# 7 Land, Soils and Geology

## 7.1 Introduction

This chapter comprises an assessment of the Land, Soils and Geology within the vicinity of the Proposed Development and the surrounding environs. The potential impacts posed by the construction and operational phases of the Proposed Development are investigated, and suitable mitigation measures are recommended to minimise impacts on the local soil and geological receptors.

The objectives of this chapter are:

- To provide a baseline assessment of the receiving environment in terms of land, soils and geology.
- To identify any potential negative impacts posed by the construction and operational phases of the Proposed Development.
- To propose suitable mitigation measures to prevent or reduce the significance of the negative effects identified.
- To consider any significant residual effects of cumulative impacts posed by the Proposed Development.

## 7.2 Consultation

ORS have been commissioned to assess the potential impacts of the Proposed Development in terms of Land, Soils, and Geology during the construction and operational phases.

The principal members of the ORS EIA team involved in this assessment include the following persons:

- **Project Scientist and Lead Author:**
  Alex Nascimento – B.Eng. (Hons) Environmental Engineering. Current Role: Senior Environmental Consultant. Experience *ca.* 13 years

- **Project Scientist and Reviewer:**
  Cathal Tighe – B.Agr.Sc (Agricultural-Environmental Science). Current Role: Senior Environmental Consultant. Experience *ca.* 5 years

- **Project Coordinator and Reviewer:**
  Oisín Doherty – B.Sc. (Geography with Environmental Science), MSc. (Environmental Management), CEnv, MIEnvSc. Current Role: Chartered Environmental Consultant. Experience *ca.* 15 years.

Consultation between ORS and other members of the planning/design team was made in order to obtain information required to assess the potential construction and operational phase impacts on local Land, Soils, and Geology.

## 7.3 Assessment Methodology and Significance Criteria

The methodology used to produce this chapter included a review of relevant legislation and guidance, a desk study, a site walkover, an intrusive investigation (in the form of trial pits excavations), an evaluation of potential effects, an evaluation of significance of the effect and

an identification of measures to avoid and mitigate effects.

This chapter was carried out in accordance with the following guidance documents:

- EPA, (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.
- EPA, (2004). Land spreading of Organic Waste – Guidance on Groundwater Vulnerability Assessment of Land.
- EPA, (2004). Guidance Note on Storage and Transfer of Materials for Scheduled Activities.
- EPA, (2012). Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites.
- European Commission, (2017). Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report.
- Institute of Geologists Ireland, (2013). Guidelines for Preparation of Soils, Geology and Hydrogeology Chapters in Environmental Impact Statements.
- National Road Authority, (2008). Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.
- Transport Infrastructure Ireland, (2019). Cross Sections and Headroom, Design Standards (DN-GEO-03036)
- CIRIA, (2001). C532 - Control of Water Pollution from Construction sites – Guidance for consultants and contractors.
- UK CIRIA Report C552 (2001). Contaminated Land Risk Assessment: A Guide to Good Practice
- IGI, (2002). Geology in Environmental Impact Statements – a Guide (Institute of Geologists of Ireland.
- Department Agriculture, Food and Marine, (2017). Nitrate Explanatory Handbook for Good Agricultural Practice For The Protection Of Waters Regulations 2018.
- DAFM, (2022). Code of Good Practice for Poultry Litter Hauliers - Legal Obligations and Good Practice Guidelines for Poultry Litter Hauliers in Relation to the Use and Disposal of Poultry Litter.
- Nitrates Directive (91/676/EEC)
- Groundwater Directives (80/68/EEC) and (2006/118/EC).
- EU Soil Strategy 2030.
- EU Common Agricultural Policy.
- Waste Management Act 1996.

### 7.3.1 Desktop Study

A desk study was undertaken in order to collate and review background information in advance of the site survey and to develop a baseline of the land, soil and geology. The following documents and sources were referenced:

- Geological Survey of Ireland (GSI) maps and datasets
- Environmental Protection Agency (EPA) maps and datasets
- National Parks and Wildlife Service (NPWS) maps and datasets
- Ordnance Survey of Ireland (OSI) maps and datasets
- Met Eireann meteorological data
- Office of Public Works (OPW) maps and datasets
- Wicklow County Development Plan (CDP) 2022-2028
- Strategic Environmental Assessment CDP 2022-2028

- Review of the County Geology of Ireland: Wicklow
- Aerial Photography from ESRI (ArcGIS).
- 1:50,000 Discovery Series Maps and 6" maps
- South Eastern River Basin District River Basin Management Plan (DoEHLG)
- Teagasc ISIS GIS maps
- General Soil Map of Ireland 2nd Edition, (1980), The National Soil Survey, An Fóras Talúntais
- An Foras Talúntais (1980), Soil associations of Ireland and their land use potential.
- County Wicklow Groundwater Protection Scheme – Main Report, revised (2003).

### 7.3.2 Field Survey

Fieldwork commissioned October 2024 consisted of the following elements:

- Trial Pit Excavations
- BRE Digest 365 Percolation/Soakaway Testing

A site walk-over was conducted by ORS geotechnical consultants on the 3rd of October 2024 to verify the finding of the desktop study and identify baseline features on the Proposed Development site including:

- Drainage patterns and distribution
- Exposures
- Drainage Infrastructure
- Flora and fauna identification and distribution
- Identification of "Poached" ground.

### 7.3.3 Impact Assessment Methodology

**Chapter 1**, **Section 1.7** and **1.8**, outline the impact assessment methodology and rationale applied to each chapter of the study. This section describes some further criteria applied to the assessment of soil and geological receptors.

**Risk Appraisal Methodology**

The Conceptual Site Model (CSM) identifies potential contaminants, receptors and exposure pathways that may be present, based on the construction and operational phase of the Proposed Development. The identification of potential "contaminant linkages" is a key aspect of the evaluation of potentially contaminated land and in quantifying the potential risk associated with sites. As such this assessment has been undertaken in line with the Source - Pathway - Receptor Model as per the "Guidelines on the information to be contained in Environmental Impact Assessment Reports" 2022 and IGI 2013 guidance notes. At the impact assessment stage, any potential beneficial or adverse impacts associated with the development are identified and assessed with reference to the baseline environment. This requires consideration of:

- Quality of effects (sensitivity of receptor)
- Significance of effects (severity)
- Description of extent and context of effects (character/ magnitude)
- Probability of effects

- Duration and frequency of effects
- Type of effect (direct, indirect, residual, etc.)

**Table 1.1** in **Chapter 1** presents the criteria for the description of effects, as outlined in the EPA guidance report 2022.

**Evaluation of Geological Receptors**

The 13-step approach to impact assessment proposed in the IGI guidelines (2013) is adopted for the evaluation of potential effects. The baseline environment is assessed by characterising the site topographical, geological and geomorphologic regimes from the data acquired. Following on from the identification of the baseline environment, the available data is utilised to identify and categorise potential effects on the soils and geological environment as a result of the Proposed Development.

These assessments include:

- Undertaking preliminary materials calculations in terms of volumetric soil and subsoil excavation and reuse associated with development design,
- Assessing ground stability risks,
- Assessing the combined data acquired and evaluating any likely effects on the soils, geology, and ground stability,
- Identifying effects and considering measures that would mitigate or reduce the identified effect.

The significance of effects of the Proposed Development has been assessed in accordance with the EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports, 2022. The effects associated with the Proposed Development are described with respect to the EPA guidance in the relevant sections of this chapter.

**Magnitude and Significance of Impact**

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 National Road Authority (NRA) (2008) rating criteria, the importance of the geological features is rated in **Table 7.1** followed by an estimation of the magnitude of the impact in **Table 7.2** . This determines the significance of the impact prior to application of mitigation measures as set out in **Table 7.3** .

**Table 7.1** Sensitivity/ Value of the Proposed Development's Geological Features (NRA, 2008)

| Magnitude | Criteria | 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 Proposed Development site is significant on a national or regional scale | Geological feature on a regional or national scale (NHA).<br>• Large existing quarry or pit.<br>• 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 Proposed Development site is significant on a local scale | Contaminated soil on site with previous heavy industrial usage<br>• Large recent landfill site for mixed wastes<br>• Geological feature of high value on a local scale (County Geological site)<br>• Well drained and/or high fertility soils<br>• Moderately sized existing quarry or pit<br>• 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 Proposed Development site is moderate on a local scale | Contaminated soil on site with previous light industrial usage<br>• Small recent landfill site for mixed wastes<br>• Moderately drained and/or moderate fertility soils<br>• Small existing quarry or pit<br>• 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 Proposed Development site is small on a local scale | Large historical and/or recent Proposed Development for construction and demolition wastes<br>• Small historical and/or recent landfill Proposed Development for construction and demolition wastes<br>• Poorly drained and/or low fertility soils<br>• Uneconomic extractable mineral resource |

The assessment of the severity/ magnitude of an impact incorporates the timing, scale, size, and duration of the potential effect. The magnitude criteria for geological effects are defined in **Table 7.2** .

**Table 7.2** Severity/ Magnitude of Impact on Geological Features (NRA, 2008)

| Magnitude | Criteria | Description and Example |
|---|---|---|
| **Large Adverse** | Results in loss of attribute | Loss of high proportion of future quarry or pit reserves<br>• Irreversible loss of high proportion of local high fertility soils<br>• Removal of entirety of geological heritage feature<br>• Requirement to excavate / remediate entire waste from site<br>• 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<br>• Removal of part of geological heritage feature<br>• Irreversible loss of moderate proportion of local high fertility soils<br>• Requirement to excavate / remediate significant proportion of waste from site<br>• Requirement to excavate and replace moderate proportion of peat, organic soils |
| **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<br>• Removal of small part of geological heritage feature<br>• Irreversible loss of small proportion of local high fertility soils and/or<br>• high proportion of local low fertility soils<br>• Requirement to excavate / remediate small proportion of waste from site<br>• 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 |

Based on the determination of the findings from the above **Tables 7.1** and **7.2** the following matrix is used to establish the significance of the impact.

**Table 7.3** Rating the Significance of the Impact in Geology (NRA, 2008)

| 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 |

## 7.4 Description of the Receiving Environment

### 7.4.1 Background

This section of the chapter provides the baseline information in terms of geomorphology (landscape and topography), superficial and solid geology. The regional review of geological and hydrogeological conditions covers a zone of at least 2 km from the Proposed Development site, as suggested in the IGI guideline.

The Proposed Development site is found in the townland of Moneylane, Arklow, Co. Wicklow. approximately 2.1km southeast of the town of Arklow, Co. Wicklow and approximately 23km southwest of Wicklow Town, Co. Wicklow. The approximate grid reference location for the centre of the Proposed Development is T 22154, 72252, ITM: 722094, 672281.

The underlying geology has a major influence on topographical, hydrogeological and hydrological features within the Proposed Development vicinity, hence this chapter is closely linked to **Chapter 8 – Hydrology and Hydrogeology**.

The receiving environment is described below for the Proposed Development under the following headings:

- Topography
- Drift (Quaternary) Geology
- Bedrock Geology
- Soils and Subsoils

### 7.4.2 Topography

The Landscape Character Assessment present on the previous Wicklow County Development Plan in 2016 has not been updated for the purposes of the current Wicklow CDP 2022-2028, however it is considered to remain a robust and up to date reflection of the landscape character zones of the County.

This detailed Landscape Character Assessment identified 15 distinctive landscape categories, which were placed within a landscape hierarchy, presented in the **Table 7.4** below and as shown on **Figure 7.1** from the Map 17.09A-E from the CDP. The categories remain as described in the Landscape Character Assessment appendix of the 2016 CDP and are carried forward to the current CDP.

**Table 7.4** Wicklow Landscape categories

| HIERARCHY | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| **Landscape Category** | **Mountain And Lakeshore AONB** | **Coastal Areas AONB** | **Areas of High Amenity** | **Corridor Area** | **Lowlands** | **Urban Area** |
| **Landscape Area** | The Mountain Uplands | Northern Coastal Area | North East Mountain Lowlands | N11 Corridor | Rolling Lowland Areas 1-6 | All towns ranging from Levels 1-6 of the Wicklow Settlement Hierarchy |
| | The Blessington Lakes Area | | South East Mountain Lowlands | | | |
| | The Bray Mountains Group | Southern Coastal Area | Southern Hills | N81 corridor | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | The North Eastern Valley / Glencree | | Baltinglass Hills<br>Transitional Lands | | | |

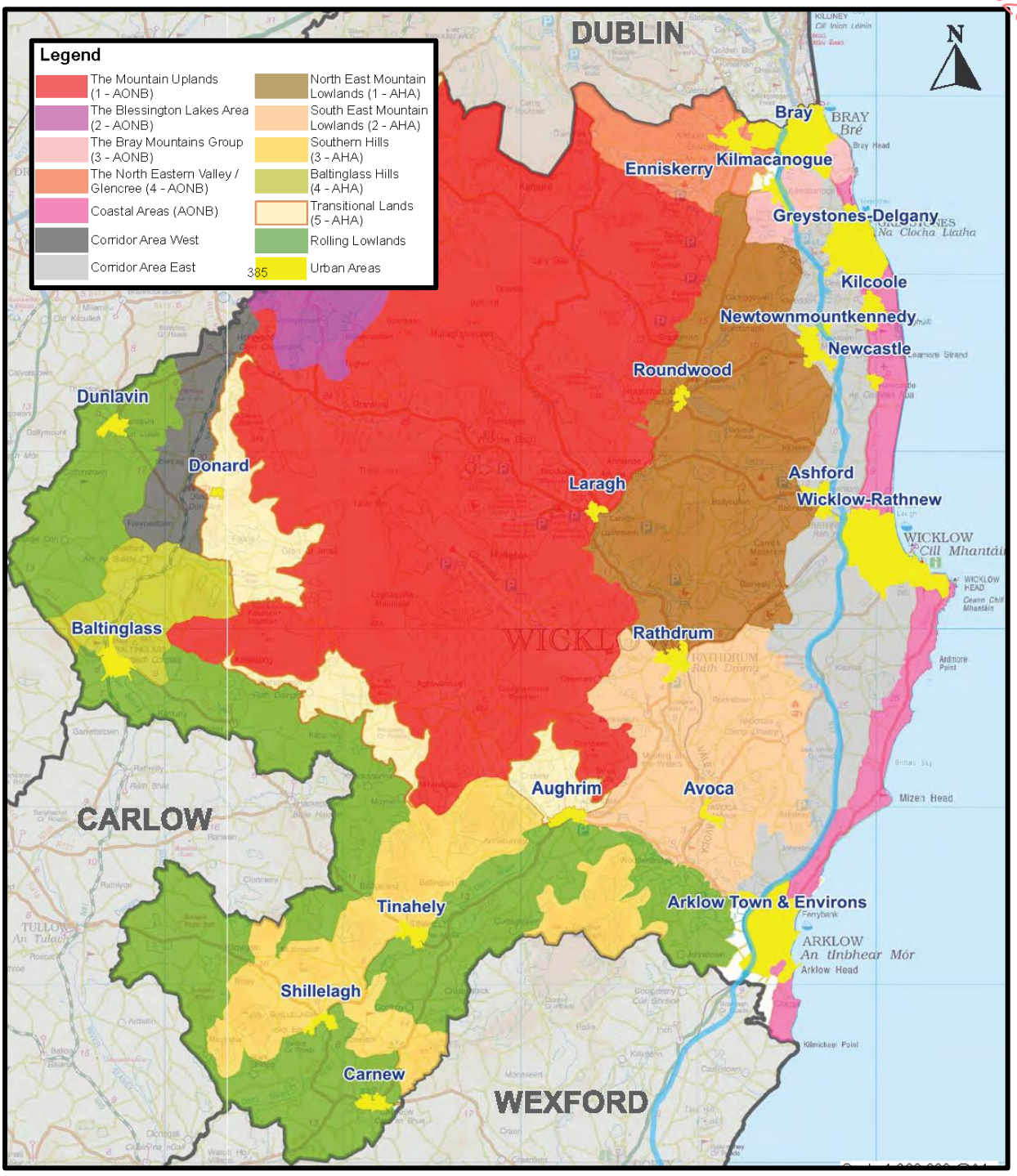


**Figure 7.1:** Wicklow Landscape Category Map (Map 17.09A-E of Wicklow CDP 2022-2028)

Based on the mapping of the Landscape Category of Wicklow, the Proposed Development is completely within the “Corridor Area East”, bordering to the South with Rolling Lowlands. Considering a 2.0 km radius from the Proposed Development, there are also a small portion of Area of High Amenity (AHA) named as Southeast Mountain Lowlands *ca.* 1.7 km to the North of the Proposed Development, and *ca.* 780 m to the East, the urban area of Arklow Town & Environs.

