

# ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED COOM GREEN ENERGY PARK GRID CONNECTION

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## VOLUME 2 – MAIN EIAR

### CHAPTER 10 - SOILS, GEOLOGY AND HYDROGEOLOGY

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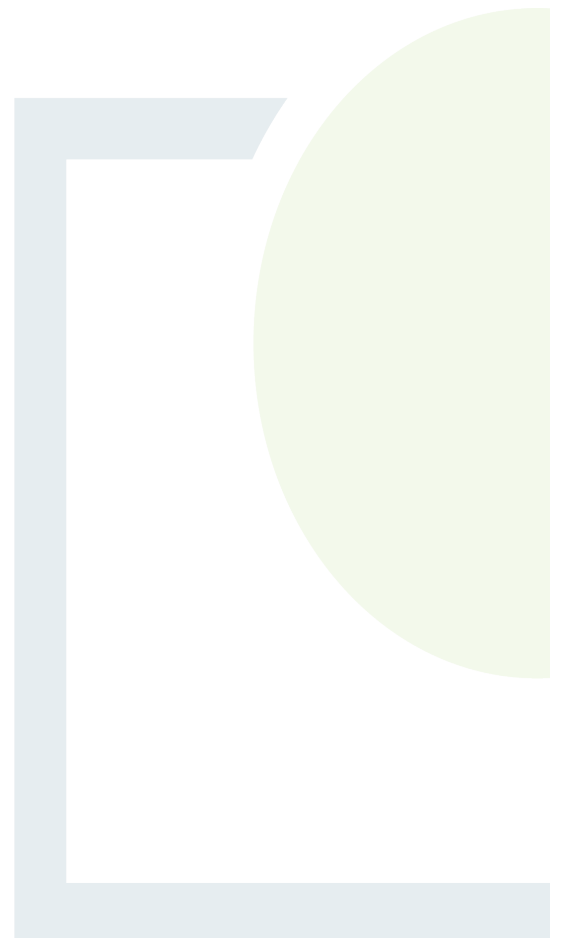
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## 10. SOILS, GEOLOGY AND HYDROGEOLOGY

### 10.1 Introduction

This chapter has been prepared to examine the potential effects of the proposed Coom Green Energy Park Grid Connection on existing geological conditions within the study area. The effects of the Proposed Development are considered, taking account of mitigation measures to reduce or eliminate any residual impacts on soils, geology and hydrogeology. The assessment also considers the cumulative effects associated with other nearby developments.

The Proposed Development is defined in Chapter 1 - Introduction and a detailed description of the Proposed Development is set out in Chapter 2 - Development Description.

The Proposed Development assessed in this EIAR comprises the following elements:

- A 110 kV Underground Cable (UGC) Grid Connection Route from the permitted onsite substation at Lackendarragh to the existing Barrymore 110 kV substation located near Rathcormac, Co. Cork (also referred to herein as the '**110 kV GCR**');
- A 33kV Underground Cable (UGC) Collector Network Route between the western and eastern arrays of the permitted Coom Green Energy Park (CGEP) development (also referred to herein as the '**33 kV CNR**');
- A 110kV onsite substation at Lackendarragh, in line with the latest Eirgrid functional specifications (also referred to herein as '**110 kV Substation**').

### 10.2 Statement of Authority

This Chapter has been prepared by EurGeol Emily Archer PGeo of Fehily Timoney and Company.

Emily is a Chartered Senior Geologist with a BSc in Geology from University College Cork and an MSc in Applied Environmental Geoscience from University College Cork. She is a professional member of the Institute of Geologists of Ireland (PGeo) and the European Federation of Geologists (EurGeol). Emily has 7 years of post-graduate experience working in the fields of geoscience and ground engineering. She has experience working on renewable energy projects within the Irish market, preparing Soils, Geology and Hydrogeology EIAR chapters for wind farms sites.

Technical review of this chapter has been completed by the following:

Tom Clayton MEng. (Distinction) Civil Engineering - a Chartered Engineer with 17 years of experience within the geotechnical sector with excellent skills in analytical design (including finite element analysis). Tom has expertise in transport geotechnics (for road, rail, underground rail schemes, active travel and greenway schemes), deep excavations and shafts (primarily in the Middle East and London) and Energy Geotechnics (both for solar and wind farms). Tom also specialises in earthwork stabilisation and has worked in asset management and design consultancy roles for both highways and rail projects.



## 10.3 Assessment Methodology

In summary the methodology adopted for this assessment includes:

- Review of appropriate guidance and legislation;
- Characterisation of the receiving environment;
- Review of the proposed project;
- Assessment of potential effects;
- Identification of mitigation measures;
- Assessment of cumulative impacts; and
- Assessment of residual impacts.

The assessment methodology and criteria are outlined in Section 10.3.4.

### 10.3.1 Relevant Guidance

The main EIA guidelines are listed in Chapter 1, other topic specific reference documents used in the preparation of this section include the following:

- NRA (2009), Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- IGI (2013), Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements;
- EPA (2003), Towards Setting Guideline Values for the Protection of Groundwater in Ireland;
- EPA (2022), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- Irish Wind Energy Association (IWEA) (2012), Best Practice Guidelines for the Irish Wind Energy Industry.

### 10.3.2 Water Framework & Groundwater Directives, Status and Risk Assessment

The Water Framework Directive (WFD) provides for the protection, improvement and sustainable use of waters, including rivers, lakes, coastal waters, estuaries and groundwater within the EU Member States. It aims to prevent deterioration of these water bodies and enhance the status of aquatic ecosystems; promote sustainable water use; reduce pollution; and contribute to the mitigation of floods and droughts.

Under the Water Framework Directive large geographical areas of aquifer have been subdivided into smaller groundwater bodies (GWB) for them to be effectively managed.

The overriding purpose of the WFD is to achieve at least “good status” in all European waters and ensure that no further deterioration occurs in these waters. European waters are classified as groundwaters, rivers, lakes, transitional and coastal waters. The first cycle of river basin management planning, which covered the period 2009-2015, developed plans and associated programmes of measures based on eight River Basin Districts (RBDs) within the island of Ireland. These plans set ambitious targets that envisaged that most water bodies would achieve good status by 2015.



The Groundwater Directive establishes a regime which sets groundwater quality standards and introduces measures to prevent or limit inputs of pollutants into groundwater. The directive establishes quality criteria that take account of local characteristics and allows for further improvements to be made based on monitoring data and new scientific knowledge. The directive thus represents a proportionate and scientifically sound response to the requirements of the Water Framework Directive (WFD) as it relates to assessments on chemical status of groundwater and the identification and reversal of significant and sustained upward trends in pollutant concentrations in groundwater.

### 10.3.3 Consultation

The scope for this assessment has been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties as summarised in Chapter 5 – EIA Scoping and Consultation. Responses from the consultees identified a range of observations which have been taken into consideration in the preparation of the respective chapters of this EIAR.

### 10.3.4 Impact Appraisal Methodology

As outlined in Section 10.1, the aim of this is to identify the effects of the construction, operation and decommissioning of the Proposed Development and associated works on the existing soils, geology and hydrogeology within the study area. The assessment also identifies appropriate mitigation measures to minimise these effects.

The following elements were examined to determine the potential effects of the Proposed Development on the soils, geology and hydrogeology within the study area:

- characterisation of the soils, geology and hydrogeology underlying the study area,
- evaluation of the potential effects of the Proposed Development.

The baseline geological and hydrogeological conditions within the study area were determined following a desktop review of publicly available information including aerial photography and EPA and GSI online databases.

