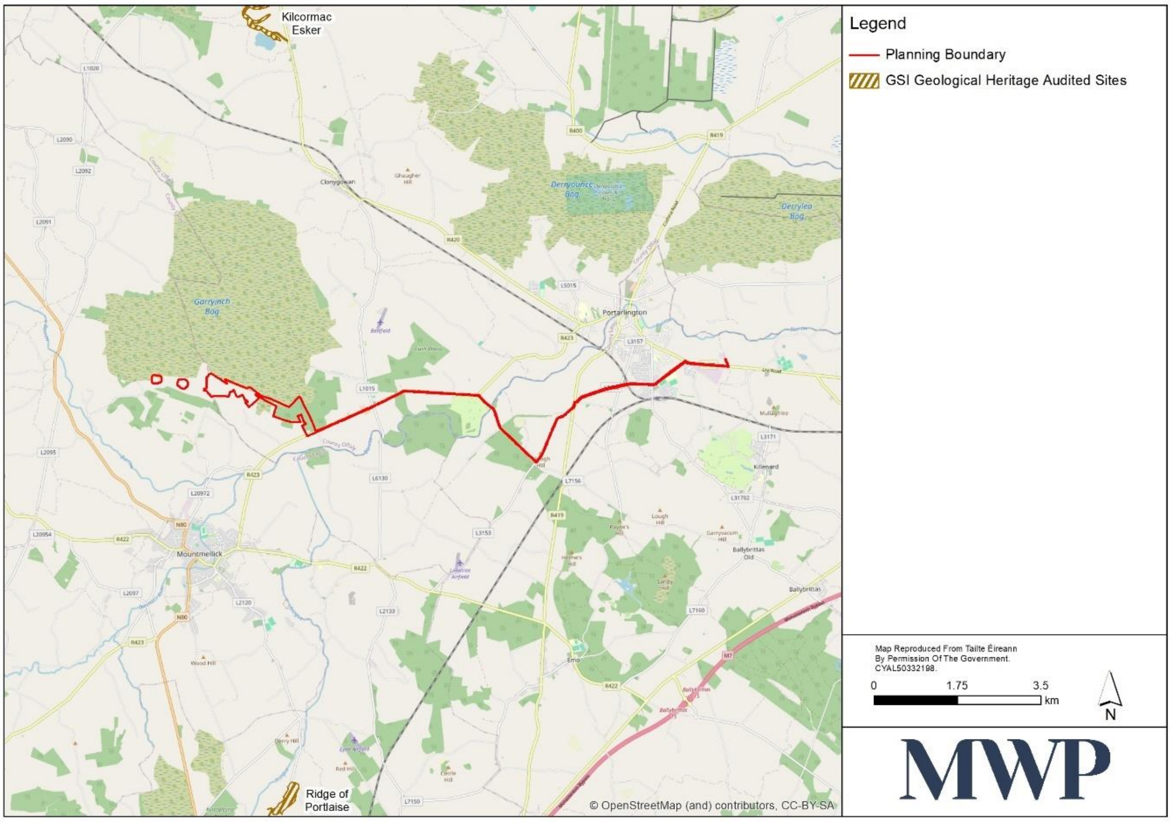

Figure 6.6: Geological Heritage Audited Sites (Source: GSI)

6.3.5 Existing Peat Stability Assessment

A PSRA report was prepared by MWP as part of the EIAR for the proposed development. The PSRA report is included as Appendix 5 in Volume 3 of this EIAR. The purpose of the peat stability assessment was to determine the stability i.e. Factor of Safety (FoS), of the peat slopes where construction is proposed. This involved geotechnical assessments of each of the optimised infrastructure locations and included peat depth measurements and shear strength testing. Peat probing was carried out by Ground Investigations Ireland.

A number of positive observations in term of stability of the site were noted as follows:

- No existing landslides are noted on the Geological Survey of Ireland landslide database
- No evidence of historical landslides or incipient instability were noted during the site visits.
- The drainage appears to be functioning well and having the effect of drying the peat. This is positive in terms of peat stability as deposits of very wet peat have been identified as a contributory factor to previous peat landslide.

The Landslide Susceptibility Map on the GSI data viewer (Figure 6.7) indicates that the site is classified as “Low”, “Low (inferred)” and “Made” south of Portarlington town. Areas classified as ‘Moderately Low’ and ‘Moderately High” are found south of Portarlington town but outside the proposed development site. The nearest historic landslide event “Cooltederry 2008” was recorded on the 16/08/2008 along the railway line between Dublin and Cork just south of Portarlington town recorded as “Early morning the 11.00 hrs train from Dublin to Cork had its engine derailed after hitting a landslide meters from Portarlington Station. The train eventually came to a stop, quarter of a mile south. Nobody was injured”. This landslide was triggered by Exceptional Rainfall.

