8 SOILS AND GEOLOGY

8.1 INTRODUCTION

This chapter assesses the impacts of the Project on the soils and geology of the Site. Where negative effects are predicted, the chapter identifies appropriate mitigation strategies therein. The assessment considers the potential effects during the following phases of the Project:

- Construction of the Project;
- Operation of the Proposed Development; and
- Decommissioning of the Project (final phase).

The Project refers to all elements of the application for the construction and operation of the proposed Gortloughra Wind Farm (**Chapter 2: Development Description**). The Proposed Development refers to the wind farm only.

This chapter of the EIAR is supported by Figures provided in **Volume III** and by the following Appendix document provided in **Volume IV** of this EIAR:

- **Appendix 8.1** - Peat Stability Risk Assessment (PSRA). Garne Geotechnical Services. March 2025.

A Construction Environmental Management Plan (CEMP) is appended to the EIAR in **Appendix 2.1**. In the event that permission is granted for the Project, the final CEMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned. It will include all the mitigation prescribed within the EIAR. A summary of the mitigation measures is included in **Appendix 15.1**.

8.1.1 Assessment Structure

Table 8.1 presents the acronyms used in this chapter.

Table 8.1: Acronyms Used in Chapter 8

Acronym	Full Form
EIAR	Environmental Impact Assessment Report
PSRA	Peat Stability Risk Assessment
CEMP	Construction Environmental Management Plan
SAC	Special Area of Conservation
SPA	Special Protection Area
NRA	National Roads Authority
EPA	Environmental Protection Agency
GSI	Geological Survey of Ireland
IGI	Institute of Geologists of Ireland
IWEA	Irish Wind Energy Association

Acronym	Full Form
NPWS	National Parks and Wildlife Services
OSI	Ordnance Survey of Ireland
TDR	Turbine Delivery Route
GCR	Grid Connection Route

In line with the Directive 2011/92/EU as amended (the EIA Directive as amended), and current EPA guidelines, the structure of this Soils and Geology chapter is as follows:

- Details of the assessment methodology utilised for desk and field studies;
- Description of baseline conditions at the Site;
- Identification and assessment of impacts to soils and geology associated with the Project during the construction, operational and decommissioning phases of the Proposed Development;
- Mitigation measures to avoid or reduce the impacts identified;
- Identification and assessment of residual impact of the Project considering mitigation measures; and,
- Identification and assessment of cumulative impacts, if and where applicable.

This Chapter of the EIAR has been prepared by Andrew Garne B.Sc., M.Sc., MIGI, P.Geo. Andrew is a Registered Professional Geologist with over 30 years of relevant experience including over 25 years in Ireland where he has undertaken many Geological and Peat Stability Assessments for numerous windfarms throughout Ireland.

8.2 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

8.2.1 Assessment Methodology

The following assessments were undertaken in order to evaluate the potential impacts of the Project on the soils, geology and ground stability aspects of the environment at the Site:

- Characterise the topographical, geological and geomorphological regime of the Site from the data acquired through desk study and onsite surveys;
- Consider ground stability issues as a result of the Project, its design and methodology of construction;
- Assess the combined data acquired and evaluate any likely impacts on the soils, geology and ground stability aspects of the environment;
- If impacts are identified, consider measures that would mitigate or reduce the identified impact; and,
- Present and report these findings in a clear and logical format that complies with EIAR reporting requirements.

8.2.2 Relevant Legislation and Guidance

This assessment complies with the EIA Directive as amended, which requires Environmental Impact Assessment for certain types of major development before development consent is granted. This assessment was undertaken in accordance with the following Irish legislation (transposition of the aforementioned directive):

- SI No. 296 of 2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018.
- S.I. No. 473 of 2011, European Union (Environmental Impact Assessment and Habitats) Regulations 2011;
- S.I. No. 584 of 2011, European Union (Environmental Impact Assessment and Habitats) (No.2) Regulations 2011;
- S.I. No. 272/2009 – European Communities Environmental Objectives (Surface Waters) Regulations 2009, and subsequent amendments; and S.I. No. 9/2010 – European Communities Environmental Objectives (Groundwater) Regulations) 2010, and subsequent amendments.

In addition to this legislation relevant to geological, geotechnical, hydrological and hydrogeological aspects of the environment were referred to, such as:

- Planning and Development Regulations 2001 as amended.
- The Heritage Act 1995, as amended; and,
- The Wildlife Acts 1976 – 2012 as amended.

The Cork County Development Plan (2015-2021) and the now adopted Cork County Development Plan (2022-2028) were also considered as part of the EIA process.

This assessment has been prepared using, inter alia, the following guidance documents, which take account of the aforementioned legislation and policy:

- Department of Housing, Planning and Local Government (2019) Draft Revised Wind Energy Guidelines;

- EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports – May 2022 (Supersedes 1997, 2002 and 2017 versions);
- Institute of Geologists of Ireland (IGI) (2002) Geology in Environmental Impact Statements – A Guide;
- IGI (2013) Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements;
- Irish Wind Energy Association (IWEA) (2012) Best Practice Guidelines for the Irish Wind Energy Industry;

- National Roads Authority (NRA) (2008) Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- NRA (2008) Environmental Impact Assessment of National Road Schemes – A Practical Guide – Rev 1;
- CIRIA (2006) Control of Water Pollution from Linear Construction Projects – Technical Guidance;
- BSI (1999) Code of Practice for Site Investigations – BS 5930; and,
- NPWS (2015) National Peatlands Strategy.
- Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Developments. Scottish Government. 2nd Edition, April 2017.

8.2.3 Desk Study

A desk study consisting of a review of all available datasets, information, and literature resources relevant to the Site has been completed. During the desk study and initial phases of the fieldwork, the Study Area comprised a much larger area than the current red line boundary. The initial Study Area is demonstrated by the spread of peat probes undertaken as part of the PSRA (see Figure 5 of the PSRA). The desk study was undertaken for this area plus a narrow corridor which included the two Grid Route Options along with the TDR.

The most current datasets and information maintained by the Environmental Protection Agency (EPA), Geological Survey of Ireland (GSI), Ordnance Survey of Ireland (OSI) and the National Parks and Wildlife Service (NPWS) were reviewed to assist in establishing the hydrological and hydrogeological characterisation of the Site. This involved the following components:

- Acquire and compile relevant available maps of the Project;
- Study and assess the proposed locations of turbines, Site tracks, borrow pit, temporary construction compound, Grid Connection Route (GCR), Turbine Delivery Route (TDR), Met Mast and Onsite Substation and Control Building relative to available data on Site soils, subsoil, bedrock geology, Site topography and slope gradients;
- Study and assess the PSRA, (**Appendix 8.1**);
- Overlay Ordnance Survey of Ireland (OSI) 1:250,000, 1:50,000 and 1:10,560 (6") maps with AutoCAD plan drawings;
- Overlay Geological Survey of Ireland (GSI) Geology maps (1:100,000) to determine Site bedrock geology and the presence of any major faults or other anomalies;
- Overlay GSI Landslide Susceptibility maps to determine Site landslide susceptibility risk classification;
- Overlay GSI Heritage Sites (Audited) maps to determine the risks of the development to any known Heritage Sites;

- Overlay EPA and Teagasc (Agricultural Agriculture & Food Authority) Soils and Subsoil maps (1:50,000) to determine categories of soils and subsoil at the Site;
- Search of the GSI landslide database for records of landslide mass movement events at and near the Study Area; and,
- Search of National Parks and Wildlife Service designated Sites of Co. Cork.

8.2.4 Field Work

8.2.4.1 Geotechnical Investigations, Site Walk Over and Observations

An initial Site walkover survey was carried out by Garne Geotechnical Services from 14th to 15th of June 2021. Additional walkover surveys were made on 28th June 2021, 8th to 10th April 2022, 20th December 2022, 9th June 2023, 1st July 2023, 27th January 2024, 13th April 2024 and 19th April 2024 following layout design changes. The walkovers included peat gouge cores and/or hand-dug trial pits taken at the Turbine Foundations/Hardstands, Onsite Substation and Control Building and Temporary Construction Compound locations.

A total of 354 peat probes, 8 gouge cores, 9 hand-dug trial holes and 98 hand-held shear vane tests were undertaken predominantly at Turbine Foundations, at Turbine Hardstands, at the proposed Onsite Substation and Control Building location and along proposed access tracks at nominal 100 m centres. A further 1112 probes were undertaken outside the current EIAR boundary and along the proposed Grid Connection Route Options 1 and 2. Measurements of slope were also made using a hand-held inclinometer at each of the shear vane test locations. The approximate peat probe depths are shown in **Figure 5** of the PSRA. Details obtained at each probe location are presented in **Appendix 1** of the **PSRA**.

8.2.5 Evaluation of Potential Effects

8.2.5.1 Sensitivity

Sensitivity is defined as the potential for a receptor to be significantly affected by a proposed development (EPA, 2022). The EPA provides guidance on the assessment methodology, including defining general descriptive terms in relation to magnitude of impacts however, in terms of qualifying significance of the receiving environment the EPA guidance also states that:

"*The value of the superficial/ solid geology should be identified to allow an assessment of the impact of the proposed development to be considered adequately*" (EPA, 2015).

Potential effects arising from a proposed development in terms of soils and geology will be limited to a localised scale, and therefore in describing the sensitivity of soils and geology it is appropriate to rate such while considering the value of the receiving environment or

Site attributes. To facilitate the qualification of geological attributes, guidance specific to land and soils as set out by National Roads Authority (NRA), and guidance specific to landscape as set out by Scottish National Heritage (SNH) has been used in conjunction with EPA guidance.

The following table presents rated categories and criteria for rating Site attributes (NRA, 2008).