**Figure 7.2** below shows the Proposed Development overlayed onto the proximate Wicklow landscape mapping.

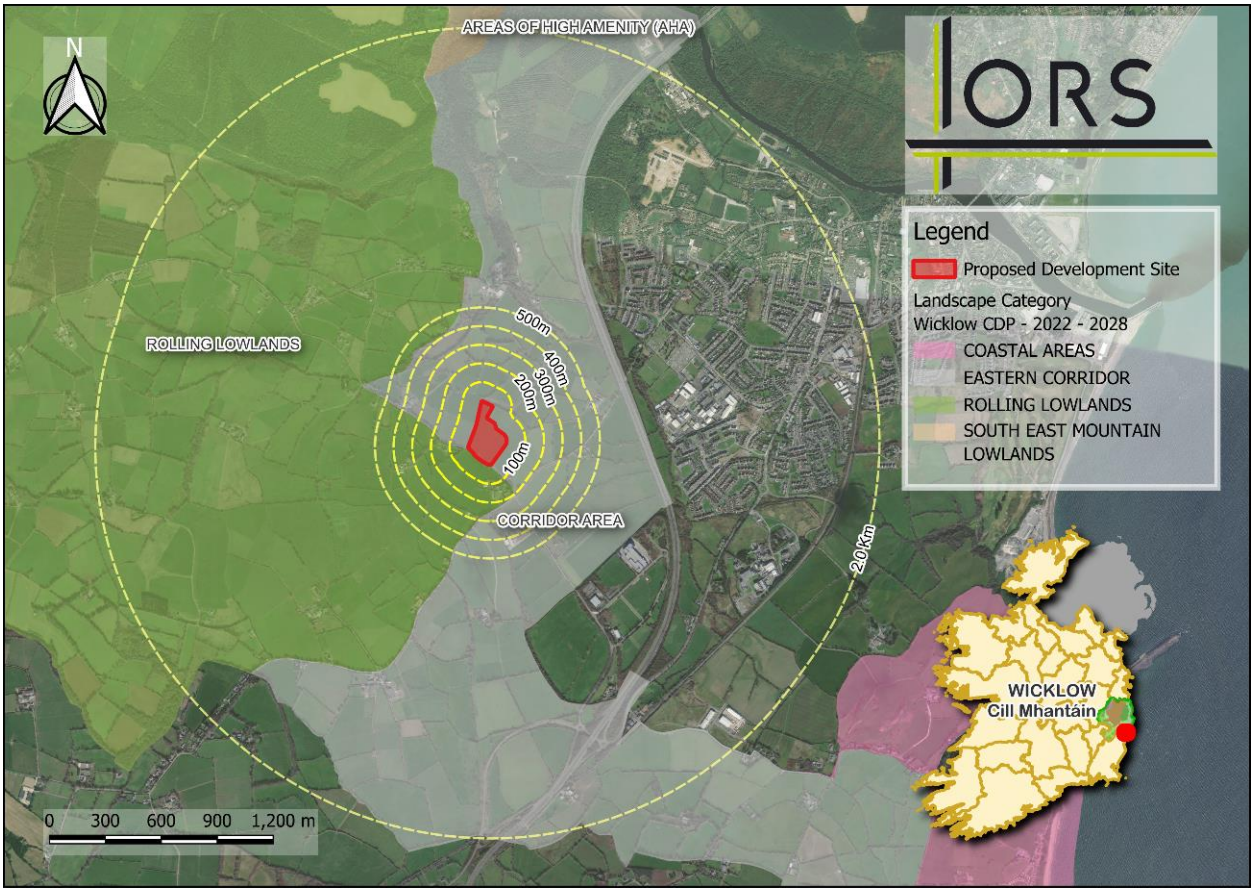


**Figure 7.2:** Overlay of the Proposed Development in relation to the proximate Wicklow Landscape categories

A generalised description of each of the four landscape areas identified within 2.0km of the Proposed Development are presented below.

### 4(a) - The N11 Corridor

The Proposed Development site is within the Corridor Area category, and specifically in the N11 landscape area. This landscape area is described as, relating to lands adjoining, surrounding or considered to be influenced by the man-made features of the N11. This route, for the most part, runs through the more low-lying and accessible tracts of land, dissects the Glen of the Downs wood in the north of the County and provides coastal views north of Wicklow

Town. This landscape area acts as the main connection between the major towns along the east coast of the County.

**Rolling Lowlands**

The Proposed Development borders this area to the South. The gently rolling and undulating countryside is best described as low-lying when compared to the rest of the terrain in County Wicklow. These landscape areas are generally located adjacent to the corridor zone or surrounded by more elevated lands within the 'Area of High Amenity'. The rolling lowlands are made up of the following 6 areas:

- West of the N81, including lands surrounding Grangecon and Dunlavin;
- Southeast of Baltinglass extending as far as south of Knockananna;
- To the extreme southwest of the County surrounding the Rathwood and Coolkenna areas and adjoining County Carlow;
- South of Shillelagh, surrounding the Carnew area and adjoining the more elevated lands within County Wexford;
- Lands located to the east of Tinahely and Aughrim adjoining the Area of High Amenity to the south, and lands west of Arklow adjoining the foothills of Croghan Mountain.

**3(b) - Area of High Amenity (AHA) The South East Mountain Lowlands**

Transitional undulating lands bordering the Area of Outstanding Natural Beauty and surrounding the distinctive features of the Vale of Avoca, lands surrounding the village of Avoca and the Aughrim River Valley. The area includes a number of designated views, prospects (extensive landscape views) and significant cultural heritage in the form of the Avoca Mines County Geological site and Avondale House.

**6 - Urban Areas**

All locations designated as 'settlements' in the County settlement hierarchy (i.e. areas falling within Levels 1-6) are considered 'urban' areas for the purpose of landscape classification. In terms of landscape classification, these settlements have already been deemed suitable for development (of the type allowed by the settlement strategy and the development standards of this plan) and the impacts on the wider landscape of such development has already been deemed acceptable. Therefore, it will not be necessary for developments in urban areas to have regard to the surrounding landscape classification or to carry out landscape or visual impact assessment. In the case of the development, the Proposed Development site is to the west of the Urban Area of Arklow Town & Environs.

The **Figure 7.3** below shows an adapted map from the Wicklow CDP 2022-2028 i.e. the appendix Natural Heritage & Biodiversity Map No. 17.10B, illustrating Views of Special Amenity Value or Special Interest.

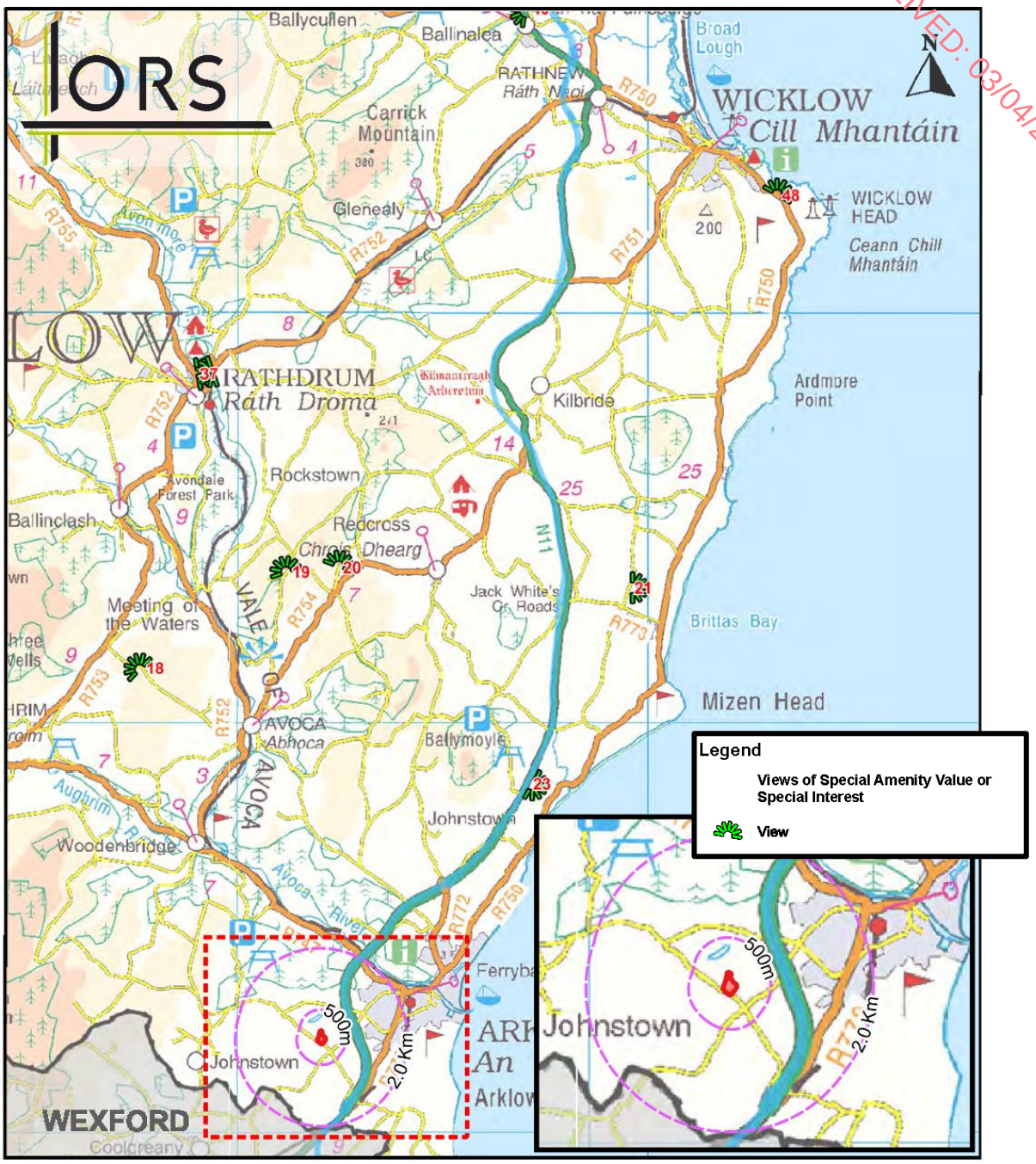


**Figure 7.3:** View of Special Amenity Value or Special Interest (Natural Heritage & Biodiversity Map No. 17.10B

Based on the information, there are no Views of Special Amenity Value or Special Interest within or close to the Proposed Development site. The closest is that identified as (18) “views from the L-6169 towards the R753 and the Avonbeg River Valley and across to Cushbawn Mountain”, *ca.* 9.8 km Northeast of the Proposed Development site. The Plan presents also some prospects of Special Amenity Value (SAV) or Special Interest (SI), which is illustrated in the **Figure 7.4** overleaf.

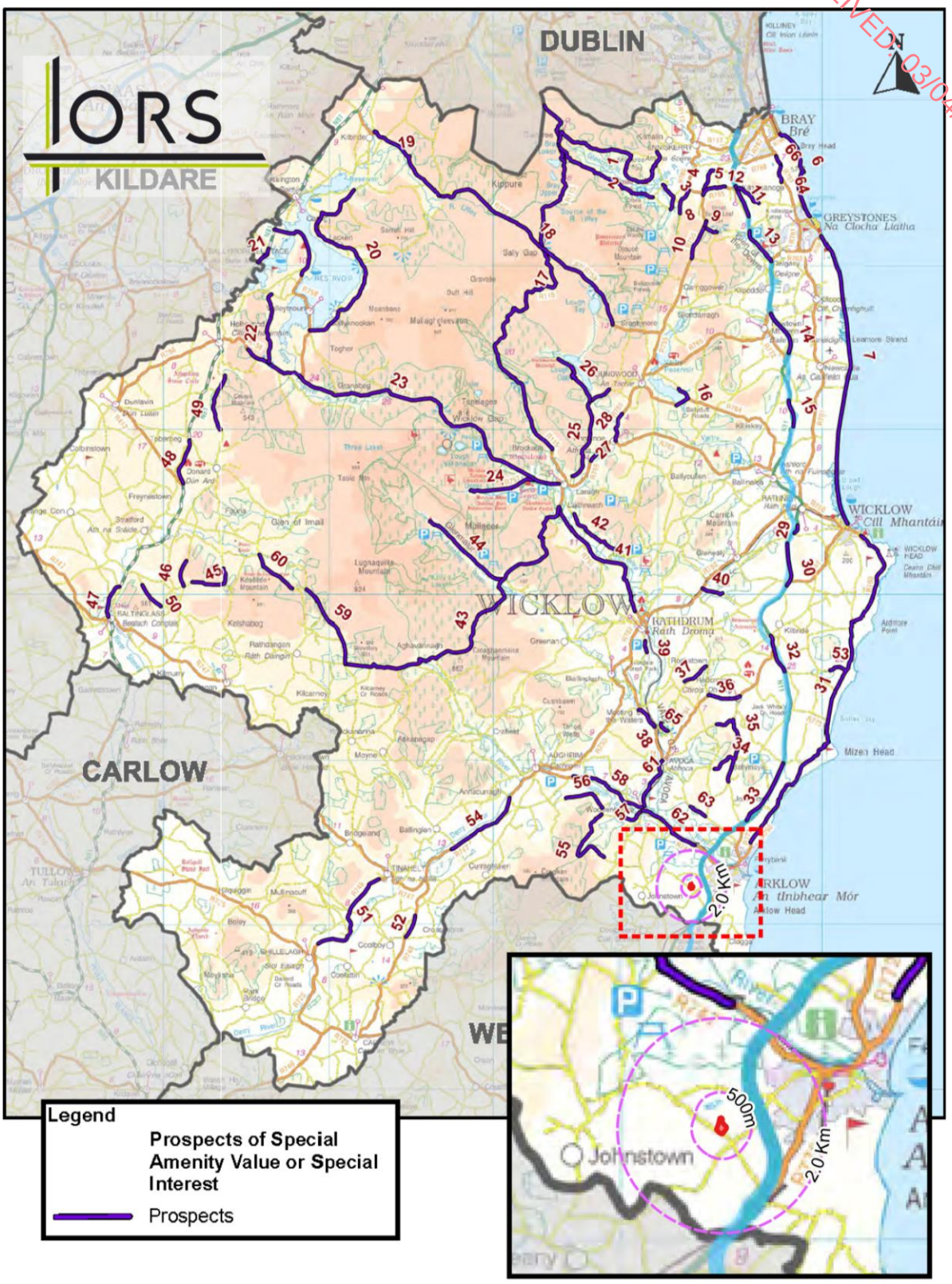


**Figure 7.4:** Prospects of Special Amenity Value or Special Interest (Map No. 17.11 of WCDP 2022-2028)

The closest prospect SAV or SI is *ca.* 2.4 km to the North of the Proposed Development, identified as (62) in **Figure 7.4** above. The prospect is observed from the vantage point of the R747 Vale of Avoca east of Woodenbridge. From this origin, there are prospects of "both sets of Vale of Avoca including Avoca River Valley".

The area's landscape is predominantly agricultural, interspersed with several watercourses. To the north, the Ballyduff, Moneylane, and Rooaun streams are present, while the Knockanree stream lies to the west. To the south, a tributary of the Moneylane stream can be found. The site's topography slopes gently from south to north, with the highest point at 51.9 m AOD located at the southernmost boundary. From this peak, the terrain descends smoothly northward, culminating at approximately 46.5 m AOD along the northern boundary. This gradual decline spans 333 meters, resulting in a total elevation change of 5.4 meters and an average slope of 1.63%, classifying the terrain as a moderate slope.

**Figure 7.5** below illustrates the Proposed Development site and local topography.

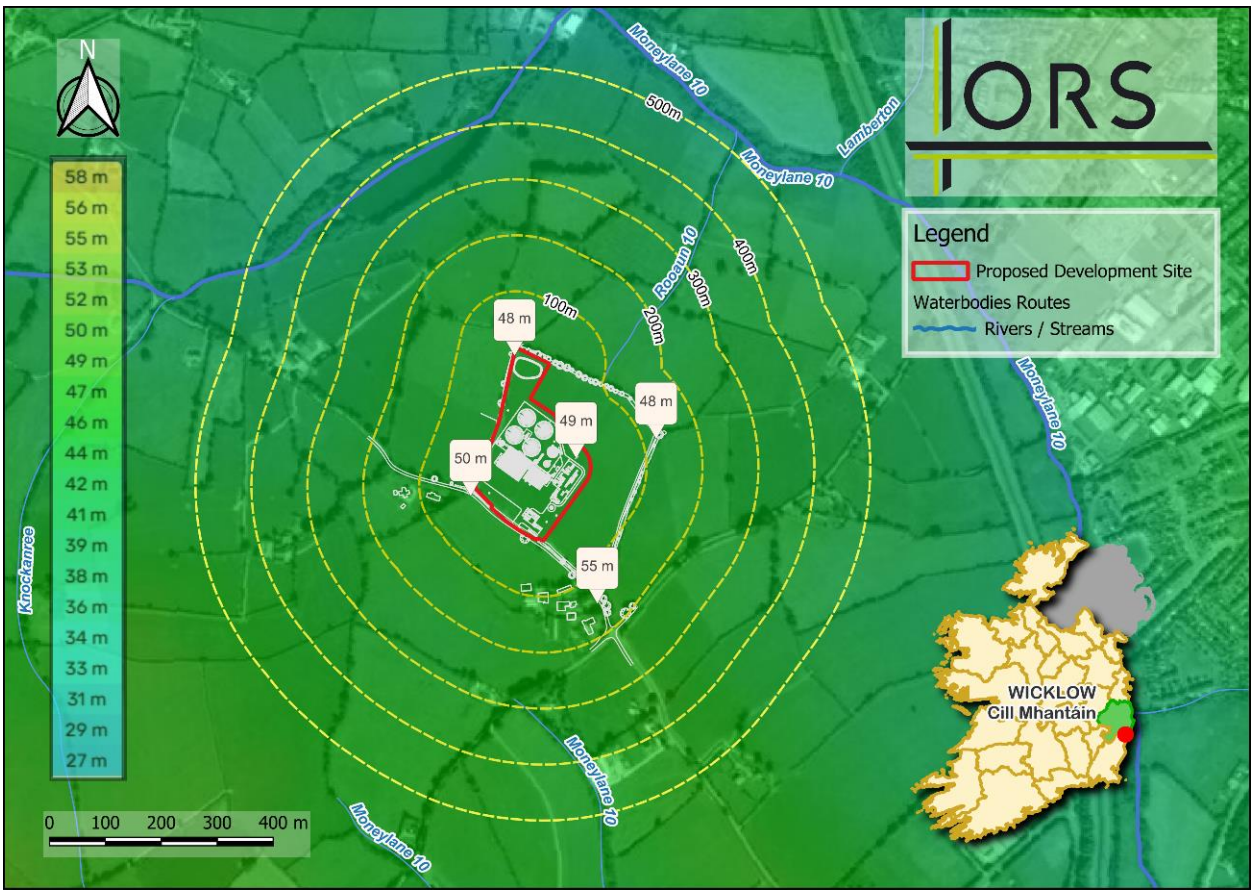


**Figure 7.5:** Topographical map of the landscape surrounding the Proposed Development (topographic-map.com)

A topographical survey was carried out on the site and the results are shown in **Figure 7.6**, where it can be seen that the slope is smooth and has a clear pattern. The overall water run-off is represented by the arrows over the area.