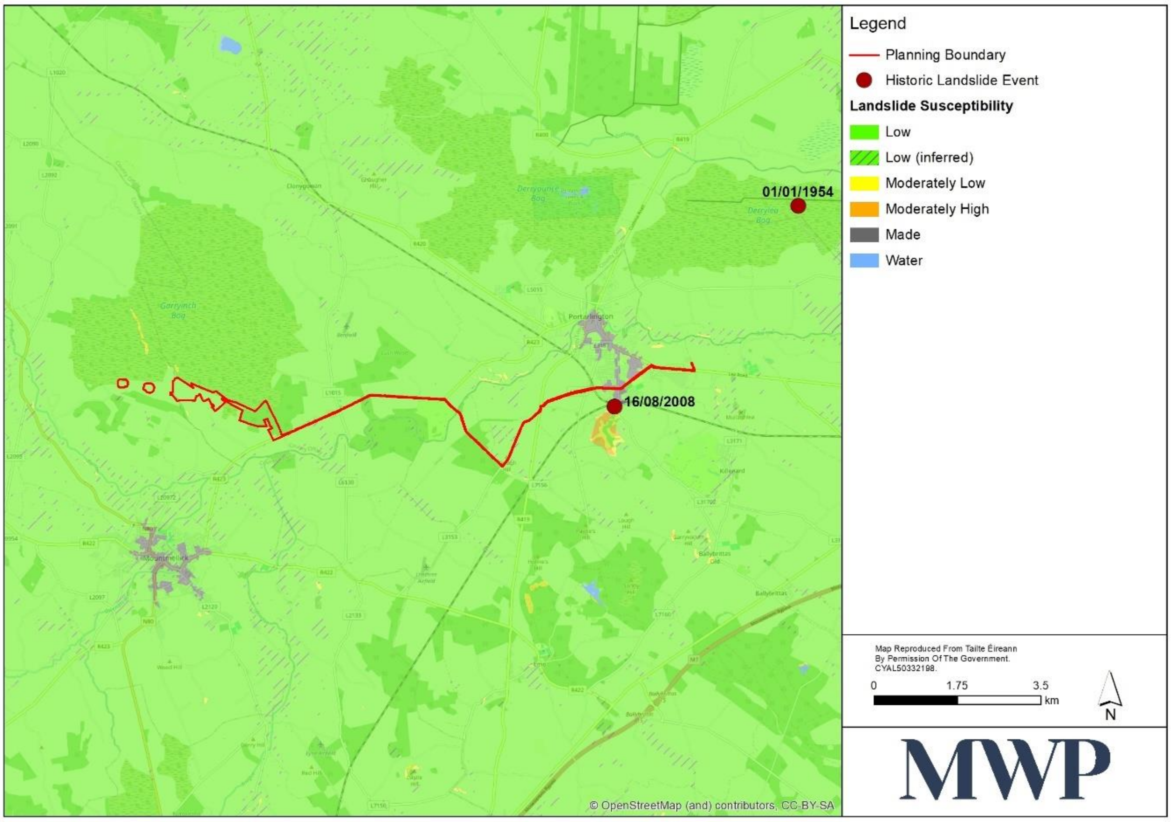

Figure 6.7: Landslide Events and Susceptibility (Source: GSI)

From topographical maps and LiDAR, it was indicated that there were slope angles of greater than 2° and so a PRSA must be commenced. Refer to the PRSA for full details of the assessment method.

The findings showed that the area assessed, as part of the Stage 2 assessment, that the risk level is Negligible and is suitable for the proposed works. The findings include recommendations and control measures for construction work in peatlands to ensure that all works adhere to an acceptable standard of safety.

6.4 Potential Impacts of the Project

6.4.1 Construction Phase

Key elements of the civil works and activities associated with the construction phase of the proposed development are outlined in the following subsections.

Wind Farm Collector Cable and Access Track

The construction of the proposed collector cable and access track will principally comprise of the following civil works and activities:

- Pre-commencement activities including site investigation work and pre-construction surveys;
- Felling of any areas of coniferous forestry plantation necessary to facilitate construction works;
- Site preparation including fencing (for ecology, water and archaeological exclusion zones if necessary),
- Construction of new watercourse crossing at Cottoner's Brook;
- Earthworks and drainage infrastructure associated with construction of collector cable and new access road;
- Cable trenching and ducting;
- Cable laying;
- Reinstatement of the cable collector track;
- Aggregate placement, grading and compaction for new access track.

110kV Substation

Key elements of the civil works and activities associated with the construction phase of the substation are as follows:

- Pre-commencement activities including site investigation work and pre-construction surveys;
- Site preparation including fencing (for ecology, water and archaeological exclusion zones if necessary);
- Construction of site entrances and sections of internal access roads necessary to facilitate access to the temporary construction compound;
- Installation of site drainage systems;
- Construction of temporary construction compound including site offices, parking, material laydown and storage areas, etc;
- Establishment of temporary storage of stockpiled overburden and surplus excavated materials within the material storage areas;
- Bulk earthworks for formation of access road and substation compound base;
- Substation compound base and equipment foundations;
- Cable trenching and cable laying;
- Construct of control building and install equipment within compound;
- Construction of permanent drainage system;
- Aggregate placement, grading and compaction for substation access road;
- Complete site works: lighting, security fencing, gates, signage;
- Reinstatement of temporary drainage system;
- Demobilise offices and tidy up site.

110kV Grid Route

- Pre-commencement activities including site investigation work and pre-construction surveys;
- Cable trenching and cable laying;

- Construction of Joint Bays and communication chambers;
- HDD under watercourse crossings;
- Reinstatement of the public road.

Construction phase impacts potentially associated with the proposed development are listed in **Table 6.1** below.

Table 6.1 Construction phase impacts potentially associated with the proposed development

Construction Phase Effect	Source
Land Take	Lands currently classed as commercial forestry, pasture, scrub and peatlands will be required for the construction of the access track above the collector cable, 110kV substation, temporary site compound, installation of the underground grid connection cable, storage of construction materials and spoil, and ancillary site development works.
Peat, Subsoil and Topsoil Excavation	Excavation of peat, subsoil and topsoil will be required for the construction of underground collector cable, access track, 110kV substation, temporary site compound and grid cable connection trench.
Geological Resources	Aggregates and concrete will be used during construction. Materials required will mainly consist of higher-grade materials not available to be won on site, e.g. stone material for roads and foundations, and concrete for the construction of the hardstanding areas.
Accidental Spills & Contamination/Pollution	Construction traffic and construction materials such as oil and lubricants, and cement/ concrete could result in accidental leaks or spills to the soil. Wastewater from construction processes or leakage from poor welfare facilities can alter the nutrient and microbial balance of the land and soils environment. Contaminated runoff arising from soil erosion on construction sites can pose a significant risk to the geological and hydrogeological environments, if allowed to percolate into the soil matrix. Any effect from contamination of the soil may also indirectly effect the hydrological/hydrogeological environment.
Soil Erosion, Soil Compaction and Soil Stability	Earthworks and stockpiling of soils increase the likelihood of conditions which could lead to soil erosion, compaction or slippage. Soil compaction may occur due to movement of overland traffic, such as construction and maintenance vehicles, heavy machinery with large tyre threads can remove topsoil and soils from excavations. Slippage can occur as a result of an increase in overburden load on slopes, earthworks that affect slope angles and embankments, unstable embankments, unstable excavations, cut-and-fill techniques from excavations, uncovered stockpiled materials, or unforeseen ground conditions not identified during geotechnical investigations. These can be exacerbated by adverse weather conditions from heavy rain, wind, and ice. Sedimentation can also affect safety on the site from build-up, flooding from drain blockages, and maintenance issues from soil erosion. Soil loss due to erosion can result if areas are left exposed.

