MWP

Chapter 09 Land and Soils

Ballinla Wind Farm

Ballinla Wind Farm Limited

July 2025

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Project No.	Doc. No.	Rev.	Date	Prepared By	Checked By	Approved By	Status
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9. Land and Soils

9.1 Introduction

This chapter describes any potential effects on land and soils due to the construction, operation and decommissioning of the Proposed Development. The nature and probability of any effects on the existing land and soils environment arising from the overall development has been assessed. The assessment comprises of:

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

9.1.1 Competency of Assessor

This chapter of the EIAR has been prepared by Sally Kelly and Serena O'Donnell of MWP. Sally has over 20 years post graduate experience in geo-environmental consultancy with extensive experience in the management of soil and groundwater remediation projects and has a MSc in Environmental Diagnostics. Sally has worked on the co-ordination and preparation of EIAR chapters and prepared and peer reviewed environmental reports for a variety of project types including wind energy, solar farms and commercial developments.

Serena holds a BA in Geography and a MSc in Applied Environmental Geoscience from University College Cork. Since joining MWP Serena has worked on a variety of environmental projects assisting with the preparation of EIAR chapters, Environmental Impact Reports, Geotechnical Interpretative Reports, Geotechnical Assessment Reports, CEMPs and RWMPs.

9.1.2 Legislation

This document follows the following European and Irish legislation:

- EU Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the Environment as amended by Directive 2014/92/EU of the European Parliament and of the Council.
- Heritage Act 2018.
- The Planning and Development Act 2000 as amended, and the Planning and Development Regulations 2001 as amended 2001 – 2023.
- Offaly County Council (2024): Offaly County Development Plan 2021 – 2027.

9.2 Methodology

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

- Coillte (2009): Forest Operations & Water Protection Guidelines.
- Environmental Protection Agency (EPA) (2022): Guidelines on the Information to be contained in Environmental Impact Assessment Report.
- EU Environmental Impact Assessment of Projects: Guidance on Scoping. European Union.
- Environmental Protection Agency (2022): Glossary of Effects included in Guidelines on Information to be contained in Environmental Impact Assessment Reports.
- European Union (2017): Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU).
- Institute of Geologists Ireland (2013): Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements.
- National Roads Authority (2005): Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Statements.
- National Roads Authority (2009): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.
- Scottish Executive (2017): Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, 2nd Edition.

9.2.1 Desktop Study

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

- Review of Ordnance Survey Mapping and aerial photography to establish existing land use and settlement patterns within the survey area, refer to Section 9.2.3.
- Examination of the Geological Survey of Ireland (GSI) datasets pertaining to geological (bedrock, heritage, subsoil, etc.) and extractive industry data.
- Examination of EPA/ GeoHive/ Teagasc online soil and subsoil maps.
- Review of 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 Offaly's County Council (OCC) Planning Register to identify relevant development proposals currently under consideration by the Council.

Following the desktop study and field surveys, a set of geological and soil maps were generated in GIS using data acquired from GSI, the EPA and GeoHive Online maps, and are included as figures in this chapter.

9.2.2 Site Walkover and Field 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. Dates of the site visits are provided in Table 9.1.

Engineering and environmental site walkovers were used to review characteristics of the site that needed consideration in the design. These include the access tracks in the site, the location of the site entrances, the existing drainage within the site, a review of the ground conditions and a review of the topography of the area.

No evidence of historical landslides or incipient instability were noted during the site visits.

Table 9.1: Summary of Site Visits

Date	Personnel	Purpose of Site Visit
20/06/2023	Paddy Curran	Site Visit
29/06/2023	Graeme Thornton	Walk Over
08/03/2024	Conor McLoughlin	Site Visit
02/08/2024	Graeme Thornton	Site Walk Over
28/01/2025	Graeme Thornton	Site Walk Over

9.2.3 Study Area

The EIAR study area for Land and Soils primarily focused on the footprint of the Proposed Development infrastructure, as well as the lands adjacent to the site. The Proposed Development area and study area for the land and soils assessment is shown in Figure 9.1.

The Proposed Development is located in a rural area of east Co. Offaly. The site is approximately 4km west of the Edenderry town boundary and 24km east of Tullamore.

The Proposed Wind Farm is within the townland of Leitrim in the municipal district of Edenderry, Co. Offaly. The Proposed Turbine Delivery Route will include development in the townlands of Leitrim, Ballyleakin, Ballyfore Big, and Ballinla (Geashill By) Co. Offaly. The Proposed Grid Connection will be a linear development within the townlands of Leitrim, Lumville, Ballinla, Clarkeville, Ballyfore Big, Ballyfore Little, Ballyeakin and Ballykilleen, Co. Offaly. The Proposed Grid Connection includes an 8km underground cable along the public roads from the Proposed Wind Farm southeast to the existing Philipstown 110kV substation adjacent to the Edenderry Power Station.

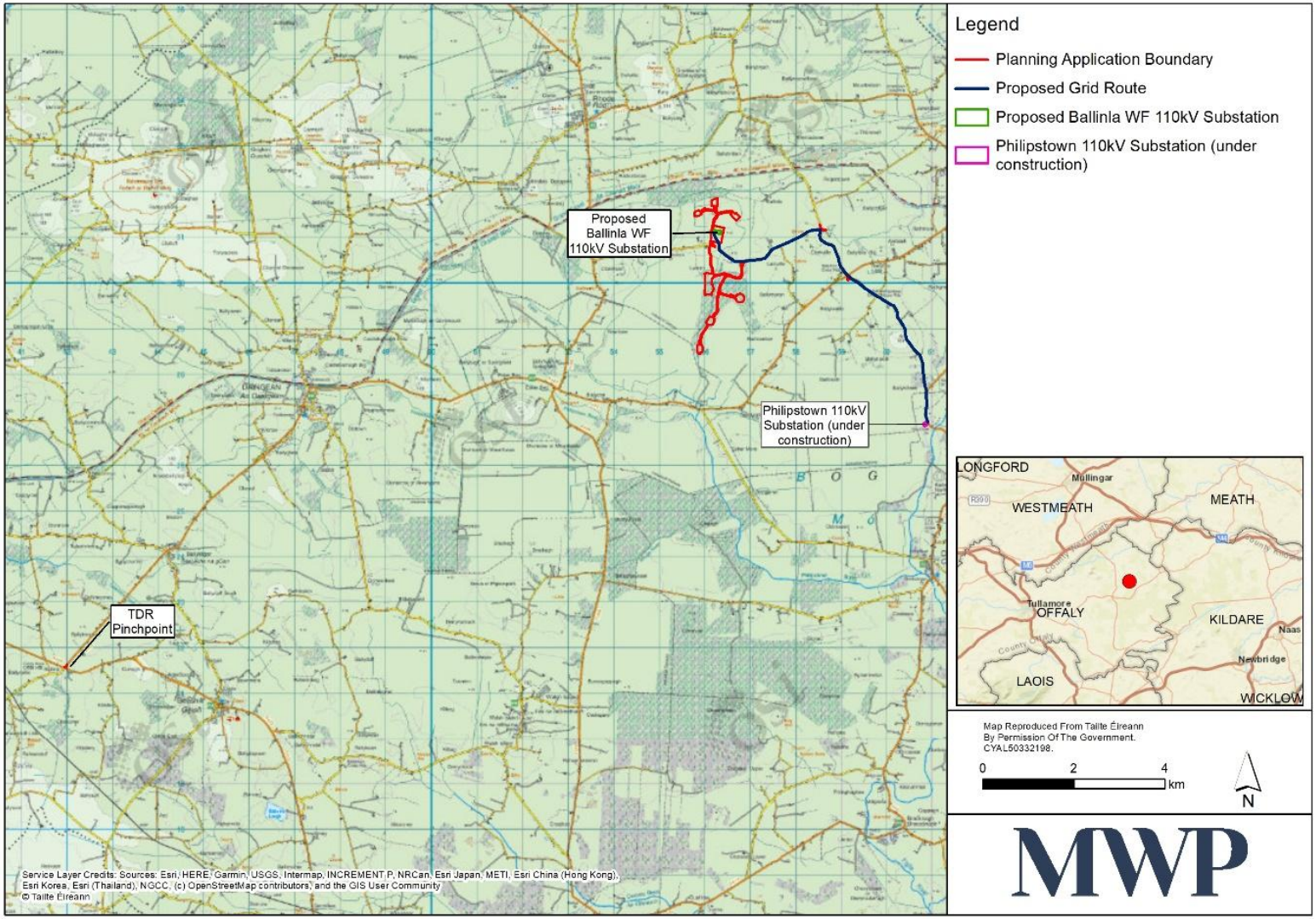

Figure 9.1: Site Location of the Proposed Development

9.2.4 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 08 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 were consulted, however at the time of writing no response has been received.

9.2.4.1 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.

9.2.5 Statement on Limitations and Difficulties Encountered

Limitations and difficulties have not been encountered during the assessment.

9.3 Baseline Environment

9.3.1 Site Location and Description

The site of the Proposed Development is located in a rural area of east Co. Offaly. The site is approximately 4km west of the Edenderry town boundary and 24km east of Tullamore. The Proposed Wind Farm is within the townland of Leitrim in the municipal district of Edenderry, Co. Offaly.

The Proposed Development red line boundary includes a total land area of approximately 42ha. The existing land cover at the site is a mix of agricultural land and coniferous forests.

