

Borrisbeg Grid Connection

Chapter 7 Land, Soils, Geology

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7.1 Introduction

7.1.1 Background and Objectives

Hydro-Environmental Services (HES) was engaged by RPS to carry out an assessment of the potential likely and significant effects of the Proposed Grid Connection. The Proposed Grid Connection will connect the Consented Wind Farm to the national grid via a loop in loop out connection to the existing overhead Ikerrin to Thurles 110kV line. This chapter assess the potential significant effects from the Proposed Grid Connection on the Land, Soils and Geology aspects of the receiving environment.

The Proposed Grid Connection is described in full in Chapter 3 of this EIAR.

This chapter provides a baseline assessment of the environmental setting of the Site, as described in Chapter 3, in terms of Land, Soils and Geology and discusses the potential likely significant effects that the construction, operation and decommissioning of the Proposed Grid Connection may have.

Where required, appropriate mitigation measures to avoid any identified significant effects to Land, Soils and Geology (i.e., natural resources) are recommended and the residual effects of the Proposed Grid Connection post-mitigation are assessed.

This chapter should be read in conjunction with the following Appendices:

- Appendix 7-1: Trial Pit Logs
- Appendix 7-2: Borehole Logs
- Appendix 7-3: Particle Size Distribution Certs

7.1.2 Statement of Authority

Hydro-Environmental Services (HES) are a specialist geological, hydrological, hydrogeological and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford.

Our core areas of expertise and experience includes soils, subsoils and geology. We routinely complete impact assessments for land, soils and geology, hydrology and hydrogeology for a large variety of project types including wind farms and renewable energy projects.

This chapter of the EIAR was prepared by Michael Gill and David Broderick. Michael Gill (P. Geo., B.A.I., MSc, Dip. Geol., MIEI) is an Environmental Engineer/Hydrologist with over 24 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms in Ireland. He has also managed EIAR assessments for infrastructure projects and private residential and commercial developments. In addition, he has substantial experience in wastewater engineering and site suitability assessments, contaminated land investigation and assessment, wetland hydrology/hydrogeology, water resource assessments, surface water drainage design and SUDs design, and surface water/groundwater interactions. For example, Michael has worked on the EIS/EIARs for Borrisbeg Wind Farm, Slievecallan Wind Farm, Cahermurphy (Phase I & II) Wind Farm, and Carrownagowan Wind Farm, and over 100 other wind farm related projects across the country.

David Broderick P.Geo (BSc, H. Dip Env Eng, MSc) is a Hydrogeologist with over 17 years' experience in both the public and private sectors. Having spent two years working in the Geological

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Survey of Ireland working mainly on groundwater and source protection studies David moved into the private sector. David has a strong background in groundwater resource assessment and geological, hydrogeological/hydrological investigations in relation to developments such as quarries and wind farms. David has completed numerous geology and water sections for input into EIARs for a range of commercial developments. David has worked on over 80+ other wind farm related projects across the country. David was involved in the preparation of the Land, Soils and Geology chapter for Borrisbeg Wind Farm (the Consented Wind Farm).

7.1.3 Relevant Legislation

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

- Planning and Development Acts, 2000-2021;
- Planning and Development Regulations, 2001 (as amended);
- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment;
- S.I. No. 296 of 2018 European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018;
- The Heritage Act 1995, as amended.

7.1.4 Relevant Guidance

The Land, Soils and Geology chapter of this EIAR was prepared in accordance with, where relevant, the guidance contained in the following documents:

- Environmental Protection Agency (2022): Guidelines on the Information to be contained in Environmental Impact Assessment Reports;
- Institute of Geologists Ireland (2013): Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements;
- National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DoHPLG, 2018); and,
- Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU), (European Commission 2017).

7.2 Assessment Methodology

7.2.1 Desk Study

A desk study of the Site and the surrounding areas was completed in July and August 2025. This involved collecting all relevant geological data for the Study Area. The desk study included consultation with the following data sources:

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland - Groundwater and Geology Databases (www.gsi.ie);
- Geological Survey of Ireland – Geological Heritage site mapping (www.gsi.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 18 (Geology of Tipperary). Geological Survey of Ireland (GSI, 1996);
- Geological Survey of Ireland – 1:25,000 Field Mapping Sheets;
- General Soil Map of Ireland 2nd edition (www.epa.ie); and,
- Aerial Photography, 1:5000 and 6 inch base mapping.

7.2.2 Baseline Monitoring and Site Investigation

Hydrological walkover surveys, including detailed drainage mapping and baseline monitoring/sampling, was undertaken by David Broderick of HES (refer to Section 7.1.2 above for qualifications and experience) on several dates between November 2022 and September 2023. These site surveys and site investigations were completed in order to characterise the baseline environment for the Consented Wind Farm and the Proposed Grid Connection. During these works a comprehensive geological dataset was collected, both for the Consented Wind Farm and for the Proposed Grid Connection.

The site investigation works completed for the Consented Wind Farm application comprised of the drilling of 3 no. boreholes, the completion of 143 no. soil/peat probes at the Wind Farm Site, 23 no. probes along the Proposed Grid Connection, the excavation of 16 no. trial pits and Particle Size Distribution (PSD) of 4 no. soil samples recovered from the trial pits.

The relevant data has been incorporated into this EIAR Chapter and includes the following:

- Site walkover surveys along the Proposed Grid Connection.
- The completion of 28 no. soil probes along the Proposed Grid Connection and at the end masts locations.
- The excavation of a trial pit (TP16) at the proposed 110kV Substation location.
- The 3 no. boreholes referred to above were drilled by Peterson Drilling Services in 2023. BH3 is located approximately 500m to the west of the proposed 110kV substation and has been included in this chapter to aid the characterisation of the hydrogeological environment.
- Logging of subsoil exposures across the Site where mineral soils and peat profiles are exposed; and,
- Mineral subsoils and peat were logged according to BS: 5930 and Von Post Scale respectively.

7.2.3 Scope and Consultation

The scope for this EIAR has been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties.

A scoping request was issued to Geological Survey of Ireland (GSI) on the 14th July 2025. A response was received on the 25th July 2025 which was informative in nature with regard sources of online data for baseline assessment purposes. No specific issues or concerns were raised in the GSI's scoping response.

A scoping request was issued to the Environmental Protection Agency (EPA) and the Department of Agriculture, Food and the Marine on the 14th July 2025. No response has been received to date.

7.2.4 Impact Assessment Methodology

Using information from the desk study and data from the site investigations, an assessment of the importance of the land, soil and geological environment within the study area and Site is assessed using the criteria set out in Table 7-1 (NRA, 2008).

Table 7-1: Estimation of Importance of Soil and Geology Criteria (NRA,2008)

Importance	Criteria	Typical Example
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 site 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 site 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.	Large historical and/or recent site for construction and demolition wastes.

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Importance	Criteria	Typical Example
	Degree or extent of soil contamination is minor on a local scale.	Small historical and/or recent landfill site for construction and demolition wastes.
	Volume of peat and/or soft organic soil underlying site is small on a local scale.	Poorly drained and/or low fertility soils.
		Uneconomically extractable mineral Resource.