Table 8.2: Criteria for Rating Site Attributes – Soils and Geology Specific

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

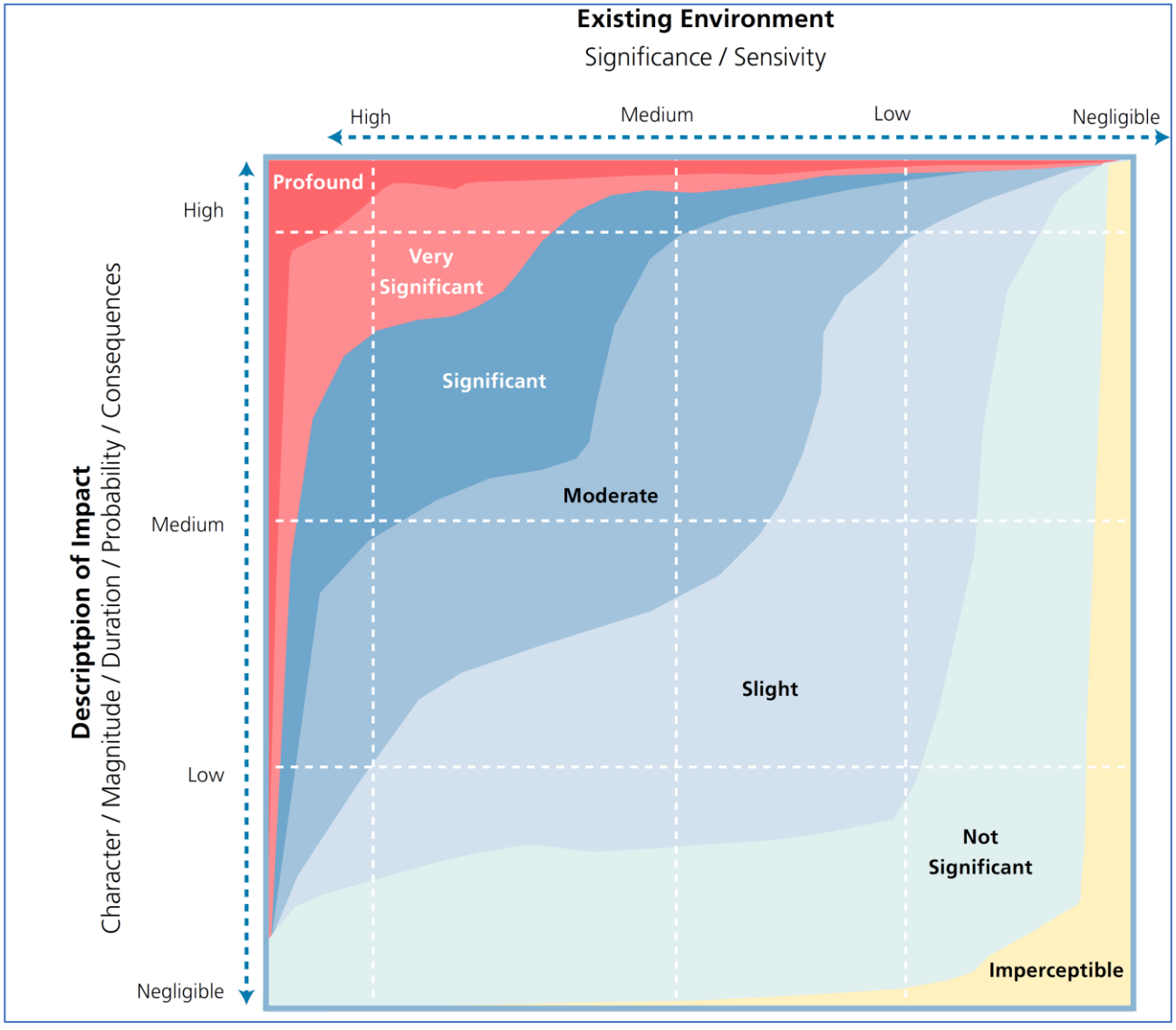
*Relative to the total volume of inert soil disposed of and/or recovered

Given that the Site contains mostly poorly drained and low fertility soils along with low volumes of peat on a local scale, it is considered that the **Importance** of the Site is rated as **Low**.

The sensitivity of the receiving geological environment is defined by the baseline quality, as well as its potential to absorb change and for substitution.

The diagram shown in **Figure 8.1** presents how comparison of the character of the predicted impact to the sensitivity of the receiving environment can determine the significance of the impact (EPA, 2022).

Figure 8.1: Comparison of the Character of the Predicted Impact to the Sensitivity of the Receiving Environment (EPA, 2022)



8.2.5.2 Magnitude

The magnitude of potential impacts arising as a product of the Project are defined in accordance with the criteria provided by the EPA, as presented in the following table (EPA, 2022). These descriptive phrases are considered general terms for describing potential effects of the Development, and provide for considering baseline tends, for example: a *Moderate* impact is one which *is consistent with the existing or emerging trends*.

Table 8.3: Describing the Magnitude of Impacts

Magnitude of Impact	Description
Imperceptible	An impact capable of measurement but without noticeable consequences.
Slight	An impact that alters the character of the environment without affecting its sensitivities.
Moderate	An impact that alters the character of the environment in a manner that is consistent with the existing or emerging trends.
Significant	An impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Profound	An impact which obliterates all previous sensitive characteristics.

In terms of soils and geology, magnitude is qualified in line with relevant guidance, as presented in the following table (NRA, 2008). These descriptive phrases are considered development specific terms for describing potential effects of the Development, and do not provide for considering baseline trends and therefore are utilised to qualify impacts in terms of weighting impacts relative to Site attribute importance and scale.

Table 8.4: Qualifying the Magnitude of Impact on Soil and Geological Attributes

Magnitude of Impact	Description	Example
Large Adverse	Results in a loss of attribute.	Removal of the majority (>50%) of geological heritage feature.
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute.	Removal of part (15-50%) of geological heritage feature.
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute.	Removal of small part (<15%) of geological heritage feature.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity.	No measurable changes in attributes.
Minor Beneficial	Results in minor improvement of attribute quality.	Minor enhancement of geological heritage feature.
Moderate Beneficial	Results in moderate improvement of attribute quality.	Moderate enhancement of geological heritage feature.
Major Beneficial	Results in major improvement of attribute quality.	Major enhancement of geological heritage feature.

8.2.5.3 Significance Criteria

Considering the above definitions and rating structures associated with sensitivity, attribute importance, and magnitude of potential impacts, rating of significant environmental impacts is done in accordance with relevant guidance, as presented in the table below which is, in effect, a risk matrix.

This matrix qualifies the magnitude of potential effects, based on the weighting of these effects considering their importance and/or sensitivity of the receiving environment. In terms of Soils and Geology, the general terms for describing potential effects (**Table 8.3: Describing the Magnitude of Impacts**) are not linked directly with the Development specific terms for qualifying potential impacts (**Table 8.4: Qualifying the Magnitude of Impact on Soil and Geological Attributes)** therefore, both descriptive (**Table 8.3**) and qualifying (**Table 8.4**) terms are used in describing potential impacts of the Project. This is largely driven by the likely localised characteristic of potential effects arising as a product of the Project in terms of Soil and Geology, and the separation of land areas based on baseline conditions (**Section 8.4**).

Table 8.5: Weighted Rating of Significant Environmental Impacts

Sensitivity (Importance of Attribute)	Magnitude of Impact			
	Negligible (0-2%)	**Small (2-15%)**	**Moderate (15-50%)**	**Large (>50%)**
Extremely High	Slight / Moderate	Significant	Profound	Profound
Very High	Slight	Significant / Moderate	Profound / Significant	Profound
High	Slight / Imperceptible	Moderate / Slight	Significant / Moderate	Profound / Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

8.2.5.4 Scoping Responses and Consultation

Information has been provided by a number of consultee organisations during the assessment, and this is summarised in **Table 8.6**. The response to each point raised by consultees is also presented within the table, demonstrating where the design of the Project has addressed responses to specific issues indicated by respective consultees.

Table 8.6: Scoping Responses and Consultation

Consultee	Type and Date	Summary of Consultee Response With Relevance to This Chapter	Addressed
IPPC (Irish Peatlands Conservation Council)	Letter in response to Scoping Report Received 22 February 2023	*"Landslide Susceptibility - Of the nine proposed wind turbines six are located on areas of high or moderately high landslide susceptibility. Peat has an exceptionally high water content, is a low density material with low compressive strength. Disturbed peat also has a low sheer strength. These parameters allow long runouts to develop when there is a peat failure with the potential to destroy aquatic wildlife directly and downstream. The possibility and extent of runouts could be examined further to ascertain where these might occur, what paths they would take and what would be at risk environmentally. This of course has to be dove-tailed with proper contingency and management plans in the event of an actual peat-slide. There is a high possibility that if there is a peat slide event it would affect neighbouring designated sites which would be unacceptable and disastrous. If there is a possibility of any more damage occurring to the designated sites and ANNEX habitats as a result of this development then the project should not go ahead. Suitable measures must be taken to ensure landslide susceptibility levels are not worsened due to the disturbance associated with this development. The IPCC could not support a project that does not assess the risks in relation to increased landslide susceptibility."*	Peat stability is addressed primarily in **Section 8.3.10** and within the PSRA contained in **Appendix 8.1**.
GSI (Geological Survey of Ireland)	Letter in response to Scoping Report 18 January 2022	*"Geoheritage – Our records show no CGSs (County Geological Sites) in the immediate vicinity of the proposed wind farm."* *Geological Mapping - Geological Survey Ireland maintains online datasets of bedrock and subsoils geological mapping that are reliable and accessible. We would encourage you to use these data which can be found here, in your future assessments.* *Geohazards - Geohazards can cause widespread damage to landscapes, wildlife, human property and human life. In Ireland, landslides, flooding and coastal erosion are the most*	Geoheritage is addressed in **Section 8.3.8** of the EIAR. Online geological maps were consulted during the Desk Study which is addressed in **Section 8.2.3**. Peat stability is addressed primarily in **Section 8.3.10** and within the PSRA contained in **Appendix 8.1**.