Following the assessment of the existing environment, the unmitigated effects of the Proposed Development during the construction, operational and decommissioning phases on sensitive receptors identified were determined. The evaluation of the significance of the impacts was undertaken in accordance with the IGI guidance (2013).

Where potential effects were identified, mitigation measures were recommended to minimise effects on the environment to acceptable levels of significance. The residual effect from the Proposed Development was then re-appraised taking into account the recommended remedial measures. The residual impacts from the proposed development are presented in Section 10.7 of this chapter.

### 10.3.5 Evaluation Criteria

During each phase (construction, operation, maintenance and decommissioning) of the Proposed Development, several activities will take place on site, some of which will have the potential to cause effects on the geological regime at the proposed site and the associated soils, geology and hydrogeology. These potential effects are discussed throughout this chapter. Mitigation measures where required are presented in Section 10.6.



### 10.3.5.1 Assessment of Magnitude and Significance of Impact on Soils, Geology and Hydrogeology

An impact rating has been developed for each of the phases of the Proposed Development based on the Institute for Geologists Ireland (IGI) Guidance for the preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements. In line with the IGI Guidance, the receiving environment (Geological Features) was first identified.

Using the NRA rating criteria in Appendix C of the IGI Guidance, the importance of the geological and hydrogeological features is rated (Tables 10-1 and 10-2) followed by an estimation of the magnitude of the impacts on geological and hydrogeological features (Tables 10-3 and 10-4).

This determines the significance of the impact prior to application of mitigation measures as set out in Table 10.1:

**Table 10-1: Criteria Rating Site Importance of Geological Features (NRA, 2009)**

Magnitude	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 the site is significant on a national or regional scale	Geological feature 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 the 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 high 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 the 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. Degree or extent of soil contamination is minor on a local scale. Volume of peat and/or soft organic soil underlying the site 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 Uneconomic extractable mineral resource



**Table 10-2: Criteria Rating Site Importance of Hydrogeological Features (NRA, 2009)**

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple wellfields. Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – e.g. NHA status.  Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source.
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer. Groundwater provides large proportion of baseflow to local rivers.  Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source. Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer Potable water source supplying >50 homes. Outer source protection area for locally important water source.
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer. Potable water source supplying <50 homes.

The assessment of the magnitude of an impact incorporates the timing, scale, size and duration of the potential impact. The magnitude criteria for impact on Geological and Hydrogeological features are outlined in Tables 10-3 and 10-4 respectively.



**Table 10-3: Estimation of Magnitude of Impact on Geological Features (NRA, 2009)**

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



**Table 10-4: Estimation of Magnitude of Impact on Hydrogeological Features (NRA, 2009)**

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	Removal of large proportion of aquifer. Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems. Potential high risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >2% annually.
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Removal of moderate proportion of aquifer. Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems. Potential medium risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >1% annually.
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Removal of small proportion of aquifer. Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems. Potential low risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >0.5% annually.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Calculated risk of serious pollution incident <0.5% annually.

The matrix in Table 10-5 determines the significance of the impacts based on the importance and magnitude of the impacts as determined by Tables 10-1 to 10-4.

**Table 10-5: Ratings of Significance of Impacts for Geology/Hydrogeology (NRA, 2009)**

Importance of Attribute	Magnitude of Impact			
	Negligible	Small Adverse	Moderate Adverse	Large Adverse
Very High	Imperceptible	Significant/Moderate	Profound/Significant	Profound
High	Imperceptible	Moderate/Slight	Significant/Moderate	Profound/Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight/Moderate



The determination of the significance of each impact for this site is discussed in Section 10.5.

### 10.3.6 Desk Study

A desk study was undertaken to help determine the baseline conditions within the study area and planning boundary to provide relevant background information. The desk top study involved an examination of the following sources of information:

- OSI (November 2025), Current and historic Ordnance Survey Ireland mapping and ortho-photography.
- Taluntas (1980), General Soil Map of Ireland (1)
- Geological Survey of Ireland (November 2025) GSI Public Data Viewer ([www.spatial.dcenr.gov.ie](http://www.spatial.dcenr.gov.ie))
- Environmental Protection Agency (November 2025) Review of the EPA online mapping (<http://gis.epa.ie/Envision>).
- Study of the proposed layout of the development.

To determine the existing hydrogeological regime within the study area the following EPA and GSI online datasets and mapping from the sources outlined above were reviewed:

- Catchment & Management Units;
- Groundwater Bodies Status and Risk;
- Drinking Water Protection Areas;
- Groundwater Resources (Aquifers);
- Groundwater Wells and Springs;
- Karst Features; and
- Groundwater Vulnerability.

## 10.4 Receiving Environment

The receiving environment is described hereunder. This includes descriptions of the underlying quaternary and bedrock geology, areas of geological heritage, areas of economic interest with respect to geological resources and potential for soil contamination.

### 10.4.1 Quaternary Deposits

The Quaternary Geology underlying the Proposed Development is discussed below and presented in Figure 10.1, Volume 4 of the EIAR. The subsoils present within the development site and wider study area were taken from the Geological Survey of Ireland (GSI) online mapping - Quaternary Geology of Ireland (1:50,000 scale) and comprise:

- Till derived from Devonian sandstones (TDSs);
- Bedrock outcrop or sub-crop (Rck);
- Limited extent of Alluvium (A);
- Limited extent of blanket peat (BktPt) and Cut Peat (Cut).



As shown in Figure 10.1, Volume 4, the majority of the Proposed Development is located within areas classified as Till derived from Devonian Sandstones. Limited areas of bedrock outcrop or sub crop are identified along the route of the 110 kV GCR and the 33 kV CNR. There is a limited extent of Alluvium identified along the south-western section of the 110 kV GCR, and a limited extent of Blanket Peat and Cut Peat identified in the western-most extent of the Proposed Development.

#### 10.4.2 Bedrock Geology

The Geological Survey of Ireland (GSI) 1:100,000 scale bedrock geology map shows that the Proposed Development traverses the Ballytrasna Formation for the majority of the route. The eastern extent of the Proposed Development is underlain by the Gyleen Formation and Waulsortian Limestones.

The Ballytrasna Formation is described by the GSI as comprising dusky-red mudstone with subordinate pale-red sandstones occurring throughout the formation. The Upper Devonian Gyleen Formation is described by the GSI as comprising of fining upwards sequences of red Sandstones with thinly bedded alternations of green and red Sandstones, Siltstones and Mudstones. The Carboniferous Waulsortian Limestones are described by the GSI as comprising massive un-bedded lime-mudstone.

The bedrock geology of the Proposed Development and surrounding area is presented in Figure 10.2, Volume 4 of the EIAR.

#### 10.4.3 Hydrogeology

##### 10.4.3.1 *Aquifer Classification and Groundwater Bodies Description*

The GSI classifications for the aquifer in the Proposed Development, including the principal aquifer characteristics are summarised in Table 10-6, and shown on Figure 10.3, Volume 4 of the EIAR. All aquifers in the study area are bedrock aquifers; there are no gravel aquifers within the study area (i.e. a gravel deposit of greater than 1km<sup>2</sup> with a saturated thickness of greater than 5m).

**Table 10-6: Summary of Aquifer Classifications & Characteristics**

Groundwater Body	European Code	Aquifer Name	GSI Aquifer Classification	Status	Transmissivity (m <sup>2</sup> /day)
Glenville	IE_SW_G_037	Unnamed	Locally important aquifer- bedrock which is moderately productive only in local zones	Good	2- 20 m <sup>2</sup> /d
Tallow	IE_SW_G_074	Unnamed	Regionally Important Karstified Aquifer	Good	270 – 1820 m <sup>2</sup> /d

According to interim classification work carried out as part of the Water Framework Directive and published by the EPA, the Glenville and Tallow GWBs are classified as having ‘Good’ status in terms of quality and quantity. The overall risk for both GWBs is under review by the EPA with regards to groundwater quality.