The guideline criteria (EPA, 2022) for the assessment of likely significant effects require that likely effects are described with respect to their extent, magnitude, type (i.e. negative, positive or neutral) probability, duration, frequency, reversibility, and transfrontier nature (if applicable). The descriptors used in this environmental impact assessment report are those set out in the EPA, 2022 Glossary of effects as shown in Chapter 1 of this EIAR. In addition, the two impact characteristics proximity and probability are described for each impact and these are defined in Table 7-2.

In order to provide an understanding of this descriptive system in terms of the geological/hydrological environment, elements of this system of description of effects are related to examples of potential likely significant effects on the geology and morphology of the existing environment, as listed in Table 7-3.

Table 7-2: Additional Impact Characteristics

Importance	Criteria	Typical Example
Proximity	Direct	An impact which occurs within the area of the proposed project, as a direct result of the proposed project.
	Indirect	An impact which is caused by the interaction of effects, or by off-site developments.
Probability	Unlikely	The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
	Likely	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.

Table 7-3: Impact Descriptors related to the receiving environment

Importance	Characteristics	Potential Hydrological Impacts
Quality	Significance	
Negative only	Profound	Widespread permanent impact on: • The extent or morphology of a cSAC. • Regionally important aquifers. • Extents of floodplains.

Importance Characteristics		Potential Hydrological Impacts
		Mitigation measures are unlikely to remove such impacts.
Positive or Negative Significant		Local or widespread time-dependent impacts on: • The extent or morphology of a cSAC / ecologically important area. • A regionally important hydrogeological feature (or widespread effects to minor hydrogeological features). • Extent of floodplains. Widespread permanent impacts on the extent or morphology of an NHA/ecologically important area. Mitigation measures (to design) will reduce but not completely remove the impact – residual impacts will occur.
Positive or Negative Moderate		Local time-dependent impacts on: • The extent or morphology of a cSAC / NHA / ecologically important area. • A minor hydrogeological feature. • Extent of floodplains. Mitigation measures can mitigate the impact OR residual impacts occur, but these are consistent with existing or emerging trends
Positive, Negative or Neutral	Slight	Local perceptible time-dependent impacts not requiring mitigation.
Neutral	Imperceptible	No impacts, or impacts which are beneath levels of perception, within normal bounds of variation, or within the bounds of measurement or forecasting error.

7.2.5 Study Area

The study area for the land, soils and geological environment is limited to within the Site i.e. EIAR Site Boundary. There is no potential for the Proposed Grid Connection to effect the land, soils and geological environment outside of the Site. The desk study assessment did consider all available mapping within a minimum 2km distance of the Site.

7.2.6 Limitations and Difficulties Encountered

No limitations or difficulties were encountered during the preparation of the Land, Soils and Geology Chapter of the EIAR. The investigations carried out at the Site for the purpose of the EIAR and planning application are very thorough.

7.3 Existing Environment

7.3.1 Site Description and Topography

The Site is located approximately 3.8km northeast of the town of Templemore, Co. Tipperary. The proposed 110kV Substation, wind farm control buildings, and associated temporary construction compound are in agricultural pastures in the townland of Clonmore, to the southeast of the Consented Wind Farm.

The underground cabling route is located in the townlands of Clonmore and Strogue and measures approximately 2.1km (900m within the road network and 1.2km within agricultural fields). From the proposed 110kV substation, the underground cabling route travels to the east through agricultural fields for 120m. The Proposed Grid Connection underground cabling route then travels along the local road network (L-7039, L-7038 and a 5m crossing of the R433) for approximately 900m. The remainder of the Proposed Grid Connection underground cabling route (~1.08km) is located off of the existing road network and is proposed within new access tracks through agricultural grassland to the north of the Cork – Dublin Railway line or beneath the proposed temporary construction compound. The proposed 2 no. end masts are located in grasslands adjacent to the Ikerrin to Thurles 110kV overhead line. The Site has a total area of 47.5 hectares (ha).

Topography at the Site is relatively flat, ranging from 108 to 111mOD (metres above Ordnance Datum). Topography falls very gently to the southwest.

7.3.2 Land and Land Use

Based on Corine land cover mapping (2018), the Site is located in an area of agricultural pastures. No major land use changes have been recorded by Corine mapping (1990-2018). Land at the Site has been verified by inspection of recent aerial imagery and by walkover surveys. The proposed 110kV Substation, wind farm control buildings, temporary construction compound, 1.2km of the underground cabling route and the end masts are located in agricultural pastures. Meanwhile, approximately 900m of the Proposed Grid Connection underground cabling route is located along the local road network as stated in section 7.3.1 above.

7.3.3 Soils and Subsoils

The published EPA soil map (www.epa.ie) for the area shows that the Site is overlain predominantly by mainly basic poorly drained mineral soils (BminPD). The EPA also map some mineral alluvium soils along the underground cabling route, associated with the Clonmore Stream. Soils in the surrounding lands are mapped typically as BminPD soils, with some peat and basic well drained mineral soils (BminDW) mapped in the wider area.

The published GSI subsoils map (www.gsi.ie) for the local area shows that the Site is underlain predominantly by till derived from Carboniferous limestones (TLs). Some alluvium subsoils are also mapped along the underground cabling route, associated with the Clonmore Stream. Subsoils in the surrounding lands are mapped largely as TLs subsoils, with some cutover peat (Cut) mapped in the wider area. No peat subsoils are mapped to overlap with any element of the Proposed Grid Connection.

A subsoil geology map for the Site is shown as **Figure 7-1**.

Soils and subsoils at the Site have been verified through site investigations comprising of soil/peat probing and a trial pit excavation.

A total of 23 no. soil probes were completed along the underground cabling route and at the end masts. Only 7 no. probes encountered shallow peat or a peaty topsoil. Peat depths ranged from 0.2 to 0.3m.

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A trial pit was also excavated at the proposed 110kV substation location on 5th July 2023 and extended to a depth of 0.8mbgl (metres below ground level). This trial pit encountered 0.1m of mineral topsoil which was underlain by 0.3m of firm brown SILT/CLAY, which was in turn underlain by firm sandy, gravelly SILT/CLAY with cobbles and boulders.

The location of the soil probes and trial pits within the Site are shown on Figure 7-2.