Consultee	Type and Date	Summary of Consultee Response With Relevance to This Chapter	Addressed
		prevalent of these hazards. We recommend that geohazards be taken into consideration, especially when developing areas where these risks are prevalent, and we encourage the use of our data when doing so. Landslides are common in areas of peat, rock near surface and in fine to coarse range materials (such as glacial tills), areas which are found within the proposed wind farm area. Geological Survey Ireland has information available on landslides in Ireland via the National Landslide Database and Landslide Susceptibility Map both of which are available for viewing on our dedicated Map Viewer. Associated guidance documentation relating to the National Landslide Susceptibility Map is also available. *Natural Resources (Minerals/Aggregates) - Geological Survey Ireland is of the view that the sustainable development of our natural resources should be an integral part of all development plans from a national to regional to local level to ensure that the materials required for our society are available when required. Geological Survey Ireland highlights the consideration of mineral resources and potential resources as a material asset which should be explicitly recognised within the environmental assessment process. We would recommend use of the Aggregate Potential Mapping viewer to identify areas of High to Very High source aggregate potential within the area. In keeping with a sustainable approach we would recommend use of our data and mapping viewers to identify and ensure that natural resources used in the proposed Gortloughra Wind Farm are sustainably sourced from properly recognised and licensed facilities, and that consideration of future resource sterilization is considered."*	Natural resources are addressed in **Section 8.3.7**.
Cork County Council	Letter in response to Scoping Report 11 April 2022	*"Note – Given the occurrence of peatland habitats at the site, a peat stability assessment to manage all risks associated with peat instability should/ will likely be provided. I note that any such peat stability assessment and peat management*	Peat stability is addressed primarily in **Section 8.3.10** and within the PSRA contained in **Appendix 8.1**.

Consultee	Type and Date	Summary of Consultee Response With Relevance to This Chapter	Addressed
		plan will need to be assessed by technically competent persons on behalf of Cork County Council to assess the conclusions of these reports and ensure the site is safe from the risk of peat failure/slips/slides or erosion."	
Irish Water	Letter in response to Scoping Report Received 22 June 2023	*"Where the development proposal includes backfilling of materials, the waste sampling strategy for the proposed development to ensure the material is inert."*	Only clean, inert fill will be used in the development. These issues are addressed in **Sections 8.4.2.1.3** and **8.4.2.1.4**.

8.3 BASELINE DESCRIPTION

8.3.1 Introduction

An investigation of the existing land, soils and geology characteristics of the Study Area was conducted by undertaking a desk study, consultation with relevant authorities and Site-based fieldwork surveys. All data collected has been interpreted to establish the baseline conditions within the Study Area and the significance of potential adverse effects have been assessed. These elements are discussed in detail in the following sections.

8.3.2 Site Description

The Site is located 9.7 km north-west of Dunmanway, Co. Cork and 19 km south-east of the county boundary between Cork and Kerry. The Site is located on relatively high ground, at elevations ranging from 243 m AOD on the northern side of the site at the entrance 326 m, to 510 m AOD towards the middle of the Site and 306 m AOD on the southern side of the Site.

The Site is located within the townlands of an tSeithe Bheag (Shehy Beg) (Muscraí Gaeltacht), Gortloughra, Cloghboola and Inchinroe.

The Site extends to 117.21 ha. The lands are under the ownership of third parties and the principal land use in the general area is comprised of agricultural sheep grazing, farmland and open mountain heath.

The pre-planning site investigations show that there are vast areas of shallow peat of less than 0.5 m with some isolated and deep pockets of up to 3.8 m. The presence of peat on site

and other constraints have influenced the project design. This is further detailed and assessed within this chapter of the EIAR.

The southern extent of the Site is located within the townland of Shehy Beg. To the south and south-east of the site are the townlands of Shanacrane West and Tooren respectively.

To the north of the Site there are additional areas of blanket bog, forestry, Douce Mountain, Lough Nambrackderg, pre-existing Shehy More Windfarm and the townlands of Shehy More, Cloghboola, Derryriordane South and Inchiroe. To the east of the site is the townland of Coolmountain and additional areas of forestry.

To the west and south-west of the Site are the townlands of Gortloughra, Coomclogh, Glanycarney, the Cousane Gap and the R585 road. The wider area surrounding the Site is rural in nature with low intensity agriculture in the form of pastoral grassland, peat harvesting and commercial forestry plantations being the predominant land use.

The topography of the Site is mountainous and undulating with slopes locally recorded up to 30° at some probe locations. The turbines are generally located on areas of moderate slope (typically less than 10°, although locally slopes do exceed 10°) and with low peat depths (typically less than 0.5 m). Due to the slope of the ground, little ponding was observed, however most of the peat was saturated during the field surveys.

The Site forms part of the southern fringes of the Shehy Mountains and is therefore generally elevated in nature. The highest peak at the site is Shehy More (546 m OD) which broadly divides the northern and southern sections of the Site. To the north of the Site is Douce Mountain (474 m OD), in between Douce Mountain and Shehy More is a valley through which the L8544 local road traverses and which forms part of the northernmost extent of the Site. The northern portion of the site ranges in elevation from 200 m OD with increasing steeper inclines existing to the south as far as the summit of Shehy More at 546 m OD.

The southern face of Shehy More is also steep with elevations reducing rapidly from 546m OD to 400 m OD across an approximate distance of 300 m. The southernmost extent of the Site ranges in elevation from approximately 250 – 300 m OD. Further south beyond the Redline Boundary the topography is generally flat in the townland of Shanecrane East at an elevation of approximately 120 m. To the west of the Site beyond the EIAR boundary is Carrigmount with an elevation of 342 m OD. To the east and south-east of the Site there are

peaks ranging in elevation from 312 m OD, 332 m OD and 375 m OD and the Cousane Gap through which the R585 regional road traverses.

8.3.3 Turbine Delivery Route (TDR)

Temporary works will be required to accommodate the delivery of the turbine components. These temporary works are subject to a separate planning application but are assessed as part of this EIAR and are located in the townlands of Lackanashinnagh, Shanacashel, Mallow, Glan, Curradrinagh, Seanlárach (Shanlaragh), Kilnadur, Inchincurka, Carrigdangan, Johnstown, Commons, Derrygortnacloghy, Gortneadin, Carrignacurra, Cappanclare, Curraheen, Coolroe West, Cooragreenane, Gortaknockane, Gortnacarriga, Tooreenalour, Garraí na Tórnóra (Garryantornora), Cornery, Cloghboola, and Inchinroe.

While not part of the planning consent for this planning application, this EIA also assesses the works at 18 No. locations along the TDR from Port of Cork to Site.

The proposed TDR is shown in **Figures 8.7** to **8.12** in **Volume III**.

8.3.4 Grid Connection Routes

The townlands along which the two grid connection options transverse include:

- **Option A (Dunmanway):** an tSeithe Bheag (Shehy Beg), Gortloughra, Inchinroe, Cloghboola, Cornery, Garraí na Tórnóra (Garryantornora), Tuairín na Lobhar (Tooreenalour), Gort na Carraige (Gortnacarriga), Moneylea, Coolcaum, Coolmountain, Tullagh, Moneyreague, Togher, Cooranig, Keelaraheen, Neaskin, Ardcahan, Knockduff, Gurteennasowna and Ballyhalwick.
- **Option B (Carrigdangan):** an tSeithe Bheag (Shehy Beg), Gortloughra, Inchinroe, Cloghboola, Cornery, Garraí na Tórnóra (Garryantornora), Tuairín na Lobhar (Tooreenalour), Gort na Carraige (Gortnacarriga), Cooragreenane, Coolroe West, Gortnahoughtee, Derryleigh, Gortatanavally, Carrigdangan and Johnstown.

The GCR options follow the existing road networks. The use of existing infrastructure at bridges, horizontal directional drilling (HDD) under watercourses and/or the replacement of some exiting culverts with appropriately sized new culverts along the grid connection route will be carried out to facilitate the construction of the Grid Connection. Short duration temporary shallow trenching will be carried out along the reminder of the Grid Connection. As the Grid Connection will be predominantly within existing road pavements, there will be negligible impact on the existing soils and geology.

The route of the above grid connection options is provided in **Figure 8.1** to **Figure 8.6** in **Volume III**. The grid feasibility study carried out by TLI can be found in **Appendix 2.2**.

8.3.5 Bedrock Geology

The GSI maps and website for this area shows that the majority of the site is underlain by Devonian age sedimentary "Old Red Sandstone" (Ardaturrish Member and Old Head Sandstone Formation) as shown in **Figure 8.1** in **Volume III**. It should be noted that outcrops of bedrock are present throughout the Site, particularly within the upland (central) parts of the main Site around Shehy More. Examples of typical outcrops are shown in **Plates 8.1** and **8.2**.

The proposed Grid Connection options also traverse Devonian age "Old Red Sandstone" (shown in **Figure 8.1**). In addition to the Ardaturrish Member and Old Head Sandstone Formation, both GCR options also traverse the Toe Head Formation, Castlehaven Formation, Gun Point Formation, and Caha Mountain Formation.

In addition to the above formations, the TDR also traverses the Little Island Formation, Waulsortian Limestone, Ballysteen Formation, Cork Red Marble Formation, the Ballytrasna Formation, the Gyleen Formation and the Clashavodig Formation.

Structurally, the site is crossed by a northwest-southeast trending fault which does not appear to pass through any turbine locations but does cross the GCR and TDR. An anticlinal fold axis trends east-west across the northern part of the site. These structures will not have any significant effect on the Project.

Plate 8.1: Example Outcrop of Sandstone within the south-east part of the site (near T09)

Plate 8.2: Example Outcrop of Siltstone within the north of the site (between T01 and T02)

8.3.6 Soils and Subsoils

The desk study on soils includes a detailed review of published literature and datasets on soils, subsoils and minerals pertaining to the site. From information obtained from the GSI[1] and EPA[2] websites, the following soils are understood to exist on the Site.