The Proposed Development is located predominantly within the Glenville Groundwater Body (GWB) with the eastern extremity traversing the Tallow GWB as shown in Figure 10.4, Volume 4 of the EIAR.



The descriptions of the GWBs within the study area have been taken from the 'Summary of Initial Characterisation' draft reports for each defined GWB published by the GSI in accordance with the Groundwater Working Group Publication: Guidance Document GW2 (2003). The GWB Characterisation Reports are available from the GSI Public Data Viewer.

#### Glenville GWB

Due to the general absence of intergranular permeability within the underlying Ballytrasna Formation, groundwater flow generally occurs in faults and joints within this GWB. The majority of the groundwater flow generally occurs in an upper, shallow weathered zone. This is due to the lesser frequency and connectivity of water-bearing fractures and fissures at depth within the GWB.

The main recharge mechanism for the GWB is via diffuse recharge from rainwater percolating through the subsoils. According to the GSI, groundwater within this GWB is generally unconfined with local groundwater flow towards the rivers and streams, and flow paths will not usually exceed a few hundred metres in length.

#### Tallow GWB

The Tallow GWB is classified as a Regionally Important Karstified Aquifer (Rkd) dominated by diffuse flow, underlying the eastern extent of the proposed grid connection route. The main aquifer lithology in this GWB is Dinantian Pure Unbedded Limestones (Waulsortian Limestone Formation) as shown in Figure 10.2, Volume 4 of the EIAR. The bedrock aquifer is generally devoid of intergranular permeability with groundwater flow occurring in faults and joints, enlarged by karstification. Due to the high frequency of fissures in this GWB, overall groundwater flow is thought to be of a diffuse nature.

Sandstone ridges within the adjacent Glenville GWB provide surface water runoff which recharges the aquifer lithologies within the Tallow GWB. According to the GSI a small volume of groundwater may cross as throughflow from the sandstones in the Glenville GWB. Recharge within the Tallow GWB is via point and diffuse recharge. Karst features such as swallow holes and collapse features provide the means for point recharge to the underlying aquifer. Diffuse recharge occurs across the entire GWB via rainfall percolating through the subsoil.

#### *10.4.3.2 Groundwater Vulnerability*

The Groundwater Vulnerability within the Proposed Development is classified by the GSI as predominantly ranging from 'High' to 'Extreme' with areas of exposed bedrock (X – Rock Near Surface) also present. At the eastern extent of the Proposed Development, the vulnerability classification is reduced to 'Moderate'. The GSI distribution of groundwater vulnerability for the Proposed Development is shown in Figure 10.5, Volume 4 of the EIAR.

A summary of the groundwater vulnerability for the site is presented in Table 10-7. This table outlines the standard ratings of vulnerability used by the GSI, with the existing site conditions highlighted based on the available information.



**Table 10-7: Groundwater Vulnerability**

Vulnerability Rating	Hydrogeological Conditions		
	Subsoil Permeability (Type) and Thickness		
	High Permeability (sand/gravel)	Moderate Permeability (sandy soil)	Low Permeability (clayey subsoil, clay, peat)
Extreme (E)	0 - 3.0m	0 - 3.0m	0 - 3.0m
High (H)	> 3.0m	3.0 -10.0m	3.0 - 5.0m
Moderate (M)	N/A	>10.0 m	5.0 - 10.0m
Low (L)	N/A	N/A	>10 m

#### 10.4.3.3 Groundwater Supply Sources

A review of published information on groundwater supply sources within the Proposed Development was undertaken to identify potential groundwater dependant receptors at potential risk. These include group water schemes (GWS), source protection zones and private supply wells with information on these features obtained from the GSI Groundwater database.

#### 10.4.3.4 Source Protection Zones

The GSI maintains a database of Public Supply Source Protection Areas. From a review of the database there are no Public Supply Source Protection Areas within the Proposed Development site boundary.

There are however 4 No. Source Protection Areas for public water supply schemes in the vicinity of the proposed development site, and these are:

- Carrignavar, approximately 10km south of the Proposed Development boundary,
- Grenagh, approximately 7km south-west of the Proposed Development boundary,
- Watergrasshill, approximately 8km south of the Proposed Development boundary,
- Coolroe, approximately 2.5km north of the Proposed Development boundary.

These Public Supply Source Protection Areas are presented in Figure 10.6, Volume 4 of the EIAR.



#### 10.4.4 Public Water Supplies and Group Water Schemes

Based on a review of the Cork County Council Report: Aquifer Protection for Water Supplies in the Northern Division (1998) and the current EPA and GSI groundwater databases, there are no Public Water Supplies (PWS's) or Group Water Schemes (GWS) within the boundary of the Proposed Development. However, there are a number of PWS's and GWS's within the vicinity of the Proposed Development. These are:

- Coolroe (Fermoy) PWS
- Bottlehill GWS
- Grenagh GWS
- Burnfort GWS
- Knockbrack GWS
- Glenville GWS
- Whitechurch/Ryefield GWS
- Carrignavar GWS

Where available water quality and monitoring data is available for the GWS's a summary is provided in the following sections.

##### Coolroe (Fermoy) PWS

According to the GSI Report: *Fermoy Water Supply Scheme*, the Fermoy Water Supply is situated in the townland of Coolroe, about 3km west of Fermoy town in North Cork. The water supply comes from an infiltration gallery constructed in 1968. The gallery is 350 metres long and is aligned approximately east-west, some 15 to 30 metres south of the bank of the Blackwater River. There is also a Production Borehole (PW 1) drilled in December 1999, and an observation borehole (trial well, TW 4) drilled in March 1996.

The GSI reports that the water quality at both the sources is generally good, apart from elevated nitrate levels.

##### Grenagh GWS

According the GSI Report: *Grenagh Water Supply Scheme*, the Grenagh Water Supply is spread across the townlands of Grenagh North and Grenagh South (at Quarryhall Cross, which is located approximately 1km south of Grenagh village).

The water supply comprises 2 No. bored wells in the village, located at the edge of a green field area beside the council houses (one borehole in the pumphouse and the other approximately 25m away, outside) and the bored well at Quarryhall Cross.

The GSI reports that the water quality at both the sources is generally good, although there have been recorded instances of the exceedance of the Maximum Admissible Concentrations (MAC) for coliforms during historical monitoring undertaken. The GSI recommended that the supply be chlorinated.



## Carrignavar GWS

The reference material for the Carrignavar Water Supply is taken from the EPA Report: Establishment of Groundwater Source Protection Zones, Carrignavar Group Water Supply Scheme. The supply is provided by two boreholes situated approximately 50m apart. BH-1 was installed in 1994. Due to increasing demand, the borehole was unable to meet the supply required and therefore in 2004, BH-2 was installed and added to the Carrignavar Water Supply.

Groundwater analysis undertaken indicates a medium hard calcium bicarbonate hydro-chemical signature (average 105mg/l CaCO<sub>3</sub>). The average conductivity is 251µS/cm and pH is around 6.5 which is indicative of siliceous bedrock material. According to the OCM Report there was only one reported incident of Faecal Coliforms in the water supply. This was found to be an isolated occurrence. Other parameters monitored at the supply are generally reported to be below the MAC Values.