Figure 7-1: Subsoils Geology Map

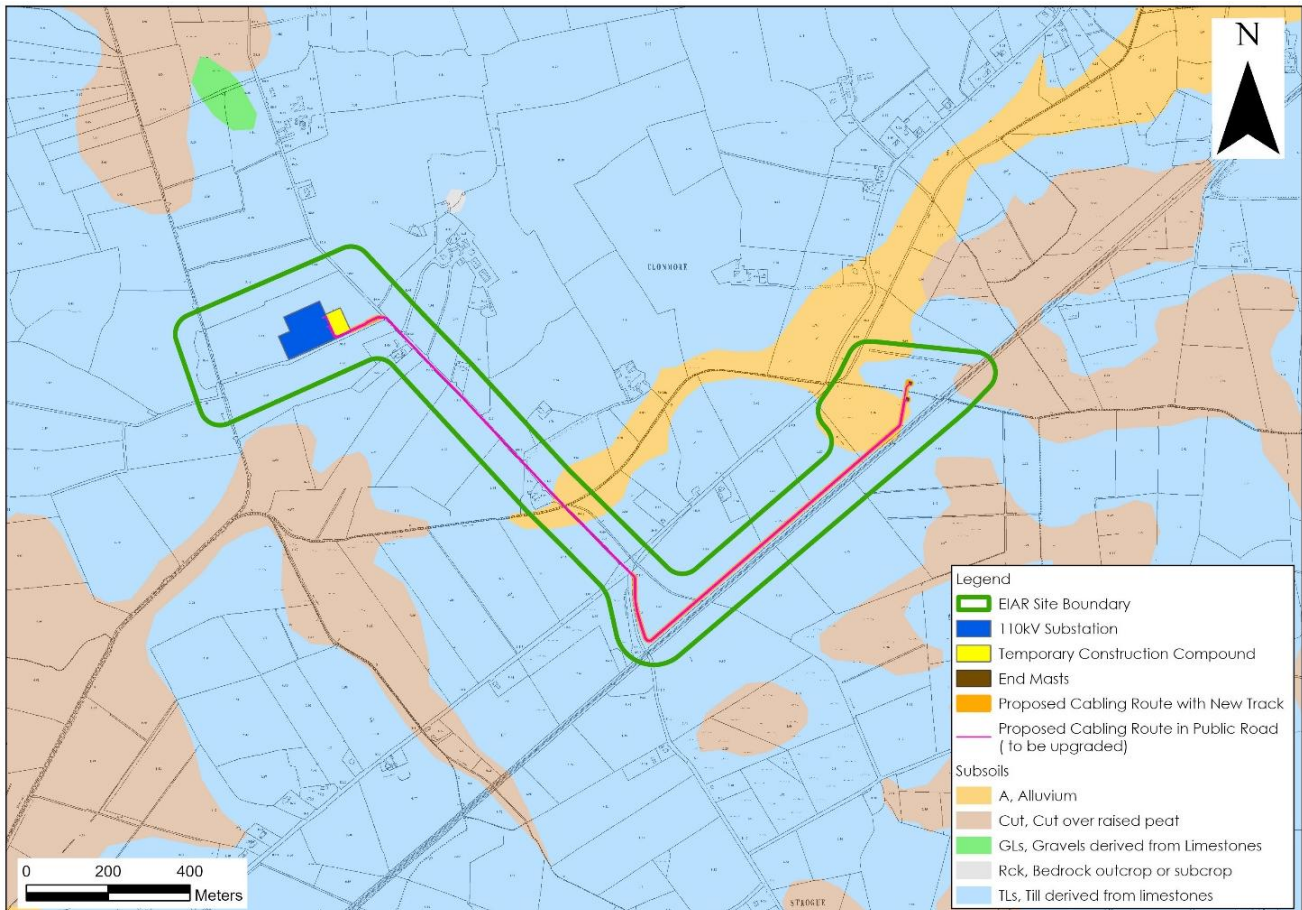
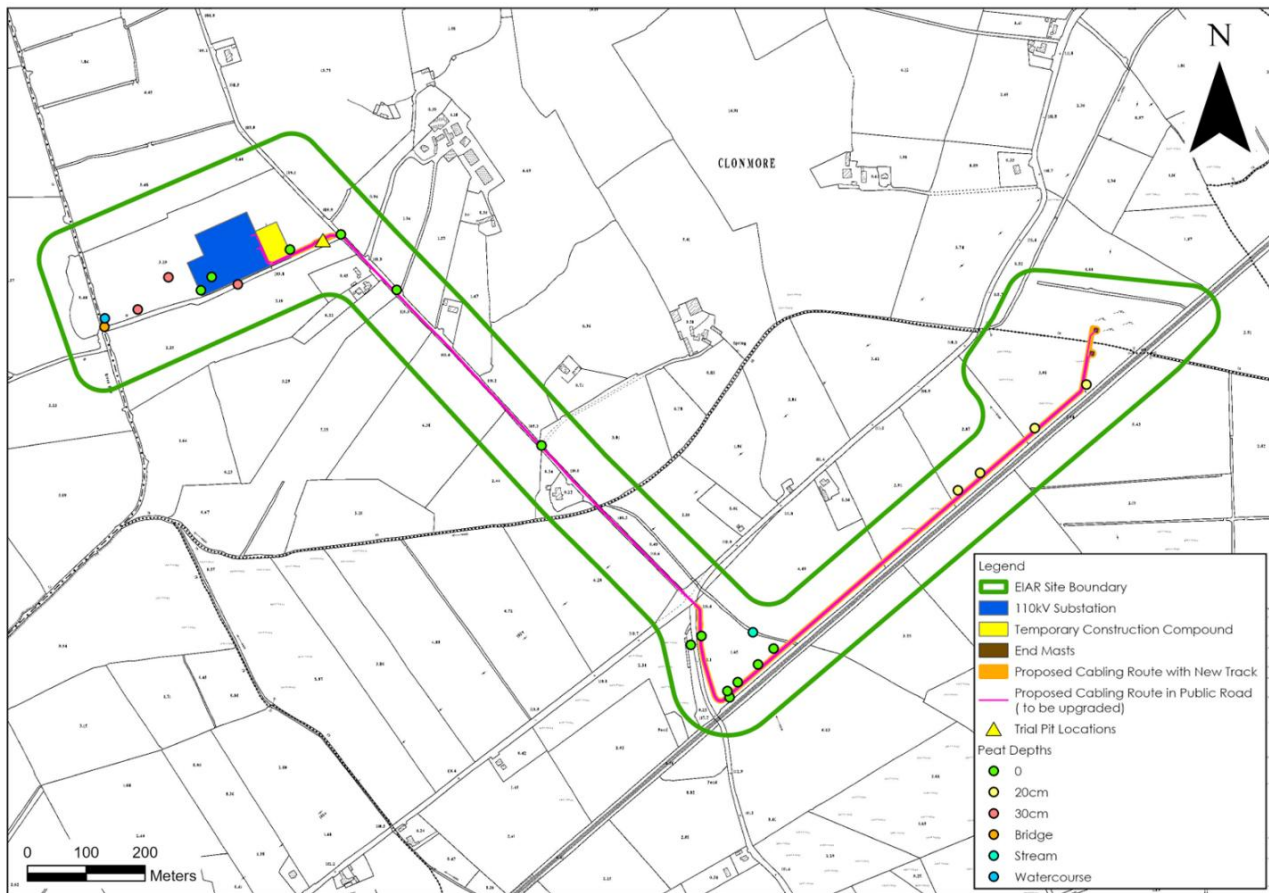


Figure 7-2: Site Investigation Locations



7.3.4 Bedrock Geology

Based on the GSI bedrock mapping (www.gsi.ie), the majority of the Site, including the proposed 110kV Substation, control buildings, temporary construction compound, end masts and the north and west of the underground cabling route, is underlain by the Ballysteen Formation. The Ballysteen Formation is described as comprising of dark muddy limestone and shale. Meanwhile, approximately 920m of the underground cabling route is mapped to be underlain by the Lisduff Oolite Member. The Lisduff Oolite Member is comprised of oolitic limestone.