- Shallow rock covers the majority of the site with minor areas of blanket peat and glacial till (based on the GSI online mapping). Peat is absent from most of the Site and from the vast majority of the Grid Connection and TDR;
- Glacial till derived from the underlying sandstone and shale covers approximately 10% or less of the main Site area and around 50% of the Grid Connection and TDR.
- Approximately 50% or more of the main site has very shallow/exposed bedrock and hence has little or no superficial geology cover.

An overview of the superficial geology for the main site and the Grid Connection options and surrounding areas is shown in **Figure 8.2**, located in **Volume III**. The superficial geology for the TDR is shown in **Figure 8.8** of **Volume III**.

8.3.6.1 Peat Depths

Peat depths within the Redline Boundary of the Site are given in **Table 8.7** below.

Table 8.7: Peat Depth Distribution by Category

Peat Depth Category	Number of Survey Points
A – Rock/Very Shallow Peat/Topsoil (0.0-0.5m)	253
B – Shallow (0.6-2.0m)	91
C – Moderately Deep (2.1-3.5m)	9
D – Deep (3.6-5.0m)	1
E – Extremely Deep (>5m)	0
Total	**354**

The table shows that the majority of the peat covering the Redline Boundary area of the Site lies in the range of 0.0-0.5m depth. The maximum peat depth recorded was 3.8m, with an average depth over the main Site of 0.49m. An additional 1112 probes were undertaken outside the current Redline Boundary.

[1] https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228
[2] https://gis.epa.ie/EPAMaps/

8.3.7 Geological Resource Importance

The GSI website for this area shows that there are no active registered quarries close to the Site, GCR or TDR. The GSI show that the site is underlain by bedrock with a moderate to high aggregate potential.

There are no recorded pits, quarries of mineral localities recorded near to the Site. The locations of the nearest registered quarries and mineral deposits relative to the Site and GCR are shown on **Figure 8.6** in **Volume III**. The nearest quarries and mineral locations relative to the TDR are shown on **Figure 8.12** in **Volume III**.

8.3.8 Features of Geological Heritage

The GSI also maintains a database for known Geological Heritage sites in Ireland. There are no Geological Heritage sites close to the Site boundary as shown in **Figure 8.5** in **Volume III**. The nearest recorded Geological Heritage site is approximately 4km northwest of the Redline Boundary at Derreendonee, Inchi Beg. In addition, the Bantry Drumlins are located approximately 7km southwest of the site as also shown in **Figure 8.5**. Details of the nearest geological site are taken from the GSI website and reproduced below.

Table 8.8: Geological Site at Inchi Beg

Site Name	Pass of Keimaneigh
IGH Theme	IGH 7
County	Cork
Townland	Derreendonee, Inchi Beg
Description	Spillway
Designation	CGS
Features	Spillway
Coordinates (IG)	110000, 64000
Coordinates (ITM)	509969.502, 564064.093

In addition to the above-named heritage site, the TDR passes adjacent to the Killumney Moraine as shown in **Figure 8.11** of **Volume III**. No works are proposed for the TDR at this location, hence there will be no impact on this geological heritage site.

8.3.9 Landslide Susceptibility

The GSI maintains a Landslide Susceptibility Map for Ireland. Although some statistical approaches were also explored, the literature research and the requirement for a methodology that could be applied to Ireland as a whole coupled with the uncertainty as to how many additional landslides would be found by extending the inventory lead to a methodology known as the Unique Condition Unit (UCU) approach. As the name suggests,

UCUs are parcels of terrain where a set of attributes are combined in a unique way. In the context of landslide susceptibility mapping, the attributes being considered are slope, soil type and an index which is a measure of overland flow concentration from intense rainfall events. The latter parameter has been called the Topographic Flow Index (TFI). As shown in **Figure 8.4** and **Figure 8.10** in **Volume III**, the Landslide Susceptibility for the Site, GCR's and TDR have been categorised by the GSI as Low to High, being generally high on the steeper, rocky parts of the Site and low on the plateaus.

The GSI also maintains a database of known landslides in Ireland. The database records no landslides on or adjacent to the Site. The nearest recorded landslide is recorded approximately 3.5km south of the Site as shown in **Figure 8.3** in **Volume III**. This event is recorded as a rock fall, located at Goulacullin in 2001. In addition, a landslide feature is also recorded approximately 5km south of the TDR at Ballygarvan as shown in **Figure 8.9** in **Volume III**.

8.3.10 Peat Slide Risk Assessment

A Peat Stability Risk Assessment (PSRA) for the Site was carried out by Garne Geotechnical Services. The details and conclusions of the PSRA are presented in the report dated 10th March 2025.

A qualitative slope stability assessment was carried out for the turbine and Onsite Substation and Control Building locations. This assessment showed that the risk of a peat slide occurring at the proposed locations of turbine T03, T04, T06, T08, T09 and the substation are considered to be "Low", while the risk of a peat slide occurring at turbines T01, T02, T07 and the Temporary Construction Compound is considered to be negligible due to a recoded peat depth of 0.5 m or less. The risk of a slide occurring along both the proposed Grid Connection Routes is also considered to be negligible due to a combination of low slopes and generally thin or absent peat in addition to the Grid Connection Route being located within existing roads and pavements.

A quantitative slope stability assessment was also undertaken for the proposed turbine and Onsite Substation and Control Building locations and along the line of the proposed Site access tracks. This assessment calculated a "Safety Ratio" for 98 probe locations where peat depth, slope and shear strength were also measured. **Figures 6 to 10** of the PSRA show the locations for each of the slope stability calculations. These calculations are based on the current ground and do not include any surcharge loadings. The results show no

locations having a calculated "Safety Ratio" of greater than 1.0 (indicated on the PSRA Figures by red dots).

Figures 11 to 15 of the PSRA show the locations for each of the slope stability calculations with the addition of a 20 kPa surcharge. This load is equivalent of stockpiling approximately 2 m depth of peat, or a typical loading from a "floating road" with construction traffic. The calculations now show 7 locations of elevated risk within the Redline Boundary (indicated by red dots), being located approximately 150 m west and 100 m south T01, 75 m northeast of T02 (**Figure 11**) and 150 m north of T08 (**Figure 14**).

8.3.11 Designated Sites

There are no Special Areas of Conservation (SACs) or Special Protection Areas (SPAs) (collectively referred to as Natura 2000 sites) within the Site boundary nor in close proximity to the Site. The following areas which lie close to the Site are designated according to the EPA's Map Viewer:

- Bandon River SAC (Site Code 002171) and pNHA. This lies approximately 7.3 km south-east of the Site. There is tenuous surface water connectivity between the Site and Bandon River SAC via the headwaters of the Bandon River which drain the Site;
- Derryclogher (Knockboy) Bog SAC (Site Code 001873) is located approximately 8.5 km west of the Site and is not hydrologically connected to the Site; and,
- The Conigar Bog NHA (Site Code 002386) is located approximately 5.5 km north-east of the Site. The Bog is located upstream of the proposed Site via multiple different rivers. Any potential hydrological connectivity between the proposed Site and Conigar Bog NHA is therefore very tenuous. Further information can be found in Chapter 6: Biodiversity.

8.4 ASSESSMENT OF POTENTIAL IMPACTS

8.4.1 Do Nothing Impact

The "Do Nothing Impact" is the effect on the Site should the Proposed Development not be constructed. In this case, it is envisaged that the current land use would remain as it is now, with continued low intensity grazing for cattle and sheep. Given the nature of the land, being generally rural uplands with occasional peat bog formation, it is unlikely that any substantial changes in this use will occur in the near future.

8.4.2 Construction Phase Potential Impacts

The Project is characterised by the following civil engineering works to provide the necessary infrastructure to complete the wind farm as described in **Chapter 2, Project Description**:

- Erection of eight wind turbines with an overall ground to blade tip height of 175 m. The candidate wind turbine will have a rotor diameter of 150 m and a hub height of 100 m.
- Construction of Site access roads, Turbine Hardstands and Turbine Foundations.
- Development of a site drainage network.
- Internal wind farm underground power and communications cabling.
- Erection of a permanent 100 m Met Mast for monitoring wind speeds.
- Construction of a Temporary Construction Compound for use during construction.
- Excavation of 1 no. borrow pit.
- Biodiversity improvements including improvement of heath habitat in fenced off lands designated for Habitat Enhancement and restriction of livestock in lands to allow establishment of heath vegetation in these areas.
- Recreational community improvements including the erection of 4 No. permanent information boards relating to cultural heritage and upgrades to amenity tracks across the site.

The direct and indirect effects of the construction activities, and their expected duration are discussed further in the following sections. The effect on use of land and on natural resources required to carry out the works which relate to soils and geology is also discussed.

8.4.2.1 Subsoil and Bedrock Removal

Subsoil and bedrock removal will occur during construction excavations and is an unavoidable consequence of the Project. Removal of the soil and bedrock is considered to be a permanent effect as it would not normally be reversed although some reinstatement of the soils is possible after decommissioning. No further subsoil or bedrock removal will be required during operation. The overall weighted potential impacts here are considered to be of **slight** significance, **permanent** and **negative**.

8.4.2.1.1 Land Take

Some land take will be required during the construction and operation of the wind farm. This will be required for construction of Site access tracks, Turbine Foundations, Onsite Substation and Control Building, borrow pit and Met Mast. Temporary land take will also be needed for construction of grid cables both on and off the Site and for parts of the TDR which will require temporary widening.

8.4.2.1.2 Excavations

Excavations will be required for most aspects of the Project including for turbines, Turbine Hardstand areas, Site access tracks, TDR, Temporary Construction Compound, borrow pit, cable trenches and Grid Connection. Estimates of excavation volumes are presented in **Table 2.7.13 of Chapter 2.**

8.4.2.1.3 Turbines and Hardstand areas

Construction of the Turbine and Met Mast Hardstands will require the excavation of overburden material to the noted area and depth, the laying of a geotextile material on the formation surface and placing engineered stone and a top dressing. The main Turbine Hardstands will be 4,155 m^2 and will be 0.3 m in depth depending on the local bedrock profile and the varying soil depth giving a surface area of 33,240 m^2 for eight turbines and a material volume requirement of approximately 9,972 m^3.