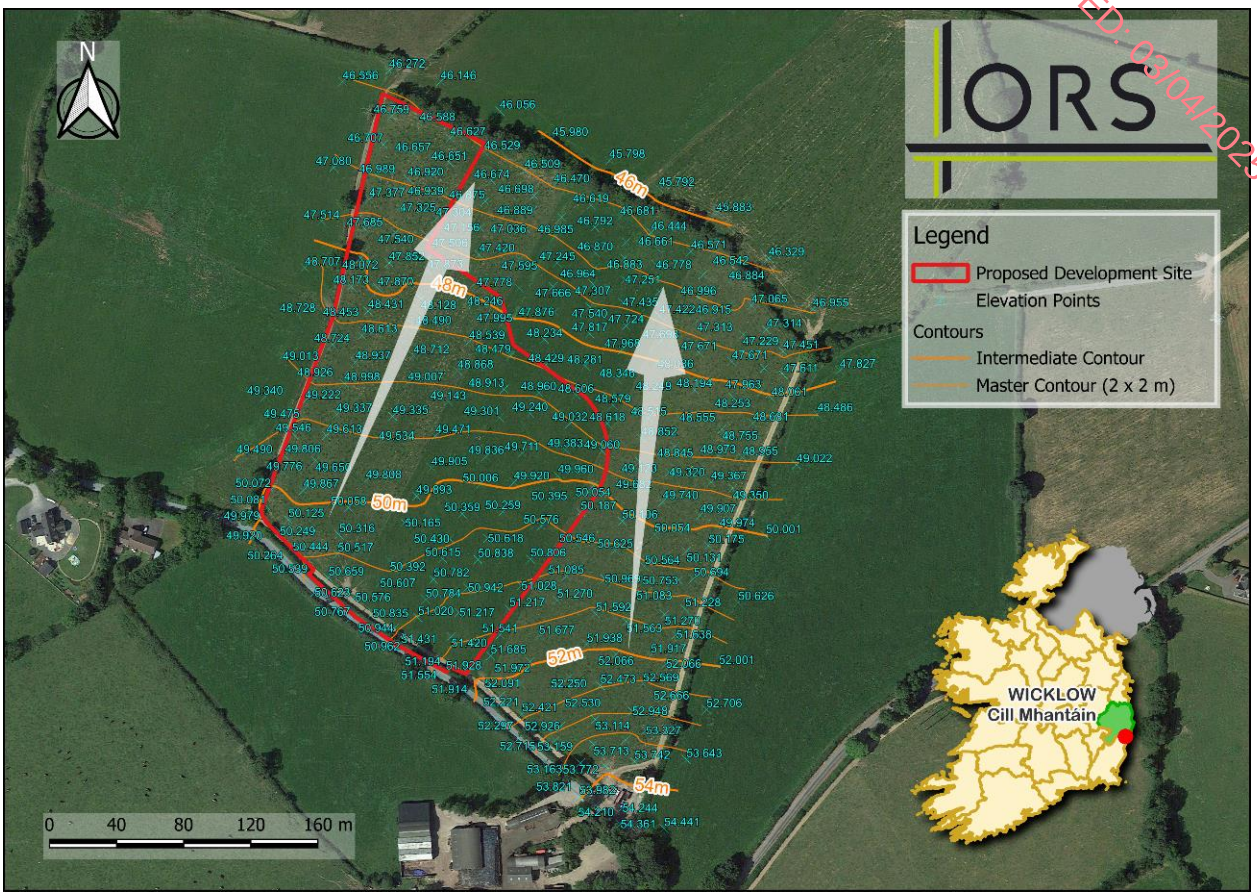


**Figure 7.6:** Overall topography and water run-off on the Proposed Development site

### 7.4.3 Geological Heritage

The Irish Geological Heritage (IGH) Programme identifies and selects a complete range of sites that represent Ireland's geological heritage under sixteen themes ranging from karst features to hydrogeology. The IGH Programme is a partnership between the GSI and the National Parks and Wildlife Service (NPWS) and sites identified as important for conservation are designated as Natural Heritage Areas (NHA).

Reference to the GSI online database confirms the proposed site is not within a geological heritage site and that there are no designated sites within the 2 km study area of the Proposed Development. The closest site is Woodenbridge Wellfield, which is described as "*the public water supply source for the Arklow area*" located *ca.* 3.8 km northwest of the Proposed Development site, which is outside the 2 km study area. **Figure 7.7** overleaf indicates the location of this Geological Heritage site within the wider region.

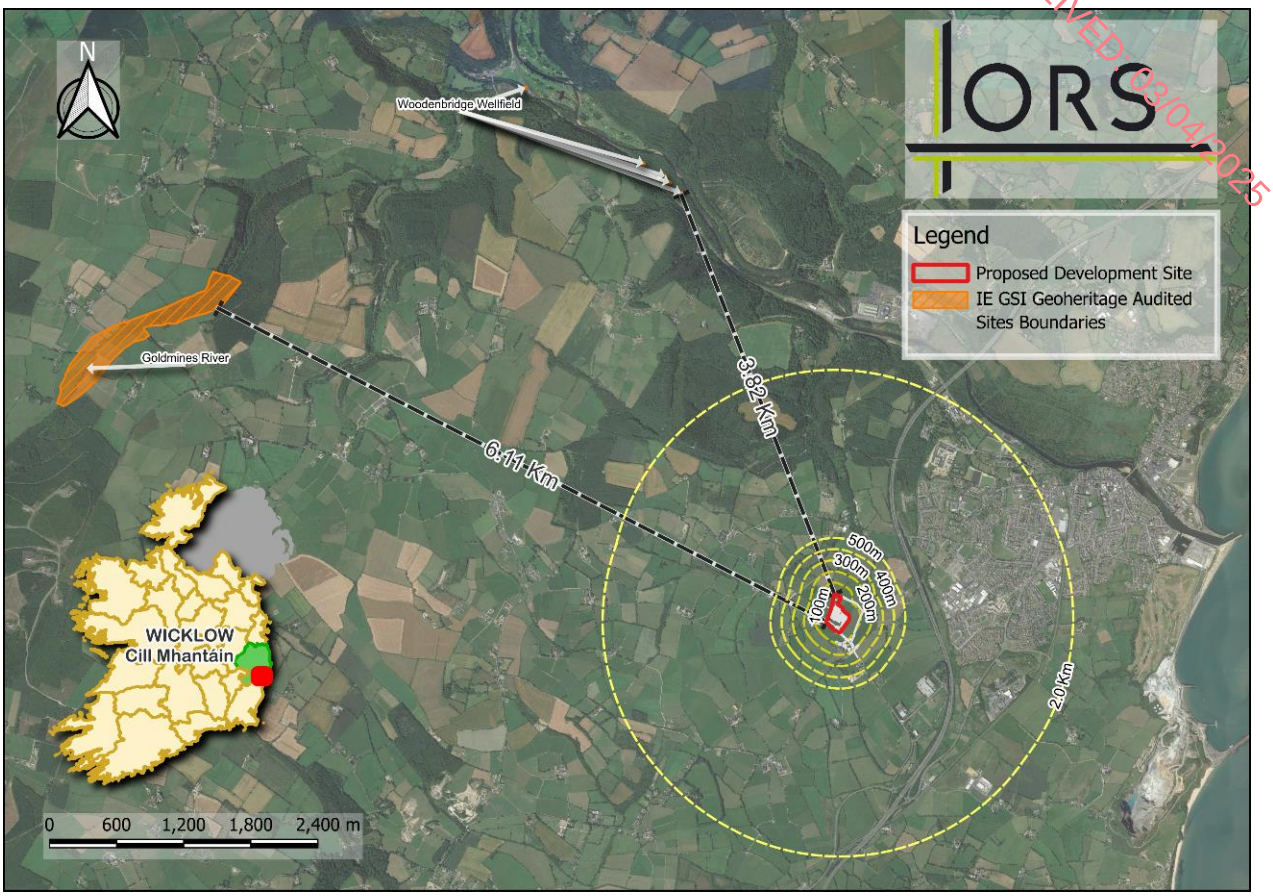


**Figure 7.7:** Geological Heritage sites within the vicinity of the Proposed Development site

### 7.4.4 Drift (Quaternary) Geology

Drift is a general term applied to all mineral material (clay, silt, sand, gravel and boulders) transported by a glacier and deposited directly by or from the ice or as fluvioglacial deposits. It generally applies to deposits laid down during the Pleistocene (Quaternary) glaciations. Drift can also be included under Holocene (Quaternary) deposits. The drift geology of the area principally reflects the depositional process of the last glaciation. Typically, during the ice advance, boulder clays were deposited, sub-glacially as lodgement till over the eroded rock head surface, whilst moraine granular deposits were laid down at the glacier margins. Subsequently, with the progressive retreat of the ice sheet from the region, granular fluvio-glacial deposits were laid down in places by melt waters discharging from the front of the glacier.

The Quaternary sedimentary deposits of the Proposed Development site are classified as Till derived from Lower Palaeozoic sandstones and shales (TLPSsS), a type of glacial deposit consisting of a heterogeneous mixture of unsorted sedimentary rock, including boulders, gravel, sand, silt, and clay. These deposits are derived from the erosion and transportation of rock material from the underlying Lower Palaeozoic bedrock, which is composed of sandstones and shales. The formation of this till is a consequence of the glaciers' erosion and transportation of rock material from the underlying Lower Palaeozoic bedrock, which is composed of sandstones and shales. As the glacial ice melts, it deposits this material, creating a thick layer of till that

covers the landscape.

There are also some areas within the Study Area where can be found Alluvium (A) sediments in the immediate surroundings, other types of till such as Irish Sea Till derived from Lower Palaeozoic sandstones and shales (IrSTLPSsS), sediments such as Gravels derived from Lower Palaeozoic sandstones and shales (GLPSsS), and Bedrock outcrop or subcrop (Rck). The dispersion of these various sediments is shown in **Figure 7.8**

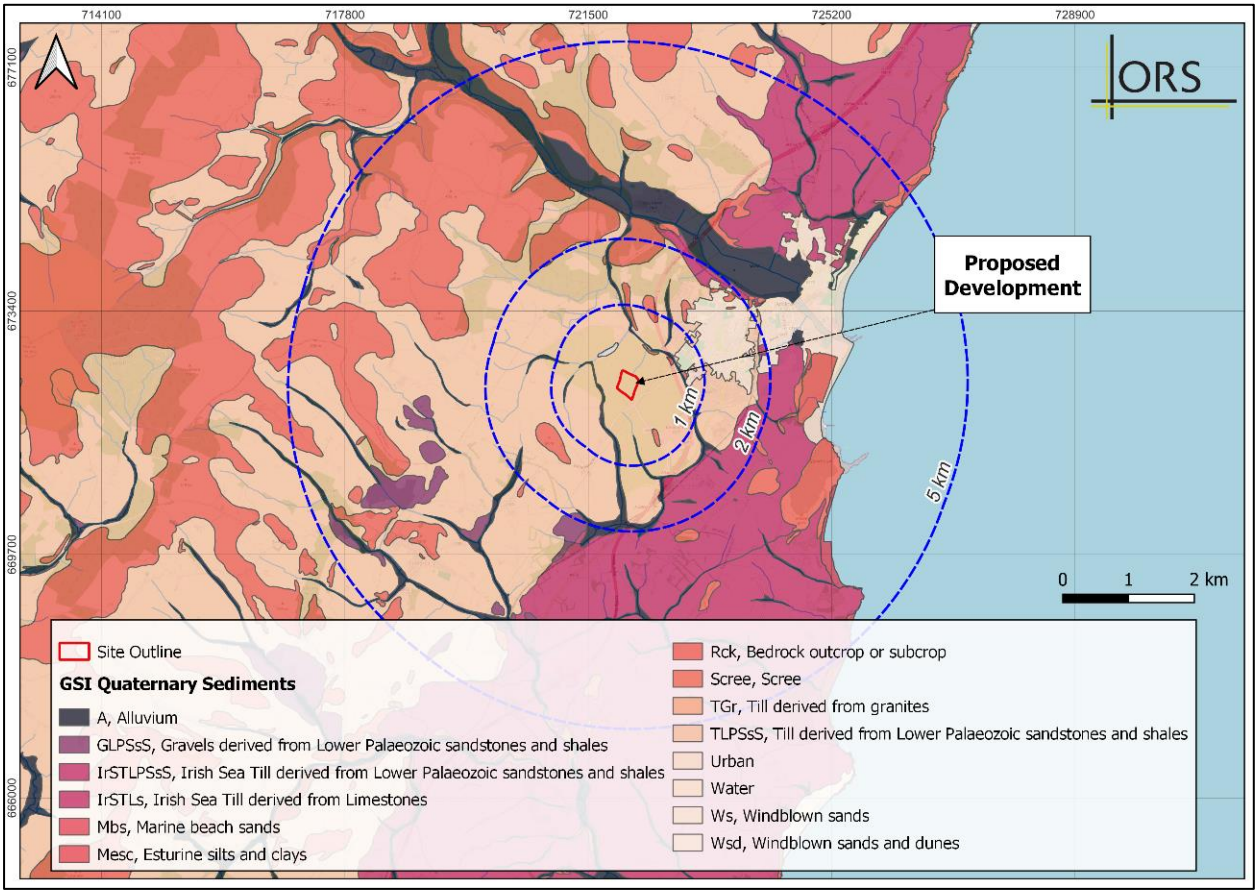


**Figure 7.8:** Quaternary sediments in the Proposed Development environs (Source: GSI)

The Second Edition General Soil Map of Ireland categorizes this region within the “Flat to Undulating Lowland (Mainly Wet Mineral and Organic Soils)” group, a broad physiographic division. The area predominantly consists of Gleys (90%) with associated Grey Brown Podzolics (10%). The parent material is believed to be glacial muds of Irish Sea origin, while the site itself is underlain by till derived exclusively from Lower Palaeozoic sandstones and shales.

The physiography of the Proposed Development site—defined as the interplay of physical and geographical features—was also analysed. Ireland’s physical landscape is categorized into physiographic units based on factors such as bedrock geology (solid rock at or below the surface), Quaternary sediments (primarily from the Ice Age), and geomorphology (landforms).

The Geological Survey of Ireland (GSI) has developed three physiographic maps, each providing varying levels of detail.

In all three GSI maps, the Proposed Development site is consistently categorised as part of an extensive area of cultivated lowlands, stretching from the coastline to the interior hills. The immediate vicinity is characterised by a lowland landscape with flat to gently undulating sediments, as depicted in **Figure 7.9** below

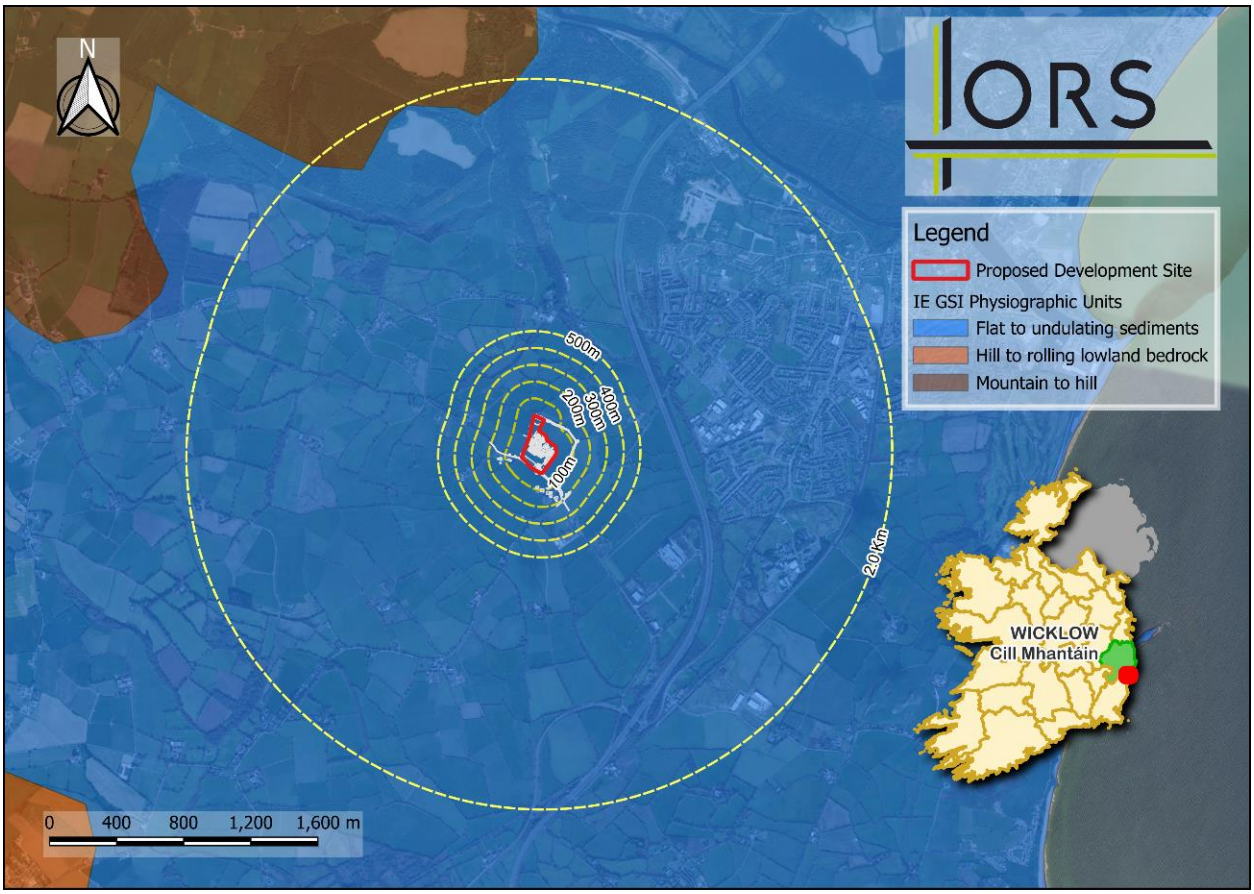


**Figure 7.9:** Physiographic Character of the Proposed Development and surrounding landscape

In view of the Proposed Development, the soils which are likely to be affected by the development are characteristic of the local and regional context and occur in abundance.

## 7.4.5 Bedrock Geology

### Regional Bedrock Geology

A detailed analysis of the 1:500,000 bedrock mapping highlights the presence of fifteen distinct bedrock classes underlying County Wicklow. For the purposes of this study, the bedrock geology is grouped into five primary units:

**Leinster Granite**: The most prominent unit, the Leinster Granite, is a large granitic batholith

(label No. 8 in Figure 7.11) that intruded into Lower Palaeozoic sedimentary and volcanic rocks approximately 405 million years ago. This formation underlies much of the Wicklow Mountains and is a defining feature of the county's geology.

**Bray Group** (Cambrian Age, 541–485 Ma): The oldest rocks in County Wicklow, the Bray Group (label No. 32), consist of a thick sequence of greywackes and quartzites. These rocks crop out between Bray Head and Ashford. The quartzites, known for their hardness and resistance to weathering, form prominent hills such as Great Sugarloaf and Little Sugarloaf.

**Ribband Group** (Ordovician Age, 485–443 Ma): The Ribband Group (labels Nos. 35 and 39) comprises shales, mudstones, and siltstones, characterized by their distinct banded or striated appearance, which inspired their name. This group is prominent in the eastern region of Wicklow, with additional occurrences in the western and northwestern parts of the county.