The GSI map a large north-northwest to south-southeast orientated fault to dissect the north of the Site. This fault is located in the vicinity of the temporary construction compound and the 110kV Substation. However, given the shallow nature of the proposed works, and the age of this geological fault, which is 10s of millions of years old, the presence of a mapped fault is of no consequence for the Proposed Grid Connection.

The GSI do not map the presence of any bedrock outcrop within the vicinity of the Site.

Similarly, there are no mapped karst features in the area of the Site. The closest mapped karst feature is a cavity which was identified in a borehole to the south of Templemore. This mapped karst feature is located approximately 3.8km to the northeast of the Site.

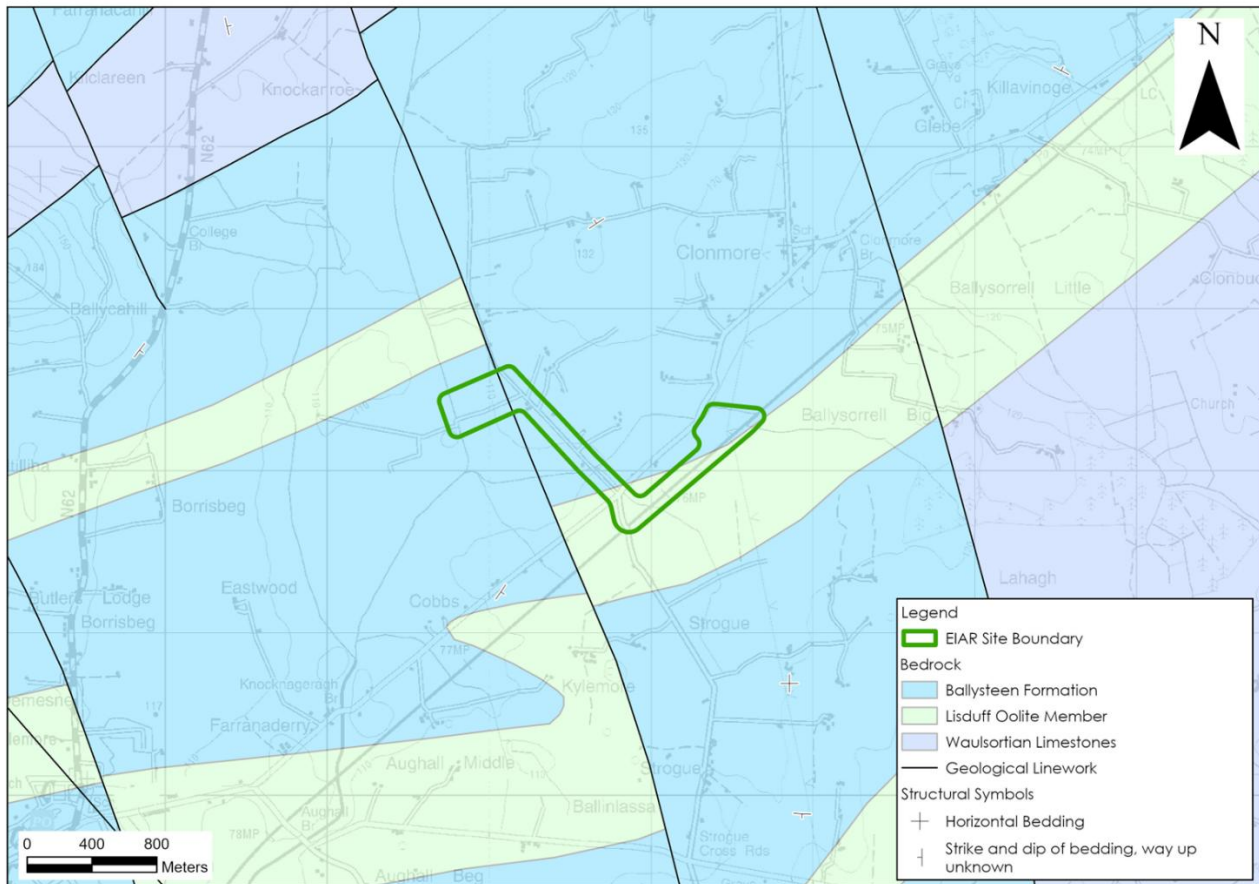
The nature of the local bedrock has been previously verified during the site investigations for the Consented Wind Farm whereby bedrock was encountered in a total of 7 no. trial pits and 3 no. boreholes. BH3 was drilled at the location of T8, approximately 500m to the west of the proposed 110kV substation. This BH3 encountered 4.6m of overburden (sandy, silty CLAY) over medium

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strong to strong dark grey limestone with occasional fractures. This dark grey limestone is consistent with the description of the Ballysteen Formation which is mapped to underlie the north and west of the Proposed Grid Connection.

A GSI bedrock geology map for the Site is shown as Figure 7-3.

Figure 7-3: Bedrock Geology Map



7.3.5 Economic Geology

The GSI Online Minerals Database accessed via the Public Data Viewer (www.gsi.ie) does not record the presence of any active bedrock quarries or sand and gravel pits in the immediate vicinity of the Site. The closest active quarry is Lisduff Limestone Quarry in Co. Laois, located ~4.5km to the northeast.

The closest mapped mineral locality is situated approximately 3.4km to the northwest in the townland of Craigueadarg. This is the site of an old iron pit in dark crystalline limestone. Limestones of the Ballysteen Formation are recorded at Lisduff Quarry in the townland of Knockahaw, located approximately 4.5km to the northeast.

The GSI do not record the presence of any historic quarries or sand and gravel pits in the vicinity of the Site.

The GSI online Aggregate Potential Mapping Database (www.gsi.ie) shows that the crushed rock aggregate potential of the Site ranges from 'Very Low' to 'Moderate'.

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Furthermore, the vast majority of the Site is not located within an area mapped for granular aggregate potential (i.e. potential for gravel reserves). Areas of 'Low' potential are mapped along the course of the Clonmore Stream.

7.3.6 Soil Contamination

There are no known areas of soil contamination in the area of the Site. During the site walkovers or intrusive investigations, no areas of contamination concern were identified.

According to the EPA online mapping (<http://gis.epa.ie/Envision>), there are no licensed waste facilities on or within the immediate environs of the Site. The closest IPC licenced facility is the Galmoy Mines site which is located approximately 11km east of the Site.

There are no historic mines at or in the immediate vicinity of the Site that could potentially have contaminated tailings.

7.3.7 Geohazards

The GSI Landslide database (www.gsi.ie) does not record any historic landslides in the vicinity of the Site or in the surrounding lands.