The Grand Canal is to the north of the main development site, approximately 500m from the nearest turbine. The majority of the main development site consists of pastures while the more elevated areas of the site are composed of coniferous forest, which are owned and managed by forestry companies. The surrounding land includes some pastures and lands principally occupied by agriculture. The lands within the site of the Proposed Development are owned by a number of different private landowners and one semi state body. Primary access to the main development site will be provided from the local public road linkage (L5010) between the L-5006 in the east and the R400 to the west.

The Proposed TDR will include development in the townlands of Leitrim, Ballyfore Big, Ballyleakin, and Ballina (Geashill By) Co. Offaly. The Proposed Grid Connection is approximately 8km and is located along road networks within the townlands of Leitrim, Lumville, Clarkville, Ballyfore Big, Ballyfore Little, Ballyeakin and Ballykilleen. Current land-use along the Proposed TDR and the Proposed Grid Connection comprises of public road corridor, public open space, pastures, mixed forestry and land principally used by agriculture with significant areas of natural vegetation.

9.3.2 Existing Land Use

The land use at the study area has been mapped as shown in **Figure 9.2.** 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 study area:

- 231 – Pastures
- 312 – Coniferous Forests
- 211 – Non-irrigated arable land
- 412 – Peat bogs
- 313 – Mixed Forests
- 112 – Discontinuous urban fabric

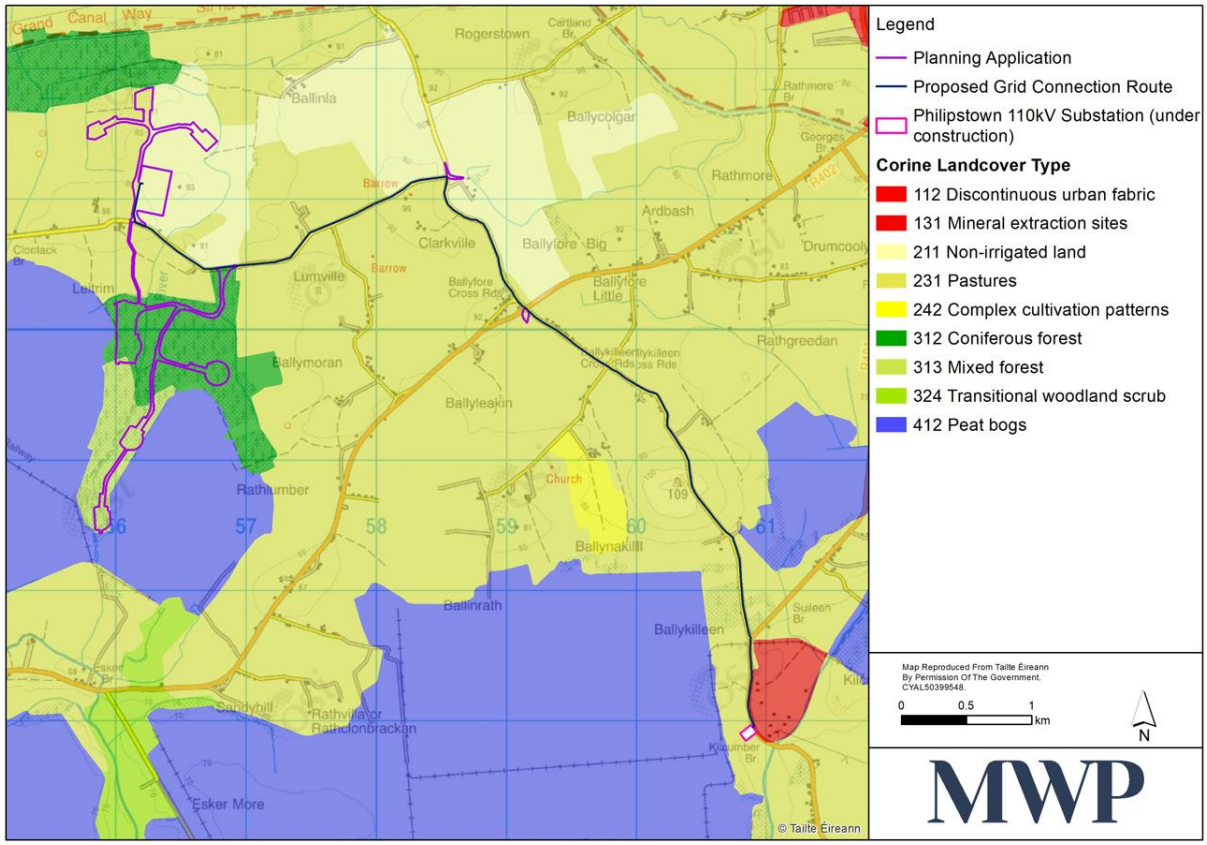

Figure 9.2: Corine Landcover

9.3.3 Topography

The site is described as being mostly flat land with one gentle slope in the area of the substation. The elevations range from 69.5m to 78.6m AOD.

9.3.4 Regional Geology

The GSI Map Viewer shows that the lithology of Co. Offaly is comprised of the Lucan Formation and Waulsortian Limestones. The Proposed Wind Farm and the majority of the Proposed Grid Connection is underlain by limestone of the Edenderry Oolite Member. The southern area of the Proposed TDR and the Ballinla (Geashill By) TDR node are underlain by Waulsortian Limestones.

Geology in the surrounding area is typically comprised of limestones and shale of the Waulsortian Limestones unit, Lucan Formation, Ballysteen Formation and Allenwood Formation with some localised areas of volcanics to the west.

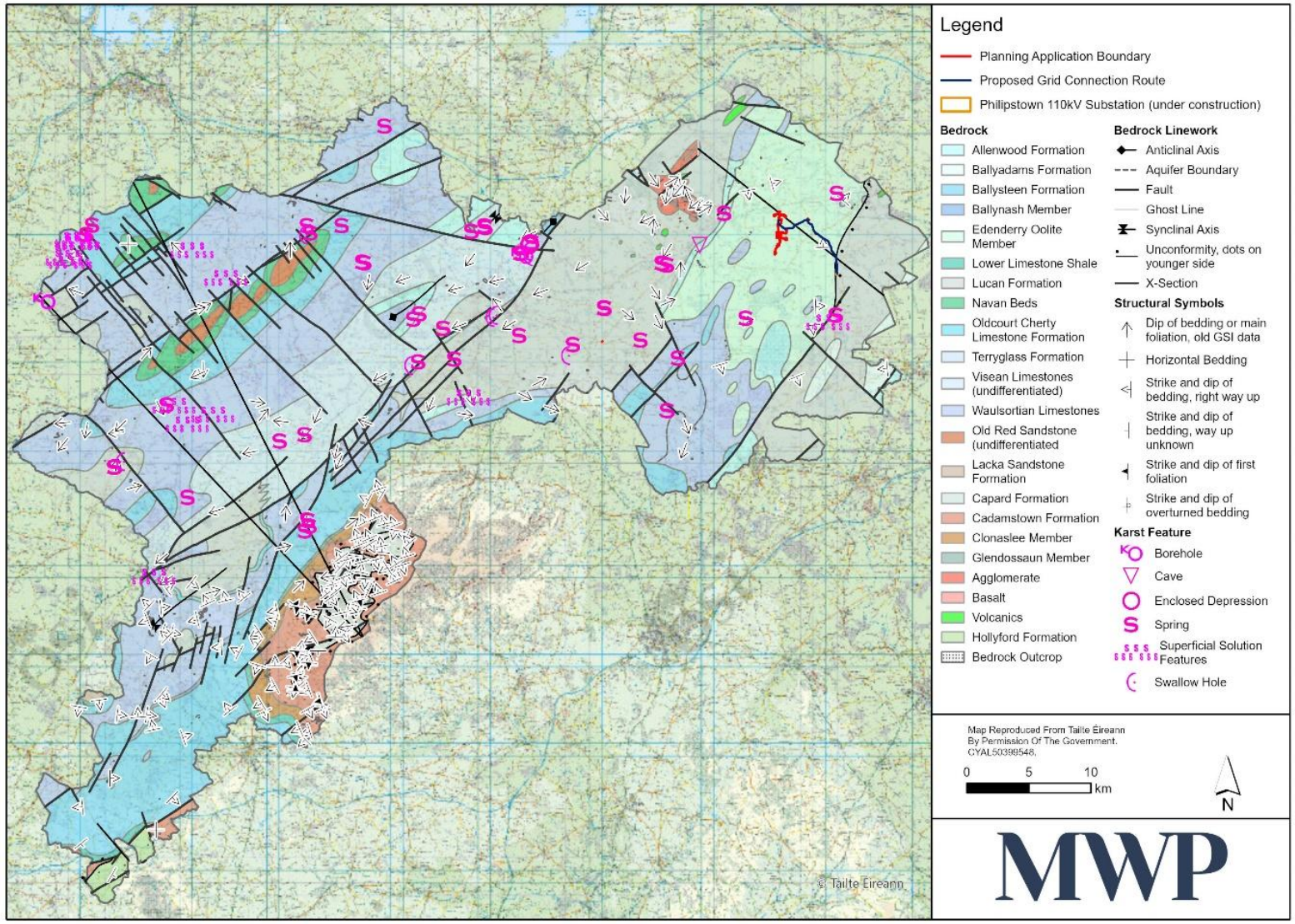

Figure 9.3: Regional Geology of County Offaly

9.3.5 Local Geology

The bedrock geology of this Proposed Development site is dominated by Edenderry Oolite Member which is described as Oolithic limestone. Waulsortian Limestone are located to the northeast of the Proposed Development site. Lucan Formation is also present on the grid route. The Ballinla (Geashill By) TDR node to the southwest of the wind farm site is also underlain by Lucan Formation. The bedrock geology of the Proposed Wind Farm, grid connection route and surrounding area is presented in Figure 9.4.