**Duncannon Group**: The Duncannon Group (label No. 38) is a narrow belt of volcanic rocks trending northeast-southwest in eastern Wicklow. This belt spans 2–4 km in width and 15 km in length, with its central area located near Avoca.

**Kilcullen Group** (Silurian Age, 443–419 Ma): The Kilcullen Group (label No. 49) consists of greywackes, siltstones, and schists, confined to the western part of Wicklow between Brittas and Baltinglass.

The Bedrock Map of County Wicklow, derived from the generalised 1:500,000 bedrock geology map produced by the Geological Survey Ireland (GSI) and the Geological Survey of Northern Ireland (GSNI), is shown in **Figure 7.10**. It provides a visual representation of the bedrock geology as described above.

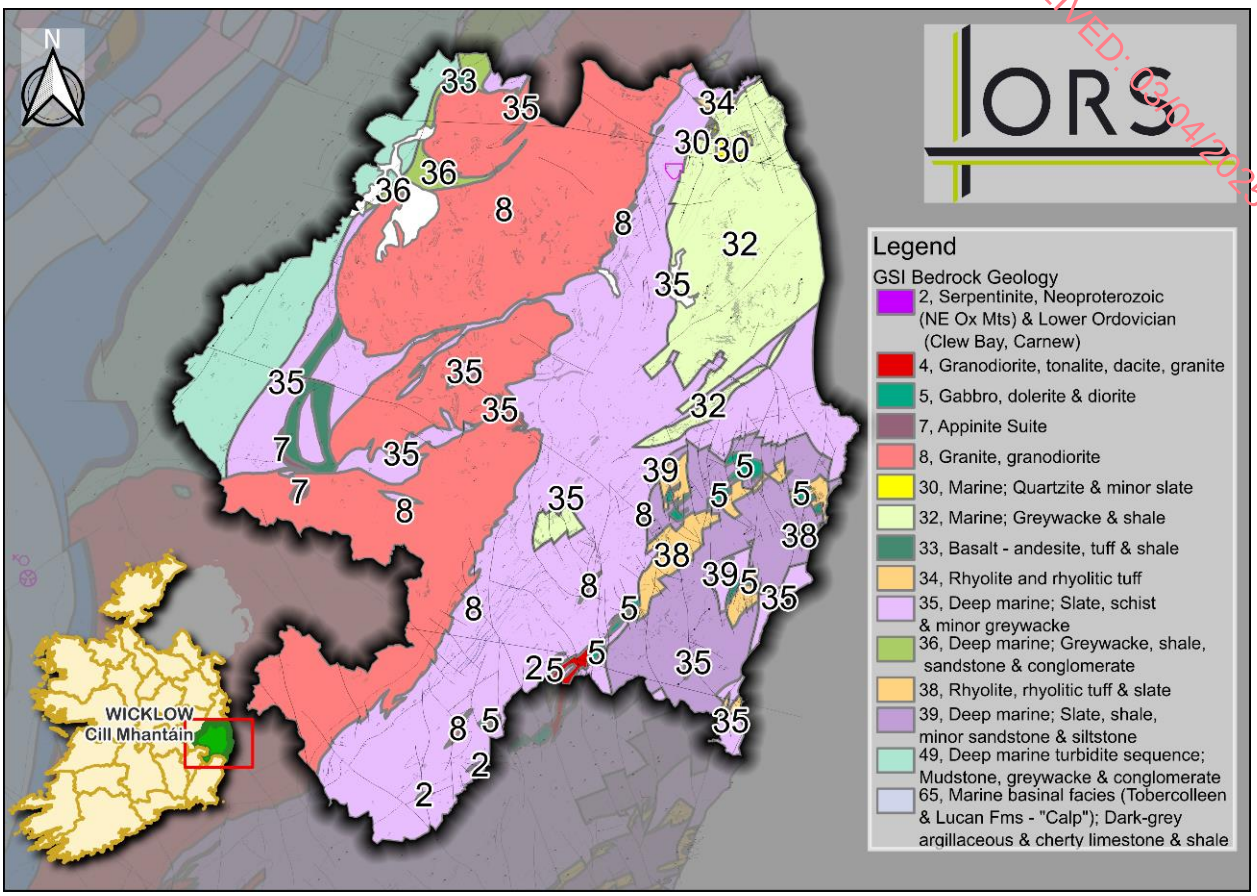


**Figure 7.10:** Bedrock Geology for Wicklow County - GSI GSNI 500k Ireland (ROI/NI) ITM

The Lower Palaeozoic sedimentary rocks in County Wicklow were formed on the seafloor of the ancient Iapetus Ocean, which occupied a position between two continents. The ocean was characterised by the accumulation of sediments derived from the weathering of the continental landmasses to the northwest and southeast. The Bray Group rocks were deposited in a proximal location to the ocean's edge, whereas the Ribband Group rocks were of a finer grain and formed in deeper waters. The Iapetus Ocean began to close during the Ordovician period as a result of plate tectonic movements, which led to the formation of volcanic arcs. The volcanic rocks present in Wicklow's Duncannon Group represent the remaining evidence of these volcanic arcs. The youngest sediments in Wicklow, the Kilcullen Group, were also turbidites and formed on the margin of the ocean as it was closing.

During the Caledonian orogeny, the continents collided, resulting in the formation of mountains and significant geological changes in Ireland. The event involved the intrusion of granite, deformation of existing rocks, and metamorphism. The Leinster Granite in County Wicklow represents a significant product of this orogeny. The compression that occurred during the event resulted in the formation of cleavage in sedimentary and volcanic rocks, as well as the development of folding patterns that can be observed throughout the county.

Wicklow is renowned for its diverse range of igneous intrusions, which include granites, diorites, appinites and andesite. The intrusion of minor granites and diorites occurred in proximity to the Leinster Granite, with Carrigmore representing a notable locality for diorites.

The Leinster Granite margin is characterised by the presence of ultrabasic appinites. Andesite volcanic rocks are present in the western region of Wicklow. Notable intrusions from the Pleistocene Period, also known as the Ice Age, include dolerites, such as those in Arklow Rock, and the Croghan Kinshelagh granite. The formation of glaciers in the Wicklow Mountains resulted in the creation of notable features such as Glendalough, Glenmalure, and Glenmacnass. The ice sheet that covered Wicklow exhibited a complex flow pattern, with only the highest peaks protruding above the thick ice. Following the conclusion of the ice age, the modern drainage pattern was established on top of the deglacial channel network, resulting in the formation of some areas of random drainage along the Kings River. Furthermore, peat was formed across a significant portion of the Wicklow Mountains, while coastal erosion resulted in the development of headlands, beaches, bars, spits, and sand dunes.

A more detailed understanding of the bedrock in County Wicklow can be achieved by increasing the resolution of the map to 1:100,000, as illustrated in the **Figure 7.11**. This facilitates the identification of a more comprehensive classification of the geological formations present in the region.

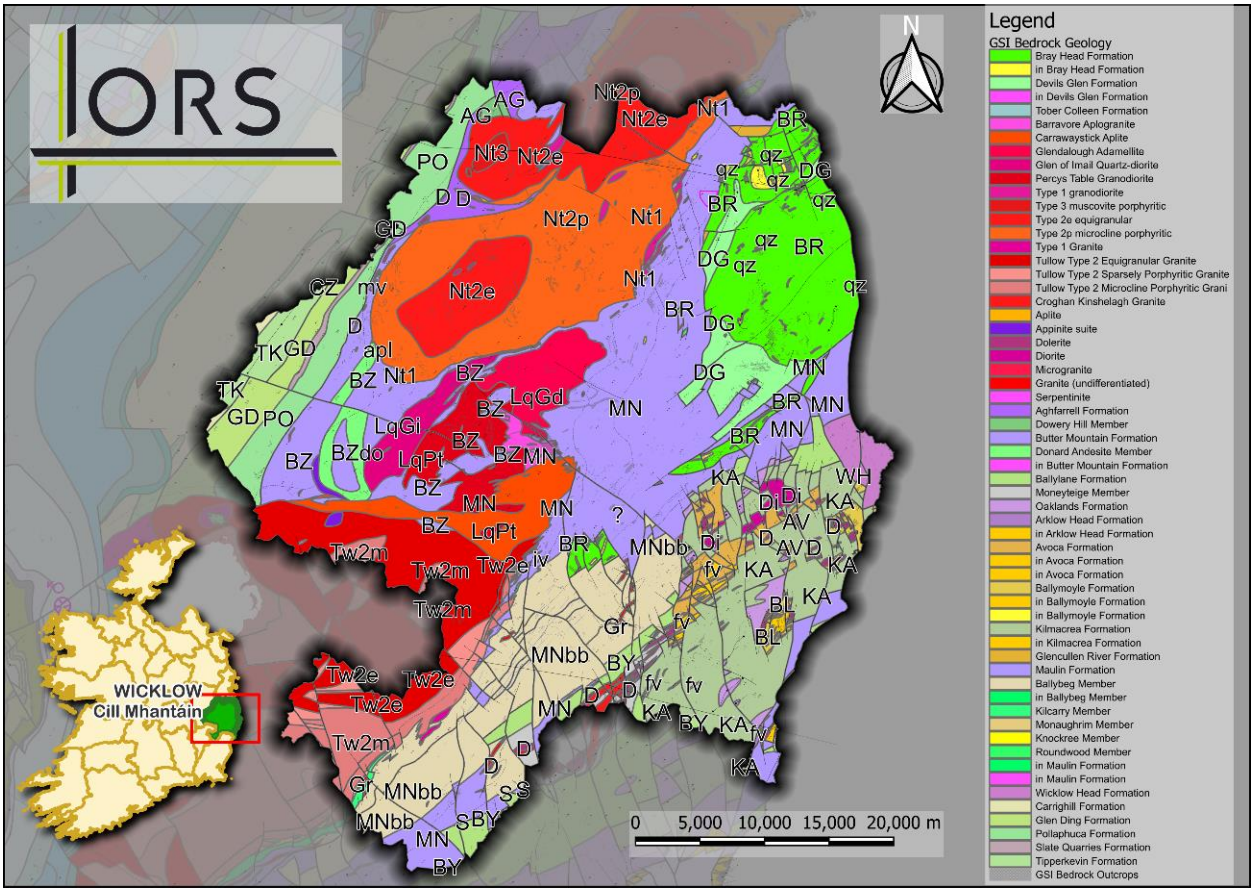


**Figure 7.11:** Bedrock Geology for Wicklow County - GSI 100k Ireland (ROI) ITM

The map above illustrates that the Bedrock Geology is divided into a greater number of levels, while maintaining coherence with the formation depicted on the previous 1:500,000 map.

**Local Bedrock Geology**

Bedrock is defined as a consolidated aggregate of minerals underlying the ground surface and any soils present. Above the bedrock is usually an area of broken and weathered unconsolidated rock in the basal subsoil. Sedimentary rock lies in beds which may comprise different rock types and which may be horizontal or inclined, so that the rock encountered at the ground surface may change over a short distance.

As indicated by the Geological Survey of Ireland and the National Draft Generalised Bedrock Map, the bedrock within the 2 km study area of the Proposed Development is predominantly comprised of the Kilmacrea Formation (KA), which is primarily known for its role as an aquifer in the Redcross area of the County. The formation is composed of Ordovician metasediments, predominantly fractured and weathered shales. The formation is distinguished by a gradation in permeability, exhibiting higher permeability in the upper layers and a decline in permeability with depth.

Additionally, the study area encompasses portions of Oaklands Formation, situated *ca.* 300m to the north, *ca*. 1.0 km northwest and *ca*. 1.4 km east of the Proposed Development. These formations are characterised by green, red-purple and buff slate and siltstone rocks.

The formation underlying the site is the previously mentioned Kilmacrea (KA), one of the four which composes the Duncannon Group, with the Avoca, the Arklow Head and the Ballymoyle formations. These rocks outcrop from the south of Wicklow town to Rathdrum, Avoca and Arklow. This region is highly faulted. The 1:100,000 Bedrock Solid Geology Map indicates that the bedrock type in this formation is dark grey and black mudstones, slates and shales with occasional pale grey sandstones and tuffs. The rocks of this formation are extensively jointed, fractured and weathered. This results in higher permeabilities closer to the surface, and along fault zones. Trial wells are generally less than 100 metres deep, thus there are few reports of inflow of water below this level. The permeability decreases rapidly with depth from the ground surface. The bedrock is often relatively well fractured to a depth of 30 metres.

Water levels vary depending on topography, ranging from near surface to depths of over 20 m. Artesian conditions may be obtained where boreholes penetrate the aquifer through confining clay layers or impermeable bedrock. Larger supplies may be developed where storage is increased by overlying gravels or where the borehole is located close to a major fault zone.

The bedrock geology and linework on the 1:100,000 scale mapping from the (GSI) indicate the presence of a number of geological linework features (e.g. unconformity, faults, etc.) within the 2 km study area. The nearest unconformity is situated *ca.* 270m to the north-east of the Proposed Development, extending from north to south. The second is located *ca.* 400m to the south, extending from east to west. These faults are either between the Kilmacrea Formation rocks themselves or occur when the Oakland Formation rocks are contacted. Bedrock geology and linework can be seen in **Figure 7.12**.

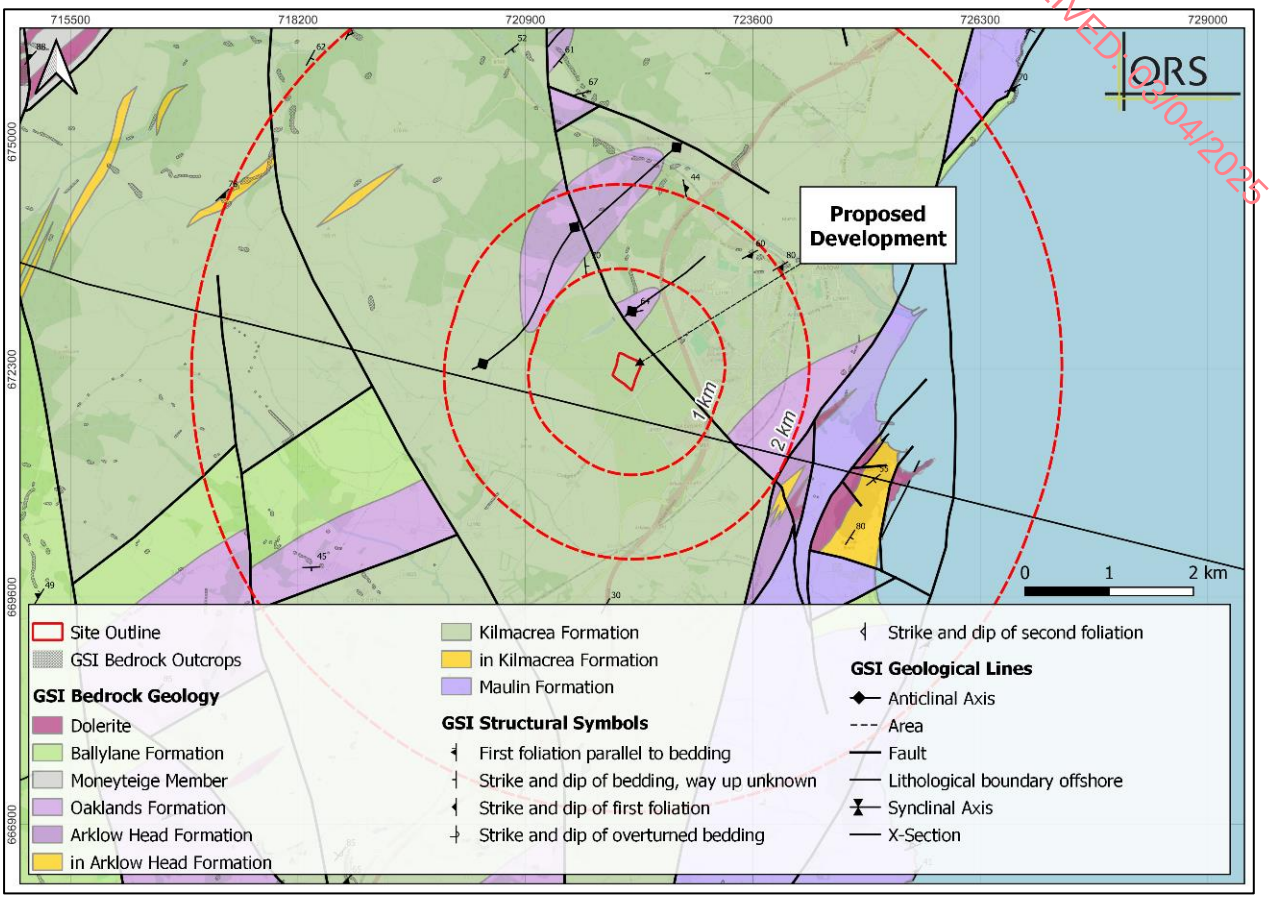


**Figure 7.12:** Regional Bedrock Formations (GSI)

## Depth to Bedrock

According to the GSI database, there are 28 groundwater wells within the 2 km study area. All of these groundwater wells are defined as Boreholes. There are no wells on the Proposed Development or within 500m. Four of these to the north of the site [3217SWW058, 3217SWW060, 3217SWW066, 3217SWW068] appear to be trial wells related to the Arklow Waste Treatment Plant and are listed as “not currently being used”.

The details of groundwater wells within 2 km of the Proposed Development are outlined in **Table 7.5** below. Error! Reference source not found. superimposes the approximate location of the groundwater wells listed in **Table 7.5** relative to the groundwater vulnerability rating of the area. The Proposed Development boundary is marked out in red. Groundwater wells within the wider area have a varying yield class from excellent to poor.

The lands on which the Proposed Development is located have been assigned a variety of vulnerability ratings ranging from moderate along the centre-northern area and high along the southern portion of the Proposed Development. The recorded depth to bedrock encountered for the corresponding wells in the wider area are generally between 1.4m to 91.4m below ground level (bgl). The Proposed Development is situated above the Kilmacrea Formation which is designated by the Geological Survey of Ireland (GSI) National Draft Bedrock Aquifer Map as a Locally Important Aquifer which is moderately productive only in local zones- (Classification

reference - LI).