The GSI Landslide Susceptibility Map (www.gsi.ie) classifies the probability of a landslide occurring at a given location. The probability of a landslide occurring at the Site is mapped as being 'Low'.

Due to the localised and very shallow nature of the peat, along with flat topography, the risk of peat instability or slide is very low.

7.3.8 Geological Heritage and Designated Sites

There are no recorded Geological Heritage sites, mineral deposit sites or mining sites (current or historic) within the Site.

A large, active limestone quarry called Lisduff Quarry County Geological Site (CGS) (Site Code: LS019) is located approximately 4.5km northeast of the Site. This is an important representative site with extensive exposures of Ballysteen Limestone. Devilsbit CGS is located ~7.7km to the west, whilst Borrisnoe and Cloncannon CGS, which is recommended for Geological NHA, is located approximately 8.9km to the northwest of the Site. Meanwhile, Lisheen Mines CGS and the Nore Valley Bog CGS are located 9.3 and 9.6km to the southeast and north of the Site respectively. Further details on all geological heritage sites within 10km of the Site are presented in Table 7-4.

Table 7-4: Geological Heritage Sites

Site Code	Site Name	IGH Theme	Description
LS019	Lisduff Quarry CGS	IGH8	A large, active limestone quarry with extensive exposures of Ballysteen Limestone
TY026	Devilsbit CGS	IGH10 and IGH12	A mountain-top plateau with near-vertical cliffs Excellent exposure into alluvial fan conglomerates and associated early Devonian sandstones.
TY016	Borrisnoe and Cloncannon CGS	IGH2 and IGH4	A roadside quarry and farm/forestry trackside exposures. Best representation section available for the earliest known vascular land plants.
TY053	Nore Valley Bog CGS	IGH7 and IGH16	An expansive area of raised bog
TY044	Lisheen Mine	IGH15	A major Irish-type zinc-lead deposit of considerable scientific and economic importance.

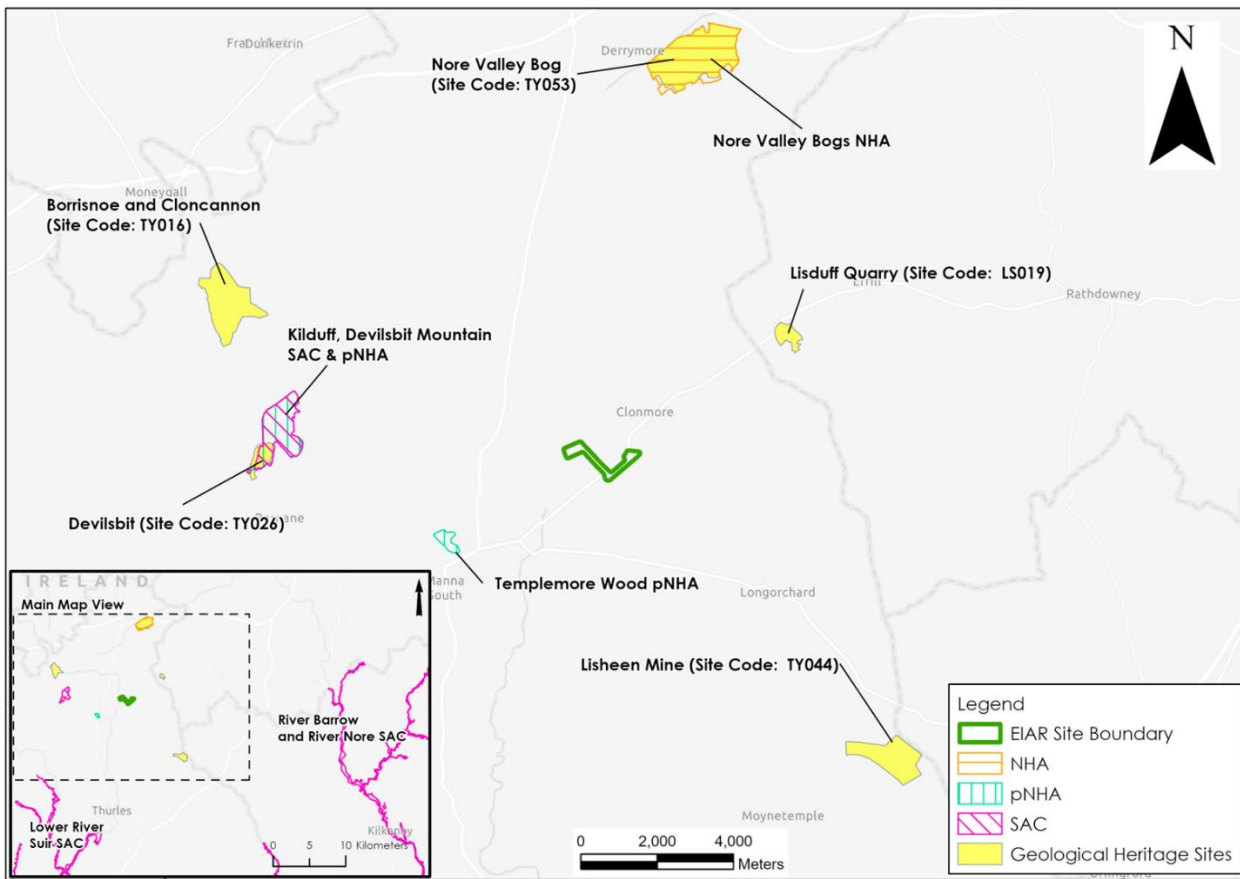
Within the Republic of Ireland designated sites include Natural Heritage Areas (NHAs), Proposed Natural Heritage Areas (pNHAs), Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs).

The Site is not located within any designated conservation site. The nearest designated site is the Templemore Wood pNHA (Site Code: 000942) which is located directly north of Templemore town, approximately 3.9km southwest of the Site. The Kilduff, Devilsbit Mountain pNHA and SAC (Site Code: 000934) is located approximately 7.2km west from the Site. The Nore Valley Bogs NHA is located approximately 9.6km to the north.

Designated sites that are hydrologically connected to the Proposed Grid Connection include the Lower River Suir SAC (Site Code: 002137) situated ~18km to the south and downstream of the Site along the Suir River channel. Further downstream the River Suir discharges into the River Barrow and River Nore SAC (Site Code: 002162) >100km downstream of the Site. Hydrologically connected Designated Sites downstream of the Proposed Grid Connection are assessed in Chapter 8 (Hydrology/hydrogeology).

The locations of nearby Geological Heritage sites and Designated Sites and are shown on Figure 7-4.

Figure 7-4: Geological Heritage Site and Designated Sites



7.3.9 Receptor Sensitivity and Importance

Based on the criteria set out in Table 7-1 above, the poorly drained soils/subsoils at the Site can be classed as being of 'Low' importance. The soils and subsoils at the Site are not designated.

The bedrock geology underlying the Site can be classed as being of 'Medium' importance where the bedrock could be used on a sub-economic scale.