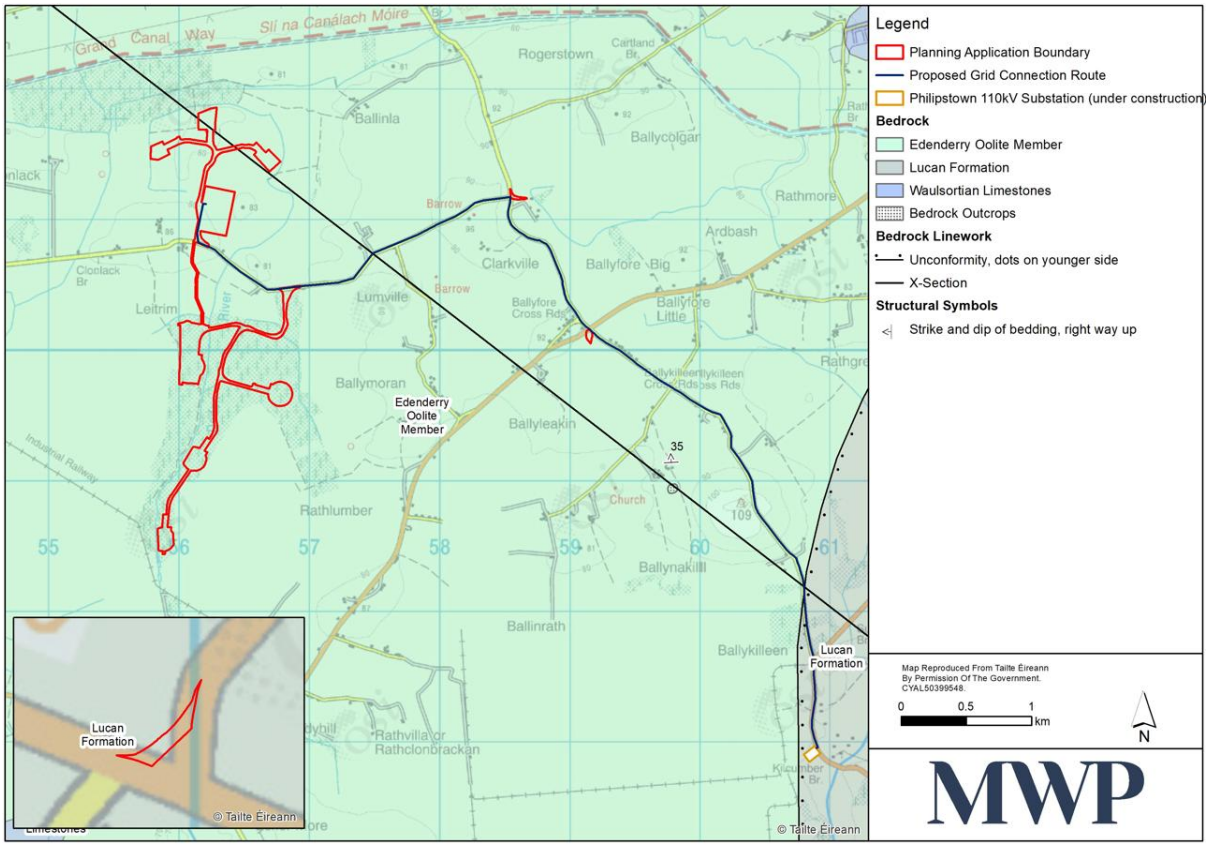

Figure 9.4: Local Geology of the Proposed Development

9.3.6 Soil and Subsoil

Soil includes the topsoil (soil) and subsoil, which together provide for the following principal functions.

- Facilitate the hydrological cycle in the filtration/recharge, storage and discharge of rainwater.
- Support all terrestrial ecology, including all flora and fauna (and all food crops).
- Protect and enhance biodiversity.
- Holding or preserving archaeological remains.
- Provision of raw materials and a base on which to build.

Soil (topsoil) and subsoil may derive from parent geological material and organic matter under the influence of processes including weathering and erosion.

As shown in **Figure 9.5**, the Teagasc Soils Map available on the GSI website indicates that the Proposed Wind Farm is predominantly underlain by peat, which is classified as having 'poor' drainage. Smaller pockets of limestone-derived till are identified in the northern part of the site, which are considered to have 'moderate' drainage characteristics.

Figure 9.6, based on GSI Quaternary Sediment Mapping, also shows that the Proposed Wind Farm site is underlain by a combination of cut-over raised peat and limestone-derived till. The Proposed Grid Connection and Proposed TDR are similarly underlain by limestone-derived till, however, since much of the Grid Connection follows existing public roadways, it is expected that quaternary sediments in these areas will largely consist of made ground.

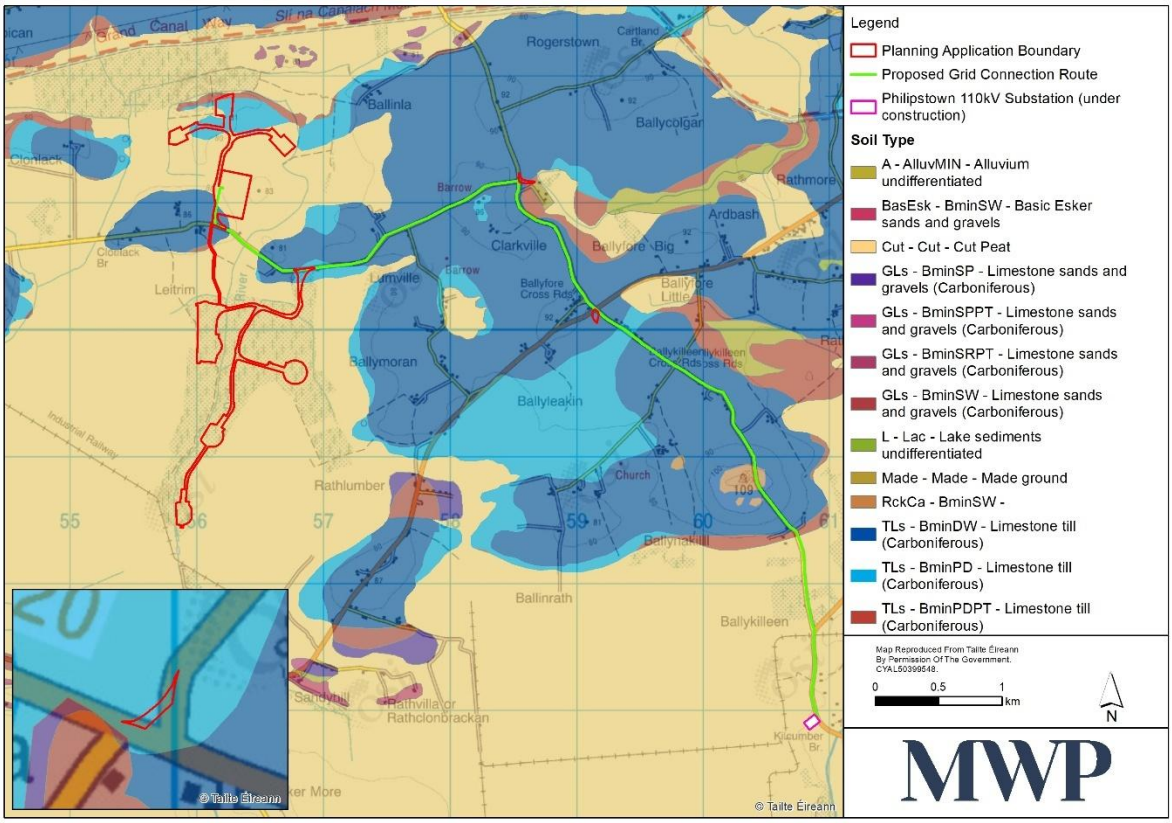

Figure 9.5: Teagasc Soils Map of Wind Farm Site and Grid Connection Route (GSI)