### 10.4.5 Groundwater Wells and Springs

Based on a review of the GSI Groundwater Wells and Springs database there are 5 No. Groundwater Wells recorded (500m to 1km accuracy) within 1km of the Proposed Development.

Figure 10.3, contained within Volume 4 of the EIAR, shows the location of groundwater wells within the vicinity of the Proposed Development included in the GSI dataset. Table 10-8 below outlines details of groundwater wells and springs held within the GSI dataset within 1km of the proposed development.

**Table 10-8: Summary of Wells within 1km of the Proposed Development**

Location ID	Easting (ING)	Northing (ING)	Type	Total Depth (m BGL)	Current Use	Yield Class	GSI Location Accuracy (m)
1409SEW014	165070	93710	Borehole	4.5	Unknown	Unknown	10-50m
1709SWW004	180300	94500	Borehole	22.9	Agricultural use only	Poor	10-50m
1709SWW006	173250	93600	Borehole	38.1	Agricultural & domestic use	Poor	10-50m
1409SEW040	162760	91660	Borehole	86.9	Agricultural & domestic use	Poor	200-500m
1409SEW001	165160	91740	Borehole	45.7	Unknown	Poor	500-1km
1407NEW005	164290	89480	Borehole	34.1	Unknown	Poor	Within 5km
1407NEW013	164300	89120	Borehole	27.4	Unknown	Poor	Within 5km



Location ID	Easting (ING)	Northing (ING)	Type	Total Depth (m BGL)	Current Use	Yield Class	GSI Location Accuracy (m)
1407NEW012	164300	89180	Borehole	22.3	Unknown	Moderate	Within 5km
1407NEW009	164300	89350	Borehole	21.3	Unknown	Poor	Within 5km
1407NEW011	164300	89240	Borehole	28.0	Unknown	Poor	Within 5km
1407NEW010	164300	89300	Borehole	5.9	Unknown	Poor	Within 5km
1407NEW006	164290	89410	Borehole	12.2	Unknown	Poor	Within 5km
1407NEW016	164300	89050	Borehole	15.2	Unknown	Poor	Within 5km

#### 10.4.6 Karst Features

The underlying bedrock (Waulsortian Formation) at the eastern extent of the Proposed Development is prone to karstification. However, according to the GSI datasets, there are no karst features recorded within the Proposed Development. The nearest karst feature is Killavull Cave (564693E 596814N) which is located approximately 8km to the northwest of the Proposed Development. Additionally, there are a series of unnamed caves located approximately 10km northeast of the Proposed Development.

The karst features are displayed on Figure 10.7, Volume 4 of the EIAR.

#### 10.4.7 Geological Heritage

The GSI - Irish Geological Heritage Section (IGH) and NPWS (National Parks and Wildlife Service) have undertaken a programme to identify and select important geological and geomorphological sites throughout the country for designation as NHAs (Natural Heritage Areas) – the Irish Geological Heritage Programme. This is being addressed under 16 different geological themes. For each theme, a larger number of sites (from which to make the NHA selection) are being examined, to identify the most scientifically significant. The criterion of designating the minimum number of sites to exemplify the theme means that many sites of national importance are not selected as the very best examples. However, a second tier of County Geological Sites (CGS) (as per the National Heritage Plan) means that many of these can be included in County Development Plans and receive a measure of recognition and protection through inclusion in the planning system.

The GSI Online Irish Geological Heritage database indicates that the proposed development area is not located in an area of specific geological heritage interest. The nearest site of significant geological heritage features to the Proposed Development is Dangan Mushroom Rock which is approximately 15km north-east of the Proposed Development.



The distribution of Geological Heritage sites is shown on Figure 10.8, Volume 4 of the EIAR.

#### 10.4.8 Economic Geology

The GSI Online Minerals Database accessed via the Public Data Viewer shows a number of mineral occurrences within proximity of the eastern section of the Proposed Development. Their distribution is shown on Figure 10.9, Volume 4 of the EIAR. These are recorded as Limestone, none of which are located within the site boundary.

The GSI Aggregates database indicates that there is a very low to moderate potential for crushed rock aggregate across most of the Proposed Development as shown in Figure 10.10, Volume 4 of the EIAR. There is an area of high potential in the eastern section of the Proposed Development, associated with the Waulsortian Limestone bedrock.

The GSI Aggregates database indicates that there is a very low to no potential for granular aggregate across the Proposed Development as shown in Figure 10.11, Volume 4 of the EIAR.

### 10.5 Potential Effects

The potential effects on the underlying soils, geology and hydrogeology within the Proposed Development are assessed in the following sections for the activities associated within each phase (construction, operation and decommissioning) as described in Chapter 2.

The potential effects are assessed in accordance with the evaluation criteria outlined in Section 10.1. The unmitigated potential effects are summarised in Tables 10-9 and 10-10. The proposed mitigation measures are then considered to reduce or eliminate potential effects.

#### 10.5.1 Do Nothing Effect

If the Proposed Development were not constructed, it is likely that the current land uses will continue for the foreseeable future. The effect on the soils, geology and hydrogeology would remain largely unaltered as a result.

#### 10.5.2 Construction Phase

The following on-site activities have been identified as the sources of potential effects on the existing geological and hydrogeological conditions during the construction phase of the Proposed Development:

##### 10.5.2.1 *Tree Felling*

An area of the Proposed Development comprises of commercial coniferous forestry.

Felling of approximately 17.8 ha of coniferous forestry is required within and around the Proposed Development to accommodate the construction of part of the grid connection.

These works will be the subject of a Felling Licence Application to the Forest Service prior to construction as per the Forest Service's policy on granting felling licenses for these developments.



Proposed tree felling will involve the use of heavy felling machinery and exposure of underlying soils to surface water runoff, which could result in soil erosion. This also could lead to an increase in sediment and nutrient concentrations in the surface water run-off which may in turn impact groundwater in the Locally Important Aquifer beneath the Proposed Development.

The use of plant and machinery during tree felling works will require the storage and use of fuels and oils. Their storage and use present potential for spills and leaks which could contaminate underlying exposed soils and groundwater.

Further assessment of potential effects to surface water discharges from felling activities are discussed in Chapter 11 of the EIAR.

The magnitude of these potential effects, prior to mitigation, is considered to be of Moderate significance.

#### 10.5.2.2 Earthworks

The Proposed Development will require construction phase earthworks associated with the removal of overburden deposits for the construction of the 110 kV substation at Lackendarragh.

As such there is the potential for the soils, geology and hydrogeology to be affected from the excavation and movement of existing Glacial Till deposits during the construction phase of the Proposed Development.

The following earthworks excavations will be required:

- Excavation of Topsoil;
- Excavation of Glacial Till to bedrock (as required).

The following filling and material deposition operations will be required:

- Deposition of surplus material in berms for reinstatement purposes across the site;
- Importation and Filling of site won and imported General Fill and Engineering Aggregates

Ideally, a suitable bearing stratum is encountered within 3m from ground surface so that the substation foundation can be finished at / near existing ground level. Poured concrete will be required for the foundations of the substation building and plinths.

Some temporary stockpiles of material may be necessary prior to reinstatement; however, no permanent stockpiles of material will remain after construction.

It is proposed that all onsite materials excavated shall be retained on site and re-used where suitable as part of the construction phase to minimise the import materials requirements.

Surplus Topsoil and Glacial Till recovered from excavations will be used for the reinstatement purposes across the Proposed Development.