The land, soils/subsoils and bedrock geological formations underlying the Site are included in the impact assessment due to their proximal location to the Proposed Grid Connection and the potential direct effects that it may have on these receptors.

Furthermore, all geological heritage sites and designated sites have been screened out of the impact assessment due to their distant location from the Site. There is no potential for effects to occur on these geological heritage sites or designated sites.

7.4 Characteristics of the Proposed Grid Connection

The Proposed Grid Connection is described in full in Chapter 3 of the EIAR. In summary the Proposed Grid Connection comprises 1 no. 110kV electrical substation, 2 no. wind farm control buildings, a temporary construction compound, an underground cabling route which will connect the substation to the national grid, new access tracks, 2 no. lattice masts, 2 no. watercourse crossings and all associated spoil management and drainage works.

The main characteristics of the Proposed Grid Connection which could affect the land, soils and geological environment are described below:

- The establishment of the temporary construction compound, which will cover a total area of approximately 2,540m². Refuelling will occur at this compound, in a bunded refuelling and containment area. The compound will also house welfare facilities for the duration of the construction phase;
- Construction of the 110kV substation which will have a footprint of 11,600 m². The substation compound will also include 2 no. wind farm control buildings, which will include staff welfare facilities for the operational phase;
- Construction of an underground cabling connection, approximately 2.1km long, between the proposed 110kV substation and the existing 110kV Ikerrin to Thurles overhead line (OHL). The existing OHL will be broken by 2 no. end masts to facilitate the connection.
- Construction of approximately 120m of new access tracks along the underground grid connection cabling route that will run through the agricultural fields to the east of the proposed substation, and construction of approximately 1.08km of new access track through agricultural fields from the L-7038 to the proposed end masts (approx. 1.2km overall in agricultural fields and approx. 900m in local roads).

The above works required for the construction of the Proposed Grid Connection will require granular fill which will be sourced from locally licenced quarries. The volumes required are detailed in **Table 7-5**.

Table 7-5: Estimated Sand and Stone Requirements for the Proposed Grid Connection

Development Component	Area m ²	Stone Fill Required (m ³)
Permanent 110kV Substation	11,600	6,960
Temporary construction compound	2,540	1,520
Access Roads, cable route and 2 no. end masts	8,500	4,860

The soils beneath the substation, temporary construction compound and end masts will be excavated and replaced with construction grade granular fill. The trench along the underground electrical cabling route will be typically 0.6m wide by 1.2m deep. The trench will be located predominately within the carriageway of public roads and grassland. The approximate quantity of spoil requiring management for the Proposed Grid Connection is presented in Table 7-6 below.

Some of the excavated materials from the Grid Connection underground electrical cabling route will go to an appropriate licenced facility as required. This is dependent on the road makeup at locations along the underground electrical cabling route. The remaining spoil will be managed into linear

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berms up to 1 m high alongside the new access tracks proposed along the grid connection cable route within agricultural fields and within the substation field, up to 4m high creating a visual screening of the substation from the nearby local roads during the operational phase. Where feasible, some spoil may be accommodated within the spoil management areas of the Consented Wind Farm.

Table 7-6: Approximate Spoil Volumes Requiring Management

Component	Spoil Volume (m³) (approx.)
Permanent 110kV Substation and temporary construction compound	13,500
Grid Connection cabling Route and 2 no. end masts	3,600
Total Spoil to be managed m³ (including 10% contingency factor)	18,810

Note: A contingency factor of 10% has been applied and is included to the excavated spoil volumes above to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the Site.

7.5 Likely Significant Effects and Associated Mitigation Measures

7.5.1 Do Nothing Scenario

If the Proposed Grid Connection did not receive a grant of permission, the Site will continue to function as it does at present, with no changes made to the current landuse and potential for impacts on land, soils and geology environment through the construction and operation of the Proposed Grid Connection would not occur.

If the Proposed Grid Connection were not to proceed, the Consented Wind Farm would not be constructed, therefore the indirect short term construction phase impacts and long term operational phase impacts, (which have been determined to not have significant environmental effects, refer to ACP Planning Reference 318704), will not occur.

Likewise, the indirect positive contribution the Proposal Grid Connection to meeting National and EU targets for the production and consumption of electricity from renewable resources by 2030 and the reduction of greenhouse gas emissions.

7.5.2 Construction Phase – Likely Significant Effects and Mitigation Measures

The likely impacts of the Proposed Grid Connection and mitigation measures that will be put in place to eliminate or reduce them are shown below. These relate to the construction phase. It should be noted that the main potential impacts on the soils and geology environment will occur during the construction phase.

7.5.2.1 Effects on Land and Land use

The construction of the proposed substation compound will result in a permanent change in land at these locations whereby agricultural land will be replaced by a hardstand area. The total footprint of the proposed substation compound is 11,600 m².

There will also be a temporary change to land at the location of the proposed temporary construction compound (2,540m²). The temporary construction compound will only be used for the duration of the construction phase and will be reinstated once construction works associated with the Proposed Grid Connection have been completed.

With regards to the underground electrical cabling route, there will be a change to the land environment where new access tracks are proposed to overlie to the cabling route. Approximately 120m of new access tracks are proposed through the agricultural fields to the east of the proposed substation, with approximately 1.2km of new access track proposed from the L-7038 to the proposed end masts. These works will result in the loss of agricultural land. The total footprint of the new access tracks and end masts is 2,450m².

However, there will be no effects on the lands where the underground cabling route is located along the existing public road network. The works will result in the excavation of a narrow trench to accommodate the cabling. This trench will be reinstated once the cabling is emplaced with a comparable ground surface.

There will be no effects on the land or landuse adjoining the Site.

Pathway: Construction Land take.

Receptor: Land and Landuse (i.e. the land upon which the Proposed Grid Connection will occur).

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Potential Pre-mitigation Effect: Negative, slight, direct, likely, long-term effect on land and landuse.

Impact Assessment / Mitigation Measures

- The loss of agricultural land resulting from the Proposed Grid Connection on a local or regional scale is minimal and therefore the effects of actual agricultural land loss is imperceptible.
- The loss of land associated with the Proposed Grid Connection (11,600m³ substation compound and 2,450m² access tracks and end masts) represents only 2.9% of the lands within the EIAR Site Boundary.
- No mitigation is proposed with regard agricultural loss of land as it is an accepted part of the Proposed Grid Connection.

Residual Effect Assessment: Due to the small footprint of the Proposed Grid Connection on a local scale the residual effect is considered to be a negative, direct, slight, likely, long-term effect on land and landuse.

Significance of Effects: For the reasons outlined above, no significant effects on land or landuse will occur at the Site.

7.5.2.2 Soil and Subsoil Excavation

Excavation of mineral soil/subsoil will be required for the installation of foundations for the on-site substation, end masts and for the excavation of the underground cabling route. The estimated volumes of spoil to be excavated and relocated are summarised in Table 7-6.

Excavation of subsoils will also be required along the underground cabling route. However, these deposits will be removed from the underground electrical cabling trench and will be accommodated in linear berms along the route or to a local licenced facility.