Construction Phase Effect	Source
Peat Instability and Failure.	The proposed route of the underground collector cable, 110kV substation and temporary site compound are underlain predominantly by cutover/cutaway peat. Whilst the site is largely flat, slope angles greater than 2° have been identified which are associated with an increased risk of peat instability and failure during construction works.
Tree Felling and Hedgerow Removal	Felling of commercial conifer forestry is required to accommodate the construction of the underground collector cable and new access/service road from the windfarm to the 110kV substation, and the construction of the new entrance and access road will require the removal of an area of approximately 45m of hedgerow and scrub vegetation. Removal of the vegetation will both disturb the soil around the roots and expose the soil to heavy machinery.

6.4.2 Operational Phase

6.4.2.1 Substation Maintenance

During the operation, the developer or a service company will carry out regular maintenance of the substation. During the life of the project, it is envisaged that at least two permanent jobs will be created in the form of operator or maintenance personnel. In addition, operation and monitoring activities may be carried out remotely with the aid of computers connected via a telephone broadband link. However, routine inspection and preventive maintenance visits will be necessary to ensure the smooth and efficient running of the substation and require a minimal presence.

6.4.2.2 Grid Connection and Collector Cable maintenance

It is unlikely that the underground 110Kv grid cable or collector cable will require much maintenance during its operation but in the event a fault does occur, inspection of the fault can be carried out to determine what works to the ducting may be required.

Operational phase impacts potentially associated with the proposed development are listed in **Table 6.2** below.

Table 6.2: Operational phase effects potentially associated with the proposed development

Operational Phase Effect	Source
Geological Resources	A small amount of granular material may be required to maintain access tracks during operation which will place intermittent minor demand on local quarries.
Accidental Spills and Contamination/Pollution	Occasional construction traffic, necessary for maintenance of infrastructure including substation and grid cables, could result in minor accidental leaks or spills of fuel/oil. The transformer in the substation is oil cooled. There is potential for spills/leaks of oils from this equipment resulting in contamination of soils and groundwater.

6.4.3 Decommissioning

The grid cable and substation will remain a permanent part of the national grid infrastructure and therefore decommissioning is not foreseen.

In the event that the development is to be decommissioned, decommissioning is typically in the reverse order of construction. The general decommissioning activities are outlined below:

6.4.3.1 Wind farm collector cable and access road

The underground electrical collector cable from the wind farm to the substation would be disconnected and remain in place. The access roads will be left for use by the landowners.

6.4.3.2 110kV Substation

All aboveground components including buildings, structures and equipment will be removed during decommissioning.

All underground electrical collector cables coming to the substation from the wind turbines would be cut at the perimeter of the substation; with any cables less than 1m deep removed. Any hazardous material such as oils or lubricants will be removed in accordance with Waste Management standards.

All foundations will be removed to a depth of at least 1 meter below ground surface, backfilled, graded and then covered with topsoil. Based on discussions with landowners, access roads no longer needed will be removed and the disturbed land areas subsequently graded and reseeded.

6.4.3.3 110kV Underground Grid Connection

The underground electrical 11kV cable would be disconnected and remain in place. All other underground elements (junction boxes, joint bay, cable ducts etc) would also remain insitu.

Decommissioning phase impacts potentially associated with the proposed development are listed in **Table 6.3** below.

Table 6.3: Decommissioning phase effects potentially associated with the proposed development

Decommissioning Phase Effect	Source
Geological Resources	Aggregates and topsoil will be required to backfill excavation of substation foundations and shallow (<1m) cables.
Accidental Spills and Contamination/Pollution	Construction traffic and removal of hazardous materials such as oil and lubricants, could result in accidental leaks or spills.
Soil Compaction and Erosion	Soil compaction may occur due to movement of overland traffic, such as construction and maintenance vehicles, heavy machinery with large tyre threads can remove topsoil and soils from excavations.

6.5 Assessment of Impacts and Effects

The potential impacts and effects of the proposed development on land and soils are considered in this section. Where significant effects are identified mitigation measures are proposed before considering if significant residual effects are likely.

6.5.1 Do-Nothing

If the proposed development for which this document has been prepared does not go ahead, it is assumed that the landuse will remain unchanged without the construction of the wind farm collector cable, proposed substation and 110kV underground grid connection. The land-use along the proposed development route comprising forestry, road transport, agriculture and residential will remain unchanged. There will be no alteration of the existing land and soils regime.

6.5.2 Construction Phase

The following sections describe the predicted impact on each of the effects identified in Section 6.4 above, and in the absence of mitigation, characterises the significance of these impacts. A summary of all the construction phase effect ratings is given in Table 6.5 located at the end of this section.

6.5.2.1 Land Take

6.5.2.1.1 110kV Substation and Underground Wind Farm Collector Cable and Access Track

The 110kV substation development and wind farm collector cable and access track will require a permanent land take of circa 4ha. The land use, which is typical of the surrounding areas, currently consists of agricultural land (pasture), scrub and peatlands with mature and semi mature trees.

There will be an additional temporary land take of scrubland during the construction phase of 0.5ha for the temporary construction compound. This area will be reinstated once the construction works have been completed.

6.5.2.1.2 Underground 110kV Grid Connection Cable

The grid connection will have a length of c.10.85km and will run within public roads. All works within the public road network will be fully reinstated.

Overall, the impact of land take during the construction phase is assessed as a **negative, not-significant, localised, permanent effect.**

6.5.2.2 Peat, Subsoil and Topsoil Excavation

6.5.2.2.1 110kV Substation and Underground Wind Farm Collector Cable and Access Track

It is estimated that approximately 60,175m³ of excavated soils and peats will be generated during the construction of the substation and wind farm underground collector cable and access track. All soils, subsoils, peat and stone generated from these excavation works will be retained on site within the development boundary and reused in bunding, landscaping and reinstatement of the temporary construction compound. Excess spoil material will be stored on site in designated peat deposition areas.