The Turbine Foundations will be approximately 25.5 m in diameter and have a depth of approximately 2.25 m. The Turbine Foundation design will depend on the turbine type and will be decided by the structural engineers at detailed design stage but will fall within the above dimensions. The central part of the foundation will be approximately 6 m in diameter, will be raised from the main Turbine Foundation below ground level and will encompass cast-in bolts to connect to the bottom of the turbine tower and reinforced bar structural elements. The volume of concrete and steel required for each Turbine Foundation will be 590 m^3 and 86 tonnes respectively. The area around and above the Turbine Foundation will be backfilled with compacted granular material and the only portion exposed in the long term will be the central foundation section. Material will be sourced from the onsite borrow pit or from a local quarry (within 55 km), such as those identified in Table 2.4 of Chapter 2: Project Description and reproduced below as Table 8.9.

Table 8.9: Local Quarries and Concrete Suppliers

Quarry	ITM (Easting)	ITM (Northing)	Distance (km)	Direction
Mid Cork Quarries	527417	563055	11.20	E
Kilmichael Quarry	529902	564136	13.6	E
McSweeney Bros	129231	050925	16	SE
Roadstone Castlemore	544615	566921	28.50	NE
Keohane Readymix Shannonvale	537623	545474	26	SE
Finbarr O'Neill Limited	551046	572626	36.5	NE

Quarry	ITM (Easting)	ITM (Northing)	Distance (km)	Direction
Roadstone Ballygarvan	569239	564013	53	E

Depending on the results of these further confirmatory site investigations, the possibility of less invasive construction methods such as installing rock anchors will be explored as a means of reducing the footprint and material volumes of the Turbine Foundations. Traditional gravity foundations are considered for EIA purposes as this represents a worst-case scenario due to the amounts of concrete required (c.590 m^3 v c.300 m^3 for rock anchors).

Based on the results of peat probing and geotechnical assessments to date (detailed within this chapter), peat depths are not deep enough to require piling of Turbine Hardstands. Therefore, the construction method for all the Turbine Hardstands will be via excavated approach.

The construction methodology for the Turbine Foundations will depend on the strength and depth of the substrata (layers of rock or soil beneath the surface) specific to each location. Turbine Foundations will need to be taken down to competent bearing strata by excavating through the peat / soil, subsoil and rock if necessary.

The material encountered at each turbine and infrastructure location is considered to be mostly shallow topsoil/peat overlying bedrock. Minor areas of glacial till may also be encountered locally. It is expected that excavations for the majority of infrastructure will be taken down to bedrock. Due to the depth of the excavation required for the turbine foundations (maximum depth of 3 m), some excavation of rock will be required. The exact depth of excavation will be determined at detailed design stage.

Excavations will require imported granular fill material to upfill the excavation to the levels required for construction. This weighted impact is considered to have a **slight, permanent, negative** effect on the environment.

It is proposed that the structural granular fill material will be obtained from locally approved quarries (see **Table 8.9**) considering the onerous specification required for this type of material (the material has to conform to a regular suite of chemical and physical tests prior to use).

The environmental effects of the construction of the hardstanding foundations are similar to that of the founded Site access tracks as discussed in **Section 8.4.2.1.4**. Ground investigations in the form of peat probing and gouge coring has been carried out along the proposed Turbine Hardstand locations to inform the depth of excavation and upfill required. Similar to above, some of the material may be required from local quarries (see **Table 8.9**). The potential effect of extracting material from external quarries include extra pressure on transport routes and increased fuel consumption. This is discussed in **Chapter 14** "**Traffic and Transport**". Only licenced quarries will be used. All imported material will be fully tested in accordance with industry standards (TII Specification for Roadworks Series 800 and S.R.21 2014 + A1: 2016). Only verified clean, inert material will used.

8.4.2.1.4 Site Access Tracks

The Site access tracks are necessary to allow access for cranes and delivery trucks during construction of the Project and also during servicing/repairs to the wind turbines once operational. The existing access track from the L8544 will be upgraded and used to minimise additional land take. The Site access tracks will be upgraded and constructed so that the width will be 5 m but will be wider at bends where a width of 5.5 m is to be provided. The maximum gradient on the Site will be approximately 15.7% with the exception of the access track to the Met Mast which has a gradient of approximately 17.3%. A stone layer will be provided so as to provide a good grip during wet weather. Gradients above 12-14% will usually require components to be towed by a specialist towing vehicle. Considering the maximum gradient on site, as mentioned above, the towing of delivery vehicles is likely to be required.

Approximately 3,790 m of the existing Site access track length will be used for the Proposed Development. The upgraded Site access tracks will be approximately 17,055 m^2 in surface area and will require approximately 7,675 m^3 of stone material.

There will also be 2,040 m of new Site access tracks required for the Proposed Development. These will be constructed to provide a width of 4.5 m and will cover an area of 9,180 m^2 and require c.4,131 m^3 of rock. These roads will be excavated to firm bearing strata and constructed using rock from the Turbine Foundation excavations, the proposed borrow pit or imported to Site from a nearby quarry.

The Site access track layout follows the existing access track into the Site as far as possible, avoids environmental constraints, and follows the natural contours of the land. Every effort has been made to minimise the length of track necessary.

The Site access tracks will be upgraded to carry a minimum 12 tonne axle construction loading. The design will consist of 150 mm of 50 mm Down Quarried Rock / Gravel Pavement on an average of 400 mm Down Crushed Run Rock. The proposed Site access track construction detail is shown in **Figure 2.5** of **Chapter 2**.

The surface of the Site access tracks will be maintained during the construction phase. Harmful constituents such as hydrocarbons pose a risk of environmental contamination and also a risk to human health if found in drinking water sources. All imported stone to the Site will have undergone appropriate quality testing to Transport Infrastructure Ireland (TII) specifications.

Ground investigations in the form of peat probing has been carried out along the proposed Site access tracks to inform the depth of excavation and upfill required for the access tracks. Soil sealing is the covering of a soil with an impermeable material; it often affects agricultural land, puts biodiversity at risk and increases the risk of flooding. The use of impermeable material is an inevitable direct effect to some extent of most types of construction. Permeable geotextile is usually placed at the base of access tracks, along with other infrastructure, as part of their design. However, this will have a weighted **imperceptible, negative, permanent** impact due to the relatively small footprint of infrastructure and its location.

Similar to above, some of the material may be required from local quarries. The potential effect of extracting material from external quarries include for the extra pressure on transport routes and increased fuel consumption. This is discussed in **Chapter 14 "Traffic and Transport"**. Only licenced quarries will be used. All imported material will be fully tested in accordance with industry standards (TII Specification for Roadworks Series 800 and S.R.21 2014 + A1: 2016). Only verified clean, inert material will used. The weighted potential impacts here are considered to be **slight, permanent** and **negative**.

8.4.2.1.5 Bedrock Excavations

Due to the numerous areas of shallow bedrock encountered on the Site, it is likely that bedrock excavations will be required at some of the Turbine Foundations, Turbine Hardstands, Site access track excavations and possibly for Onsite Substation and Control Building excavations. A visual assessment or the exposed bedrock suggests that the excavated bedrock will predominantly comprise strong siltstone and sandstone. This material is likely to be suitable for re-use after crushing and screening, and would be of use as granular fill for Site access track construction.

The detailed confirmatory ground investigations prior to construction will confirm the quality and strength of the bedrock. It is likely that heavy breakers will be required in areas where deep or large excavations are required in very strong rock. Blasting will not be undertaken. The long-term weighted impacts of bedrock excavation are considered to be **slight**, **permanent** and **negative**.

8.4.2.1.6 Site Cable Trenches

Cable trenches throughout the Site will be excavated to a maximum depth of 1.2 m. Excavation of peat, bedrock and locally glacial till will be required. Imported granular fill will be used to surround the cables, however the majority of the excavated soils will be used for backfill with only minor amounts being removed and used elsewhere for berm landscaping. The weighted impacts associated with excavations for cable trenches are considered to be **slight**, **temporary** and **negative**.

8.4.2.1.7 Borrow Pit

One borrow pit is being proposed to enable on Site stone extraction for the construction of part of the Site access tracks and the Turbine Hardstands. It will be located within the northern part of the Site, between the Temporary Construction Compound and T1. Spoil will initially be excavated and stockpiled locally or for re-use for site remediation purposes. Peat depths in this area were found to be consistently below 0.5 m. The borrow pit will be reinstated using excavated soils which are unsuitable for re-use elsewhere on the Site. The weighted impacts associated with construction of the borrow pit are considered to be **slight, temporary** and **negative**.

8.4.2.1.8 Met Mast

As part of the grid code requirements, all wind farms with an installed capacity of greater than 10 MW are required to supply continuous, real-time data for the wind farm location. The data required is the wind speed and wind direction at turbine hub height, air temperature and air pressure. The data required for the Proposed Development will be provided by a dedicated meteorological mast of 100 m in height (location as detailed in **Figure 1.1** in **Volume III**).

The Met Mast will be located on the southwest of the Site as detailed in **Figure 1.2** and will be a free-standing lattice type structure as shown in **Figure 2.7**. The Met Mast foundation will be approximately 12 m by 12 m, with a depth of 2.25 m and will be designed and constructed similar to the Turbine Foundations. It will encompass a cast-in insert or bolts to connect to the bottom of the met mast and reinforced bar structural elements. The area around and above the foundation will be backfilled with compacted granular material (gravel like material).

The Met Mast will be linked to the Onsite Substation and Control Building via buried Wind

Farm Internal Cabling for power and communication and will be required for the full operational duration of the Proposed Development.

The weighted impacts associated with construction of the met mast are similar but less than for construction of the turbines and are considered to be **insignificant, permanent** and **negative**.