Pathway: Extraction/excavation.

Receptor: Soil and subsoil.

Pre-Mitigation Potential Effect: Negative, slight, direct, likely, permanent effect on soil and subsoil.

Proposed Mitigation Measures by Design:

General mitigation measures:

- Placement of infrastructure in areas with suitable ground conditions.
- All excavated spoil material will be managed on-site, either placed within the identified spoil management areas (i.e. linear berms along access roads) or within the substation field (up to 4m high creating a visual screening of the substation from the local roads during the operational phase).
- Excavated soils/subsoils shall be excavated and managed separately to topsoil; this will prevent mixing of materials and facilitate reuse afterwards.
- Depending on the road makeup along the underground cabling route, some of the excavated materials will go to an appropriate licenced facility as required.

With regards to the placement of spoil alongside access roads during the construction of the Proposed Grid Connection:

- The placement of spoil will be restricted to a maximum height of 1.0m, subject to confirmation by the Geotechnical Engineer.

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- Where practical, the surface of the placed spoil is shaped to allow efficient run-off of surface water. Where possible, shaping of the surface of the spoil will be carried out as placement of spoil within the area progresses. This will reduce the likelihood of debris run-off and ensure stability of the placed spoil.
- The surface of the deposited spoil will be profiled to a gradient to be agreed with the Geotechnical Engineer and vegetated or allowed to vegetate naturally as indicated by the Project Ecologist.
- All the above-mentioned general guidelines and requirements will be confirmed by the Geotechnical Engineer prior to construction.

Residual Effect Assessment: The mitigation measures described above combined with the ‘low’ importance of the soils/subsoils means that the residual effect will be a negative, slight, direct, likely, permanent effect on soil and subsoils due to disturbance and relocation within the Site.

Significance of Effects: For the reasons outlined above, no significant effects on peat and subsoils will occur.

7.5.2.3 Contamination of Soil by Leakage and Spillage

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a pollution risk. The accumulation of small spills of fuels and lubricants during routine plant use can also be a significant pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. Large spills or leaks have the potential to result in significant effects (i.e. contamination of soil, subsoils and pollution of the underlying aquifer) on the geological and water environment, depending on where a spill may occur, *i.e* underground cabling route. Additionally, waste tar, removed from the road hardstanding along the underground cabling route has the potential to affect soil/subsoil geochemistry.

Pathway: Soil and subsoil and underlying bedrock pore space.

Receptor: Soil and subsoil, bedrock.

Pre-Mitigation Potential Effect: Negative, slight, direct, short-term, unlikely effect on soil, subsoils and bedrock.

Proposed Mitigation Measures:

- Where possible maintenance of construction vehicles and refuelling will be completed off-site.
- On-site refuelling will take place in designated refuelling areas located throughout the Site. Heavy plant and machinery will be refuelled on-site by a fuel truck that will arrive to Site as required on a scheduled basis. Other refuelling will be carried out using a mobile double-skinned fuel bowser, with spill kits on the ready for any minor accidental leakages or spillages. When not in use the fuel bowser, will be parked only on a level area within the Site.
- Fuels stored on Site will be minimised but will be in bunded locations.
- Only trained and authorised personnel will be permitted to refuel equipment on-site.
- Mobile measures, such as dip trays and fuel absorbent mats, will be used during refuelling activities as necessary.
- The substation transformer and oil interceptor will be on a bunded concrete plinth capable of holding 110% of the stored oil volume and to prevent leakage to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- All waste tar material arising from the public roads during construction of the underground electrical cabling route will be removed off-site and taken to an appropriately licenced facility;

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- The plant used during construction will be regularly inspected for leaks and fitness for purpose; and,
- An emergency plan for the construction phase to deal with accidental spillages will be contained within the Construction Environmental Management Plan (CEMP) Appendix 3-2 of this EIAR. Spill kits will be available to deal with accidental spillage in and outside of re-fuelling areas.

Residual Effect Assessment: The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor. The residual effect will be negative, imperceptible, direct, short-term, unlikely effect on soil and subsoils and bedrock.

Significance of Effects: For the reasons outlined above, and with the implementation of the listed mitigation, no significant effects on soil, subsoils and bedrock will occur.

7.5.2.4 Erosion of Exposed Soil and Subsoils During Construction of Infrastructure

Erosion of soil/subsoil by the pathways listed below, can have the effect of reducing the overall volume of soil/subsoil, with the potential for some eroded subsoils to reach watercourses, leading to water quality issues such as high turbidity. Erosion of soils/subsoils may occur at any works area where excavation is ongoing i.e substation foundations, access road construction, cable trench excavations.

The main impacts associated with this aspect is to the water environment, and therefore this aspect is further assessed in detail in Chapter 8 Hydrology and Hydrogeology.

Pathway: Vehicle movement, surface water and wind action.

Receptor: Soil and subsoil.

Pre-Mitigation Potential Effect: Negative, imperceptible to slight, direct, permanent, likely effect on soil and subsoils by erosion and wind action.

Proposed Mitigation Measures:

- Soil/subsoil removed from the construction areas will be used for landscaping or managed in linear berms along access roads and surrounding the substation.
- Temporary drainage systems will be required to limit runoff impacts during the construction phase.
- Soils removed from the cable trench will be accommodated in linear berms or removed to an appropriately licenced facility.

Residual Effect Assessment: Soils, subsoils and spoil can be eroded by vehicle movements, wind action and by water movement. To prevent this all excavation works and spoil storage will be carried out using best practice methods and most spoil material will remain within the Site and reseeded and planting will be completed to bind landscaped soil and spoil together. Following implementation of these measures the residual effects will be a negative, imperceptible, direct, permanent, likely effect on soil and subsoils by erosion and wind action.

Significance of Effects: For the reasons outlined above, no significant effects on soils or subsoils will occur.

7.5.2.5 Potential Effects on Geological Heritage and Designated Sites

The works proposed as part of the Proposed Grid Connection are remote from any geological heritage site or designated site (refer to **Section 7.3.8**).

Potential effects on designated sites including Special Areas of Conservation (SACs) and Special Protected Areas (SPAs) are assessed in Chapter 8 Hydrology and Hydrogeology.

Pathway: There is no pathway for effects on the land, soils and geological environment of Geological Heritage Sites and Designated Sites as a result of the Proposed Grid Connection. All designated sites and protected areas are outside of the Site. There is no potential for the Proposed Grid Connection to impact the land, soils and geological environment outside of the Site.

Receptor: Geological Heritage Sites.

Pre-Mitigation Potential Effect: No potential for effects.

Residual Effect Assessment: There will be no residual effects on geological heritage sites as a result of the Proposed Grid Connection.

Significance of Effects: No effects.