**Table 7.5** Groundwater Wells within 2 km of the Proposed Development (GSI Well Database)

| GSI Reference | Easting Northing | Well Type | Depth (m bgl) | Depth to Rock (m) | Well Use | Yield m3/d | Proximity to Proposed Development |
|---|---|---|---|---|---|---|---|
| 3217SWW065 | 322440, 171660 | Borehole | 91.4 | 7.5 | | 287 | 535m SW |
| 3217SWW059 | 322000, 173020 | Borehole | 91.4 | 7.5 | | 151 | 577m N |
| 3217SWW026 | 322830, 171280 | Borehole | 35.7 | 9.2 | Domestic use only | 38 | 580m SE |
| 3217SWW102 | 321870, 171570 | Borehole | 61 | 3 | Agri & domestic use | 21.8 | 600m S |
| 3217SWW067 | 321420, 172520 | Borehole | 91.4 | 15.5 | | 314.2 | 670m W |
| 3217SWW054 | 322210, 170930 | Dug well | 1.5 | | | | 678m S |
| 3217SWW021 | 322200, 170860 | Borehole | 21.6 | 2.4 | Domestic use only | 22 | 745m S |
| 3217SWW077 | 323030, 172730 | Borehole | 48.7 | | Domestic use only | 80 | 800m NE |
| 3217SWW019 | 321380, 171020 | Dug well | 4.2 | | | | 845m SW |
| 3217SWW058 | 321600, 173160 | Borehole | 91.4 | 7.5 | | 347.3 | 863m NW |
| 3217SWW060 | 321400, 173080 | Borehole | 73.2 | 9 | | 440 | 971m NW |
| 3217SWW066 | 321260, 172940 | Borehole | 91.4 | 12.5 | | 400 | 990m NW |
| 3217SWW068 | 321060, 172880 | Borehole | 91.4 | 3 | | 628.4 | 1.1km NW |
| 3217SWW069 | 321110, 171540 | Borehole | | | Domestic use only | 275 | 1.1 km SW |
| 3217SWW025 | 320340, 171700 | Borehole | 31.1 | 12.2 | | 49 | 1.2 km W |
| 3217SWW018 | 323090, 170620 | Borehole | 13.7 | 1.2 | Domestic use only | 38 | 1.3 km SE |
| 3217SWW055 | 323100, 170570 | Borehole | 34.4 | 15.2 | | 55 | 1.3 km SE |
| 3217SWW017 | 323040, 170220 | Borehole | 21.3 | 6.7 | Domestic use only | 27 | 1.5 km SE |
| 3217SWW020 | 323010, 170270 | Borehole | 21.3 | 6.7 | Domestic use only | 27 | 1.5 km SE |
| 3217SWW076 | 323540, 171480 | Borehole | 76.2 | | Industrial use | 20 | 1.5 km SW |
| 3217SWW004 | 320080, 172540 | Borehole | 33.5 | 6.1 | Domestic use only | 38 | 1.5 km W |
| 3217SWW024 | 320080, 172630 | Borehole | 26.8 | 0.9 | Domestic use only | 22 | 1.5 km W |
| 3217SWW040 | 323170, 174080 | Borehole | 120 | 4.5 | Other | 3 | 1.8 km N |
| 3217SWW042 | 323130, 173960 | Borehole | 61 | | Domestic use only | 35 | 1.8 km N |
| 3217SWW041 | 323180, 174180 | Borehole | 61 | 12 | Industrial use | 120 | 1.9 km N |
| 3215NWW011 | 323250, 169990 | Borehole | 27.4 | | Domestic use only | 20 | 1.9 km SE |
| 3217SWW028 | 324000, 170450 | Borehole | 22.5 | 3 | | 38 | 2.0 km SW |

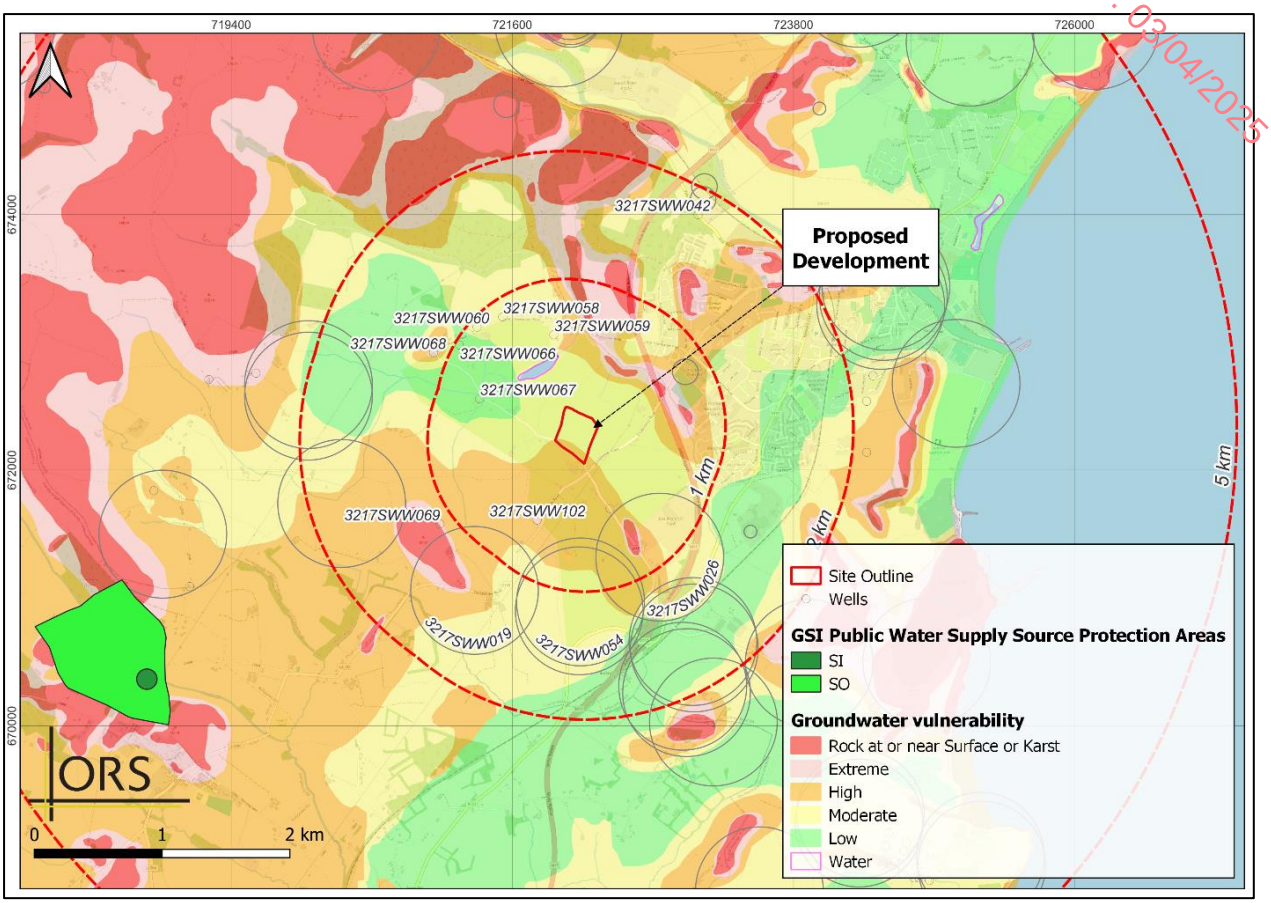


**Figure 7.13:** Groundwater Vulnerability and location of Groundwater Wells and associated depth to bedrock (GSI Maps)

### Karst Features

Karst areas are defined by landforms created through the dissolution of soluble rocks, and karst aquifers are particularly susceptible to pollution. Additionally, karst features can contribute to localised flooding. According to GSI maps, no karstic features are present within the Proposed Development site or its immediate vicinity. However, potential karst areas may exist within the broader 2 km study area due to the presence of groundwater vulnerability zones classified as "Rock at or near Surface or Karst" in some surrounding locations. These areas, however, are situated at least 450 m from the site boundary.

The closest of these zones are approximately:

- 460 m, 680 m, and 780 m to the northeast;
- 670 m and 880 m to the north;
- 680 m to the south-southeast; and
- 1.1 km to the southwest.

County Wicklow has only one recorded karst landform, identified as a cave in Deerpark,

Ballybawn, approximately 39.6 km north of the Proposed Development. Therefore, there are no karst features within the 2 km study area, and none have been identified within a 30 km radius, as shown in **Figure 7.14**. Furthermore, no connectivity to karst features has been confirmed within the 5 km study area.

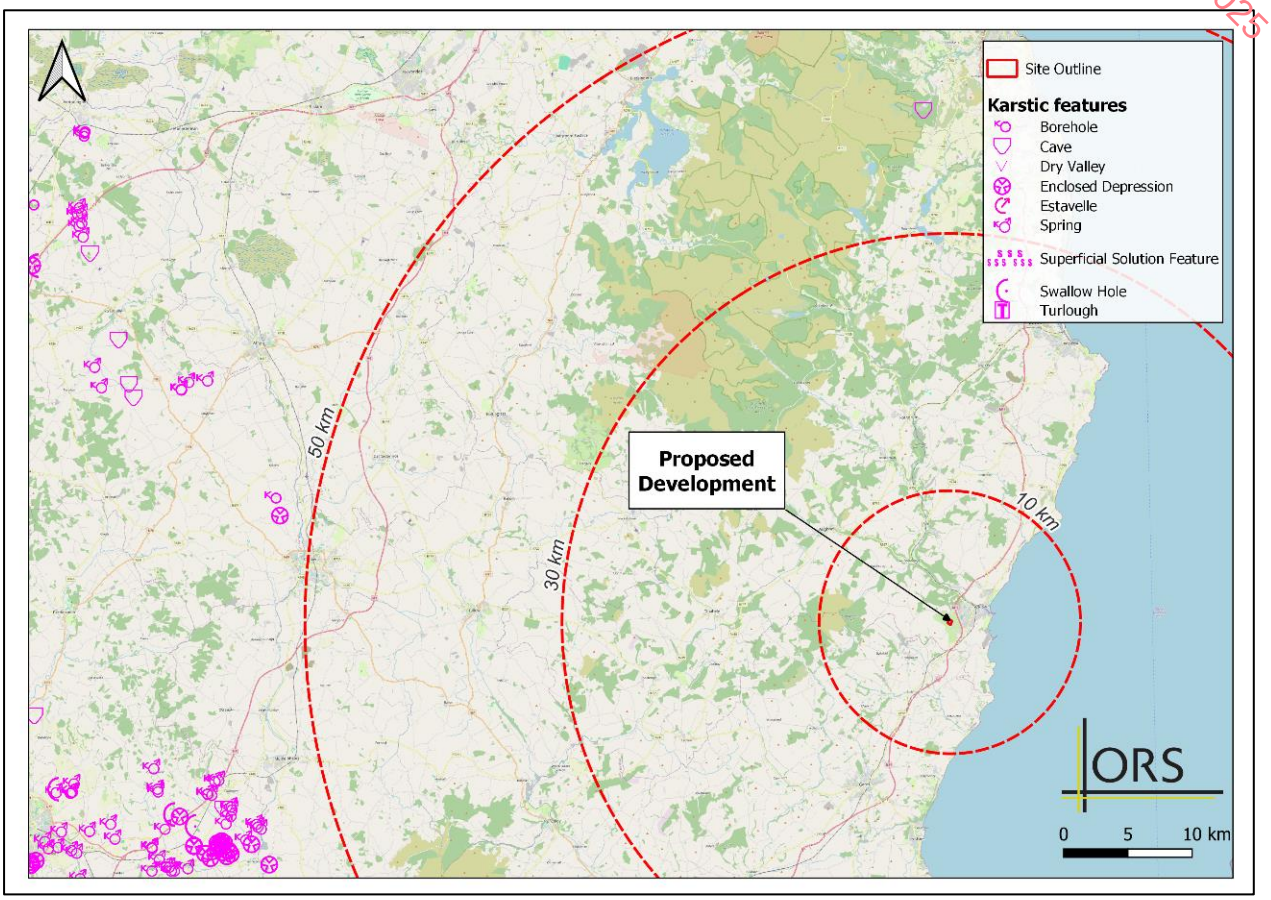


**Figure 7.14:** Karst Features, Traced Groundwater Movements, Groundwater Vulnerability, And Groundwater Source Protection Areas Overlaying Regional Bedrock Formations and Outcrop Extents. (GSI)

### Mineral Aggregate Resources

There are no active quarries on or adjacent to the site. The nearest active quarry recorded on the GSI's online database are in the area of Arklow Rock, *ca*. 2.8 km Southeast of the Proposed Development site.

### Radon

The EPA's Radon Map shows that the site is located across a Low to Moderate risk Radon area, with 5% to 10% of houses in the vicinity of the Proposed Development site estimated to have radon levels above the Reference Level respectively. The most elevated risk area, Moderate, is where the office is to be placed. **Figure 7.15** below shows the Proposed Development overlaying the EPA's Radon Map, highlighting the office area.

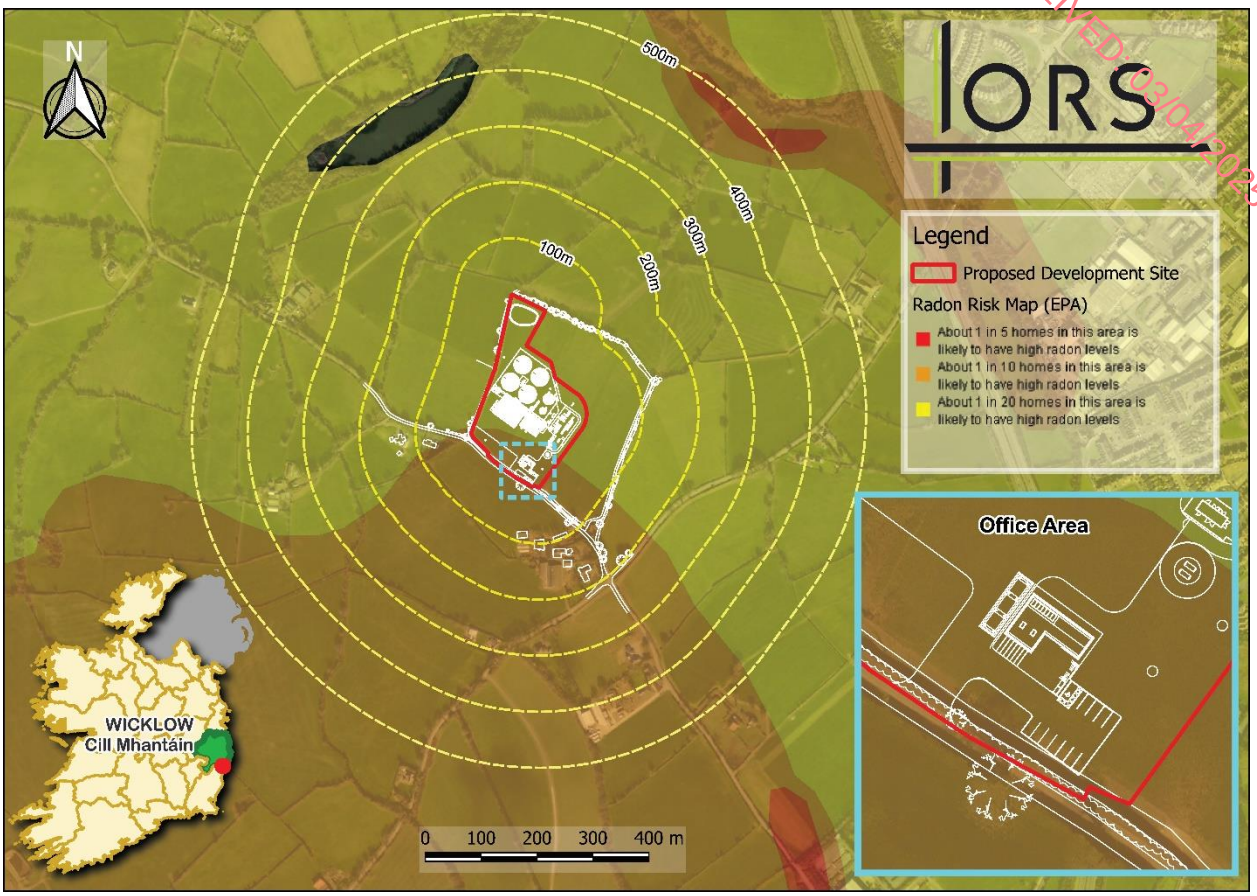


**Figure 7.15:** EPA's Radon Risk Map

## Seismic Activity

Seismic activity is recorded by the Irish National Seismic Network. The Geophysics Section of the School of Cosmic Physics, Dublin Institute for Advanced Studies, has been recording seismic events in Ireland since 1978. **Figure 7.16** overleaf illustrates historical and recorded seismic events since 1980. Recorded seismic activity in Ireland since 1980 (Last update 23/11/2024).