Figure 2.5 and Figure 2.6 in **Chapter 2 Development Description** of this **EIAR** show the location of the material storage areas. The peat deposition areas were selected by taking account of flat topography, good containment given local ground conditions, no risk of slippage due the flat topography and the avoidance of any natural drains. These areas will require preparation which includes the construction of natural stone berms to manage the location of stored materials. The material storage areas will be graded and vegetated with locally occurring vegetation feedstock. The deposition areas will be fenced in for a period of 12 months post construction to allow for revegetation.

6.5.2.2.2 *Underground 110kV Grid Connection Cable*

Spoil excavated from the public road associated with the placement of the underground 110kV cable to the grid connection point at the Bracklone substation, is estimated to be approximately 15,305m^3. Of this approximately 8145m^3 will be surface paving material. This will be removed to a suitable approved waste facility.

The impact from peat, subsoil and topsoil excavation during the construction phase is assessed as a **negative, moderate, localised, permanent effect.**

6.5.2.3 Geological Resources

Large amounts of aggregates and concrete will be used during construction (See **Table 6.4** for approximate quantities). Materials required will mainly consist of higher-grade materials not available to be won on site, e.g. stone material for roads and foundations, and concrete for the construction of the hardstanding areas. Concrete and aggregate materials will be sourced from authorised facilities.

Table 6.4: Summary of Approximate Aggregate Quantities

Stone/Aggregate	Approx Quantity
Substation compound	86,950m^3
Wind Farm collector cable and access road	26410m^3
110kV Grid Route	3260m^3
Temporary Construction compound	2500m^3
Concrete	Approx Quantity
Substation compound	100m^3
Wind Farm collector cable and access road	1050m^3
110kV Grid Route	3260m^3
Temporary Construction compound	20m^3
Paving Material (asphalt/tarmacadam)	Approx Quantity
110kV Grid Route	8145m^3

Whilst the quantity required is large, the volumes required would not be considered significant in context of the overall regional supply and therefore the impact on geological resources during the construction phase is assessed as a **neutral, not significant, localised, permanent effect.**

6.5.2.4 Accidental Spills & Contamination/Pollution

Construction materials, including any hazardous substances such as fuel and oil, have the potential to affect the soil and geological environment should a spill occur. The accumulation of spills of fuels and lubricants during routine plant use can also be a pollution risk. Construction plant and machinery will be run on hydrocarbon fuel and oil and activities relating to hydrocarbons (storage, bunding, refuelling) will be managed during the works. Any effect from a hydrocarbon spill to soil may also indirectly effect the hydrological/hydrogeological environment.

Cement / concrete will be transported to and used across the site. Without proper management, cement spills and other construction materials pose a threat to the land and soils environment (soil matrix) and may indirectly impact on the hydrological environment and groundwater environment, as pH would likely be altered.

Wastewater from construction processes or leakage from poor welfare facilities can alter the nutrient and microbial balance of the land and soils environment.

Contaminated runoff arising from soil erosion on construction sites can pose a significant risk to the geological and hydrogeological environments, if allowed to percolate into the soil matrix. Sedimentation can also affect safety on the site from build-up, flooding from drain blockages, and maintenance issues from soil erosion. Soil loss due to erosion can result if areas are left exposed.

The impact of accidental spills during the construction phase is assessed as a **negative, moderate, localised, temporary to short-term effect.**

The activities that can cause damage to the existing geological environment may indirectly effect the aquatic environment without appropriate mitigation measures where required. Water management procedures are detailed in Chapter 7 Water of this EIAR.

6.5.2.5 Soil Erosion, Soil Compaction and Soil Stability

6.5.2.5.1 Soil Erosion

Soil erosion describes the removal of soil particles from the soil. This can be caused by weather, water flow or the movement of heavy vehicles.

Soil erosion may occur on site due to earthworks taking place, stockpiling of soils and extra surface water run-off. The movement of construction vehicles, maintenance vehicles and heavy machinery with large tyre threads throughout the site may remove topsoil which may also lead to soil erosion. Soil loss due to erosion can result in areas being exposed.

6.5.2.5.2 Soil Compaction

Soil compaction describes the reduction of pore space within the soil structure. This also causes the soil to have less total pore volume, an increase in bulk density, reduced rate of water infiltration and drainage, expulsion of air within the soil, and change in soil strength.

Soil compaction may occur due to movement of overland traffic, such as construction and maintenance vehicles, resulting in reduction of pore space within the soil structure, an increase in bulk density, reduced rate of water infiltration and drainage, expulsion of air within the soil, and change in soil strength. Regular movement of heavy vehicles and plant on off-alignment sections, and greenfield areas would result in an increased risk to soil and subsoil integrity during the construction phase of the proposed development. Without mitigation, other effects such as a temporary increase in surface water runoff, and subsequently an increase in erosion may result.

Soil compaction as part of construction works, including soil improvement works which often require compaction of subsurface material to reach grade, are not included in these effects.

6.5.2.5.3 Slope Stability

A slope failure involves a mass movement of earth material under shear stress along one or several surfaces. A slip is defined as a small movement of soil, debris, earth, or rock down a slope. These can affect the land and soils environment during the construction phase of a development, particularly in excavations, material movement, earthworks, and storage of material on site. Without appropriate mitigation measures as outlined in further sections, this can result in several direct effects including erosion, contamination, sedimentation, instability of the land, and waste generation, as well as indirectly effecting other environments including water, biodiversity, material assets and landscape and visual.

Slippage can occur as a result of an increase in overburden load on slopes, earthworks that affect slope angles and embankments, unstable embankments, unstable excavations, cut-and-fill techniques from excavations, uncovered stockpiled materials, or unforeseen ground conditions not identified during geotechnical investigations. These can be exacerbated by adverse weather conditions from heavy rain, wind, and ice. Slips are more likely to occur on slopes >25° but have been known to occur on much gentler slopes.

Stockpiled material is at risk of slipping if no mitigation measures are implemented.

The impact of soil erosion, soil compaction and soil stability during the construction phase is assessed as a **negative, moderate, localised, short-term effect.**

6.5.2.6 Peat Instability and Failure.

Raised peat and slope angles of greater than 2° were identified within the site which is why a detailed Peat landslide hazard and risk assessment is required for this site. The PSRA completed by MWP for the proposed development using the industry best practice guidance of the Scottish Executive and Scottish Government guidelines for Peat Landslide Hazard and Risk Assessments concluded that the calculated risk level associated with peat landslides at the proposed development side is Negligible. See **Section 6.2.3** and **Appendix 5** for further detail on the PSRA completed for the proposed development site.