7.5.3 Operational Phase – Likely Significant Effects and Mitigation Measures

Very few potential direct impacts are envisaged during the operational phase of the Proposed Grid Connection. These may include:

- Some construction vehicles or plant may be necessary for maintenance which could result in minor accidental leaks or spills of fuel/oil;
- The transformer in the substation are oil cooled. There is potential for spills / leaks of oils from this equipment resulting in contamination of soils and groundwater; and,
- In relation to indirect impacts a small amount of granular material may be required to maintain access tracks during operation which will place intermittent minor demand on local quarries.

7.5.3.1 Potential Effects from Site Road Maintenance

In relation to indirect effects a small amount of granular material will be required to maintain access tracks/site roads during operation which will place intermittent minor demand on local quarries.

Pathway: Excavation.

Receptor: Subsoil and bedrock.

Potential Pre-Mitigation Effect: Negative, indirect, imperceptible, short term, likely effect on peat, subsoil and bedrock.

Proposed Mitigation Measures:

Use of aggregate from authorised quarries for use in road and hardstand maintenance.

Post-Mitigation Residual Effect: The use of aggregate for site road maintenance will be minor and infrequent, and all material will be imported to the Site from local authorised quarries. The residual effect is considered to be - negative, imperceptible, indirect, short-term, unlikely effect on subsoils and bedrock.

Significance of Effects: For the reasons outlined above, no significant effects on soils or geology will occur.

7.5.3.2 Potential Effects from Site Vehicle/Plant Use

Plant and site vehicles used in site maintenance will be run on fuels and use hydraulic oils. Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to land, soils and associated ecosystems. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, and is persistent in the environment.

Pathway: Soil, subsoil and bedrock pore space.

Receptor: Soil, subsoil and bedrock.

Potential Pre-Mitigation Effect: Negative, direct, slight, short term, unlikely effect on soil, subsoil and bedrock.

Proposed Mitigation Measures:

- Vehicles used during the operational phase will be refuelled off site before entering the site;
- No fuels will be stored on-site during the operational phase; and
- Spill kits will be available in all site vehicles to deal with an accidental spillage and breakdowns; and,
- An emergency plan for the operational phase to deal with accidental spillages and breakdowns will be contained in the CEMP (Appendix 3-2).

Residual Effect Assessment: The use of hydrocarbons in plant and vehicles is a standard risk associated with all operational wind farm sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor. The residual effect is assessed to be negative, imperceptible, direct, short-term, unlikely effect on peat, subsoils, and bedrock.

Significance of Effects: For the reasons outlined above, no likely significant effects on land, soils, subsoils or bedrock will occur.

7.5.3.3 Potential Effects from Oils in Transformers

The transformer in the substation will be oil cooled. There is potential for spills / leaks of oils from this equipment resulting in contamination of soils and groundwater. Hydrocarbon has a high toxicity to humans, and all flora and fauna, and is persistent in the environment.

Pathway: Soil, subsoil and bedrock pore space.

Receptor: Soil, subsoil and bedrock.

Potential Pre-Mitigation Effect: Negative, direct, slight, short term, unlikely effect on soil, subsoil and bedrock.

Proposed Mitigation Measures:

- The substation transformer and oil interceptor will be on a bunded concrete plinth capable of holding 110% of the stored oil volume and to prevent leakage to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor
- An emergency plan for the operational phase to deal with accidental spillages will be contained in the Environmental Management Plan.

Post-Mitigation Residual Effect: The use of hydrocarbons in transformers and substations is a standard risk associated with all operational wind farm sites. Proven and effective measures to

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mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor. The residual effect is assessed to be negative, imperceptible, direct, short-term, unlikely effect on peat, subsoils, and bedrock.

Significance of Effects: For the reasons outlined above, no likely significant effects on land, soils, subsoils or bedrock will occur.

7.5.4 Operational Phase Monitoring

None Required.

7.5.5 Decommissioning Phase – Likely Significant Effects and Mitigation Measures

There are no potential impacts associated with decommissioning of the Proposed Grid Connection as it will remain in place as it will become part of the National Electricity Grid under the ownership and control of the ESB and EirGrid.

7.5.6 Assessment of Human Health Effects

Potential human health effects arise mainly through the potential for soil and ground contamination. A grid connection route is not a recognized source of pollution and so the potential for effects during the operational phase are negligible. Hydrocarbons will be used onsite during construction however the volumes will be small in the context of the scale of the project and will be managed in accordance with best practice mitigation measures. The potential residual impacts associated with soil or ground contamination and subsequent health effects are negligible.

7.5.7 Risk of Major Accidents and Disasters

Due to the nature of the Site, i.e. relatively flat terrain, with an absence of peat, there is a low risk of a landslide occurring. Refer to Chapter 6 : Major Accidents and Natural Disasters for a full assessment of Major Accidents and Disasters.

7.5.8 Potential Cumulative Effects

The potential for impact between the Proposed Grid Connection, and other relevant developments has been carried out with the purpose of identifying what influence it will have on the surrounding environment when considered cumulatively and in combination with relevant existing permitted or proposed projects and plans in the vicinity of the Site, as set out in Chapter 15 Interactions and Cumulative Effects of this EIAR. Please see Chapter 15 for cumulative assessment methodology.

The proposed planning applications within the dataset have been analysed, with particular emphasis on the larger projects listed. Following this analyses, there will be no cumulative effects on the land, soils and geology environment as a result of the Proposed Grid Connection.

The construction of the Consented Wind Farm may result in cumulative effects with the Proposed Grid Connection. However, the EIAR for the Consented Wind Farm assessed the potential effects

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of the wind farm on the land, soils and geological environment and concluded that there would be no significant effects. Within the implementation of the prescribed mitigation measures for the Proposed Grid Connection and the Consented Wind Farm there will be potential for cumulative effects.

Due to the localised nature of the proposed construction works which will be kept within the Site boundary, there is no potential for significant cumulative effects in-combination with other local developments on the land, soils and geology environment as all effects are direct within the Site . Other projects outside the Site do not have the potential to reduce or increase the magnitude of effects of the Proposed Grid Connection on Land, Soils and Geology.

The only cumulative effect of the Proposed Grid Connection with respect to the lands, soils and geology will be due to the potential removal and transport of material to a licensed waste facility, where required. The environmental effects of the placement of material within the licenced waste facility are previously assessed during the licensing process of this facility.

The only other way the Proposed Grid Connection can have cumulative effects with other off-site projects and plans is via the drainage and off-site surface water network, and this hydrological pathway is assessed in Chapter 8 Hydrology and Hydrogeology. The 9-12 month construction phase of the Proposed Grid Connection, which will occur simultaneously with the construction of the Consented Wind Farm (18-24 months) will only require relatively localised excavation works within the Site boundary and therefore will not contribute to any significant cumulative effects.

7.6 References

1. British Standards Institution (BSI). (2015) BS5930 - Code of Practice for Site Investigations.
2. Department of Housing, Planning and local Government, 2018: Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment.
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4. European Union, 2017: Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU).
5. Geological Survey of Ireland (GSI). (1999) Geology of Tipperary, 1:100,000 scale Bedrock Geology Series, Sheet 18.
6. Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements.
7. National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.
8. Scottish Natural Heritage report (SNH) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms (SNH, 2013).