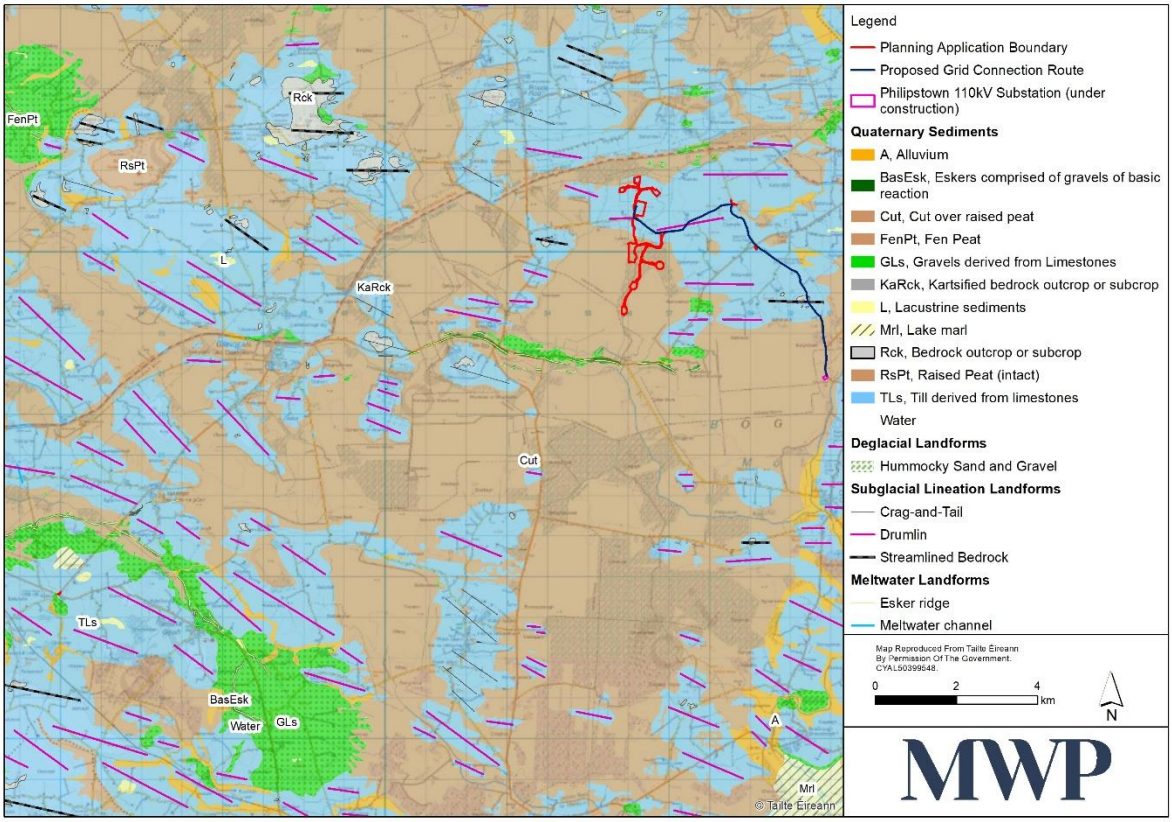

Figure 9.6 Quaternary Sediments

9.3.7 Site investigations

Ground investigations, in the form of peat probing and soakaway testing, were completed for portions of the Proposed Development area by Ground Investigations Ireland (GII) during August 2024 and September 2024 (GII, 2024).

The ground investigations in the northern section of the Proposed Wind Farm included the excavation of eight soakaway pits to a maximum depth of 2.1m below ground level (mbGL), logging of soils encountered, and preparation of a factual report. The ground conditions encountered are summarised as follows:

- Topsoil was encountered from ground level to depths typically ranging from 0.2mbGL to 0.35mbGL.
- Gravelly CLAY and SAND with low cobble content was encountered between 0.35mbGL and the final depth of excavation at 2.1mbGL.
- Groundwater was encountered as seepage at a depth of 2.0mbGL in trial pit SA06 only.
- Soakaway testing for the site concluded that four of the eight testing locations failed with the remaining returning an f value ranging between 1.188E-05 m/s and 7.475E-06 m/s. It was subsequently concluded that the site was unsuitable for discharge to ground.

The site investigations in the northern section of the Proposed Wind Farm align with the GSI quaternary sediment mapping which notes the northern portion of the Proposed Wind Farm is predominantly underlain by limestone derived till with the southern portion of the Proposed Windfarm underlain by peat at depths ranging from 0.27m to 4.04m.

9.3.8 Geological Heritage

There are no mapped geological heritage sites within the Proposed Development. The geological heritage site at Croghan Hill (GSI Site Code: OY014) is located approximately 8km to the northwest of the Proposed Development. This is described as a prominent hill rising from an otherwise flat landscape of midland raised bogs and pastures. The geological heritage site known as Toberdaly (GSI Site Code: OYO28) is located approximately 5km to the northwest of the Proposed Development. This is described as a natural freshwater spring that supplies the Rhode rural water supply scheme. Kilcormac Esker (GSI Code: OT018) is located approximately 15km southeast of the Proposed Wind Fam and approximately 2km from the Ballina (Geashill By) TDR node. This esker is noted as forming part of the much larger Killimor-Birr-Fivealley-Kilcormac Esker System and described as a good example of a deglacial, meltwater-deposited complex, deposited under the ice or at the margin. Mount Briscoe Cave (OY024) is approximately 7km from the Proposed Development and noted as an inactive small cave. Clonkeen Mushroom Rock (OY007) is approximately 10km from the site and is described as a mushroom rock isolated upstanding rock in a grass field. See **Figure 9.7** for Audited Geological Heritage Sites in the vicinity of the Proposed Development.

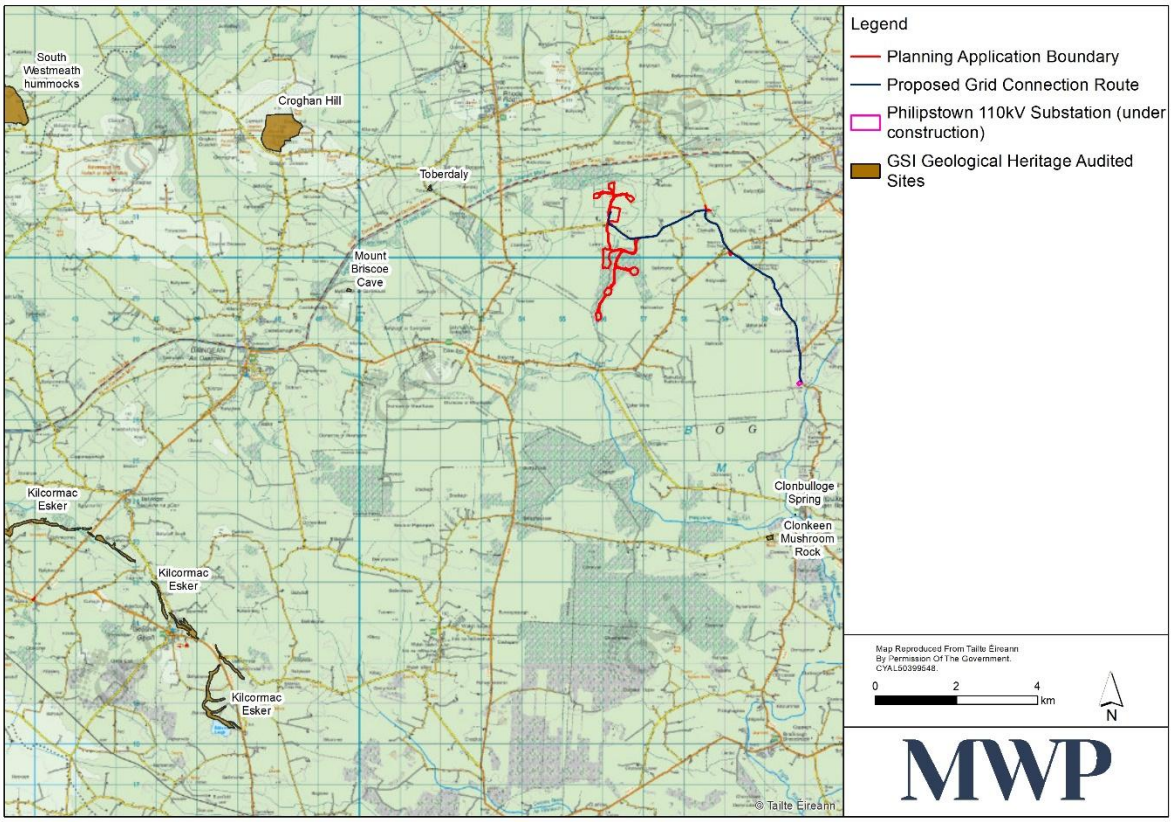

Figure 9.7 Geological Heritage Sites

9.3.9 Economic Geology

According to the Geological Survey of Ireland (GSI), there are several quarries operating in the vicinity of the Proposed Development site in County Offaly including:

- Kilrathmurry Pit, Kilsaran Build, Kilrathmurry, Enfield, Co. Kildare (GSI Quarry Number: KE005).
- Clonard Quarry, Kilsaran Build, Enfield, Co. Kildare (GSI Quarry Number: KE001).

- Allen Quarry operated by Roadstone Limited, Kilmeague, Naas, Co. Kildare (GSI Quarry Number: KE006).
- Clongall Pit, George Dunne, Clongall, Castlejordan, Co. Meath (GSI Quarry Number: MH010).
- Derryarkin Pit, Conor Kilmurray, Derryarkin, Rhode, Co. Offaly (GSI Quarry Number: OY010).
- Drumman, Roadstone Limited, Rochfortbridge, Co. Westmeath (GSI Quarry Number: WH005).
- Derrygreenagh Quarry, Roadstone Limited, Derrygreenagh, Co. Offaly (GSI Quarry Number: OY012).

The location of quarries in the area is shown in **Figure 9.8.** The closest quarry to the site is Kilmurray Sand and Gravel Quarry (Derryarkin Pit) which is located approximately 13km from the nearest point of the Proposed Development.