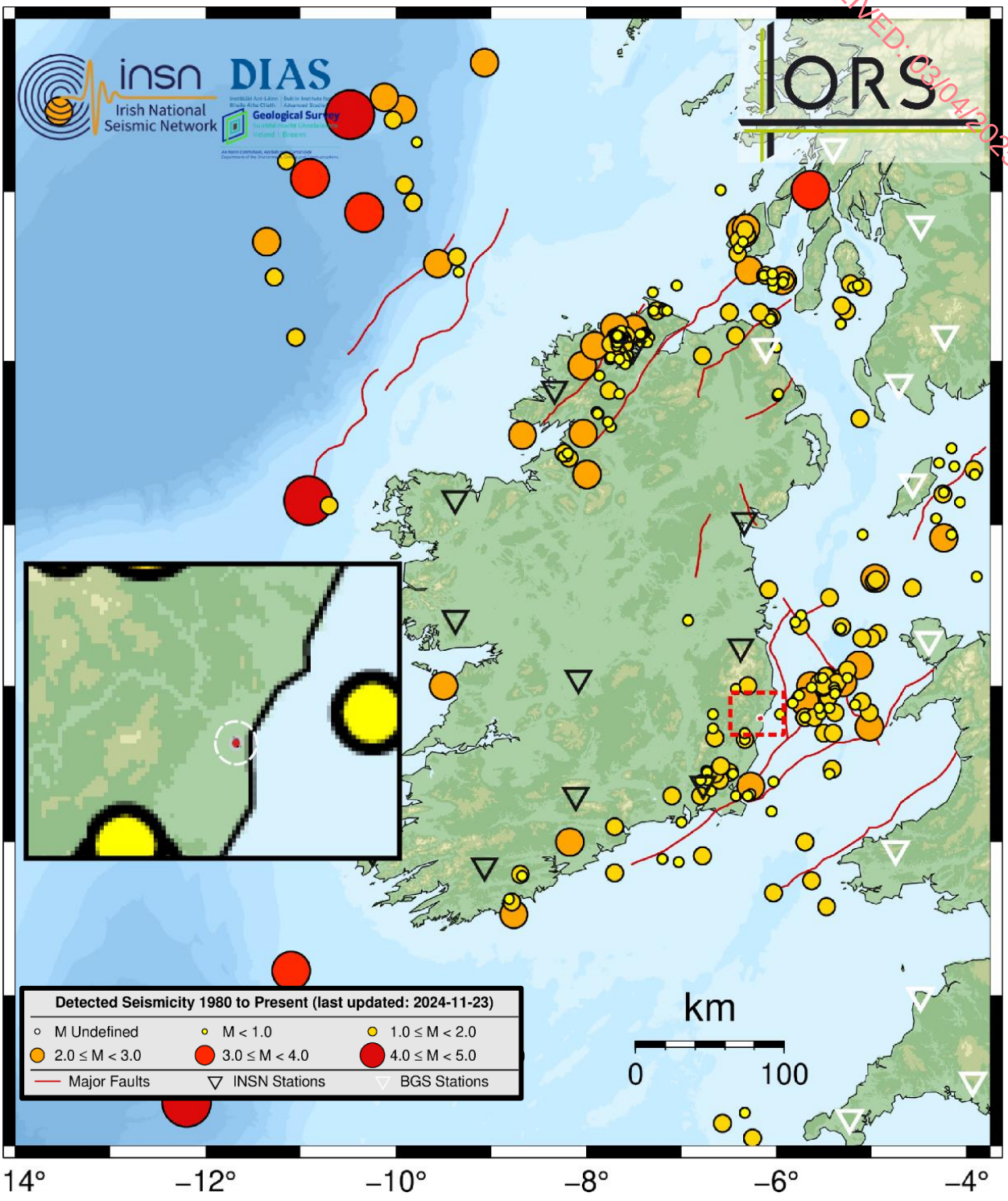


**Figure 7.16:** Historical and recorded seismic events since 1980 (School of Cosmic Physics, Dublin Institute for Advanced Studies)

As can be seen on **Figure 7.16**, there is no significant seismic activity recorded within the vicinity of the Proposed Development site.

### 7.4.6 Soils and Subsoils

Soils can be referred to as topsoil or subsoil. Topsoil is the active layers at ground level where living organisms are found. Changes in soil characteristics are delineated in “horizons”. Topsoil is referred to as horizons ‘A’ and ‘B’. Subsoil is the loose uncemented (unlithified) sediments present between the soil ‘B’ horizon and bedrock. Subsoils are termed the ‘C’ horizon.

The geology of Ireland exerts a profound influence on soil formation. The mineralogical composition of the underlying bedrock determines the nature of the overlying soils, particularly in areas where the soils are formed directly over the bedrock. The physical and chemical properties of the bedrock in Ireland exhibit considerable variation, even over relatively short distances. In the case of this study, acidic igneous rocks such as granite are the most prominent in the Wicklow mountains.

**Regional Soil and Subsoil**

The formation of soil is dependent upon geology, climate, vegetation, altitude, and landform shape. Soil landscapes found in Ireland are a consequence of the changing climatic conditions over the last 100,000 years (the last glacial age was *ca.*12,000 years ago) and the management of land by farmers.

The soils in Co. Wicklow are mainly derived from a mixture of silicious stones, volcanic rocks, mineral alluvium and peat material, and it is characterized by a diverse range of soil types, primarily influenced by its varied topography and geological formations. The predominant soil groups in the county include:

- **Brown Earths** (*ca.* 40%): These soils are typically found on well-drained slopes and upland areas. They are characterized by a well-developed brown horizon and are generally acidic in nature.
- **Lithosols** (*ca.* 17%) Lithosols are skeletal stony soils, usually overlying solid or shattered bedrock. They are often associated with podzols at higher elevations. Generally, such soil areas have bare rock outcropping at frequent intervals and many also have steep slopes.
- **Peat** (*ca. 15%*)**:** Biogenic deposit that forms in waterlogged conditions where plant material accumulates faster than it can decompose, primarily composed of partially decomposed plant matter and can store significant amounts of carbon.
- **Brown Podzolics** (*ca. 13%)*: These soils are often found in areas with coniferous forests or heathland vegetation. They are characterized by a distinct bleached horizon and an accumulation of organic matter in the lower part of the profile.
- **River Alluvium** (*ca*. 4%) A deposit of clay, silt, and sand deposited by flowing floodwater in a river valley or delta, which typically produces fertile soil.
- **Luvisols** (*ca.* 4%) - Soils having an argic horizon (a subsurface horizon with a distinct higher clay content than the overlying horizon) with a cation exchange capacity equal to or more than 24 $cmol_c$ per kg clay throughout.
- **Others** (*ca.* 7%) associations in minor presence in the County, e.g. Rocks, Dunes or Blown Sand, Urban, Podzols, Lake alluvium and water bodies.

These soil types have significant implications for agriculture, forestry, and land use in County Wicklow. The Acidic Brown Earths, while fertile, can be prone to erosion on steep slopes. Lithosol earths are usually limited to rough grazing. Brown Podzolics, while often infertile, can support coniferous forests and other specialised vegetation.

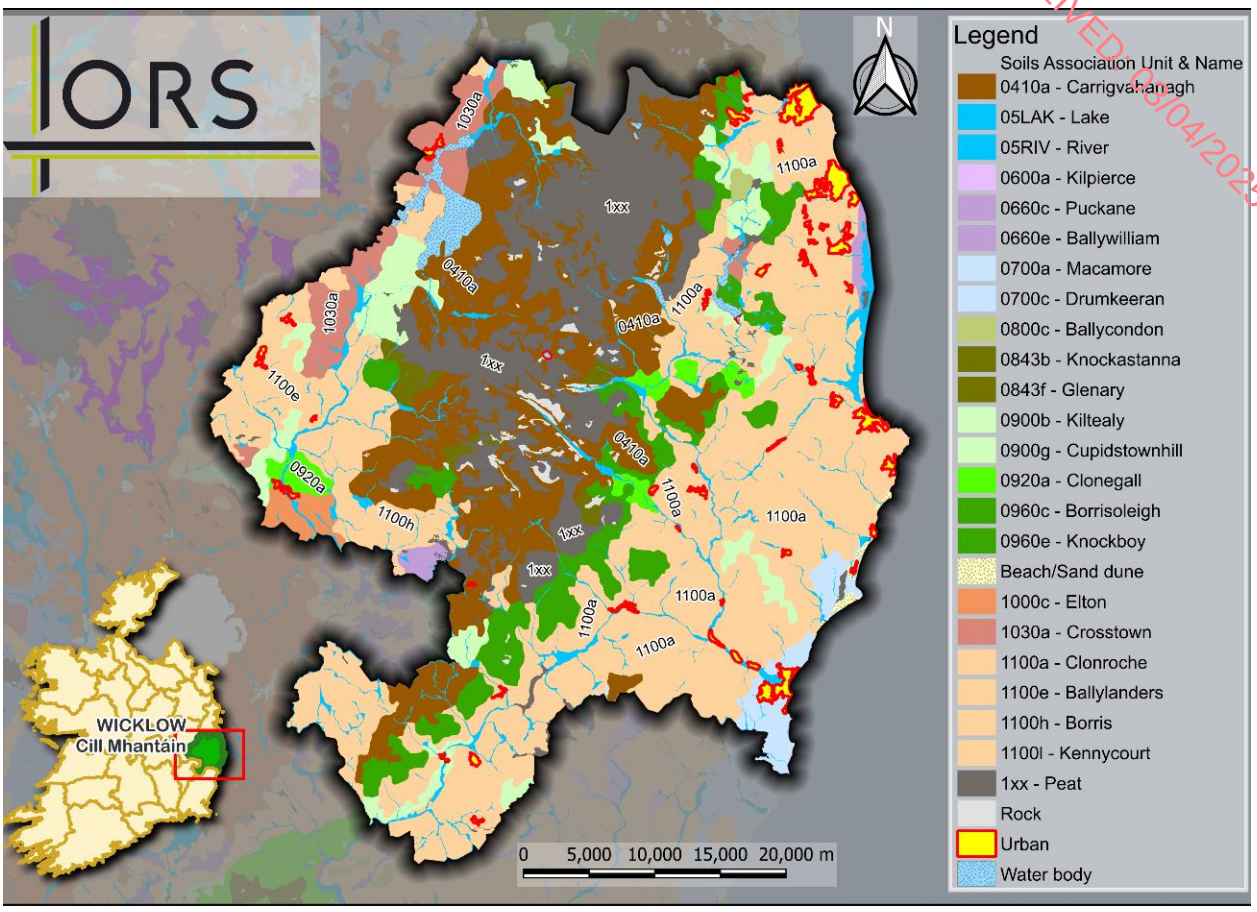


**Figure 7.17**: National Soil Map of South County Wicklow (Source: GSI)

### Local Soil and Subsoil

The Irish Soil Information System (SIS) – SIS SOIL project, supported by the Irish Environmental Protection Agency and Teagasc, has developed a national association soil map for Ireland at a scale of 1:250,000, together with an associated digital soil information system, providing both spatial and quantitative information on soil types and properties across the country. This resource groups similar soil groups together into 11 soil 'Great Groups' and associated 'Sub-Groups', allowing for the taxonomical classification of soil types throughout Ireland.

The SIS SOIL indicates that within the 2 km range study area exists four soils associations: Macamore (0700a), Clonroche (1100a), River Alluvium (05RIV) and Urban. The Proposed Development site overlies soils of the Macamore Series (0700a). **Figure 7.18** presents the Proposed Development and the 2 km range Study Area overlayed on the SIS SOIL mapping data.

The western portion is almost entirely covered by well-drained Brown Earth classified as Clonroche (1100a). To the Northeast there is Urban soils, where Arklow town is. Around the banks of the rivers Moneylane, Ballyduff and their tributaries in the area can be found river alluviums (05RIV) and, in the eastern portion of the study area there is soils derived from Irish Sea Drift, the Macamore Association (0700a).

The GSI maps indicates that the Proposed Development overlies soils classified as Macamore, present across the whole Proposed Development and over a range of 200m from the Proposed Development boundary. These soils, derived from sea drift material are poorly-drained. This condition must be attributed in part to the high clay content particularly in the lower depths.

The soils of this series, which are of a sandy loam to sandy clay loam texture and of a medium base status, have been classified as low-humic podzolic gleys. The profile is distinguished by a dark greyish-brown surface horizon of sandy loam to sandy clay loam texture, with deeper horizons of a "heavier" texture that are typically grey and strongly mottled. The weak structure and the 'heavy' texture of the subsoil are the primary factors responsible for the poor drainage of these soils. For this reason, they are classified as surface-water Gleys. Even on favourable slopes, poor drainage is evident, which usually, in the unimproved state, carry rush (Juncus) dominated pastures. One of the more striking features of the profile is the presence of a uniformly brown (more oxidised) horizon at a depth of thirty-six inches. This phenomenon of strongly gleyed horizons above less gleyed horizons is mainly due to a 'perched' water table.

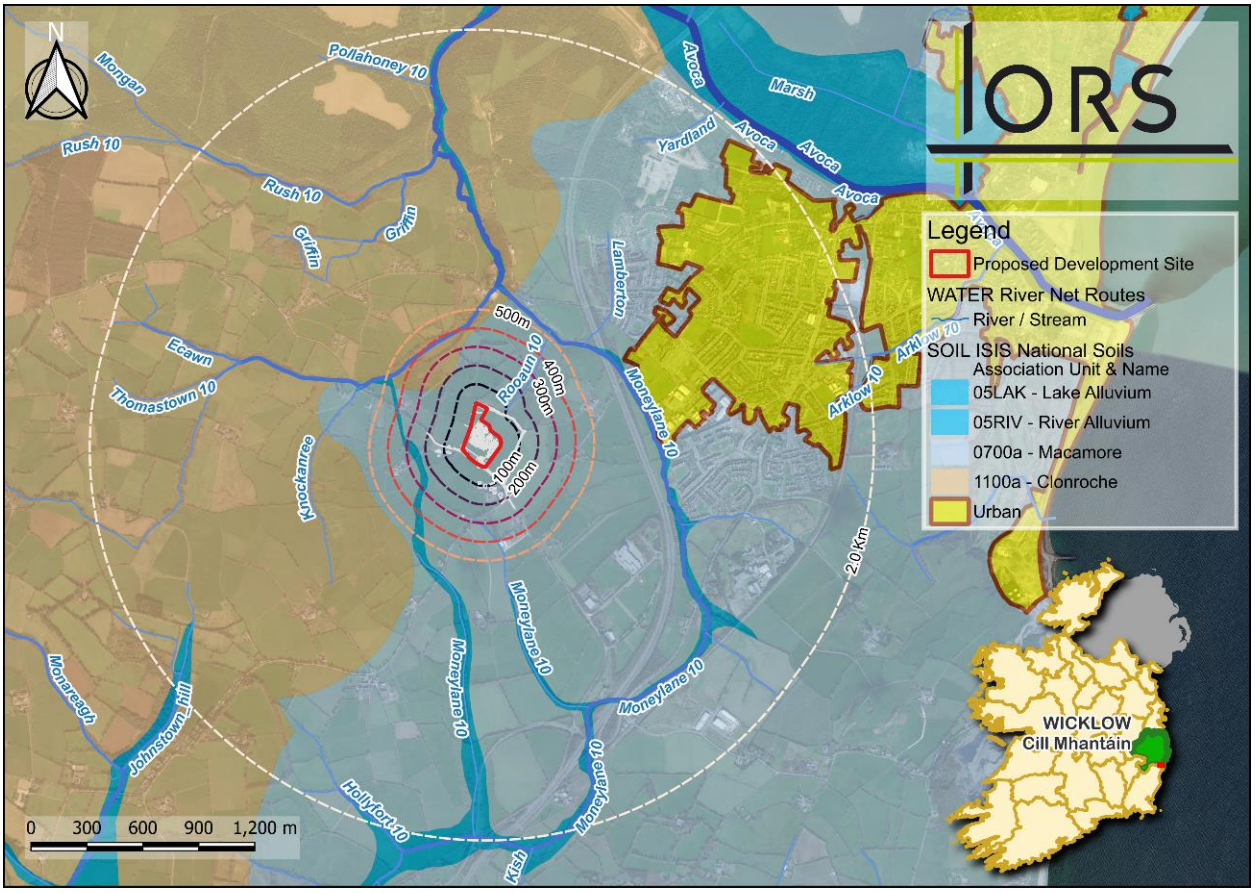


**Figure 7.18:** Irish Soil Information System (ISIS) Map – Surface Soils. Map detailing soil types underlying the Proposed Development (EPA and Teagasc)

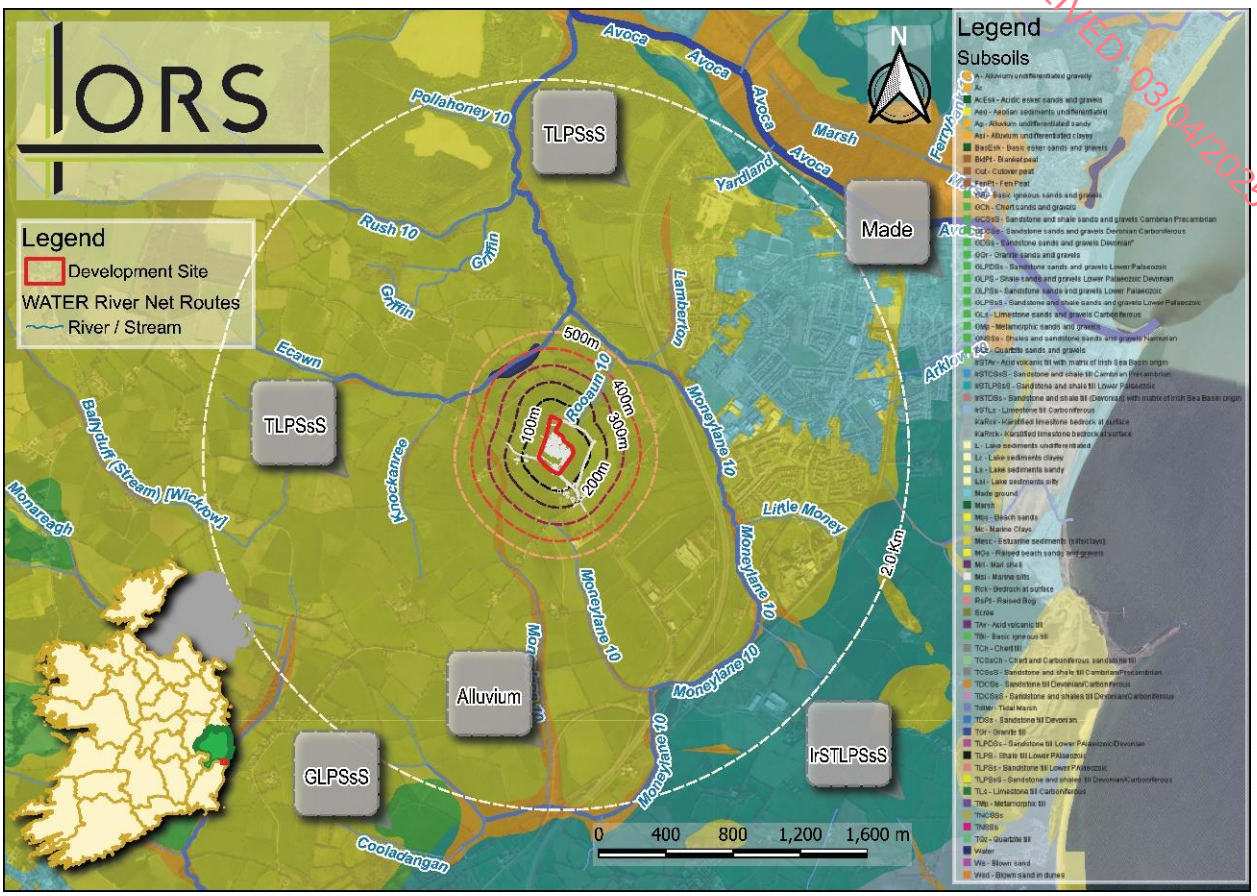


**Figure 7.19:** Teagasc Subsoil Map detailing subsoil types underlying the Proposed Development (Teagasc)

The Teagasc representative soil profile description for the 'Macamore' series notes it as having a fine loamy texture. The first horizon ($Ag_1$) is a fine loamy which contains a high proportion of sand (55.3%) and smaller proportions of silt (26.7%) sized particles with lower proportions of clay (18%) in the top horizon (0-20cm).