The risk of peat slides while considered low at this site, good practices and precautionary measures should always be implemented when working on sites where peat is present. Appropriate mitigation measures can be found in **Section 6.6**.

The impact of peat instability and failure during the construction phase is assessed as a **negative, moderate, localised, medium-term effect** .

6.5.2.7 Tree Felling and Hedgerow Removal

Felling of commercial conifer forestry is required to accommodate the construction of the underground collector cable and new access/service road from the windfarm to the 110kV substation. Overall felling of approximately 2.8ha of commercial forestry will be required. This felling will be undertaken by Coillte prior to the commencement of development. Additionally, the construction of the new entrance and access road for the proposed substation will require the removal of an area of approximately 45m of hedgerow and scrub vegetation.

The main effects arising from tree felling involve effects to soil. Landscaping, soil excavation, and root and stump harvesting can cause extensive soil disturbance and expose underlying overburden which may influence soil stability and contribute to soil sedimentation, soil erosion and surface water runoff. A large volume of soil can remain attached to roots when stumps are extracted from the ground. The use of heavy machinery can induce soil loading and compression of soft deposits which may influence surface water runoff and soil erosion rates.

Without appropriate mitigation measures, tree felling operations has the potential to have an effect which can cause noticeable changes in the character of the land and soils environment, affecting its sensitivities. The impact of tree felling and hedgerow removal during the construction phase is assessed as a **negative, moderate, localised, short-term effect.**

Table 6.5: Construction Phase Effect Rating

Effects	Quality of Effect	Significance	Spatial Extent	Duration
Land Take	Negative	Not significant	Localised	Permanent
Peat, Subsoil and Topsoil Excavation	Negative	Moderate	Localised	Permanent
Geological Resources	Neutral	Not significant	Localised	Permanent
Accidental Spills & Contamination/Pollution	Negative	Moderate	Localised	Temporary to Short-term
Soil Erosion, Soil Compaction and Soil Stability	Negative	Moderate	Localised	Short-term
Peat Instability and Failure.	Negative	Moderate	Localised	Medium-term
Tree Felling and Hedgerow Removal	Negative	Moderate	Localised	Short-term

6.5.3 Operational Phase

During the operational phase of the proposed development, significant effects on land and soils are not anticipated. Once the construction phase has ceased large scale works will no longer be required. No additional land take is required as part of the operational phase.

A small amount of granular material may be required to maintain access tracks during operation which will place intermittent minor demand on local quarries. Geological effects are assessed as **neutral, imperceptible, localised, permanent.**

Some construction traffic may be necessary for maintenance of infrastructure including substation and grid cables which could result in minor accidental leaks or spills of fuel/oil. The transformer in the substation is oil cooled and therefore there is potential for spills / leaks of oils from this equipment. Accidental spill effects are assessed as **negative, moderate, localised, temporary/short-term.**

The effects of the operational phase on land and soils are summarised in **Table 6.6** below.

Table 6.6: Operational Phase Effect Rating

Effect	Quality of Effect	Significance	Spatial Extent	Duration
Geological Resources	Neutral	Imperceptible	Localised	Permanent
Accidental Spills and Contamination/Pollution	Negative	Moderate	Localised	Temporary/Short-term

6.5.4 Decommissioning Phase

The grid cable and substation will remain a permanent part of the national grid infrastructure and therefore decommissioning is not foreseen. However, in the event that the development is to be decommissioned, the removal of the aboveground components of the substation, along with the foundations and collector cable at depths of <1m below ground surface will result in impacts similar to those associated with construction but of reduced magnitude due to the reduced scale of the proposed decommissioning works in comparison to construction phase works.

During decommissioning, it may be possible to reverse or at least reduce some of the potential impacts caused during construction by rehabilitating the developed area, removing all structures backfilling, grading and reseeding. Other impacts such as possible soil compaction and contamination by fuel leaks will remain but will be of reduced magnitude.

The effects of the decommissioning phase on land and soils are assessed in Table 6.7 below.

Table 6.7: Decommissioning Phase Effect Rating

Effect	Quality of Effect	Significance	Spatial Extent	Duration
Geological Resources	Neutral	Slight	Localised	Permanent
Accidental Spills and Contamination/Pollution	Negative	Moderate	Localised	Temporary to Short-term
Soil Compaction and Erosion	Negative	Slight	Localised	Short-term

6.5.5 Cumulative Impacts and Effects

The proposed development will facilitate the export of electricity from the permitted Dernacart Wind Farm (Planning Ref ABP-310312-21) to the Bracklone 110kV substation (Planning Ref. 20/638).

The permitted Dernacart Wind Farm is located to the west of the proposed development substation and has not yet been constructed. The effects of the Dernacart Wind Farm on the receiving land, soils and geology environment were assessed as part of the EIAR undertaken for the permitted wind farm. The EIAR concluded that, with the implementation of appropriate mitigation, the residual impact would be imperceptible. Mitigation measures to be implemented are outline in Chapter 13 of the Wind Farm EIAR. There is potential for the Dernacart Wind Farm and Bracklone 110kV substation to be constructed at the same time as this proposed development which may cause a slight cumulative effect as a result from the demand for fill material from local quarries. Notwithstanding works have currently commenced on the Bracklone substation therefore there is unlikely to be any cummulative construction effects in respect of these developments.

With exception of the Dernacart Wind Farm and the Bracklone substation, for which the cumulative impacts have already been assessed, there are no other plans or projects in close proximity to the proposed development site which may cause cumulative impacts on the land and soils environment. The measures in the EIAR for the Dernacart Wind Farm and the Bracklone substation mitigation measures will prevent any significant cumulative effects.

6.6 Mitigation and Monitoring Measures

6.6.1 Construction Phase

Peat movement is unlikely to occur, however, if onsite mitigation measures are not adhered to and peat movement is noted, a series of emergency responses and procedures that would be implemented will be implemented. Inappropriate construction methodology can cause instability in otherwise stable conditions. Therefore, the appointed contractor will review all of their methodologies, equipment, construction vehicle loads and safety procedures against the information in this report and produce temporary works designs appropriate to their procedures which take into account peat stability.