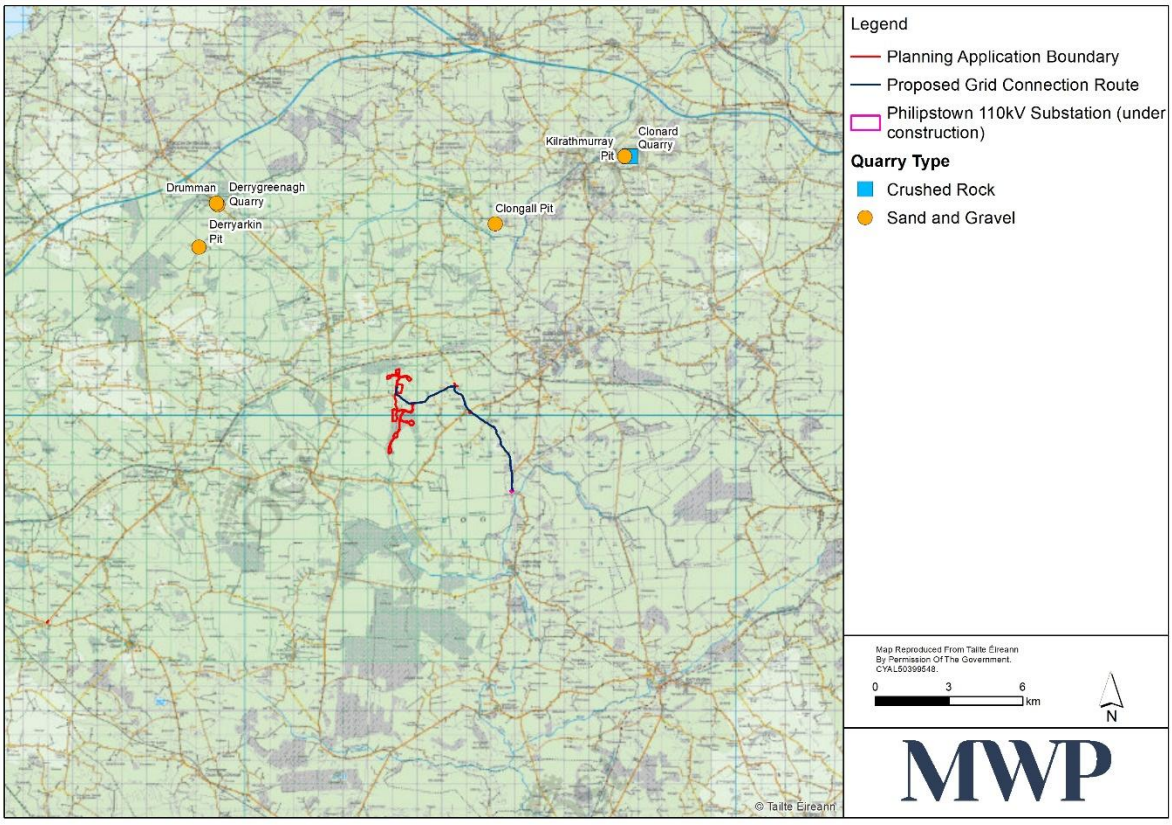

Figure 9.8 Quarries within Vicinity of Proposed Development

9.3.10 Existing Slope Stability

A **Peat Stability Risk Assessment** report has been carried out for the Proposed Development and is presented in **Appendix 9**. A review of the GSI Landslide Event Maps and Quaternary Geology Maps was undertaken in conjunction with a site walkover by a component Geotechnical Engineer.

From a desk-top review, the GSI's Landslide Events database has no records of any landslide events recorded within or in proximity to the development site. The two closest events include 'Edenderry' which occurred in 1989 approximately 7km east of the development site with the collapse of a section of the of the Grand Canal Embankment and 'Daingean1975' which occurred in 1975 on the Daingean Bog approximately 7km west of the Proposed Wind Farm site.

Cut over raised peat was shown on the GSI Quaternary Geology Maps in the southern area of the Proposed Wind Farm. The extents of the peat were mapped, and peat probes were carried out and found a range of peat depth from ≤0.5m to 4m.

No signs of past instability or incipient instability were noted during the site walkover.

Overall, there is no risk of peat instability at this site, or from felling activities, as the limited area of peat identified onsite, is being completely avoided.

9.3.11 Spoil Deposition Area

Within the Proposed Wind Farm, there is one permanent spoil deposition area located in a commercially forested area that will be cleared to accommodate T4, this area will be used for surplus excavated material generated during construction.

The area is proposed to hold 86,600m^3 of material and will raise the ground level at the area by 2m. The spoil deposition area will have an engineered slope, so that peat slippage will not occur. The engineered slope will encircle the area to contain the peat and other subsoils used within the berm. Once finished the deposition area will be allowed to revegetate naturally. The deposition area has been included in the Peat Stability Risk Assessment report in Appendix 9. The deposition area is fully outlined in MWP drawing number 23882-MWP-00-00-DR-C-5035.

9.4 Assessment of Effects

This section details the potential effects on the land and soils environment from the Proposed Development. The changes proposed onsite comprise of a number of elements including excavation for construction of the turbine hardstands and grid connection. The relevant works are further discussed in the following sections. The following sections considers the phases of construction and operation of the Proposed Development in relation to land, soil and geology.

9.4.1 Construction Phase

The predicted effects on land and soils for the Proposed Development are discussed in the following sections. The activities that can cause damage to the existing geological environment may indirectly affect the aquatic environment without appropriate mitigation measures where required, as discussed in Chapter 08 Water.

The Proposed Development will involve removal of soils to facilitate the construction of elements of the Proposed Development such as turbine foundations, access tracks, hardstand emplacements, underground cabling and temporary works. Substantial amounts of aggregates, concrete, and steel will be used during construction. Concrete and additional aggregate materials will be sourced from authorised facilities.

Any potential waste soil will be notified under Article 27 (European Communities (Waste Directive) Regulations 2011) or treated to comply with Article 28 (European Communities (Waste Directive) Regulations 2011) if practicable. Any materials containing invasive species will be appropriately managed and sent to authorised facilities.

The evaluation of the most likely significant effects is described below. The lands within the development boundary, where the permanent works are proposed including the Proposed Wind Farm and associated infrastructure, will give rise to the majority of the potential impacts associated with the Proposed Development, consequently these potential impacts form the primary basis of the impact assessment.

9.4.1.1 Change of Land Use

Land use is the term to describe the human activities which take place within a given area of space.

All new development proposals have the potential to affect the character of a local area and human environment by introducing a new incompatible land use activity which could result in physical disruption, severance or exclusion of the user's ability to continue existing activities, or the sterilisation of lands thus preventing any additional further land use potential.

The northern portion of the Proposed Wind Farm consists of agricultural lands pastures while the southern portion comprises commercial coniferous and mixed forest. The Proposed TDR and Proposed Grid Connection traverse a variety of land uses, including public road corridors, public open spaces, pasturelands, mixed forestry, and agricultural lands interspersed with significant areas of natural vegetation. During the construction phase of the works, material will be excavated, moved, altered or compacted and will influence the existing land use requirements. In this respect, land use will change over the course of the construction phase from existing forestry and pastural activities to the construction of the Proposed Development, however existing forestry and agricultural activities will remain during construction outside of the Proposed Development.

The felling of commercial forestry to accommodate the Proposed Development will result in a temporary change in land use from managed woodland and agricultural land to construction zones, including turbine bases, access tracks, and hardstands. The proposed construction works will include the removal of soil and subsoil from the construction areas resulting in slight alterations to site topography. However, these changes will be imperceptible concerning the land and landscape of the Proposed Development. All excavations will be reinstated to ground level/existing level.

It is considered that in the absence of mitigation measures, the alteration of land use has the potential to alter the character of the land and soils (including geological) environmental regime in a manner that is consistent with emerging baseline trends. It will have **negative, slight, local, short term, direct, likely,** of **low** magnitude on the land environment effect from the change of land use within the Proposed Development. The overall significance of the effect is assessed as **slight**.

9.4.1.2 Effects on Soil and Geology

Soil Erosion

Soil erosion is the process whereby agents, such as wind and water, gradually detach, remove, and transport soil particles, causing a breakdown in the soil resource by degradation of the soil structure and alteration of geomorphology. Soil erosion from wind, water and ice can occur when:

- Topsoil is removed, exposing the soil and subsoil.
- Soil levels from cut and fill practices are altered due to excavation and compaction.
- Open excavations are left exposed for a period of time.
- Stockpiled and exposed soil is not maintained or stored incorrectly.
- Activities from earthworks leave soils exposed.
- Mismanagement of material transport, material alterations and waste disposal occur.
- Other construction activities such as vehicular movement and heavy machinery with large tyre threads remove topsoil and soils from excavations.
- Heavy rainfall causes soil to mobilise.

During the construction phase, volumes of topsoil, subsoil and peat will be excavated, moved, altered and/or removed from certain areas of the site. Topsoil and subsoil will be reused for landscaping. Excavated subsoil will be required for site levelling, construction of the wind farm site infrastructure, i.e., gravity foundations for turbine bases, crane hardstands, lidar, substation, grid connection, access tracks and drainage accommodation work. This will result in permanent removal of material at excavation locations. Stone required for the construction of new access tracks, construction compound and drainage will be imported from local quarries, where required.

The total volume of excavated material for the Proposed Development is approximately 84,714m^3. All material volume estimates can be found in **Table 3-1** in **Chapter 03 Civil Engineering** of this **EIAR.**

Excavation, material management, and vehicular movement activities will be managed during construction as detailed in the **Construction Environmental Management Plan (CEMP) (Appendix 2-1).**

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 or Horizontal Directional Drilling (HDD). The method requires the preparation of the launch and receiving pits including the removal of any surface vegetation and levelling with the front bucket of an excavator. There is no need for removal of topsoil in the general area with the exception of the specific entrance and exit pit requirement. Regular movement of heavy vehicles and plant on-off alignment sections, and greenfield areas would result in an increased risk to soil integrity during the construction phase of the Proposed Development, without implementation of mitigation measures discussed in further sections. Without mitigation, other effects such as a temporary increase in surface water runoff, and subsequently an increase in erosion may result.