Throughout the lower horizon $Ag_2$ (20-38cm) this proportion of particle sizes remains relatively consistent with a major increase in sand (56.8%) and clay (21.6%) and a minor increase in silt (21.6%). In the following horizon, BG (38-91cm), there are important changes on the particle's percentage, Sand (22.6%) becoming the lower and Clay (46.5%) the higher. Towards the final horizon (CG) (91 cm +) a higher proportion of clay (50.6%) and silt (32.1%) and a small portion of Sand (17.3%) are noted. A detailed representative soil profile description from the Teagasc SIS database of the 'Macamore' soil series is included in **Appendix 7.1**. This representative soil description available for the 'Macamore' series is not taken from the subject site and so will differ from the proposed site in Moneylane.

The EPA databases indicate the parent material for the subsoils beneath the site are Sandstone and shale till (Lower Paleozoic) (TLPSsS). The till is described as diamicton, which relates to its terrigenous sediment that is unsorted to poorly sorted and contains particles ranging in size from clay to boulders, suspended in an unconsolidated matrix of mud or sand. This unsorted matrix is due to glaciation. These subsoils are present practically all over the 2

km area of Study. In the area of Arklow Town there are Made subsoil, and to Northeast and Southeast there are Sandstone and shale till (Lower Paleozoic) with matrix of Irish Sea Basin origin subsoils (IrSTLPSsS). The subsoil in the areas delineated as alluvium are described as having undifferentiated alluvium subsoils.

The existing site is used for agricultural purposes and due to its topography is suited to pastural grazing and silage production.

**Licensed sites**

A review of the EPA and DCCAE website for existing and historic, licensed and illegal waste activities, mines and industries was carried out to identify any potential contamination sources present in the area and to identify any potential contaminating activities near the Proposed Development site.

The desk study indicated that no recorded illegal waste activities sites were present within a 2 km radius of the Proposed Development site. The site visit confirmed that there was no evidence of illegal dumping on the site itself.

There are three Integrated Pollution Prevention Control (IPPC) facilities within the study area, two of them with surrendered licenses, one for Vitra (Ireland) Limited (P0823-01), located 817 m to the Southeast of the Proposed Development and one for Servier International B.V (P0128-01), located *ca.* 1.5 km to the Southeast of the Proposed Development. The third, and active license is Sigma-Aldrich Ireland Limited, (P0089-06), is located *ca.* 1.9 km North from the Proposed Development. It is not foreseen that these licensed facilities will have an effect on the Proposed Development.

The details of these licences i.e. granted in the immediate area of the development are outlined in **Table 7.6**.

**Table 7.6** Licensed Integrated Pollution Prevention Control (IPPC) Facilities and Industrial Emissions License applications (EPA Maps) within the 2 km study area

| Licence Number | Major Class of Activity | Distance from Proposed Development | Name | Licence Status | Class Activity (EPA Act 1992, as amended - 1st Schedule) | |
|---|---|---|---|---|---|---|
| P0823-01 | Industry | 817m SE | Vitra (Ireland) Limited | Surrendered | 13.4.1 | The manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day, or with a kiln capacity exceeding 4 $m^3$ and a setting density per kiln exceeding 300 $kg/m^3$ |
| P0128-01 | Industry | 1.5 km SE | Servier International B.V. | Surrendered | 5.6 | The manufacture of pesticides, pharmaceutical or veterinary products and their intermediates, not included in paragraphs 5.12 to 5.17. |
| P0089-06 | Industry | 1.9 km NE | Sigma-Aldrich Ireland Limited | Licensed | 5.16 | The production of pharmaceutical products including intermediates. |

There are no mapped current licensed/unlicensed or historic waste facilities/dump sites within

the immediate vicinity of the Proposed Development. The closest facility is the Ballynurtagh Landfill Facility located *ca*. 9.4 km Northeast of the Proposed Development, in Ballinvalley, Co. Wicklow. The facility is a licensed waste facility (W0011-02). Another facility is located *ca*. 18 km southwest of the Proposed Development and is a licensed landfill (W0123-01). Due to the significant distance (>5 km) of other waste facilities from the site, it is not foreseen that these facilities will have an effect on the Proposed Development.

A study of the previous planning applications present on the Wicklow County Council Planning Application webviewer was carried out for a range of 2 km of the Proposed Development. The most recent and relevant are as illustrated on the **Figure 7.20.**

**Figure 7.1** Proposed Development site and most recent and relevant planning applications in the area (Adapted from Wicklow CoCo Planning Applications https://wicklow.maps.arcgis.com/apps/webappviewer/)

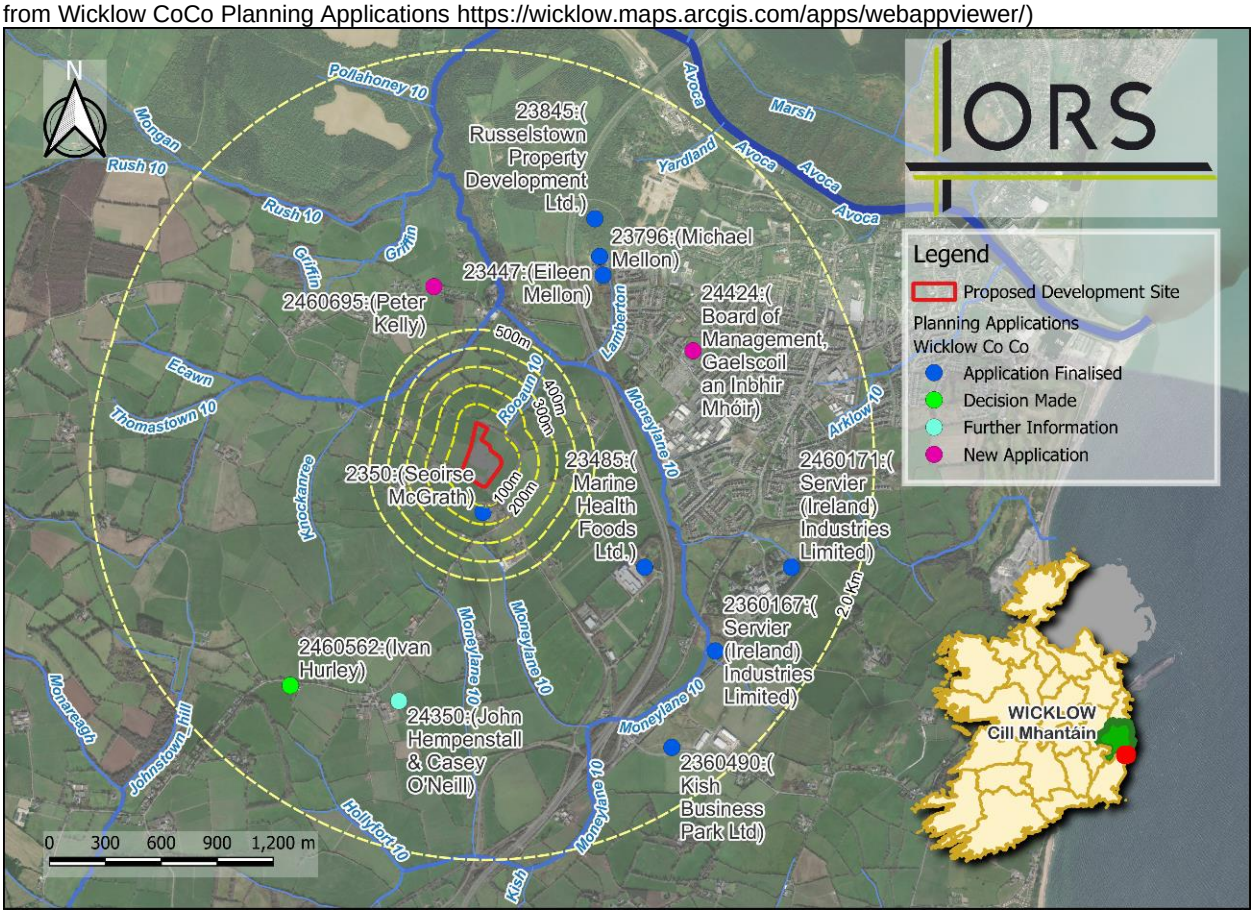


**Figure 7.20:** Proposed Development site and most recent and relevant planning applications in the area (Adapted from Wicklow CoCo Planning Applications https://wicklow.maps.arcgis.com/apps/webappviewer/)

No previous applications for permission on the Proposed Development have been submitted. Details of the most relevant applications in the last year, regarding potential associated impacts, are presented in the **Figure 7.20** and shown in the **Table 7.7** below.

**Table 7.7** Most recent and relevant planning applications in the area (From: Wicklow CoCo Planning Applications https://wicklow.maps.arcgis.com/apps/webappviewer/)

| Application | Applicant | Status | Description | Address | Received Date | Decision Date | Loca-tion |
|---|---|---|---|---|---|---|---|
| **2460695** | Peter Kelly | New Application | construction of a slatted cattle house/store, cattle handling facilities, farm roadway and farmyard entrance, together with associated concrete yards and site works | Ballyduff North, Arklow | 11/11/2024 | 14/01/2025 | *Ca.* 760m N |
| **2350** | Seoirse McGrath | Application Finalised | to erect circular slurry storage tank | Moneylane, Arklow | 21/01/2023 | 20/03/2024 | *Ca.* 136m S |
| **2460562** | Ivan Hurley | Decision Made | Permission for upgrade to existing sewage treatment system | Teach Beag, Curranstown | 17/09/2024 | 11/11/2024 | *Ca.* 1.5 km SW |
| **24350** | John Hempenstall & Casey O'Neill | Further Information | construction of a fully serviced dormer dwelling house with detached domestic garage and associated site works and new access drive to existing shared entrance | Curranstown Lower, Arklow | 23/08/2024 | | *Ca.* 1.2 km S |
| **23485** | Marine Health Foods Ltd. | Application Finalised | to erect a 532m2 commercial building comprising a 432m2 manufacturing/industrial unit with an ancillary 100m2 office space along with all associated site works including storage yard, car parking and connect to the existing services | IDA Business Park, Ballynattin | 24/03/2023 | 06/02/2024 | *Ca.* 960m SE |
| **2360490** | Kish Business Park Ltd | Application Finalised | construction of internal estate road and all associated site works | Kish Business Park, Clogga Road | 11/12/2023 | 13/02/2024 | *Ca.* 1.7 km SE |
| **2360167** | Servier (Ireland) Industries Limited | Application Finalised | erect 14,500.77 m2 of photovoltaic panels on a ground mounted system with all associated site works at Servier (Ireland) Industries Limited. The development will comprise of a 2.0 MWp Solar PV farm on 3.36 hectares of land located to the south of our ex | Gorey Road, Arklow | 21/07/2023 | 21/10/2023 | *Ca.* 1.5 km SE |
| **2460171** | Servier (Ireland) | Application Finalised | 1) Construction of a single storey office building with an | Moneylane, Gorey | 27/03/2024 | 21/05/2024 | *Ca.* 1.7 km SE |

| Application | Applicant | Status | Description | Address | Received Date | Decision Date | Loca-tion |
|---|---|---|---|---|---|---|---|
| | Industries Limited | | approximate gross floor area of 339 sq. m.; 2) Provision of permeable surfaced parking area, including 8 no. car parking spaces, and 6 no. bicycle spaces; 3) Provision of permeable surfaced area | Road, Arklow | | | |
| **24424** | Board of Managemen t Gaelscoil an Inbhir Mhoir | New Application | the continued use of the existing prefabricated buildings previously granted under register reference numbers 12/610024, 14/1439, 16/798, 17/196 and 19/426, together with associated ancillary site works | Gaelscoil an Inbhir Mhoir, Emoclew Road | 22/10/2024 | 16/12/202 4 | *Ca.* 1.2 km NE |
| **23845** | Russelstown Property Developmen t Ltd. | Application Finalised | 95 dwellings comprising 71 no. semi-detached and terrace houses with 2,3 and 4 bedrooms together with 24 apartments in 6 blocks and Creche. The development includes provision of open spaces, roads, footpaths, connection to services and all associated an | Site at Ballyraine Upper, Arklow | 20/11/2023 | 23/01/202 4 | *Ca.* 1.2 km NE |
| **23447** | Eileen Mellon | Application Finalised | A) erect 6No. dwelling houses, consisting of 6No. 3-bedroom dwellings (house type A1), B) provision of vehicular and pedestrian access, C) provision of off street parking facilities, D) Ancillary site works and connection to existing services | Ballyraine Upper, Arklow | 09/03/2023 | 19/10/202 3 | *Ca.* 1.1 km NE |
| **23796** | Michael Mellon | Application Finalised | (A) Erect 21No. dwelling houses, consisting of 6No. 3-bedroom dwellings (House type A1), 1No. 3-bedroom dwellings (House type A2), 8No. 3-bedroom dwellings (House type B1 & B3 ) and 6No. 2-bedroom dwellings (House type | Ballyraine Upper, Arklow | 24/10/2023 | 18/12/202 3 | *Ca.* 1.0 km NE |

| Application | Applicant | Status | Description | Address | Received Date | Decision Date | Loca-tion |
|---|---|---|---|---|---|---|---|
| | | | B2), (B) Provision of vehicular and | | | | |

Given the nature, characteristics and distance of the site from the aforementioned developments, it is not expected that there will be any interaction between them, so it is not anticipated that any of these developments will have an impact on the Proposed Development.

**Historic Land Use**

The historic maps indicate no obvious sources of contamination based on previous land use within the Proposed Development site. The 25-inch historic maps (1863-1924) indicate that the area in the immediate vicinity of the Proposed Development site consists of agricultural lands. A disused clay pit is located *ca.* 770 m to the West of the site. A disused quarry is located *ca.* 809 m, also to the West of the site. A corn mill is noted *ca.* 670 m to the north of the site. In subsequent maps of the area, none of these structures have had visibly lasting impressions or effects on the environment. The historic land uses and up to present day are summarised in **Table 7.8** overleaf.

**Table 7.8** Historical Land Use (https://webapps.geohive.ie/)

| Date | Description |
|---|---|
| **1837-1842** | The location at Moneylane and its environs are shown as farmlands. Some structures are located in the surrounding lands, *ca.* 100 m to the southwest. |
| **1863-1924** | The mapping has not shown any notable changing in the area, with land being greenfield. |
| **1995** | The region is still occupied by farmlands, now having the presence of buildings in the surroundings. There is a farm *ca.* 90 m to the south of the Proposed Development site. |
| **2001-2005** | The proposed site is greenfield.<br>No significant changes to the surrounding environs compared to previous years. |
| **2013-2018** | The proposed site continues to be greenfield.<br>New buildings are noted in the surroundings, such as a residential unit *ca.* 116 m to the West of the site. |

**Landslides**

The GSI's online mapping shows a landslide event and a susceptibility map. Considering the conclusions presented in the mappings, the Proposed Development site is in an area classified as a Low Landslide Susceptibility.

The landslide database from the same GSI online mapping indicates that there are no historic landslides recorded on the site, although there is one recorded within a 2 km radius of it, *ca.* 1.6 km southeast of the site on the Railway embankment Bogland Arklow, in February 2009, an area of sandstone and shale till (Lower Palaeozoic) with matrix of Irish Sea Basin origin (IrSTLPSsS), with no apparent impact.

### 7.4.7 Ground Investigation

Ground investigation works were conducted at the site on October 3rd, 2024, by ORS. These investigations revealed slight deviations from the general geological and subsoil conditions indicated in previous geological mapping. The topsoil was classified as gravelly silty loam, with characteristics resembling those of the Clonroche Soil Association. Differences between site investigations and broader soil mapping (e.g., EPA/GIS/Teagasc) are attributed to the extrapolation of unsurveyed soilscapes ("Terra Incognita"), map resolution, and the site's location near the transition zone between two soil association areas.

**Ground Investigation Summary**

**Trial Pits**: Four trial pits were excavated to depths ranging from 2.8 m to 3.0 m bgl (below ground level). Bedrock was not encountered in most trial pits and is estimated to lie deeper than 4 m. Groundwater was discovered only in Trial Pit 2 (TP02) at a depth of 3.0 m.

**Topography**: The site peaks at 51.928 m AOD at the southernmost boundary and slopes gradually northward to approximately 46.5 m AOD at the northern boundary.

**Trial Pit Locations**:

TP01: Excavated at the lowest point (46.657 m AOD) near the proposed attenuation tank location.

TP02: Located in the proposed processing area at approximately 49.5 m AOD.

TP03: Situated near the processing area at approximately 48.7 m AOD.

TP04: Near the proposed reception building at approximately 49.8 m AOD.

**Soil Profiles**

Topsoil: Consistently brown earth with a gravelly silty loam texture across all trial pits.

Subsoil: Varied characteristics:

TP01: A layer of lighter sand/clay beneath the topsoil.

TP02: Podzolic soils with a distinct horizon sequence: orange sandy A horizon, leached grey silt with gravel, and a dark organic-rich B horizon.

TP03 and TP04: Minor variations, including lighter gravelly clay/sand with occasional cobbles (TP03) and gravelly sandy loam with occasional cobbles (TP04).

Bedrock: Predominantly Silurian dark grey slate, with occasional pale grey sandstones and tuffs. Bedrock was encountered only in TP04 as angular shale at a depth of 1.8 m bgl.

**Groundwater**:

TP04: Water infiltration was observed at 1.8 m bgl.

Percolation Assessment (November 16–19, 2024): Conducted near TP04 on moderately sloped ground. A pit excavated to 2.1 m bgl revealed no bedrock. The water table was recorded at 1.85 m bgl, with seepage noted at 1.3 m bgl.

**Summary of Findings**

The site soil is predominantly Brown Earth with gravelly silty loam topsoil and podzolic subsoils rich in organic matter. While the site is characterised by well-drained, highly permeable soils, groundwater infiltration was observed at moderate depths. Bedrock, primarily dark grey slate, is generally deeper than 4.0 m but was encountered at 1.8 m bgl in TP04. The findings are detailed in **Table 7.9** and **Figure 7.21**.It is important to note that the assessment followed a period of heavy rainfall, which may have influenced groundwater levels.

For additional details, please refer to **Appendix 8.3** of **Chapter 8 Hydrology & Hydrogeology**.