8.4.2.1.9 Temporary Construction Compound

It is proposed to construct a Temporary Construction Compound close to the entrance to the Site adjacent to the L8544 minor road. Construction will comprise the excavation and removal of any peat/topsoil and shallow bedrock and the importation of granular fill which will be placed and rolled. The area for the Temporary Construction Compound was chosen in an area of cutaway bog in order to minimise the habitat impact. The weighted impacts associated with construction of the compound are similar but less than for construction of the Site access tracks and are considered to be **insignificant, temporary** and **negative**.

8.4.2.1.10 Volumes of Material to be Excavated

Estimated total volumes of material to be excavated are presented in **Table 2.6** of **Chapter 2**.

8.4.2.1.11 Summary of Impacts Due to Subsoil and Bedrock Removal

A general summary of the pre-mitigation impacts associated with subsoil and bedrock removal is presented in **Table 8.9.**

Table 8.9: Impact Summary – Subsoil and Bedrock Removal

Impact Description	Type	Quality	Significance	Weighted Significance	Extent	Context	Probability	Duration / Frequency
Subsoil and bedrock removal	Direct	Negative	Moderate	**Slight**	Site	Conforms to baseline	Likely	Permanent

8.4.2.2 Storage and Stockpiles

8.4.2.2.1 Overview

It is expected that the majority of spoil generated on Site will be either peat or rock. It is expected that the majority of rock (and possibly minor quantities of glacial till) will be reused for the construction of Site access tracks and reinstatement of the borrow pit. However, some stockpiling of spoil is likely to be required adjacent to the borrow pit prior to reinstatement.

As a worst case, stockpiling of spoil can give rise to increased pore pressures and the possibility of a bog burst or peat slide. Careful management of the spoil and ongoing landslide risk assessments will minimise the possibility of a landslide occurring. Due to the limited extent of peat encountered on the Site, it has been assessed within the PSRA as having a very low risk of peat instability. Refer to **Appendix 8.1 PSRA**.

8.4.2.2.2 Spoil Management

The handling, management and re-use of excavated materials are of importance during the construction phase of the project. Excavated material will arise from all infrastructure elements of the windfarm (Turbine Foundations, access tracks, Turbine Hardstands etc.). Peat should be stockpiled no higher than 1.5 m and follow the recommendations set out in the NRA Guidelines for the Management of Waste from National Road Construction Projects (NRA, 2014).

There is potential for a moderate negative effect on soil due to erosion of inappropriately handled excavated materials. However, any effects from the handling of excavated materials will be managed through good site practice (see Mitigation Measures in **Section 8.5**).

Organic matter loss can occur when wet peat is excavated and allowed to dry in the open air. For this reason, stockpiling of the peat will be reduced wherever possible, however some temporary stockpiles will be required adjacent to the borrow pit prior to reinstatement. Excavation of peat material results in the removal of an important carbon sink. A Carbon Calculator can be found in **Chapter 15**, **Air Quality and Climate**, which addresses the effect of loss of carbon to the atmosphere through the drying out of peat excavated as part of the Proposed Development.

All excavated topsoil and/or peat will remain on the Site and following temporary storage, will be used for landscaping purposes and used for reinstatement of the borrow pit. Excavated glacial till and bedrock will be re-used for the construction of Site access tracks. The process of spoil management on Site is expected to have a slight negative effect on the receiving environment.

8.4.2.2.3 Summary of Impacts Due to Storage and Stockpiles

A summary of the pre-mitigation potential impacts associated with soil/rock storage and stockpiles is given in **Table 8.10**.

Table 8.10: Impact Summary – Storage and Stockpiles

Impact Description	Type	Quality	Significance	Weighted Significance	Extent	Context	Probability	Duration / Frequency
Compaction, erosion and degradation of peat arising from vehicular movement	Direct	Negative	Moderate	Slight	Localised	Conforms to baseline Or Contrast to baseline	Likely	Long term / Permanent
Stability issues and slope failure arising from vehicular movement (Localised displacement)	Direct or Indirect / Secondary	Negative	Moderate	Slight	Localised / Potentially Regional	Contrast to baseline	Likely	Long term / Permanent
Stability issues and slope failure arising from vehicular movement (Landslide)	Indirect / Secondary	Negative	Moderate	Slight	Localised / Potentially Regional	Contrast to baseline	Unlikely	Permanent
Subsidence and settlement of newly established and upgraded Site tracks	Direct	Negative	Moderate	Slight	Localised	Conforms to baseline. Normal	Likely	Permanent
Compaction, erosion and degradation arising from vehicular movement (Localised displacement)	Direct or Indirect /Secondary	Negative	Moderate	Slight	Localised	Contrast to baseline	Likely	Long term / Permanent

8.4.2.3 Vehicular Movement

8.4.2.3.1 Overview

Vehicle movement will occur primarily during the construction phase of the wind farm. Construction vehicles will include cranes, excavators, dumper trucks, concrete trucks, private cars (construction personnel). During the operational phase, vehicles will generally be limited to occasional maintenance vehicles only. Additional vehicles including cranes will however be required in the event that any turbine requires replacement.

8.4.2.3.2 Compaction, Erosion and Degradation

Compaction of soils will occur during construction and to a limited extent during operation and decommissioning. In general, compacted soils will be excavated during construction, and access to soils away from hardstanding areas will be prevented. The weighted compaction impacts are considered to be **insignificant, permanent and negative**.

Erosion and degradation of exposed soils will also occur, primarily during construction. Weighted erosion and degradation impacts are also considered to be **insignificant, permanent and negative**.

8.4.2.3.3 Peat Stability and Slope Failure

The effects of peat stability and slope failure are discussed in **Section 8.3.10** and in the PSRA in **Appendix 8.1**. Whilst the possibility of a peat slide is considered to be very low, poorly managed construction activities (including traffic movement) can increase the risk. Any peat slide or slope failure which occurs will be localised due to the generally thin peat and the topography of the Site. Given the tenuous hydrological connectivity to designated sites in the wider region, any peat slide is highly unlikely to impact on a designated site. The weighted impact of this is considered to be **slight, permanent** and **negative**.

8.4.2.3.4 Site Access Tracks

Vehicle movement along the Site access tracks will again result in a slight compaction of the underlying soils, particularly in areas where floated roads are constructed. The impacts associated with vehicle movements along the Site access tracks is considered to be **slight, permanent** and **negative.**

8.4.2.3.5 Summary of Impacts Due to Vehicular Movement

A summary of the pre-mitigation impacts associated with vehicle movement is given in **Table 8.11**.

Table 8.11: Impact Summary – Vehicular Movement

Impact Description	Type	Quality	Significance	Weighted Significance	Extent	Context	Probability	Duration / Frequency
Compaction, erosion and degradation of peat arising	Direct	Negative	Slight	Insignificant	Localised	Conforms to baseline Or	Likely	Long term / Permanent

Impact Description	Type	Quality	Significance	Weighted Significance	Extent	Context	Probability	Duration / Frequency
from vehicular movement						Contrast to baseline		
Stability issues and slope failure arising from vehicular movement (Localised displacement)	Direct or Indirect / Secondary	Negative	Moderate	Slight	Localised	Contrast to baseline	Likely	Long term / Permanent
Stability issues and slope failure arising from vehicular movement (Landslide)	Indirect / Secondary	Negative	Moderate	Slight	Localised / Potentially Regional	Contrast to baseline	Unlikely	Permanent
Subsidence and settlement of newly established and upgraded Site tracks	Direct	Negative	Moderate	Slight	Localised	Conforms to baseline. Normal	Likely	Permanent

8.4.2.4 Soil Contamination

8.4.2.4.1 Overview

Use of waste materials during construction, operation and decommissioning will be minimised by good site practices and waste management plans (see **CEMP** in **Appendix 2.1**). The following sections present the possible pre-mitigation impacts associated with the use of construction plant.

8.4.2.4.2 Hydrocarbons

Wherever there are vehicles and plant in use, there is the potential for a direct hydrocarbon release which may contaminate the soil and subsoil. A hydrocarbon spill has the potential to indirectly pollute water, if the soil and subsoil act as a pathway from any source of pollution. Given the extensive mitigation measures presented in the CEMP, any fuel spill would be very small and would therefore present a **slight, long-term, negative** weighted impact on the soil and geological environment.

8.4.2.4.3 Wastewater and Sanitation

Wastewater/sewerage from the temporary construction compound will be placed in a holding tank, which will be emptied periodically. Chemicals will be used to reduce odours. The waste will be taken to a local wastewater sanitation plant for treatment. Wastewater or sewerage leakage may occur but will be small, localised and short-term. The weighted impacts

associated with wastewater and sewerage is considered to be **insignificant, permanent and negative**.

8.4.2.4.4 Construction Materials

All construction materials will be stored in secure areas. Any hazardous materials will be correctly stored within properly bunded areas in accordance with good Site practice as described in the IWEA and Scottish Best Practice Guidelines and in accordance with the CEMP (**Appendix 2.1**). The weighted impacts associated with the construction materials is considered to be **insignificant, permanent** and **negative**.

8.4.2.4.5 General Waste

All construction and operation waste materials will be correctly sorted, recycled or disposed of in accordance with best practice as described in the IWEA and Scottish Best Practice Guidelines and in accordance with the CEMP (**Appendix 2.1**). A policy of Reduce, Reuse and Recycle will apply. The weighted impacts associated with waste materials is considered to be **insignificant, permanent** and **negative**.