6.6.1.1 Mitigation Measures for Peat, Subsoil and Topsoil Excavation

Appropriate engineering controls, such as the installation of a drainage system with settlement / stilling ponds, silt traps, check dams and interceptor drains, will be carried out in tandem with, and where possible, prior to, any excavation work to mitigate potential impacts. In relation to construction works, the most important aspects of these measures involve:

- The timing of the construction phase soil stripping and excavation works will take account of predicted weather, particularly rainfall.
- Soil stripping activities will be suspended during periods of prolonged rainfall events.
- The area of exposed ground will be kept to a minimum by maintaining where possible existing vegetation that would otherwise be subject to erosion in the vicinity of the 110kV Substation and Grid Connection infrastructure. The clearing of peat will be delayed until just before construction begins rather than stripping the entire site months in advance particularly during road construction.
- A minimal volume of peat and subsoil will be removed to allow for infrastructural work to take place in comparison to the total volume present on the site.

6.6.1.2 Mitigation Measures for Accidental Spills & Contamination/Pollution.

Fundamental to any construction phase is the need to keep clean water (i.e. runoff from adjacent ground upslope of the permitted development footprint) clean and manage all other runoff and water from construction in an appropriate manner. Wheel wash facilities will be available onsite for the duration of the construction phase. The proposed surface water drainage is summarised in **Chapter 7 Water** of this **EIAR**.

A bunded containment area will be provided within the compound for the storage of fuels, lubricants, oils etc.

Good site practice will be applied to ensure no fuels, oils or any other substance are stored in a manner on site in which they may spill and enter the ground, particularly when the initial top layer of made ground is excavated. Dedicated, bunded storage areas will be used for all fuels or hazardous substances. Spill kits will be maintained on site.

The potential for hydrocarbons getting into the existing drains, local watercourses, and the land and soils environment will be mitigated by only refuelling construction machinery and vehicles in designated refuelling areas using a prescribed refuelling procedure. A fuel management plan will be implemented incorporating the following elements:

- Refuelling of Construction Plant On-Site - Refuelling will be carried out using 110% capacity double bunded mobile bowsers. The refuelling bowser will be operated by trained personnel. The bowser will have spill containment equipment which the operators will be fully trained in using. Plant nappies or absorbent mats will be placed under refuelling points during all refuelling to absorb drips. Mobile bowsers, tanks and drums will be stored in secure, impermeable storage areas, over 50m away from drains and open water. To reduce the potential for oil leaks, only vehicles and machinery will be allowed onto the site that are mechanically sound. An up to date service record will be required from the main contractor. Should there be an oil leak or spill, the leak or spill will be contained immediately using oil spill kits, all oil and any contaminated material will be removed and properly disposed of in a licensed facility. Immediate action will be facilitated by easy access to oil s ill pits. An oil spill kit that includes absorbing pads and socks will be kept at the site compound and also in site vehicles and machinery. Correct action in the event of a leak or spill will be facilitated by training all vehicle/machinery operators in the use of the spill kits and the correct containment and cleaning up of oil spills or leaks. This training will be provided by the Environmental Manager at site induction. In the event of a major oil spill, a company who provide a rapid response emergency service for major fuel spills will be immediately called for assistance, their contact details will be kept in the site office and in the spill kits kept in site vehicles and machinery; and Materials Handling, Fuels and Oil Storage - Leakages of fuel/ oil from stores will be prevented by storing these materials in bunded tanks which have a capacity of 110% of the total volume of the stored oil. Ancillary equipment such as hoses and pipes will be contained within the bunded storage container. Taps, nozzles or valves will be fitted with a lock system. On-site washing of concrete truck barrels will not be allowed. A designated chute wash down area, which will retain the washout water, will be located within the construction compound and there will be no other chute wash down activity on any other part of the site.

The drainage and treatment system will be managed and monitored and particularly after extreme rainfall events during the construction phase. Controls will be regularly inspected and maintained. A programme of inspection and maintenance will be designed and dedicated construction personnel assigned to manage this programme. A checklist of the inspection and maintenance control measures will be developed and records kept of inspections and maintenance works. The purpose of this management control is to ensure that the measures in place are operating effectively, prevent accidental leakages, and identify potential breaches in the protective retention and attenuation network during earthworks operations.

Stockpiles of stripped topsoil will be in locations with minimum trafficking to prevent damage and dusting.

The access track surface can become contaminated with clay or other silty material during construction. Access track cleaning will, therefore, be undertaken regularly during wet weather to reduce the volume of sediment runoff to the treatment system. This is normally achieved by scraping the track surface with the front bucket of an excavator and disposing of the material at designated locations within the site.

6.6.1.3 Mitigation Measures for Soil Erosion, Soil Compaction and Soil Stability.

6.6.1.3.1 __Soil Erosion__

A site surface water management system will be constructed on the site to attenuate run-off, guard against soil erosion and safeguard downstream water quality. The drainage system will be implemented along all work areas including all internal site access roads, storage areas, hardstand areas and temporary site construction compound. Details of the proposed site drainage system are described in Chapter 7 Water of this EIAR.

The following gives an outline of drainage management arrangements along internal services roads:

- The surface water run-off drainage system will be implemented along all internal access routes, to separate and collect ‘dirty water’ run-off from the roadway and to intercept clean over land surface water flows from crossing internal roadways;

- To achieve separation, clean water drains will be positioned on the upslope and dirty water drains positioned on the downslope of roadsides, with road surfaces sloped towards dirty drains; and
- Clean water will be piped under both the access roads and downslope collection drains to avoid contamination. Piping the clean water under the service road allows the clean water to follow the course it would have taken before construction thus mimicking the existing surface water over land flow pattern of the site and thus not altering the natural existing hydrological regime on site. Temporary stockpiles of excavated spoil, stored in the footprint of the excavation areas, will be directed for use in backfilling and restoration or placed in the deposition areas on site. Reusable excavated sub-soils, peat and aggregate will be stored in temporary stockpiles at suitably sheltered areas to prevent erosion or weathering and shall be shaped to ensure rainfall does not degrade the stored material. Stockpiles will be stored away from any open surface water drains, managing height and slope of all stockpiles and minimising soil movement. Estimated volumes of material can be found in Chapter 2 Development Description of this EIAR. Whenever possible, existing access tracks have been utilised to access locations at the proposed development site. This reduces the volume of excavated material and imported crushed rock for track construction.