Direct impacts to the existing geological regime associated with the construction phase of the proposed development are:

- Soil compaction may occur due to movement of construction traffic. This will occur particularly within areas of compressible, soft deposits which are left in-situ during the construction phase. This could lead to an increase in surface water runoff due to reduced infiltration of rainfall and subsequently to an increase in erosion of overburden deposits left in-situ.
- The use of plant and machinery during construction will require the storage and use of fuels and oils. Their storage and use present potential for spills and leaks which could contaminate underlying exposed soils.
- During construction, imported engineering fill, concrete and excavated soils will be exposed in excavations and in temporary stockpiles. These soils will be subject to erosion by wind and rain which could deposit silt in streams with an indirect impact on surface water quality.

The magnitude of these potential impacts, prior to mitigation, is considered to be of Moderate significance.

Direct impacts to the existing hydrogeological regime associated with earthworks associated with the construction phase of the proposed development are:

- Potential for groundwater pollution from the removal of overburden deposits. The aquifer underlying the Proposed Development is classified by the GSI as ranging from 'High' to 'Extreme' with areas of exposed bedrock also present in these areas. At the eastern extent of the Proposed Development the vulnerability classification is reduced to 'Moderate'. The vulnerability of the aquifer to groundwater pollution particularly during construction stage will be increased as overburden is removed thus reducing the level of protection from groundwater pollution.
- Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer. Soil erosion as a result of exposure of soils in open excavations and temporary storage of excavated materials represents a potential impact to the underlying groundwater aquifer.

The magnitude of these potential impacts, prior to mitigation, is considered to be of Moderate significance.

Connection works will involve the installation of ducting, joint bays, drainage and ancillary infrastructure and the subsequent running of cables along the existing road network and within forestry lands. For cable trenches located in public roads, the contractor will excavate cable trenches and then lay high density polyethylene (HDPE) ducting in the trench in a surround of cement bound material (CBM). Back-filling and reinstatement in public roads will be to a specification to be agreed with the road authority.

A similar construction methodology will apply for cable trenches laid within site access tracks. In this case the cable-ducts will generally be laid when the track is being constructed and will follow the edge of the site access tracks. The trenches within these locations will generally be backfilled using the excavated material.



Direct effects to the existing environment associated with the proposed internal cabling and grid connection works include:

- The Proposed Development, associated excavations and ducting may present a preferential pathway for the movement of groundwater and/or contamination in the subsurface.  
However, the subsoil across the Proposed Development is predominantly Glacial Till which has a low permeability throughout the majority of the 110 kV GCR and 33 kV CNR routes.
- The excavations for the trenches and joint bays can have a direct impact on the exposed soils and rock in the form of increased erosion from surface water ingress.
- Where the material excavated from the Proposed Development excavations are not suitable for reuse as backfill or deposition on site this material will be disposed of at a facility licenced (subject to environmental testing and classification) to accept this waste type.

Given that the open sections of the trench will be backfilled following the installation of each section of ducting the magnitude of these potential effects, prior to mitigation, is of Slight Significance.

### 10.5.3 Horizontal Directional Drilling (HDD) Under Existing Structures

There is 1 no. EPA mapped Water Framework Directive (WFD) Watercourse that will be crossed by the 110 kV GCR. The 33 kV CNR traverses 2 no. EPA mapped WFD Watercourses: the COOM\_010, and the BRIDE (BLACKWATER)\_010. The COOM\_010 shall be traversed by HDD at 2 no. locations; one of which is located within the permitted CGEP development site where the internal wind farm access track crosses the river.

In addition to these crossings of WFD watercourses, there are 63 no. minor watercourse crossings (small streams and man-made drains) along the proposed route. For details on all watercourse crossings, please refer to Chapter 11 - Hydrology and Water Quality and see Figure 11-4, Volume 4; for the crossing locations.

Horizontal directional drilling (HDD) will be employed at several locations along the 110kV GCR and the 33 kV CNR as part of the Proposed Development.

Crossing existing culverts will be implemented using open trenching with either an undercrossing or an overcrossing, depending on the depth of the culvert.

The operation shall take place from one side of the watercourse within the public road corridor or verge and will be carried out by an experienced HDD specialist. Each crossing is expected to take place in a single day under one mobilisation.

The process will involve setting up a small, tracked drilling rig on one side of the watercourse, within the public road corridor, and at least 10m back from the stream bank. A shallow starter pit will be excavated at the point of entry and shall be located at a sufficient distance from the watercourse to achieve a minimum clearance depth below the bed of the watercourse.

A pilot hole will be bored as per the agreed alignment and shall be tracked and controlled using a transmitter in the drill head. By tracking the depth, position and pitch of the drill head the operator can accurately steer the line of the drilling operation. The drilling operation is lubricated using a fluid. When the pilot hole has been drilled to the correct profile, its diameter is increased, if necessary, to match the external diameter of the cable duct. The flexible plastic ducting is then pulled through the pre-drilled hole and sealed at each end until required for cable installation.



The depth of the bore shall be at least 3m below the level of the public road and stream bed. A pre-construction survey of buried services within the public road will be carried out by the contractor prior to commencement of the operation to confirm the conditions predicted in this EIAR.

The proposed 110kV GCR will cross the M8 Cork to Fermoy Motorway at Corrin View Estate, south of Junction 15. HDD will be used to traverse beneath both carriageways of the M8.

The locations of the launch and reception pits will be adequately spaced from the carriageway to ensure the bore is at such depth as not to conflict with the drainage or surface of the motorway or associated embankments.

There is sufficient room available to accommodate the necessary equipment. The cables will be laid at sufficient depth below the motorway to stay below the motorway drainage and without impacting on the motorway foundations.

Direct impacts to the existing environment associated with the proposed HDD works include:

- Potential for contamination to groundwater from spills/leakages during construction phase earthworks and HDD operations. The use of construction plant and associated refuelling and storage of fuels and hydrocarbons with potential for spills or leaks could result in contamination of the underlying aquifers.
- Potential for overburden collapse at the proposed HDD locations at water crossings during the advancement of the HDD bore.

The magnitude of these potential effects, prior to mitigation, is considered to be of Moderate significance.

#### 10.5.4 Operational Phase

The potential effects on soils, geology and hydrogeology from the operation of the Proposed Development are outlined hereunder.

##### 10.5.4.1 *Potential Direct Effects*

Very few potential direct effects are envisaged during the operational phase of the Proposed Development.

These include:

- Minor excavations of replaced soils, subsoils, trench backfill material will be required along the Proposed Development if a fault occurred during the operational phase. These works will be temporary and of short duration. The road surface and underlying subsoils excavated along the grid cable connection will be exported from the Proposed Development site to a licenced waste facility.
- Some construction vehicles may be necessary for maintenance of Proposed Development which could result in minor accidental leaks or spills of fuel/oil.

The magnitude of these potential effects, prior to mitigation, is considered to be of Slight Significance.



### 10.5.5 Potential Effects during Decommissioning

Very few potential direct effects are envisaged during the decommissioning phase of the Proposed Development.

The 110kV GCR and onsite substation within Lackendarragh North and ancillary electrical equipment will form part of the national grid and will be left in situ.

The 33kV CNR that connects each turbine will be removed from the cable ducting. The cabling will be pulled from the cable duct using a mechanical winch which will extract the cable and re-roll it on to a cable drum. This will be undertaken at each of the joint bays/pull pits along the cable. The access track will be excavated using a mechanical excavator at each cable pulling pit location and will be fully re-instated once the cables are removed. The construction vehicles required for carrying out these works have potential to have minor accidental leaks or spills of oil/ fuel.

The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance for an underground element that is not visible.

The magnitude of these potential effects, prior to mitigation, is considered to be of Slight Significance.