8.4.2.4.6 Summary of Impacts Due to Soil Contamination

The Development has the potential to give rise to the following pre-mitigation soil contamination effects, shown in **Table 8.12** below:

Table 8.12: Impact Summary – Soil Contamination

Impact Description	Type	Quality	Significance	Weighted Significance	Extent	Context	Probability	Duration / Frequency
Hydrocarbon contamination	Direct	Negative	Moderate	Slight	Localised*	Contrast to baseline	Likely	Long term / Permanent
Wastewater Sanitation contamination – Waste	Direct	Negative	Slight	Insignificant	Localised*	Contrast to baseline	Unlikely	Temporary
Wastewater Sanitation contamination – Chemicals	Direct	Negative	Slight	Insignificant	Localised*	Contrast to baseline	Unlikely	Long term / Permanent
Construction Material contamination	Direct	Negative	Slight	Insignificant	Localised*	Conforms to baseline	Likely	Long term / Permanent
General Waste contamination	Direct	Negative	Slight	Insignificant	Localised*	Conforms to baseline	Likely	Long term / Permanent
* Contamination of soils / peat by hydrocarbons is considered a localised impact, however if hydrocarbon contamination is intercepted by surface water features the impact is potentially regional (**Chapter 9: Hydrology and Hydrogeology**)								

8.4.3 Grid Connection Cable Routes Impacts

Grid connection trenches will also be excavated along the Grid Connections to either Dunmanway or Carrigdangan. The trenches will be predominantly within roads and verges, to a maximum depth of 1.2 m. Excavation of road aggregates, peat, bedrock and local glacial till will be required. The trenches will be backfilled using imported granular material. The excavated material will primarily be recycled on site (topsoil and peat may be re-used for landscaping around the substation and turbines whilst subsoils and bedrock will be re-used for access track construction or re-used for reinstatement of the borrow pit. The weighted impacts associated with excavations for cable trenches are considered to be **slight**, **permanent** and **negative**.

8.4.4 Turbine Delivery Route Impacts

While not part of this planning application, this EIAR also assesses the works at 18 No. locations along the TDR from Port of Cork to Site.

Temporary works will be required to accommodate the delivery of the turbine components. These temporary works are subject to a separate planning application but are assessed as part of this EIAR and are located in the townlands of Lackanashinnagh, Shanacashel, Mallow, Glan, Curradrinagh, Seanlárach (Shanlaragh), Kilnadur, Inchincurka, Carrigdangan, Johnstown, Commons, Derrygortnacloghy, Gortneadin, Carrignacurra, Cappanclare, Curraheen, Coolroe West, Cooragreenane, Gortaknockane, Gortnacarriga, Tooreenalour, Garraí na Tórnóra (Garryantornora), Cornery, Cloghboola, and Inchinroe.

There will be two turbine staging areas on either side of Crookstown and a blade lifter will be used to facilitate tight movements through Crookstown and bends in the road to Beal na Bláth. The site access will be from an existing entrance on the L8544 which will be upgraded to allow vehicles to turn in and out. It is proposed that the turbine nacelles, tower hubs and rotor blades will be landed in the Port of Cork. From there, they will be transported to the Site via the N28, N40, N22, R585, L4607and the L8544 to the upgraded site entrance.

There are 18 No. areas on the Turbine Delivery Route that will require works in third party lands. These are shown on **Table 2.5** in **Chapter 2**.

Generally, the impacts associated with this will be as per the Site access track construction but on a very minor scale and reversible. The weighted impacts are considered to be **insignificant**, **temporary** and **negative**.

8.4.5 Decommissioning of the Wind Farm

In general, the potential effects associated with decommissioning will be similar to those associated with construction but of reduced magnitude because extensive excavation, and wet concrete handling will not be required. The potential environmental effect of soil storage and stockpiling and contamination by fuel leaks will remain during decommissioning.

8.4.6 Cumulative Impacts

Cumulative effects of the Development with other developments in the region, as discussed in **Chapter 4 - Planning Policy Context**, relate to the indirect effects that may arise due to the use of public roads as haul routes to bring construction materials to Site and the cumulative effect on the use of natural resources.

There are 29 operational, consented and proposed wind farms within 20km of the Site, details of these are provided in **Table 2.1** in **Chapter 2**. For non-wind farm developments, including all small, medium and large-scale developments within 10km of the Site that are currently active in the planning system have been identified in **Appendix 2.4** of the EIAR.

The only other major development in the locality of the Site is the existing Shehy More Wind Farm, consisting of 11 turbines. The Shehy More Wind Farm abuts the existing Site to the north-east.

With respect to the soils and geology, the effects of the Proposed Development are considered to contribute to and add to the cumulative nature of adverse impacts imposed on the geology of the region. However, considering the relatively Low Importance of the land in this area, the potential for the Proposed Development to have adverse cumulative impacts on soils and geology is limited to the construction phase. In further consideration of the wider locality, given that the Shehy More Wind Farm is already constructed, the potential for in-combination effects is greatly reduced due to greatest impacts on soils and geology being most likely to occur during construction. In considering the absence of immediate proximity to designated sites, the Proposed Development is not considered likely to significantly contribute to cumulative effects in terms of soils and geology.

In terms of the Grid Connection route options and TDR, where short duration temporary works will be carried out, no existing or proposed developments have been identified which have the potential to result in cumulative impacts associated with the Proposed Development.

With respect to soils and geology, and the potential effects of the Proposed Development having been assessed as likely being localised, the Proposed Development is not considered to significantly contribute to cumulative effects.

8.5 MITIGATION MEASURES AND RESIDUAL IMPACTS

This chapter outlines the main mitigation measures which will be applied to the Proposed Development to reduce the effects of the impacts outlined previously.

8.5.1 Design Phase

8.5.1.1.1 Mitigation by Avoidance

The opportunity to mitigate any effect is greatest at the design period. In this respect, a detailed Site selection process was carried out by the Developer. This process identified deep peat and shallow bedrock as specific geotechnical constraints. The detailed Site selection process is described in **Chapter 3: Alternatives**. Furthermore, within the chosen Site, areas of deep peat and shallow bedrock were identified, and the infrastructure design sought to avoid those areas as much as possible.

In order to mitigate against the risk of landslide associated with the construction and operation of floating roads, areas of deep peat have been avoided wherever possible. It is intended that all roads will be constructed using conventional excavation and replacement construction methods.

8.5.2 Construction Phase

8.5.2.1 Subsoil and Bedrock Removal

Subsoil and bedrock removal will occur throughout the construction of the wind farm and is unavoidable. However, the impacts associated with this removal will be minimised using the following practices.

8.5.2.1.1 Mitigation by Avoidance

As mentioned previously, areas of deep peat and shallow bedrock have been avoided during construction by careful design of the wind farm.

8.5.2.1.2 Mitigation by Good Practices

Best practice as described in the IWEA and Scottish Best Practice Guidelines will be applied during construction which will minimise the amount of soil and rock excavation. All works will be managed and carried out in accordance with the **Construction Environmental**

Management Plan (CEMP) located in **Appendix 2.1**, which will be updated by the civil engineering contractor and agreed prior to any works commencing on Site.

All excavated peat will remain on Site. Localised areas of landscaping will be sealed and levelled using the back of an excavator bucket to prevent erosion.

8.5.2.1.3 Mitigation by Reduction

The disturbance of soil, subsoil and bedrock is an unavoidable effect of the Proposed Development, but careful design of the Wind Farm layout has been undertaken to ensure that the amount of earth materials excavated is kept to a minimum in order to limit the effect on the geological aspects of the Site (by avoiding areas of deep peat and shallow bedrock where possible and reducing the length of site tracks). The management of geological materials is an important component of controlling dust and sediment and erosion control.

8.5.2.1.4 Mitigation by Reuse

Bedrock will be re-used for construction of Site access tracks wherever possible. The bedrock will comprise predominantly sandstone and siltstone which, when crushed and graded, will provide a good sub-base for Site access track construction. In addition, where excavated, glacial till and gravel will also be re-used for construction of access tracks.

Peat, overburden, and rock will be reused wherever possible on Site to reinstate excavated areas. Where possible, the upper vegetative layer will be stored with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the landscaped peat. These measures will prevent the erosion of peat in the short and long term.

8.5.2.1.5 Mitigation by Remediation

On completion of the construction stage, any areas not required for operation will be reinstated. This will include the Temporary Construction Compound, turning areas and any materials storage areas. Granular material will be removed as required and reinstated with peat or other soils in keeping with the adjacent soils. Drainage will be reinstated, if required, to minimise future erosion of the soils and restore the pre-development state of the environment.

8.5.2.2 Storage and Stockpiles

8.5.2.2.1 Mitigation by Avoidance and Good Practice

The opportunity to mitigate any effect is greatest at the design period. In this respect, a detailed Site selection process was carried out by the Developer. This process identified deep peat and shallow bedrock as specific geotechnical constraints. The detailed Site selection process is described in **Chapter 3: Alternatives**. Furthermore, within the chosen Site, areas of deep peat and shallow bedrock were identified by extensive peat probing, and the infrastructure design sought to avoid those areas where possible. In this respect, by minimising volumes of excavation, volumes for storage and stockpiles will also be reduced, thus reducing the impacts associated with them.

Best practice as described in the IWEA and Scottish Best Practice Guidelines will be applied during construction which will minimise the amount of soil and rock excavation and therefore also reduce storage and stockpile requirements. All works will be managed and carried out in accordance with the **Construction Environmental Management Plan** (**CEMP** in **Appendix 2.1**), which will be updated by the civil engineering contractor and agreed prior to any Site works commencing.

8.5.2.2.2 Mitigation by Reduction

Whenever possible, soil and rock will be re-used on the Site immediately, thereby reducing the need for double handling, which will also reduce the requirements to stockpile soils. Generally, excavated rock will be used immediately for Site access track construction. Following temporary storage, topsoil and peat will be re-used on Site for landscaping purposes and for reinstatement of the borrow pit. Whenever possible, stockpiles will be avoided. Stockpiles of rock on peat soils will be avoided to prevent instability. Peat will only be stockpiled temporarily in areas of thin or absent peat and only in areas which have been confirmed for stability by a suitably experienced geotechnical engineer.

8.5.2.2.3 Vehicular Movements

Vehicular movements will be restricted to the footprint of the Proposed Development, particularly with respect to the newly constructed Site access tracks. This ensures that machinery must be kept on tracks and will not move onto areas that are not permitted for the Proposed Development.

Vehicular traffic on Site will be reduced through the re-use of excavated material on Site which will reduce the need to source material from external quarries.

8.5.2.2.4 Mitigation by Avoidance and Good Practice

Excavation volumes have been reduced during the design phase by avoiding areas of deep peat, shallow bedrock and by avoiding excessive cut and fill during construction. This will result in reduced excavation volumes and therefore reduced Site traffic.