Excavated material from the grid connection route will be used to reinstate the area around the cable trench following backfilling of the trench with approved materials. Any excess material from the grid connection route will be removed and disposed of to the onsite deposition areas. All soils, subsoils, peat and stone generated from excavation works will be retained on site within the development boundary and reused in bunding, landscaping and reinstatement of the temporary construction compound. Excess spoil material will be stored on site in designated peat deposition areas. The implementation of erosion and sediment controls will be made prior to the commencement of site clearance works. Silt traps, such as geotextile membrane, will be placed in the existing drainage network prior to construction work. These will be inspected weekly by the Environmental Manager and cleaned regularly as required as directed by the Environmental Manager. Soil Compaction

Measures will include the scheduling of HGVs during the construction phase to reduce the number of vehicle movements in, through and off site. This in turn will reduce the impact of soil compaction and erosion. Unscheduled vehicles will not have access to the site. Heavy vehicles will only follow designated and newly constructed access tracks and avoid loading areas which are not contained within the footprint of the main works to minimise disturbance of the original soil and subsoil formations and to retain soil structure.

The compound, vehicles, stockpiled materials and heavy machinery will be in place for the duration of the construction phase and will be removed once commissioning is complete.

6.6.1.3.2 __Slope Stability__

All temporary cuts/excavations will be carried out such that they are stable or adequately supported. Temporary works will be such that they do not adversely interfere with existing drainage channels/regimes.

All site excavations and construction will be supervised by a suitably competent and experienced engineer. The Contractor’s method statements for each element of work will be reviewed and approved by the engineer prior to site operations. Prior to excavation, drains will be established to effectively intercept overland flow prior to bulk earthworks. Works should be ceased during heavy rainfall or storm events.

A competent project geotechnical engineer or engineering geologist will be employed during the construction phase of the works. As part of the detailed design and assessment, identification of potential planes of weakness will be made in the overburden such as discrepancies in the material type and foliation direction in the bedrock. Earthworks will be constructed to safe stable angles in accordance with the detailed design and best practice.

Plant and materials will be stored in approved locations only (such as the proposed temporary site compound) and will not be positioned or trafficked in a manner that would surcharge existing or newly-formed slopes.

6.6.1.4 Mitigation Measures for Peat Instability and Failure.

The PSRA completed for the proposed development (Appendix 5) has yielded a negligible risk rating for this site. The engineering response for areas with negligible risk level is that the "project should proceed with monitoring and mitigation of peat landslide hazards at these locations as appropriate". The design mitigation used on this project has avoided high risk areas. An iterative design process was followed where the layout was adjusted based on information from peat probe surveys and topographical surveys.

The Construction Manager for the project should impart the philosophy that everyone on the site is aware of peat stability and report any sign of misalignment in monitoring posts. The methodology of all civil works should be reviewed by the Geotechnical Engineer.

The following general measures incorporated into the construction phase of the project will assist in the management of the risks for this site:

- Appointment of experienced and competent contractors and detailed designers;
- The construction works on site should be supervised by experienced and qualified personnel;
- Ensure construction method statements are followed or where agreed modified/ developed.
- Allocate sufficient time for the project to be constructed safely with all peat stability mitigation measures included in the programme;
- Set up, maintain and report findings from monitoring systems, including sightline monitoring;
- Maintain vigilance and awareness through Tool-Box-Talks (TBTs) on peat stability;
- Prevent undercutting of slopes and unsupported excavations;
- Prevent placement of loads/overburden on marginal ground; and,
- Manage and maintain a robust drainage system. This will be the responsibility of the appointed contractor and their designer.

Vigilance is a fundamental requirement when working on peat where inappropriate construction methodology can cause instability in otherwise stable conditions. Only competent and experienced contractors will be employed for this project.

6.6.1.4.1 Rainfall Mitigation

It is notable the previous peat slide in Ireland have generally occurred after prolonged periods of heavy rain (eg landslides at Meenbog, Derrybrien and Ballincollig Hill). Therefore, it is important to have precautions in place regardless of the negligible risk level of peat slide risk at the site. For the duration of the construction work the contractor will use weather forecasting (e.g. using Met Éireann website) to plan works their work and suspense /cease the works during periods of prolonged rainfall.

6.6.1.4.2 Monitoring Measures for Peat Instability

The precautionary principle dictates that monitoring should be carried out in areas where peat is present. The level of peat monitoring recommended for the site reflects the strategy of placing infrastructure in low-risk areas of the site, as discussed in the PSRA (Appendix 5).

The level of peat monitoring recommended for the site reflects the strategy of placing infrastructure in low-risk areas of the site. With the siting of infrastructure using mitigation by avoidance, higher risk parts of the site have been avoided and sightline monitoring is considered appropriate for this site.

Monitoring by sightlines entails driving a series of posts at approximately 5m centres, exactly aligned, across the section of bog being monitored. An illustration of this approach is given below in **Figure 6.8.** Any signs of distress or deformation in the bog will quickly manifest itself by some of the posts moving out of alignment. Early discovery of stress in the peat will give the developer an opportunity to implement emergency procedures to prevent the onset of a bog burst or localised peat slide. While the risk of such occurrence is low in this instance, the precautionary principle dictates that monitoring posts should be installed in work areas where peat is present.