### 10.5.6 Potential Cumulative Effects

Relevant projects in proximity to the proposed development are listed in Table 10-9:

**Table 10-9: Potential Cumulative Impact from other developments**

Development	Distance to Proposed Development (km)	Status	Interface	Potential Cumulative Impact
Bottlehill Landfill	0km	Constructed (Not Operational)	Potential cumulative impact on: Glenville GWB Locally Important Bedrock Aquifer Groundwater Wells and Springs	Imperceptible
Coom Green Energy Park	0km	Consented	Potential cumulative impact on: Glenville GWB Locally Important Bedrock Aquifer Groundwater Wells and Springs	Slight
Amarenco Solar Rathcormac Ltd. Solar Farm	Adjacent to proposed Barrymore 110 kV substation	TBC (Live Case)	Potential cumulative impact on: Glenville GWB Locally Important Bedrock Aquifer Groundwater Wells and Springs	Slight



The surrounding area predominantly comprises agricultural farmland and forestry with no other significant industries identified. Furthermore, given the resultant Slight to Moderate impact of the proposed development, it is considered there will be no cumulative impacts from other industrial developments on the geology and hydrogeology of the site.

It is considered given that the existing Bottlehill Landfill is not operational and has not received any waste the potential cumulative impact to groundwater receptors is considered to be Imperceptible. Should the facility become operational during the life of the Proposed Development, the engineered landfill design and effective implementation and efficacy of the mitigation measures will prevent any significant, adverse cumulative impacts. In these circumstances, any effects on the receiving environment would be Imperceptible.

The CGEP has received planning permission which could mean that construction could coincide with that of the Proposed Development. However, the construction of the Proposed Development will only require relatively localised, shallow excavation works, that will be short in duration, linear and transient in nature. The substation foundation will require concrete to be poured within the footprint. In these circumstances and given the classification of the underlying aquifer and the limited depth and width of excavation associated with the works, the potential cumulative impact to groundwater receptors is considered to be Slight.

Where plant and machinery are required for the drainage works the potential exists for minor accidental leaks or spills of fuel/oil.

Impacts on soils, geology and hydrogeology will therefore not extend beyond the immediate vicinity of the excavations/works. Therefore, no cumulative impacts between the Proposed Development and the other existing, permitted (including the CGEP) or proposed projects will occur.

There may be indirect cumulative impacts in terms of demands placed on local quarries for aggregate and concrete required during the construction phase of the development.

#### 10.5.7 Summary of Potential Effects

A summary of unmitigated potential effects on soils, geology and hydrogeology attributes from the Proposed Development is provided in Table 10-10 with the potential effects on hydrogeological attributes provided in Table 10-11.



**Table 10-10: Summary of Potential Unmitigated Impact Significance on Land, Soils and Geology Attributes**

Activity	Potential Impact	Receptor	Sensitivity	Prior to Mitigation	
				Magnitude	Significance
<b>Construction Phase</b>					
Earthworks	<p>Removal of overburden material and exposure underlying Clay and Bedrock to erosion.</p> <p>Construction traffic resulting soil compaction and increase in surface water runoff resulting in increased erosion of exposed soils.</p> <p>Importation of engineering fill and concrete products for substation</p> <p>Disposal of surplus excavated material to licenced facility</p>	<p>Local, organic soils and Glacial Till deposits.</p> <p>Bedrock</p> <p>Local quarries</p> <p>Licenced Waste Facilities</p>	Medium	Small Adverse	Slight
Felling Activities	<p>Exposure of underlying overburden leading to increased erosion.</p> <p>Felling machinery resulting soil compaction of soft deposits and an increase in surface water runoff resulting in increased erosion of exposed soils.</p>	<p>Local organic soils and Glacial Till deposits.</p>	Medium	Moderate Adverse	Moderate
HDD under Existing Structure	<p>Removal of overburden material and exposure underlying Clay and Bedrock to erosion.</p> <p>Importation of engineering fill and concrete products</p> <p>Disposal of surplus excavated material to licenced facility</p>	<p>Local, organic soils and Glacial Till deposits.</p> <p>Bedrock</p> <p>Licenced Waste Facilities</p>	Medium	Moderate Adverse	Moderate



Activity	Potential Impact	Receptor	Sensitivity	Prior to Mitigation	
				Magnitude	Significance
<b>Operational Phase</b>					
Maintenance Traffic	Release of hydrocarbons or fuel spill	Local organic soils and Glacial Till deposits. Bedrock	Medium	Small Adverse	Slight
<b>Cumulative Impacts</b>					
Potential for requirement of imported aggregate to the Bottlehill Landfill for maintenance of access tracks, landfill infrastructure	Cumulative impacts on local quarries from extraction of fill for proposed development	Local quarries	Medium	Negligible	Imperceptible
Potential for CGEP to be under construction at the same time	Cumulative impacts on local quarries from extraction of fill for proposed development	Local quarries	Medium	Small Adverse	Slight
Potential for Amarenco Solar Rathcormac Ltd. Solar Farm to be under construction at the same time	Cumulative impacts on local quarries from extraction of fill for proposed development	Local quarries	Medium	Negligible	Imperceptible



**Table 10-11: Summary of Potential Unmitigated Impact Significance on Hydrogeology**

Activity	Potential Impact	Receptor	Sensitivity	Prior to Mitigation	
				Magnitude	Significance
<b>Construction Phase</b>					
Earthworks	<p>Potential for ground water pollution from the removal of overburden deposits.</p> <p>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer</p> <p>Potential for contamination to groundwater from spills/leakages during construction phase earthworks.</p>	<p>Glenville and Tallow GWBs</p> <p>Locally and Regionally Important Bedrock Aquifers</p> <p>Groundwater Wells and Springs</p>	High	Small Adverse	Moderate/ Slight
Felling Activities	<p>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer</p> <p>Potential for contamination to groundwater from spills/leakages from felling machinery</p>	<p>Glenville and Tallow GWBs</p> <p>Locally Important Bedrock Aquifer</p> <p>Groundwater Wells and Springs</p>	Medium	Moderate Adverse	Moderate
HDD under Existing Structure	<p>Potential for ground water pollution from the removal of overburden deposits.</p> <p>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer</p> <p>Potential for contamination to groundwater from spills/leakages</p>	<p>Glenville and Tallow GWBs</p> <p>Locally and Regionally Important Bedrock Aquifers</p> <p>Groundwater Wells and Springs</p>	Medium	Moderate Adverse	Moderate



Activity	Potential Impact	Receptor	Sensitivity	Prior to Mitigation	
				Magnitude	Significance
<b>Operation</b>					
Maintenance Traffic	Release of hydrocarbons or fuel spill	Glenville GWB and Tallow GWB Bedrock Aquifer Groundwater Wells and Springs	Medium	Small Adverse	Slight
<b>Cumulative Impacts</b>					
Potential for requirement of imported aggregate to the Bottlehill Landfill for maintenance of access tracks, landfill infrastructure.	Potential for groundwater pollution from waste deposition activities at the Bottlehill Landfill	Potential cumulative impact on: Glenville GWB Locally Important Bedrock Aquifer Groundwater Wells and Springs	Medium	Negligible	Imperceptible
Potential for CGEP to be under construction at the same time	Potential for ground water pollution from the removal of overburden deposits. Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer Potential for contamination to groundwater from spills/leakages during construction phase earthworks.	Potential cumulative impact on: Glenville GWB Locally Important Bedrock Aquifer Groundwater Wells and Springs	Medium	Small Adverse	Slight
Potential for Amarenco Solar Rathcormac Ltd. Solar Farm to be under construction at the same time	Potential for ground water pollution from the removal of overburden deposits. Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer	Potential cumulative impact on: Glenville GWB Locally Important Bedrock Aquifer Groundwater Wells and Springs	Medium	Small Adverse	Slight



## 10.6 Mitigation Measures

The following section outlines appropriate mitigation measures by design and best practice to avoid or reduce the potential effect of the Proposed Development. Further details are given in the CEMP which is contained in Appendix 2.2 of the EIAR.