If poor ground conditions are encountered during excavation and a signification depth to sub-formation is required, a piled foundation may be considered. A piled foundation requires the use of a piling machine equipped with an auger drill to rotary bore a number of holes around the area of the turbine base to the sub-formation depth determined at construction stage. Once all the holes have been bored, reinforcement steel is inserted into each hole with concrete poured afterwards. The potential effects associated with piling relate to soil compaction and spoil generation. Piling if required will be limited and will not produce significant volumes of spoil. Any spoil onsite will be reused on site and removed to the deposition area or sent to a licensed facility.

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.

Slope Stability

A slope failure involves a mass movement of earth material under shear stress along one or several surfaces. The movement may be rotational or planar (Landslides in Ireland, (GSI, 2006)). A slip is defined as a small movement of soil, debris, earth, or rock down a slope. It can take the form of a minor landslide, a land slip, a soil slip, or soil creep. 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 form 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.

Importation of Stone

For the Proposed Development there is an estimated volume of 87,795 m^3 stone required as outlined in in **Chapter 03 Civil Engineering**. This volume of imported stone will come from a permitted quarry and will be used as infill on the site. The extraction and transport of stone from these quarries represent a moderate use of non-renewable natural resources. The following quarries, located in close proximity to the Proposed Wind Farm, have been identified as potential sources of aggregate for the Proposed Development:

- Kilmurray Sand and Gravel, Derryarkin, Co. Offaly. 13km distance.
- Roadstone Alenwood, Allen, Killeagh, Naas, Co. Kildare. 29km distance.
- Kilsaran Claonard, Kilrathmurry, Clonard, Co. Meath. 20km distance.

All quarries operate under valid planning permissions and environmental management systems, ensuring compliance with national regulations.

According to the EPA's 2023 Aggregates Market Analysis, Ireland produced approximately 38 million tonnes of aggregate in 2021. The volume required for the Proposed Development—approximately 88,000 tonnes (assuming 1 m^3 ≈ 1 tonne for crushed stone)—represents just 0.23% of the national annual production. This demonstrates that the Proposed Development will not result in a significant demand on national aggregate resources, nor will it necessitate increased extraction beyond existing licensed capacities.

Summary

In the absence of mitigation, soil erosion, compaction and slope stability represent a **negative, moderate, local, short-term, direct** and **likely** effect of **medium** magnitude on the soil environment of **medium** sensitivity. The overall significance of impact assessed to be **moderate**.

Excavation and construction activities in limestone bedrock are predicted to have a **negative, slight, local, short-term, direct** and **unlikely** effect of **low** magnitude on bedrock slope stability, given the generally competent nature of limestone bedrock, it is assessed **low** to **medium** sensitivity, resulting in an overall **not significant** effect.

In the absence of mitigation, the use of quarried stone aggregate for the Proposed Development represents a **negative, slight, regional, short-term, indirect and likely** effect of **low magnitude** on the natural resource environment of **low sensitivity**. The overall significance of impact is assessed to be **slight**.

9.4.1.3 Accidental Spills & Contamination/Pollution

Contamination, or pollution, is presence of human-made chemicals entering and altering the natural environment. It can occur as a result of waste-related activities, historical activities, leakages and accidental spillages of chemicals. Contamination can lead to the degradation and the physio-chemical alteration of the land and soils environment as well as cause indirect effects to the biodiversity, human health and material asset environments.

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 affect 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.

In the absence of appropriate mitigation measures, accidental spills of hydrocarbons, cement, or contaminated waters during construction could result in a **negative**, **significant**, **local**, **temporary**, **direct**, and **likely** effect of **medium magnitude** on the land and soils environment, which is assessed as having **medium sensitivity.**

Additionally, such contamination poses a **negative**, **significant**, **local**, **temporary**, **indirect** and **unlikely** effect of **medium magnitude** on the geological and hydrogeological environment, which is considered to have **medium to high sensitivity.**

Mitigation measures to limit this can be found in **Section 9.5.1.**

9.4.1.4 Effects from Tree Felling

Forestry will be removed within the Proposed Development to facilitate construction and operation. Permanent felling of approximately 21ha is required for the construction and operation of the turbines, as well as the hardstands, access tracks and deposition area. It is proposed to fell around turbines as a mitigation for bats and to facilitate construction. Approximately 5m either side of the access tracks will be felled to facilitate construction.

All tree felling will be undertaken in accordance with a tree felling license, using good working practices as outlined by the Department of Agriculture, Food, and the Marine (DAFM) Standards for Felling and Reforestation (2019) and will follow the specifications set out in Forest Service's 'Forestry and Water Quality Guidelines' (2000) and 'Forest Harvesting and Environmental Guidelines' (2000). These standards deal with sensitive areas, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel, and machine oils. All conditions associated with the felling licence will be complied with. A felling licence application will only be submitted once planning permission is received for the Proposed Development.

The felling of forestry to facilitate wind farm infrastructure is predicted to have a **negative**, **slight**, **local**, **short-term**, **direct**, and **likely** effect of **medium magnitude** on the land and soils environment, primarily due to increased exposure of soils, potential for erosion, and loss of organic matter. The receiving environment is assessed as having **medium sensitivity**, given the presence of managed commercial forestry in areas to be felled. Based on these considerations, the overall significance of the unmitigated effect is assessed as **moderate**.

9.4.2 Operational Phase

9.4.2.1 Change of Land Use

While the majority of the land use changes will occur during the construction phase of the Proposed Development, the operational phase of the proposed wind farm will result in a long-term change in land use from a combination

of commercial forestry, agricultural pastures and peatland to a renewable energy generation site. This transition involves the permanent presence of infrastructure such as turbine bases, access tracks, substation, and hardstands, which will occupy a relatively small proportion of the overall site area. While the majority of the land will remain undeveloped and reinstated post-construction, the functional use of the site will be altered.

The Proposed TDR and Proposed Grid Connection traverse a variety of land uses, including public road corridors, public open spaces, pasturelands, mixed forestry, and agricultural lands interspersed with significant areas of natural vegetation. All areas affected by the construction of the Proposed TDR will be fully reinstated upon completion of the works. As the Proposed Grid Connection follows an existing road corridor, any road surfaces disturbed during construction will also be reinstated. Consequently, no permanent change in land use is anticipated as a result of these elements of the Proposed Development.

During the operational phase, the change in land use agricultural land use to an operational wind farm is predicted to have a **negative, slight, local, long term, direct, of low magnitude** on the land use environment. The receiving environment is assessed as having a **medium** sensitivity, based on these considerations the overall significance of effect is assessed as **slight.**

9.4.2.2 Effects on Soil and Geology

Some erosion of soil will continue early into the operation phase, however as vegetation becomes established and equilibrium is achieved, erosion rates will reduce to pre-construction levels. All vehicular movement during operation and maintenance will be restricted to the areas of hardstanding and existing/newly constructed access tracks.

In the absence of mitigation, these effects may result in noticeable but limited changes to the character of the land and soils environment, without significantly affecting its function or integrity. Therefore, the effect is assessed as **negative, slight, local, short-term, direct** and **unlikely**, with a **low** magnitude**.** The receiving environment is assessed as having a **medium** sensitivity, based on these considerations the overall significance of effect is assessed as **slight**.

Notwithstanding the effects on soil and geology by the Proposed Development being assessed as not significant, mitigation measures to limit this can be found in **Section 9.5.2.**

9.4.2.3 Accidental Spills and Contamination/Pollution

During the operational phase, there remains a potential for accidental spillages or leaks of hydrocarbons (e.g. fuel or oil) from maintenance vehicles, plant, or equipment operating on-site. The oil-cooled transformers located within the substation and at each turbine also present a risk of localised contamination in the event of a leak or failure. However, all fuel and chemical storage areas, including transformer bunds, are designed to be fully contained and compliant with best practice standards, significantly reducing the risk of uncontrolled releases to the environment.

In the event of a spill, the bunding systems are designed to capture and contain the material, preventing infiltration into the underlying soils or migration to groundwater. As such, while the potential for minor leaks remains, the likelihood of a significant environmental impact is substantially reduced.

In the absence of mitigation, the potential for spills and pollution during the operational phase is assessed as a **negative, moderate, local, temporary, direct** and **unlikely** effect of **medium** magnitude. The receiving environment is assessed as having a **medium** sensitivity, resulting in an overall significance of effect assessed as **moderate**.

Mitigation measures to limit this can be found in **Section 9.5.2.**

9.4.3 Decommissioning Phase

The potential effects associated with the decommissioning of the Proposed Development will be similar to those associated with construction (i.e. soil and peat excavation, potential contamination by leaks and spills, erosion of exposed subsoils), however significantly reduced in magnitude.

At the end of the estimated 35-year lifespan of the Proposed Wind Farm, the site will be decommissioned and reinstated with all wind turbines and towers removed. Removal of infrastructure will be undertaken in line with landowner and regulatory requirements and best practice applicable at the time. The substation and grid connection will remain in place as a permanent part of the national grid.

During decommissioning, cranes of comparable size to those used for construction will disassemble each turbine. The towers, blades and all components will then be removed.

Wastes generated during the decommissioning phase will be taken off site and disposed of at an authorised waste facility. Any materials suitable for recycling will be disposed of in an appropriate manner.

At present it is anticipated that underground cables connecting the turbines to the substation will be cut back and left underground. The cables will not be removed if an environmental assessment of the decommissioning operation demonstrates that this would do more harm than leaving them in situ. The assessment will be carried out closer to the time to consider environmental changes over the project life.