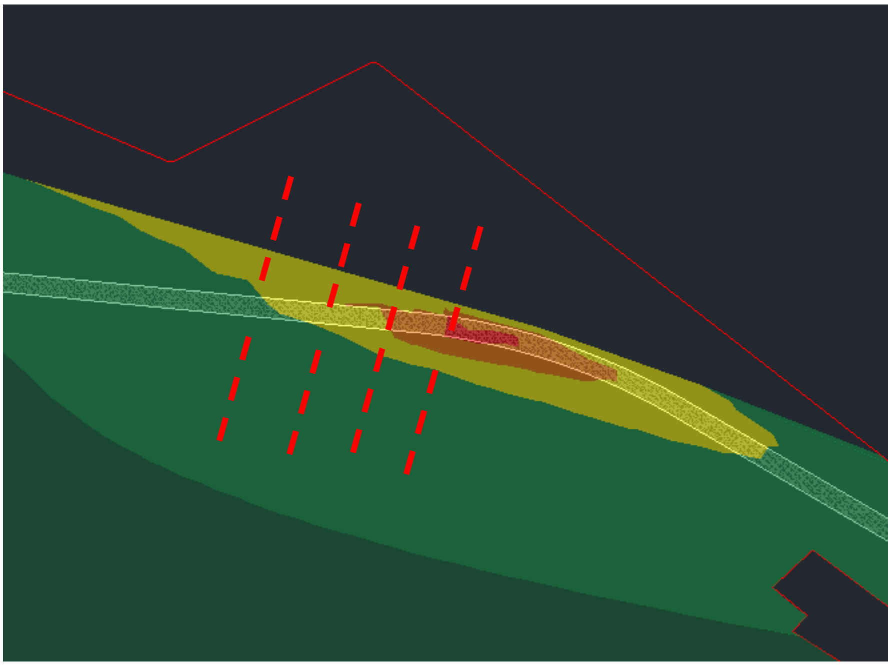

Figure 6.8 : Example of Typical Sightline Post Layout

6.6.1.5 Mitigation Measures for Tree Felling and Hedgerow Removal

Site design was carried out with cognisance to ecological features to minimise the impact of the proposed development on ecological receptors, and consequently the removal of high quality vegetation across the proposed site has been minimised.

Where removal of woodland and hedgerows is unavoidable, brash mats will be used where practicable to support vehicles on soft ground, reducing soil erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place when they become heavily used.

6.6.2 Operational Phase

Mitigation measures for land, soils and geology during the operational stage include the use of aggregate from authorised quarries for use in road and hardstand maintenance. Oil used in transformers (at the substation) and storage of oils in tanks at the substation could leak during the operational phase and impact on ground/peat and subsoils and groundwater or surface water quality. The substation transformer and oil storage tanks will be contained in a concrete bund capable of holding 110% of the oil in the transformer and storage tanks. Integrity testing of bunds and culverts will be undertaken regularly as required and storage tanks will be regularly checked for leaks. These mitigation measures are considered sufficient to reduce risk to ground/peat/soils and subsoils.

6.6.3 Decommissioning Phase

Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant. Some of the impacts will be avoided by leaving elements of the wind farm infrastructure in place where appropriate. Access tracks which are not required for farm use or forestry will be left to vegetate naturally. Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures.

6.7 Residual Impacts and Effects

Residual effects are from impacts that remain, once mitigation has been implemented or, impacts that cannot be mitigated. Provided all mitigation measures are implemented in full and remain effective throughout the construction, operational and decommissioning phase of the proposed development, no significant residual impacts on Land and Soils are expected from the proposed development. See **Table 6.8** below for Residual Effects and ratings.

Table 6.8: Residual Effects

PHASE	IMPACT	QUALITY OF EFFECT	SIGNIFICANCE	SPATIAL EXTENT	DURATION
Construction	Land Take	Negative	Not significant	Localised	Permanent
	Peat, Subsoil and Topsoil Excavation	Negative	Not Significant	Localised	Short-term
	Geological Resources	Neutral	Not Significant	Localised	Permanent
	Accidental Spills and Contamination/ Pollution	Negative	Not Significant/Slight	Localised	Temporary/Short-term
	Soil Erosion, Compaction and Slope Stability	Negative	Slight	Localised	Short-term
	Peat Instability and Failure	Negative	Not Significant	Localised	Short-term
	Tree and Hedgerow Removal	Negative	Not Significant	Localised	Short-term
Operation	Operation and Maintenance Effects	Neutral	Not Significant	Localised	Short-term

6.8 Conclusion

In conclusion, no significant effects on the land, soil and geology at the proposed development site will occur during construction, operation, or during decommissioning due to correct procedures and outlined mitigations being implemented.

The assessment also confirms that there will be no significant cumulative effects on the land, soil and geology environment as a result of the proposed development and other proposed projects.

6.9 References

British Standards Institute (2009). BS 6031:2009 Code of practice for earthworks

BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.

Offaly County Council, 2021. Offaly County Development Plan 2021–2027.

Dept. Of Agriculture, Food and the Marine, 2019. Standards for Felling & Reforestation.

Dept. Of Agriculture, Food and the Marine, 2023. Environmental Guidance for Afforestation.

Dept. Of Agriculture, Food and the Marine, 2000a. Forestry Harvesting and Environmental Guidelines.

Dept. Of Agriculture, Food and the Marine, 2000b. Forestry and Water Quality Guidelines.

Draft Revised Wind Energy Development Guidelines December 2019

EPA Online Maps, Accessed 15/05/2024.

EPA, 2022. Guidelines on Information to be contained in Environmental Impact Assessment Reports.

GeoHive Online Maps, Accessed 15/05/2024.

Geological Survey Of Ireland Online Map, Accessed 15/05/2024.

Parkes, M., Hennessy, R., Meehan, R., Gallagher, V. and Gatley, S. 2016. The Geological Heritage of Laois County. An audit of County Geological Sites in County Laois. Geological Survey Ireland. Unpublished Report.

Harber, A. J. et al, 2011. PRJ PPR556 Rock engineering guides to good practice: road rock slope excavation.

Institute of Geologists Ireland, 2013. Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements.

Laois County Council. Laois County Development Plan 2021-2027.

Nichol, D., 2006. Peatslide hazard rating system for wind farm development purposes. Proceedings of the 28th Annual Conference of the British Wind Energy Association (BWEA28, Glasgow), 00-00

OPW Flood Risk Management Climate Change Sectoral Adaptation Plan, September 2019.

Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, Energy Consents Unit Scottish Government, Second Edition 2017.

Peat Stability Report, Dernacart Wind Farm, Fehily Timoney, December 2019

National Roads Authority, 2008. Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

Teagasc, 2019. Standards for Felling & Reforestation.