### 10.6.1 Mitigation by Design and Best Practice

With regard to the proposed development, detailed design and best practice will be implemented as follows:

The works have been designed in accordance with best practice and checked by geotechnical and civil engineers, suitably qualified and experienced in excavation and earthworks design and construction methodologies.

Any excavation and construction related works will be subject to a design risk assessment at detailed design stage to evaluate risk levels for the construction, operation and maintenance of the works. Identified impacts will be minimised by the application of principles of avoidance, prevention and protection. Information on residual impacts will be recorded and relayed to appropriate parties

A detailed method statement for each element of the works will be prepared by the Contractor prior to any element of the work being carried out.

Given that the works comprises a significant proportion of excavation and earthworks, suitably qualified and experienced geotechnical personnel will be required on site to supervise the works.

The Contract will require programming of the works such that earthworks are not scheduled during severe weather conditions. Where such weather is forecast, suitable measures will be taken to secure the works.

### 10.6.2 Construction Phase

The following sections outline appropriate mitigation measures to avoid or reduce the potential impact of the proposed development.

#### 10.6.2.1 *Construction Environmental Management Plan*

A Construction Environmental Management Plan (CEMP) has been prepared for the proposed development and is included in Volume 3, Appendix 2.2. The CEMP defines the work practices, environmental management procedures and management responsibilities relating to the construction phase of the proposed development.

The CEMP describes how the contractor for the main construction works will implement a site Environmental Management System (EMS) to meet the specified contractual, regulatory and statutory requirements including the requirements identified as part of the environmental impact assessment process.

The CEMP will be updated prior to construction to take account of any amendments arising during the consenting process and relevant conditions attached to the planning permission and will be implemented for the duration of the construction phase of the project. The CEMP will be a live document and will be reviewed and updated as required.

Reference to relevant sections of the CEMP with respect to the mitigation of potential impacts to soils, geology and hydrogeology from the Proposed Development are outlined below.



### 10.6.2.2 *Tree Felling*

As outlined in Section 10.5.2.1 potential effects to the existing environment from the proposed tree felling works have been identified. The works will lead to the exposure of underlying soils to surface water runoff, which could result in soil erosion. This also could lead to an increase in sediment and nutrient concentrations in the surface water run-off which may in turn impact groundwater in the Locally Important Aquifer beneath the Proposed Development site.

One of the primary mitigation measures to be employed at the construction phase of the development is the management of silt laden runoff. The potential impact from silt laden surface water runoff from increased erosion of exposed overburden deposits will be assessed at site-specific locations particularly at new and existing drainage locations and where tree felling works are proposed.

Details of the proposed Surface Water Management System and mitigation measures are summarised below and are also outlined in the CEMP in Appendix 2.2 of this EIAR.

Best practices will be employed in the prevention of silt laden run-off from entering watercourses as discussed below.

To minimise the impact to surface water quality, existing forestry drainage will be maintained outside the immediate site area, and where appropriate additional site drainage and settlement ponds will be installed as required prior to construction activities. Silt fencing will be installed in new and existing drainage and monitoring of water quality undertaken during the tree felling works.

The use of plant and machinery during tree felling works will require the storage and use of fuels and oils. Details of oil spill protection measures adjacent to sensitive receptors and emergency spill response procedures are outlined in CEMP in Appendix 2.2 of this EIAR. Given the extent of tree felling required for the Proposed Development the significance of the effects on the soils, geology and hydrogeology is considered to be Imperceptible following the implementation of mitigation measures discussed above

### 10.6.2.3 *Earthworks*

Soil excavated from trenches along the Proposed Development will be taken to a licenced facility for disposal or recycling where required. If feasible, the upper layers of tarmac and asphalt will be excavated separately to the lower engineered fill layers. The lower engineered fill layers will be reused. The tarmac / asphalt layers will be taken to a licenced facility for disposal or recycling.

### 10.6.2.4 *Measures for Spills*

Details of oil spill protection measures adjacent to sensitive receptors and emergency spill response procedures are outlined in the CEMP which is contained in Appendix 2.2 of the EIAR.

Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled. Refuelling of construction vehicles will be carried out from these tanks or from delivery vehicles at designated refuelling areas.



Specific mitigation measures relating to the management of hydrocarbons are as follows:

- Fuels, lubricants and hydraulic fluids for equipment used on the construction site will be carefully handled to avoid spillage;
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and properly disposed of;
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling; and
- Appropriate spill control equipment, such as oil soakage pads, will be kept within the construction area and in each item of plant to deal with any accidental spillage.

#### 10.6.2.5 *Groundwater*

To mitigate against the increased vulnerability of the underlying aquifer to groundwater pollution, all excavations will be constructed and backfilled as quickly as possible. Excavations will stop during or prior to heavy rainfall events. To mitigate against possible contamination of the underlying groundwater, refuelling of machinery and plant will only occur at designated refuelling areas. Details of mitigation measures related to spills and fuel storage are outlined above.

The GSI database is however not complete; it is probable that there are other wells in addition to those in the GSI databases but are generally associated. Given the limited depth of the excavations during the construction phase and the distance to sensitive groundwater receptors the potential risk posed to groundwater supply wells is considered to be imperceptible following the implementation of mitigation measures discussed above.

If, however, in the unlikely event of a previously unknown domestic well being impacted by the proposed development, an alternative supply will be provided – either a connection to mains water or a replacement well will be drilled.

The GSI holds records of groundwater wells in the vicinity of the proposed 110kV GCR. However, trenches are shallow (1.2m deep) and will only be open for a short period.

Depending on the ground conditions, presence of services, traffic management required, weather conditions, etc., the rate of installation of cable ducting would vary between 50m and 100m per day. Dewatering is therefore unlikely to be required and no impacts on wells is envisaged.

Grid connection and internal cable trenches could provide preferential pathways for groundwater and contaminant movement. Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows. To further mitigate the risk of cable trenches becoming preferential pathways, clay plugs (or other low permeability material) will be installed at intervals along the trench to stop / inhibit water movement.

#### 10.6.3 Mitigation Measures during Operation

It is not envisaged that the operation of the Proposed Development will result in significant effects on the geological and hydrogeological regimes within the study area, as there will be no further disturbance of overburden post-construction.



The main potential effect during the operation phase would be the risk to groundwater from contamination from spills. Refuelling of maintenance vehicles will be carried out from delivery vehicles at designated refuelling areas. Specific mitigation measures relating to the management of hydrocarbons are as follows:

- Fuels, lubricants and hydraulic fluids for equipment used on the site will be carefully handled to avoid spillage.
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and properly disposed of;
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling; and
- Appropriate spill control equipment, such as oil soakage pads, will be kept within the refuelling areas and in each item of plant to deal with any accidental spillage.

Due to the reduced magnitude of the effects, no additional mitigation measures are required for the maintenance and operation of the Proposed Development.

#### 10.6.4 Mitigation Measures during Decommissioning

Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant.

Some of the impacts associated with reinstatement of the site will be avoided by leaving these in place where possible.

Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures outlined above.