Hardstand and turbine foundation areas will be left in situ and covered with soil to match the existing landscape. Access tracks will be left for use by the landowners. As such, the decommissioning phase of the project will require minimal earthworks. The turbine bases will be rehabilitated by covering with local topsoil in order to regenerate vegetation which will reduce runoff and sedimentation effects. The decommissioning phase is therefore predicted to have a positive, slight, local, long-term, direct, and likely effect of low magnitude on the medium sensitivity land and soils environment, resulting in an overall significance of effect assessed as slight.

9.4.4 Do Nothing Scenario

Under the do-nothing scenario, no development would take place on this site, the land and soils environment would remain unchanged, with the exception of future agricultural/forestry change.

If the Proposed Development were not undertaken, there would be ***no direct or indirect significant effects*** on the land, soils, or geology.

9.4.5 Cumulative Effects

Consideration has been given to the cumulative effects resulting from interactions with other surrounding developments and activities. With the exception of places where gravity is a role (on slopes) soils, geology, and land use have a largely static nature, which limits the possibility for cumulative consequences. Nonetheless, these effects may be increased by external causes, which could be organic or man-made, as was previously mentioned (wind, water, ice etc).

Evaluation of the cumulative effects must also assess the potential linkage/pathways with nearby permitted/operational development relative to shared receptors.

As part of this assessment, other offsite developments and proposed offsite developments as detailed in Chapter 02 Project Description of this EIAR were reviewed and considered for possible cumulative effects with the Proposed Development. Notable renewable energy projects within 15km of the Proposed Development are listed below:

- Battery Energy Storage System at Ballykilleen
- Cushaling Wind Farm
- Cloncreen Wind Farm
- Mountlucas Wind Farm
- Yellow River Wind Farm
- Kilcush Solar Farm
- Oldcourt Solar Farm
- Highfield Solar Farm

The closest constructed windfarm of significant scale is Cloncreen windfarm, *c.* 2 km south of the Proposed Development.

Yellow River Wind Farm is currently under construction, and due for completion in early 2025.

Kilcush Solar farm is located approximately 7km south of the Proposed Development while Oldcourt is located approximately 10km east. The Highfield Solar Farm is located near Rhode, northwest of the Proposed Development.

The potential for cumulative effects with these developments has been considered across relevant EIAR chapters. The projects considered for possible cumulative effects are located several kilometres from the Proposed Development with the associated construction works being localised and of relatively short duration with some developments likely to be completed by the time construction of the Proposed Development commences. In addition, all developments, including the Proposed Development, are subject to environmental management measures, including CEMPs, pollution prevention protocols and reinstatement strategies. These measures are designed to minimise soil disturbance, prevent contamination, and ensure post-construction recovery of the land environment. Based on these considerations, the potential for cumulative effects on the land, soils, and geology environment is assessed as **negative, not significant, local, long-term, indirect** and **unlikely,** with a **low magnitude** of impact on a **medium** sensitivity receptor, resulting in an overall significance of effect assessed as **not significant**.

9.5 Mitigation and Monitoring Measures

Appropriate mitigation measures to avoid, or significantly reduce any potential effects during the construction, operational and decommissioning phases of the Proposed Development are outlined in this section.

Embedded mitigation measures employed have been incorporated into the design of the Proposed Development in terms of locating the turbines, access tracks and other proposed infrastructure in order to reduce the effects on land and soils.

9.5.1 Construction Phase

9.5.1.1 Mitigation Measures for Land Use

The loss of agricultural land within the proposed development site is minimal and therefore the effects of are assessed to be not significant. The loss of land from agricultural production is assessed to be an acceptable part of the Proposed Development and therefore no mitigation is proposed.

21ha of forestry will be felled to accommodate the Proposed Wind Farm, however, all tree coverage felled will be replaced at replanting sites subject to technical approval through a separate consenting process. No specific measures, other than best-practice felling and replanting methodologies are proposed, and the efficacy and appropriateness of these measures will be assessed, separately, through the felling and replanting licensing process. However, subject to the adherence to standard methodologies, no significant effects are assessed as likely.

9.5.1.2 Mitigation Measures for Soil and Geology

Soil Erosion

The following mitigation measures will be implemented to reduce the soil erosion during the construction phase:

- Areas of exposed soil will be minimised by phasing construction and reinstating disturbed areas as early as possible.
- Unnecessary stripping of topsoil and subsoil will be avoided by optimising the layout and reusing existing access tracks.
- Stockpiles of stripped topsoil will be in locations with minimum trafficking to prevent damage and dusting.
- Exposed soil surfaces will be stabilised using biodegradable geotextiles, mulch, or hydroseeding, particularly on slopes and embankments.
- Temporary soil stockpiles will be shaped and compacted to reduce erosion and will be located in sheltered areas away from construction traffic.
- Access tracks and hardstands will be constructed using clean stone and geotextile membranes to prevent soil disturbance and erosion.
- Brash mats or bog mats will be deployed on soft ground to protect soil structure and prevent rutting and surface erosion.
- Heavy machinery will be restricted to designated haul routes and will not traffic over stripped or stockpiled soils.
- Buffer zones will be maintained between soil storage areas and steep slopes to prevent slippage or downslope erosion.
- All exposed soil areas will be inspected regularly for signs of erosion, and corrective actions will be implemented immediately.
- An Environmental Clerk of Works (ECoW) will be appointed to oversee soil protection measures and ensure compliance with the CEMP.
- Stripped topsoil and subsoil will be reused in landscaping and reinstatement works as soon as practicable to reduce exposure time.
- The duration and intensity of construction traffic in sensitive areas will be limited to avoid over-compaction of subsoil layers.
- A log of soil management activities, inspections, and remedial actions will be maintained throughout the construction phase.

Soil Compaction

The following mitigation measures will be implemented to reduce the soil compaction during the construction phase:

- Works will be carried out in accordance with the TMP (**Appendix 15**) to manage and control vehicular movement on site. Measures will include the scheduling of HGVs during the construction phase to reduce the number of vehicle movements in, through and offsite.
- Earthworks haulage will be along predetermined routes within the Development and any deliveries to site will be along existing national, regional, and local routes for importation and exportation of materials.
- Haulage with the Proposed Development will be along internal haul roads/access tracks, where practicable.
- 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.
- Machinery will not operate directly on excavated/stockpiled soils.
- Within and around excavations, pore water pressure will be kept low by avoiding loading the soil/subsoil and giving careful attention to the existing drainage.
- Where compaction occurs due to truck movements and other construction activities on unfinished surfaces, remediation works will be undertaken to reinstate the ground to its original condition. Where practicable, compaction of any soil or subsoil which is to remain in-situ along the site will be avoided.

Soil Stability

The following mitigation measures will be implemented to reduce the soil compaction during the construction phase:

- All temporary cuts and excavations will be designed and executed to ensure long-term stability or will be adequately supported using engineered solutions.
- Temporary works will be planned and implemented to avoid interference with existing drainage channels and natural flow regimes.
- A suitably qualified and experienced geotechnical or civil engineer will supervise all site excavations and construction activities.
- The contractor's method statements for each element of work will be reviewed and approved by the supervising engineer prior to commencement.
- Surface water interception drains will be installed upslope of all excavation areas prior to earthworks to prevent overland flow from entering exposed soil zones.
- A site-specific emergency response plan will be developed to address slope instability risks, particularly during the early excavation phase.
- The emergency response plan will include a rainfall-triggered alert system based on 24-hour advance meteorological forecasting (e.g. Met Éireann data).

- Construction activities will be suspended when rainfall exceeds a pre-defined threshold (e.g. >25 mm/hr or a 1-in-100-year storm event) and will only resume once conditions have stabilised and runoff has subsided.
- All plant, materials, and equipment will be stored in designated, level areas such as the temporary site compound and will not be placed on or near existing or newly formed slopes.
- Construction traffic will be routed to avoid surcharging or destabilising slopes, and no loading will occur near excavation edges or embankments.
- Where necessary, temporary slope reinforcement (e.g. geogrids, soil nails, or retaining structures) will be installed to maintain slope integrity.
- All excavations will be monitored for signs of instability (e.g. cracking, slumping, or water ingress), and corrective actions will be implemented immediately if required.
- A geotechnical risk register will be maintained throughout the construction phase, documenting inspections, rainfall events, and any slope-related incidents or interventions.
- All personnel will be briefed on slope stability risks and emergency procedures during site induction and toolbox talks.

The CEMP (Appendix 2-1) includes site management controls to mitigate for impacts to soil and geology.

9.5.1.3 Mitigation Measures for Accidental Spills and Contamination/Pollution

The following mitigation measures would be implemented to reduce the potential for accidental spills and leaks during the construction phase:

- The main contractor will maintain an emergency response action plan and emergency procedures will be developed by the main contractor in advance of any works commencing.
- Designate a bunded storage area at the contractor's compound(s) and away from surface water gullies or drains for oils, solvents and paints used during construction. The fuel storage tanks shall be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area or 25% of the total capacity of all the tanks within the bund, whichever is the greater.
- Chemicals will be stored within a storage container with an accompanying Control of Substances Hazardous to Health ("COSHH") Datasheet in accordance with health and safety regulations. All chemicals will be stored in designated bunded areas at least 15m away from watercourses.
- Drainage from the bunded area shall be diverted for collection and safe disposal. All containers within the storage area will be clearly labelled, so that appropriate remedial action can be taken in the event of a spillage. When moving drums from the bunded storage area to locations within the site plot, a suitably sized spill pallet will be used for containing any spillages during transit.
- All plant and equipment utilised onsite will be maintained is in good working condition. Any equipment not meeting the required standard will not be permitted for use within the Proposed Development. Only emergency breakdown maintenance will be carried out onsite.
- Drip trays and spill kits will be available onsite to ensure that any spills from vehicles are contained and removed offsite.
- Drip trays will be located under all static plant.