Best practice as described in the IWEA and Scottish Best Practice Guidelines will be applied during construction which will minimise double handling, again reducing the Site traffic. All works will be managed and carried out in accordance with the Construction Environmental Management Plan (**CEMP** in **Appendix 2.1**), which will be updated by the civil engineering contractor and agreed prior to any Site works commencing.

Excavated peat will only be moved a short distance from the point of extraction to the temporary storage area and will be also be used locally for landscaping, thus again reducing the on-Site traffic. Excavated rock (and any glacial till) will be used for access track construction as close to the source of extraction as possible.

8.5.2.3 Ground Stability

8.5.2.3.1 Mitigation by Avoidance and Good Practice

Careful design of the Proposed Development has reduced the amount of construction required in areas of deep peat, high slopes and other areas of potential ground instability. Additionally, the following mitigation measures will also be applied as recommended in the PSRA (included as **Appendix 8.1**):

- Avoidance of stockpiling on the peat;
- Avoidance of peat berms in areas of potential instability (highlighted by low safety ratios);
- Additional drainage will be provided in areas of construction;
- Avoidance of drains discharging onto areas of weak or deep peat or areas of low safety ratios; and,
- Avoidance of blasting.

As noted in the PSRA, vehicular access to any areas of deep peat (>1m) during construction will be restricted to low ground pressure vehicles, with all construction vehicles travelling on existing access tracks whenever possible.

Best practice as described in the IWEA and Scottish Best Practice Guidelines will be applied during construction which will minimise the risk of ground instability. All works will be

managed and carried out in accordance with the CEMP (**Appendix 2.1**), which will be updated by the civil engineering contractor and agreed prior to any Site works commencing.

A Geotechnical Clerk of Works will be employed during the construction phase in order to continuously monitor areas of peat, in particular areas of deep peat and the areas of potential instability highlighted in the PSRA. Ongoing physical stability checks and calculations will be undertaken in order to verify that safety standards are being met. In particular, construction areas will be checked for signs of cracking, movement, bulking or subsidence which may give rise to subsequent instability. Any areas identified will require a detailed peat stability risk assessment and ongoing monitoring which will include sighting poles and lines to be set-up across slopes in addition to ground surveying to check for any signs of ground movement.

8.5.2.3.2 Emergency Response

The CEMP (**Appendix 2.1**) includes an emergency response to be applied in the event of a landslide or ground instability. In particular, catch fences and other physical barriers (i.e. concrete blocks) will be on Site and available in sufficient quantities to be used in the event of ground instability.

8.5.2.4 Soil Contamination

The CEMP (**Appendix 2.1**) includes provision for the checking of assets (plant, vehicles, fuel bowsers) on a regular basis during the construction phase of the Development. 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.

8.5.2.4.1 Mitigation by Avoidance and Good Practice

A fuel management plan is included in the **CEMP** (**Appendix 2.1**) and includes the following elements:

- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage area, away from drains and open water;
- Fuel containers will be stored within a secondary containment system e.g. bund for static tanks or a drip tray for mobile stores;
- Ancillary equipment such as hoses, pipes will be contained within the bund;
- Taps, nozzles or valves will be fitted with a lock system;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage; and,
- Only designated trained operators will be authorised to refuel plant on Site.

8.5.2.4.2 Mitigation by Reduction

As discussed previously, careful design of the Proposed Development has reduced the amount of Site traffic required on Site by reducing access tracks lengths, excavation volumes and double handling. Similarly, good Site practice and a robust CEMP (**Appendix 2.1**) will also result in less traffic and a lower potential for fuel spills and leakages.

8.5.2.4.3 Emergency Response

Procedures and contingency plans are proposed to deal with any emergency accidents or spills. An emergency spill kit with oil boom and absorbers will be kept on Site in the event of an accidental spill. All Site operatives will be trained in its use. In addition, all vehicles will also contain emergency spill kits. Further details will be provided within the emergency response plan in the CEMP.

8.5.2.5 Material and Waste Management

All materials used on Site and wastes generated on Site will be reduced by good Site practice and attention to the CEMP (**Appendix 2.1**). A policy of reduce, re-use and recycle will apply. All waste will be segregated and re-used where possible or removed from Site for recycling. Any waste which is not recyclable or compostable will be properly disposed to landfill. Whenever possible, excavated materials will be re-used close to the area of excavation. The careful design which has been achieved will result in minimal excess soil and rock.

8.5.2.6 Construction Phase Residual Impacts

The residual impacts after implementation of all mitigation measures for the construction phase of the Project are presented in **Table 8.13**.

Table 8.13: Residual Impact Summary

Impact Description	Type	Quality	Significance	Weighted Significance	Extent	Context	Probability	Duration / Frequency
Subsoil and bedrock removal	Direct	Negative	Moderate	Slight	Localised	Conforms to baseline	Unavoidable	Permanent
Storage of stockpiles (general)	Direct	Negative	Small	Insignificant	Localised	Conforms to baseline	Likely	Temporary

Impact Description	Type	Quality	Significance	Weighted Significance	Extent	Context	Probability	Duration / Frequency
Compaction, erosion and degradation of peat arising from vehicular movement	Direct	Negative	Small	Insignificant	Localised	Conforms to baseline Or Contrast to baseline	Avoidable	Long term / permanent
Stability issues and slope failure arising from vehicular movement (Localised/ regional displacement)	Direct or Indirect / Secondary	Negative	Slight	Insignificant	Localised / Potentially Regional	Contrast to baseline	Avoidable	Long term / permanent
Subsidence and settlement of newly established and enhanced Site tracks	Direct	Neutral	Slight	Insignificant	Localised	Conforms to baseline.	Likely	Permanent
Localised stability issues arising during construction activities (Localised displacement)	Direct or Indirect / Secondary	Negative	Slight	Insignificant	Localised	Conforms to baseline	Avoidable	Long term / Permanent
Hydrocarbon contamination	Direct	Negative	Slight	Insignificant	Localised*	Contrast to baseline	Avoidable	Long term / Permanent
Construction Material contamination	Direct	Negative	Slight	Insignificant	Localised*	Conforms to baseline	Avoidable	Long term / Permanent
General Waste contamination	Direct	Negative	Slight	Insignificant	Localised*	Conforms to baseline	Avoidable	Long term / Permanent

Note:

* Contamination of soils / peat by hydrocarbons is considered a localised impact, however if hydrocarbon contamination is intercepted by surface water features the impact is potentially regional (**Chapter 9 – Hydrology and Hydrogeology**)

8.5.2.7 Operational Phase

All wastes from the Onsite Substation and Control Building (subject to a separate planning application) and ancillary facilities will be removed by the appropriate contractor. The operational team will carry out maintenance works (to Site access tracks, Onsite 110kV Substation and Control Building and turbines) and will put in place control measures to mitigate the risk of hydrocarbon or oil spills during the operational phase of the windfarm. Any vehicles utilised during the operational phase will be maintained on a weekly basis and checked daily to ensure any damage or leakages are corrected.

The potential effects are limited by the size of the fuel tank of vehicles used on the Site. Additional potential impacts will occur in the event that a turbine needs replacement. The impacts associated with this will be similar to those involved for vehicles movements during construction but much reduced.

There are no other impacts relating to soils and geology during the operational phase of the Proposed Development.

8.5.2.8 Operational Phase Residual Impacts

The potential effects on the soil and geological environment during the operational phase of the work will be mitigated through good Site practice as described in the IWEA and Scottish Best Practice Guidelines as detailed in the CEMP (**Appendix 2.1**); vehicular movements, hydrocarbon controls, sustainable use of natural resources, human health etc. as discussed previously. Overall, the residual effects from these aspects will have a not **significant, permanent, negative** effect on the Site.

8.5.3 Development Decommissioning and Restoration Phases

8.5.3.1 Decommissioning of Infrastructure

Following the permitted lifespan of the wind farm, decommissioning of the infrastructure will occur or the Site may be repowered with more modern turbines, subject to a separate planning application. All physical infrastructure (turbines, Met Mast etc.) will be removed, re-used or recycled as appropriate or upgraded if the Site is to be repowered. Hardstands will remain in-situ due to the additional impacts which would be associated with their removal.

8.5.3.2 Decommissioning Phase Residual Impacts

The residual impacts associated with decommissioning includes waste generation, hydrocarbon leakage and erosion of soil and rock. In general, impacts will be similar to those at construction, but of a greatly reduced magnitude.

8.5.3.3 Reinstatement of Redundant Access Track and Hardstand Areas

Redundant access tracks, Turbine Foundations and Turbine Hardstand areas will be reinstated post construction. Some of the Site access tracks and hardstanding areas, if not required during operation, will also be reinstated (these areas will be identified at operation stage depending on operational requirements). Areas of excess soil and rock will be reused to match the surrounding land as near as possible. Drainage and slopes will be restored as close to the original ground as possible.

After decommissioning of the wind farm, all Site access tracks and areas of hardstanding will be returned to as close to their natural state as possible unless required by the landowners for agricultural activities and the access for the amenity trails.

8.5.3.4 Reinstatement Phase Residual Impacts

On completion of reinstatement works, it is expected that the wind farm will be returned as close to its present condition as possible. In particular, areas of peat and current drainage regimes will be reinstated. It is expected that the long-term residual impacts associated with the wind farm development will therefore be negligible.

8.6 SUMMARY OF SIGNIFICANT IMPACTS

Providing the mitigation measures outlined in this report are fully implemented and best practice as described in the IWEA and Scottish Best Practice Guidelines is followed on Site, it is expected that impacts associated with the development of the wind farm will not be significant. In addition, the cumulative effects of the development are also not considered to be significant. The **CEMP** (**Appendix 2.1**) also includes a suitable monitoring programme which will ensure that there is rigid adherence both to the CEMP and to the mitigation measures outlined here during construction, operation and decommissioning of the wind farm.

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