#### 10.6.5 Cumulative

During the construction of the Proposed Development there will be the requirement for the importation of engineered fill from source quarries and potential for disposal of materials unsuitable for reuse at licensed facilities. Should these coincide with demand for imported aggregate for maintenance works at the existing Bottlehill Landfill or for the construction of the CGEP there would a cumulative effect in terms of demands placed on local quarries for aggregate.

Given the Bottlehill Landfill is already constructed and non-operational it is considered unlikely significant quantities of aggregate would be required. As such, it is considered there will be an Imperceptible cumulative effect during the construction phase of the development.

The CGEP has received planning permission so it is likely that this development will be constructed prior or at the same time as the Proposed Development. It is not envisaged that significant amounts of aggregate will be required for the construction of the Proposed Development therefore there will be a slight cumulative effect during the construction phase of the development.

No significant, direct negative cumulative effects are envisaged during the operation or decommissioning phase of the Proposed Development. As such no mitigation measures are required with respect to potential cumulative impacts of the proposed development.



## 10.7 Residual Effects

It can be observed from Tables 10-12 and 10-13 that, following the implementation of mitigation measures, the residual effect significance to the receiving environment would be imperceptible during the construction period and imperceptible during the operation of the Proposed Development. Mitigation measures will be monitored throughout the construction and operational phases.

The Proposed Development is not expected to contribute to any significant, negative cumulative effects of other existing or known developments in the vicinity. Slight residual cumulative effects from the excavation of fill material from local quarries and disposal of material deemed unsuitable for reuse are considered to result from the proposed development by placing demand on existing quarries and available void space at licensed facilities during the construction phase of the development.



**Table 10-12: Residual Impact Significance for Sensitive Geological Attributes**

Activity	Potential Impact	Receptor	Sensitivity	Prior to Mitigation		Post Mitigation	
				Magnitude	Significance	Magnitude	Significance
<b>Construction Phase</b>							
Earthworks	Removal of overburden material and exposure underlying Clay and Bedrock to erosion. Construction traffic resulting soil compaction and increase in surface water runoff resulting in increased erosion of exposed soils. Importation of engineering fill and concrete products Disposal of surplus excavated material to licenced facility	Local organic Topsoil and Glacial Till deposits. Bedrock Local quarries Licenced Waste Facilities	Medium	Small Adverse	Slight	Small Adverse	Imperceptible
Felling Activities	Exposure of underlying overburden leading to increased erosion. Felling machinery resulting soil compaction of soft deposits and an increase in surface water runoff resulting in increased erosion of exposed soils.	Local organic Topsoil and Glacial Till deposits.	Medium	Moderate	Moderate	Negligible	Imperceptible



Activity	Potential Impact	Receptor	Sensitivity	Prior to Mitigation		Post Mitigation	
				Magnitude	Significance	Magnitude	Significance
HDD under Existing Structure	<p>Potential for ground water pollution from the removal of overburden deposits.</p> <p>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer</p> <p>Potential for contamination to groundwater from spills/leakages</p>	<p>Glenville and Tallow GWBs</p> <p>Locally and Regionally Important Bedrock Aquifers</p> <p>Groundwater Wells and Springs</p>	Medium	Moderate Adverse	Moderate	Negligible	Imperceptible
<b>Operational Phase</b>							
Maintenance Traffic	Release of hydrocarbons or fuel spill	<p>Local organic Topsoil and Glacial Till deposits.</p> <p>Bedrock.</p>	Medium	Small Adverse	Slight	Negligible	Imperceptible
<b>Cumulative Effects</b>							
Potential for requirement of imported aggregate to the Bottlehill Landfill for maintenance of access tracks, landfill infrastructure.	Cumulative impacts on local quarries from extraction of fill for proposed development	Local quarries	Medium	Negligible	Imperceptible	Negligible	Imperceptible



Activity	Potential Impact	Receptor	Sensitivity	Prior to Mitigation		Post Mitigation	
				Magnitude	Significance	Magnitude	Significance
Potential for CGEP to be under construction at the same time	Cumulative impacts on local quarries from extraction of fill for proposed development	Local quarries	Medium	Small Adverse	Slight	Negligible	Imperceptible
Potential for Amarenco Solar Rathcormac Ltd. Solar Farm to be under construction at the same time	Cumulative impacts on local quarries from extraction of fill for proposed development	Local quarries	Medium	Negligible	Imperceptible	Negligible	Imperceptible



**Table 10-13: Residual Impact Significance for Sensitive Hydrogeological Attributes**

Activity	Potential Impact	Receptor	Sensitivity	Prior to Mitigation		Post Mitigation	
				Magnitude	Significance	Magnitude	Significance
<b>Construction Phase</b>							
Earthworks	<p>Potential for ground water pollution from the removal of overburden deposits.</p> <p>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer</p> <p>Potential for contamination to groundwater from spills/leakages during construction phase earthworks.</p>	<p>Glenville and Tallow GWBs</p> <p>Locally and Regionally Important Bedrock Aquifers</p> <p>Groundwater Wells and Springs</p>	High	Small Adverse	Moderate/Slight	Negligible	Imperceptible
Felling Activities	<p>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer</p> <p>Potential for contamination to groundwater from spills/leakages from felling machinery</p>	<p>Glenville and Tallow GWBs</p> <p>Locally Important Bedrock Aquifer</p> <p>Groundwater Wells and Springs</p>	Medium	Moderate	Moderate	Negligible	Imperceptible
HDD under Existing Structure	<p>Potential for ground water pollution from the removal of overburden deposits.</p> <p>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer</p> <p>Potential for contamination to groundwater from spills/leakages</p>	<p>Glenville and Tallow GWBs</p> <p>Locally and Regionally Important Bedrock Aquifers</p> <p>Groundwater Wells and Springs</p>	Medium	Moderate Adverse	Moderate	Negligible	Imperceptible



Activity	Potential Impact	Receptor	Sensitivity	Prior to Mitigation		Post Mitigation	
				Magnitude	Significance	Magnitude	Significance
<b>Operational Phase</b>							
Maintenance Traffic	Some operational traffic will be necessary for maintenance plus normal operational traffic which could result in minor accidental leaks or spills of fuel/oil.	Glenville and Tallow GWBs Bedrock Aquifer Groundwater Wells and Springs	Medium	Small Adverse	Slight	Negligible	Imperceptible
<b>Cumulative Effects</b>							
Potential for Amarengo Solar Rathcormac Ltd. Solar Farm to be under construction at the same time	Potential for ground water pollution from the removal of overburden deposits. Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer	Potential cumulative impact on: Glenville GWB Locally Important Bedrock Aquifer Groundwater Wells and Springs	Medium	Small Adverse	Slight	Negligible	Imperceptible



## 10.8 Conclusion

The assessment of soils, geology and hydrogeology has established a baseline for the receiving environment for the impact assessment. Potential effects were considered for the construction, operational and decommissioning phases of the Proposed Development as well as potential residual and cumulative effects. Mitigation measures have been proposed where relevant.

The Proposed Development site is not a sensitive site in terms of soils, geology and hydrogeology.

A number of potential effects have been identified associated with the excavation of soil and rock on the site. The significance of these potential effects is assessed as being slight to moderate significance prior to mitigation.

The Proposed Development is not expected to contribute to any significant, negative cumulative effects with other existing or proposed developments in the vicinity such as the Bottlehill Landfill and the Coom Green Energy Park.

With mitigation measures, outlined in Section 10.6, put in place during construction, operational and decommissioning stage the proposed development will have imperceptible significance on the soils, geology and hydrogeology.



## 10.9 References

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