- Hoses and valves will be checked regularly for signs of wear and will be turned off and securely locked when not in use.
- Diesel pumps and similar equipment will be checked regularly, and any accumulated oil removed for appropriate disposal.
- Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in designated impermeable refuelling areas isolated from surface water drains.
- Where mobile fuel bowsers are used on the site, in the event of a machine requiring refuelling outside of the designated impermeable area, fuel will be transported in a mobile double skinned tank.
- Adequate stocks of hydrocarbon absorbent materials (e.g., spill-kits and/or booms) shall be held onsite to facilitate response to accidental spills. Spill response materials shall also be stored on all construction vehicles.
- Ready-mixed concrete will be brought to the site by truck. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated water (for example storm water) to the underlying subsoil and groundwater.
- The pouring of concrete will take place within a designated area protected (for example by a geosynthetic material) to prevent concrete runoff into the soil/groundwater media.
- Any use of concrete in proximity to watercourses will be carefully controlled to avoid spillage. No onsite batching should occur. Washout from mixing will be carried out only in a designated contained impermeable area.
- Wash down and washout of concrete transporting vehicles will take place at an appropriate designated area and direct discharge of wash water to ground or surface waters will be strictly prohibited. Alternatively, where washout takes place onsite, it will be carried out in a designated, carefully managed onsite washout area.
- Wastewater from washing of concrete lorry chutes will be directed into a concrete washout container, lined with an impermeable membrane. The container should be of good condition, should not overflow or leak and should be easily accessible to vehicles. The containers must be checked and emptied at a frequency equivalent to the volume of concrete being used and no runoff should leave the washout location. The area much be clearly marked and must be located away from storm drain inlets, open drainage facilities, water courses and ditches.
- Access tracks will be cleaned regularly during wet weather to prevent sediment build-up and runoff.
- The drainage and treatment system will be regularly inspected and maintained by assigned personnel, especially after heavy rainfall, to ensure it functions properly and prevents leaks or failures during construction.
- In the event of an accidental spillage or pollution incident, the site manager or designate shall notify the Local Authority as soon as possible.

The CEMP (Appendix 2-1) includes site management controls to mitigate for contamination/pollution.

9.5.1.4 Mitigation Measures for Tree Felling

The following mitigation measures would be implemented to reduce the potential for felling impacts during the construction phase:

- Topsoil removed from felled areas will be reused in landscaping or placed in designated deposition areas.
- Vegetative layers will be stored right-side-up where possible to promote natural regrowth.
- Felling areas will be monitored and maintained post-construction and into the operational phase.
- Runoff from clear-felled areas will be managed using berms, silt traps, and settlement ponds to separate clean and dirty water.
- Discharge rates from drainage systems will be controlled to match pre-construction conditions using engineered settlement ponds.
- Brash mats will be used on soft ground to reduce soil erosion and prevent rutting; mats will be renewed when worn.
- Brash mats will also be provided along off-track routes where practicable to minimise soil compaction.
- All felling and reforestation works will comply with the Department of Agriculture, Food and the Marine's forestry standards (2019) and Forest Service licence conditions.
- Felling activities at the end of the forestry cycle will follow felling licence requirements and associated environmental mitigation measures.

9.5.2 Operation Phase

During the operational phase of the Proposed Development, it is anticipated that routine maintenance of infrastructure and tracks will be required across the Site. This may include work such as maintaining access tracks and drainage and carrying out wind turbine maintenance.

Should any maintenance be required onsite which would involve construction type activities; construction mitigation measures will be adhered to in accordance with the CEMP to avoid potential effects.

9.5.3 Mitigation Measures for Cumulative Effects

Based on the finding that the potential for significant cumulative effects on land and soils arising from the Proposed Development is considered to be negligible, no specific measures to mitigate against cumulative effects are considered necessary.

9.5.4 Decommissioning Phase

Where appropriate, mitigation measures used during decommissioning activities shall be comparable to those used during construction. By keeping some development components in place, when necessary, some of the effects will be avoided. In order to recover vegetation and lessen the effects of runoff and sedimentation, the turbine bases will be rehabilitated by being covered with local topsoil. Access tracks that are not needed for farming or forestry will also be allowed to naturally revert to vegetation. The wind farm's materials and equipment will all be removed from the site and disposed of or repurposed in a way that is environmentally responsible. There will be mitigation measures put in place to prevent potential pollution from fuel leaks and soil compaction caused by nearby plants.

9.6 Risk of Major Accidents and Disasters

Incidents such as landslides or technological disasters can result in liabilities such as contaminated soil, loss of infrastructure and loss of life. Proactive risk management reduces the potential for an incident to occur, and therefore the CEMP for the Proposed Development sets out the Emergency Response Procedure to be adopted in the event of an emergency including contamination, health and safety and environmental protection.

9.6.1 Peat Stability

A past landslide event did occur on the Grand Canal embankment near Edenderry, 7km east of the Proposed Development. The impact of the Proposed Development on the grand canal embankment was assessed. The closest turbine is a distance of approximately 500m from the canal, this is considered to be a sufficient distance to not impact the canal. The drainage associated with the Proposed Development does not take water away from the canal embankment. Due to the distance from the canal embankment and the design of the drainage system at the Proposed Development it is considered that the potential impact on the Grand Canal embankment is negligible.

A Peat Stability Risk Assessment report has been carried out for the Proposed Development and is presented in Appendix 9.

Overall, there is no risk of peat instability at this site, or from felling activities, as the limited area of peat identified on site, is being completely avoided. The peat stability assessment report concludes that there is a negligible risk of landslide from the Proposed Development.

9.7 Residual Effects

The residual impacts after implementation of all mitigation measures for potential effects on the land and soil environment are presented in Table 9.2. No significant residual efforts on land and soils are likely.

Table 9.2 Residual Effects

Stage	Potential Impact	Receptor	Pre-Mitigation Impact	Pre-Mitigation Significance of Effect	Post-Mitigation Impact	Mitigation	Residual Effect
Construction	Changes to land use	Land use and land cover	Negative, slight, local, short term, direct, likely.	Slight	Negative, slight, local, short term, direct, likely.	NA	**Slight**
Construction	Soil erosion	Soil environment	Negative, moderate, local, short-term, direct and likely	Moderate	Negative, slight, local, short-term, direct and unlikely	Section 9.5.1.2	**Slight**
Construction	Soil compaction	Soil environment	Negative, moderate, local, short-term, direct and likely	Moderate	Negative, slight, local, short-term, direct and unlikely	Section 9.5.1.2	**Slight**
Construction	Soil stability	Soil environment	Negative, moderate, local, short-term, direct and likely	Moderate	Negative, moderate, local, short-term, direct and likely	Section 9.5.1.2	**Slight**
Construction	Bedrock stability	Geological environment	Negative, slight, local, short-term, direct and unlikely	Not Significant	Negative, slight, local, short-term, direct and unlikely	NA	**Slight**
Construction	Importation of Stone	Geological environment	Negative, slight, regional, short-term, indirect and likely	Slight	Negative, slight, regional, short-term, indirect and likely	NA	**Slight**

Stage	Potential Impact	Receptor	Pre-Mitigation Impact	Pre-Mitigation Significance of Effect	Post-Mitigation Impact	Mitigation	Residual Effect
Construction	Accidental Spills & Contamination/Pollution	Land and soil environment	Negative, significant, local, temporary, direct and likely	Moderate	Negative, moderate, local, temporary, direct and unlikely	Section 9.5.1.3	**Slight**
Construction	Accidental Spills & Contamination/Pollution	Geological and hydrogeological environment	Negative, significant, local, temporary, indirect and unlikely	Moderate	Negative, slight, local, temporary, indirect and unlikely	Section 9.5.1.3	**Slight**
Construction	Tree Felling	Soil and geological environment	Negative, slight, local, short-term, direct and likely	Moderate	**Negative, slight, local, short-term, direct and unlikely**	Section 9.5.1.4	**Slight**
Operation	Changes to land use	Land use and land cover	Negative, slight, local, long term, direct, likely	Slight	**Negative, slight, local, long term, direct, likely**	NA	**Slight**
Operation	Effects on soil and geology during operation	Soil and geological environment	Negative, slight, local, short-term, direct and unlikely	Slight	Negative, slight, local, short-term, direct and unlikely	NA	**Slight**
Operation	Accidental Spills and Contamination/Pollution	Soil and geological environment	Negative, moderate, local, temporary, direct and unlikely	Moderate	Negative, slight, local, temporary, direct and unlikely	Section 9.5.1.3	**Slight**

9.8 Conclusions

Following a comprehensive assessment of the potential impacts on land and soil, and with the implementation of the proposed mitigation measures, no significant adverse effects are anticipated during the construction, operational, or decommissioning phases of the proposed development. The mitigation strategy addresses key risks such as soil erosion, compaction, contamination, and slope instability, and has been developed in accordance with current best practice and regulatory guidance.

A cumulative impact assessment has also been undertaken, considering other existing and permitted developments in the surrounding area. Given the scale of the proposed development and the nature of the receiving environment, no significant cumulative effects on land and soil are predicted.

Overall, the proposed development is not expected to result in any significant residual or cumulative impacts on the land and soil environment.

9.9 References

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