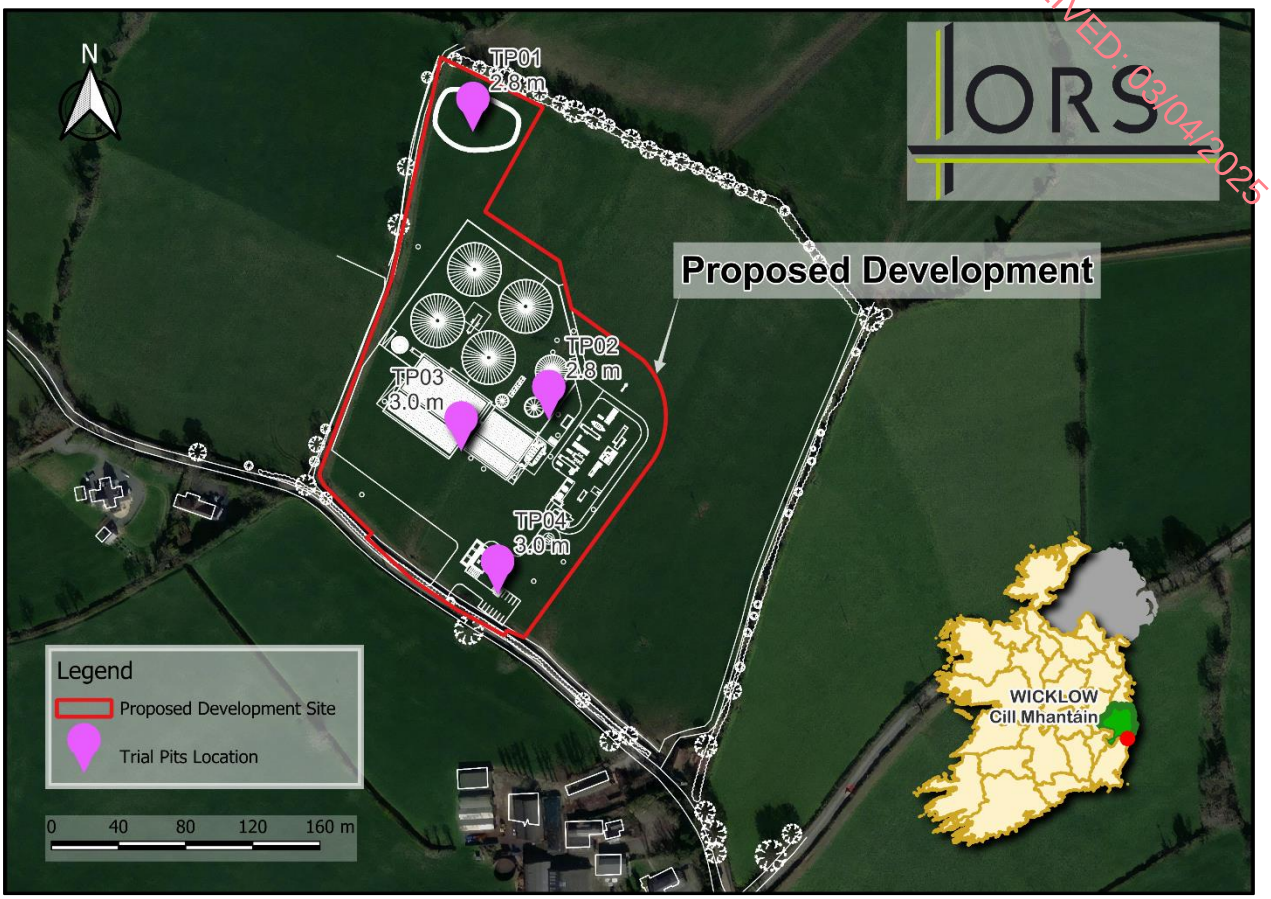


**Figure 7.21:** Location of Trial Pits (TP)

A summary of the soil profiles encountered during the ground investigation carried out as part of this report is given in **Table 7.9**.

**Table 7.9** Ground profile for each Trial Pit

| Location | Depth (m) | Ground Profile | Comments |
|---|---|---|---|
| **TP 01** | 0.0-0.7m<br>0.7-2.0m<br>2.0-2.8m<br>2.8m | Brown Earths, - gravelly silty LOAM<br>Lighter SAND/CLAY, occasional subangular gravel and cobbles. Hardpan (iron) layer present and obvious mottling. In summary: Podzolic soils with leached light-coloured sandy layer (A horizon). Accumulation (B horizon) – darker layer throughout due to accumulation of Organic matter & Hardpan Iron oxidised layer.<br>Brown LOAMY/ CLAY soil, granular cobbles (shale) abundant.<br>END OF TP | Trial Pit located at proposed Attenuation Pond area.<br>No GW or Bedrock encountered.<br>Well drained land with obvious leaching and a low water table.<br>Bedrock adjudged to be >4m depth. |
| **TP-02** | 0.0-0.8m<br>0.8-1.5m<br>1.5–2.0m<br>2.0-2.8m<br>2.8-3.1m | Brown Earths - gravelly silty LOAM<br>Podzolic soils:<br>A horizon: light coloured orange SAND/ Grey leached light coloured SILT containing gravels.<br>B horizon: Dark OM heavy layer.<br>Podzolic soils – gravelly silt, more subangular cobbles present. | Trial Pit located at proposed Tank Farm Area.<br>No Bedrock encountered.<br>GW Encountered at 3.0mbgl.<br>Well drained land with obvious leaching and perched water table. |

| | | | |
|---|---|---|---|
| | | | Bedrock adjudged to be >5m depth. |
| **TP-03** | 0-0.4<br><br>0.4-0.9m<br><br><br>0.9-3.0m<br><br>3.0m | Brown Earths - gravelly silty LOAM<br>Lighter gravelly CLAY/SAND - occasional cobble.<br>Ribbon test 12mm – high permeability soils.<br>Hardpan layer present.<br>Dark Brown SILT, subangular Shale. Small boulders present.<br><br>End of TP | Trial Pit located at centre of site<br>No Bedrock encountered.<br>No GW encountered<br>Well drained land with high permeability soils underlying.<br>Bedrock adjudged to be >3m depth. |
| **TP-04** | 0.0-0.5m<br>0.5-1.7m<br><br><br>1.7 -3.0m<br><br>3.0m | Brown Earths - gravelly silty LOAM<br>Lighter gravelly SANDY/LOAM - occasional cobble. Ribbon test 18mm – high permeability soils. Dark organic heavy Hardpan layer present.<br>Dark Brown SILT/LOAM – High Cobble/small boulder content.<br>End of TP. | Trial Pit located at the proposed office building<br>No Bedrock encountered.<br>No GW encountered<br>Well drained land with high permeability soils underlying.<br>Bedrock adjudged to be >3m depth. |

## 7.5 Likely Significant Effects

The assessment focuses on predicted impacts in relation to soils and geology. The assessment relates to impacts occurring during both the construction and operational phases of the development.

For a risk from ground contamination to exist, a contaminant source, pathway for migration and viable receptor must exist. The presence of all three of these elements is known as a 'pollutant linkage'.

Based on the dataset obtained during the desk study, intrusive site investigation, and evidence collected the following risk assessment has been carried out. This identifies the relevant sources, pathways and receptors (pollutant linkages) and assigns a qualitative risk classification of 'Positive, Neutral or Negative/ Adverse' risk to the identified Potential Pollutant Linkages (PPLs).

The likely potential pollutant linkages identified as a result of this assessment and specific for the Proposed Development have been provided in the initial Conceptual Site Model (CSM). The model has been based upon the site setting at the time of the assessment, the land use (current and reasonably foreseen future use) of the surrounding area and the state of what the proposal is (i.e. development, ongoing use, etc.).

As well as identifying the potential pollutant linkages the model includes a preliminary assessment of risk based upon the probability of effect and the likely severity of effect in the context of the site setting and proposed future Proposed Development use.

The criteria used for the risk assessment classifications in this report is detailed in the EPA guidance notes 2022, **Table 1.1** of **Chapter 1** in this report, and in the *CIRIA Report 552*.

### 7.5.1 Do-Nothing Scenario

If the Proposed Development does not proceed there would be no additional impact on the local soil, geology or geological heritage. The current rate of surface water percolation and runoff would continue to operate in its natural state.

Under the 'Do Nothing' scenario there would be no change to the current land use of the site which would remain as agricultural land.

In implementing this 'Do-Nothing' alternative, an Anaerobic Digestion Facility would not be developed and there would be no changes made to existing land-use practices. The site would likely continue to be used for agricultural grazing. Agricultural manures and slurries will be sourced from agricultural operators within a 30 km radius of the Proposed Development. In the 'Do-Nothing Scenario' these agricultural wastes would not be treated locally through the AD process. Untreated and unpasteurised manures and slurries would continue to be applied directly to land at current volumes, with the continued addition of chemical fertiliser. Furthermore, the associated $CH_4$ emissions would not be captured within the AD process.

### 7.5.2 Receptor Sensitivity

The sensitivity of the receptors identified during the study of soil and geological features within the vicinity of the Proposed Development are summarised in **Table 7.10** .

**Table 7.10** Receptor Sensitivity

| Receptor | Receptor Importance | Receptor Sensitivity | Rationale |
|---|---|---|---|
| Topsoil | Local Level | Moderate | The local topsoil is a brown earth, gravelly silty loam which is in abundance within the site. The site topsoil contains no known pollutants. The overall soil is of grassland improved, well drained land with high permeability. |
| Underlying Deposits | Local Level | Moderate | The development layout has been designed to utilise the existing site topography as far as possible **(241504-ORS-ZZ-00-DR-AR-200),** minimising the disturbance to the subsoil to achieve the desired site levels. Where possible, drift deposits will remain on site and be utilised as infill material.<br>The underlying till deposit is a diamicton (poorly sorted containing particles ranging in size from clay to boulder) drift siliceous stone parent material which is in abundance within the wider area. The site is located across a GSI designated flat to undulating sediments. |
| Bed Rock Geology | Local Level | Moderate | The underlying bedrock is composed of Ordovician metasediments, predominantly fractured and weathered shales. The formation is distinguished by a gradation in permeability, exhibiting higher permeability in the upper layers and a decline in permeability with depth. Bedrock is adjudged to be deeper than 3m below ground level. The underlying aquifer is classified as being locally important. |

### 7.5.3 Sources - Construction Phase

The construction phase is likely to yield the most potential impacts on the surrounding land, soil and geology. Potential construction phase impacts are considered in detail below and summarised in **Table 7.11**

The proposed development will consist of two primary elevations. The Reception Building will have a Finished Floor Level (FFL) of 50.3 m AOD, while the lower Digester and Pasteurisation Tank will have an FFL of 48.45 m AOD. Due to the site's existing topography, minimal earthworks will be required to cut and fill the area, creating a level base for construction.

Additionally, excavation works will be necessary to install approximately 0.9 km of gas pipeline and establish a new connection to the existing gas line. These excavation activities will take place along the L6187 local road, extending from the site south-eastward to the entrance of the IDA Business Park.

The following sections detail the potential impacts on land, soil, and geology associated with the proposed excavation and infill works.

**Topsoil Removal**

The initial phase of construction will involve the removal and stockpiling of the topsoil. The pre-construction site investigations conducted indicate a topsoil horizon of approximately 0.10 m to 0.25 m in depth of a topsoil with varying degrees of gravely silty loam. This inert material will be stripped throughout the site and be stockpiled.

For the gas pipeline installation, the topsoil will be temporary stockpiled before being used to redress the installed pipe.

Stockpiles in the absence of mitigation measures will be susceptible to erosion by climatic and hydraulic factors. Any excess topsoil will be removed from site and disposed of in accordance with current waste management regulations.

The most significant risk posed by the topsoil remotion is the migration of silt, clay and other sediment off site through wind and water borne modes of transportation. If incorrectly stockpiled and under specific climatic conditions these sediments can find their way into nearby streams. In significant quantities they can pose a risk to aquatic life and result in a degradation of water quality, as outlined in **Chapter 8 - Hydrology and Hydrogeology**.

In the absence of mitigation, the removal and stockpile of topsoil would result in a ***negative***, ***moderate*** and ***reversible*** effect on soil.

**Excavation/Subsoil Removal**

Site investigations indicate a slight variation in the depth of the subsoil horizon. In Trial Pit 1 (TP-01) the subsoil horizon was identified, with the topsoil overlaying a layer of Brown Earth at 0.7 m bgl composed of gravelly silty loam. Trial Pit 2 (TP-02) demonstrated a similar composition of topsoil overlying a brown earth at 0.8 m bgl. Water infiltration was observed at 3.0 m bgl. From 0.8 to 1.5 m bgl a layer of podzolic soil was observed which contains gravels, below this layer, cobbles are present. In the Trial Pits 3 and 4 the subsoil horizons

demonstrated a greater variety of layers in their subsoil horizons. Lighter gravelly clay and sand with occasional cobble is encountered below 0.4 m to 0.9 m bgl in Trial Pit 3 (TP-03) and lighter gravelly sandy and loam with cobble occasionally below 0.5 m to 1.7 m bgl in Trial Pit 4 (TP-04). The development proposes retaining the general gradient of the existing topography with the taller structures, tanks and digesters, being installed at a lower elevation to minimise the visual impact and to be placed within a lower level bund. This will involve cutting into the existing topography, to the centre of site. Excavated subsoil material will be redistributed on site where possible for infilling.

Mechanical soil compaction will be undertaken to ensure soil stability throughout the site. It is not expected that any excess material will need to be exported from the site, as any surplus will be reused on site for backfilling.

The soils beyond *ca.* 0.5 m below ground level have been found to be relatively consistent throughout Trial Pit 1, 3 and 4. The soils on Trial Pits 2 demonstrate the biggest differences in composition. The depths amongst all Trial Pits were consistent. The site contains a heterogeneous moderately sorted drift of primarily a gravelly silty brown earth with occasional subangular gravel and cobbles, even small boulders. This till drift consists of silt-sized particles which present a moderate susceptibility of becoming entrained in surface water run-off and/or to being blown out of a stockpile by moderate to strong breezes carrying a moderate risk of migrating into surface water receptors. A site characterisation assessment (percolation assessment), **Appendix 7.2**, conducted by Geoenvironmental Ltd, on the 16th of November 2024, indicated that the soakage in the subsoil is sufficient, with a T value of 35.56.

The lower horizons of the subsoil (>0.2 m bgl) were recorded as being more compact with a texture of soft to firm and a structureless to subangular soil structure. Further compaction of this layer during excavation and construction works is inevitable and may increase surface water run off due to reduced infiltration rates resulting in increased sediment erosion on site. The excavation of and exposure of the subsoil layer during the construction phase will result in an increased risk to the groundwater vulnerability, as outlined in **Chapter 8 - Hydrology and Hydrogeology**.

The preliminary Cut and Fill calculations (refer to **Drawing No. 24118-DR-0501**) for the site indicate that a total of 24,000 $m^3$ of material is to be excavated, composed of 9,657 $m^3$ of topsoil and 14,343 $m^3$ of subsoil. 3,715 $m^3$ will be reworked as a resoil 250 mm thick material, 5,393 $m^3$ will be placed as topsoil to landscape areas. 14,343 $m^3$ of the material is to be replaced as general fill (subsoil) to sub-formation and landscape areas. This results in a net surplus of 549 $m^3$ which will be repurposed and redistributed in landscaping and earth berms within the site. Exportation of material from excavation will not be necessary.

The importation of soil and stone increases the risk of introducing contaminated materials on site. Sourcing material from a licensed site that has undertaken ecological and environmental assessments and received all necessary permits/ licenses for the excavation of the material will be undertaken. All material will be transported to site using registered hauliers and records of material movements will be record in accordance with the waste legislation and guidance notes.

In the absence of mitigation, the extraction and reduction in the subsoil horizon / importation and alteration of the of subsoil horizons will have a ***negative, moderate*** and ***permanent*** effect on the subsoil.

**Excavation of Bedrock**

The GSI groundwater vulnerability maps have classed the entire site as overlaying a range of vulnerabilities. The lands on which the Proposed Development location has been proposed have been assigned variety of vulnerability ratings ranging from moderate along the centre-northern area and high along the southern portion of the site. The route of the proposed facility access road is underlain by areas of high vulnerability and in a specific section of the route (Ballyduff South Rd. L6187) *ca.* 730 m Southeast from the site has posing vulnerability given the presence of Rock at or near Surface. Based off the groundwater vulnerability guidelines this would indicate a soil depth of *ca.* 3-8 m at the portions of site where vulnerability is described as moderate and 1-3 m where vulnerability is described as high.

The site investigation has not encountered bedrock. Groundwater was encountered at 3.0 m bgl in Trial Pit 02 towards the centre of the site. The findings of the site investigations indicate a uniform depth of the underlying deposits in the area (>3 m bgl).

A potential effect of the construction stage could be the exposure of the underlying bedrock. Excavations of up to 3.5 m bgl will be required to reach the finished floor level (FFL) of the Digesters (53, 54, 55), Digestate Storage Tanks (56, 63), Reception Hall (51), bunded area (8, 9) and the attenuation pond. When excavation to FFL has been achieved, further earthworks will then follow to facilitate the construction of foundations and the installation of services/drainage infrastructure. Foundations of up to 2m below the FFL will be required along the structural outline of buildings.

It should be noted that the Digestion tanks (1, 2 and 3), and Digestate Storage Tanks (1 and 2), bunded area will have a FFL of 48.34m. Foundations and hard core will be a further *ca.* 0.7m below the FFL. These structures are planned for the central portion of the site where the current ground level is nearer the proposed ground level. Maximum excavations of 1.4 m bgl at the attenuation pond to the northwest are required to achieve the desired ground level. Refer to the proposed Cut and Fill drawing in **Appendix 7.2** and relevant structural site layout drawings as referenced in **Section 2.2, Chapter 2 – Project Description**

In the absence of mitigation, encountering bedrock will have a ***negative, significant***, and ***permanent*** effect.

**Access Road Adjustments and Installation of Gas Pipeline**

During the initial stages of the construction phase, enabling works will consist of stripping and stockpiling of topsoil and subsoil at the site area, as outlined above. Similarly, excavations are required for the road adjustment and the access at the site entrance, located at the southwest of the Proposed Development and to install the gas pipeline along the L6187 Local Road.

The proposed gas pipeline connecting the Proposed Development to the existing medium pressure distribution gas pipeline located *ca*. 835 m southeast at Ballynattin, Co. Wicklow, will be installed alongside the L6187 local road. This is an indicative routing of the pipeline to the Proposed Development and is subject to change pending detailed network modelling and design. Installation of the pipeline will involve temporary excavation work and will result in disturbance of the underlying soil and subsoil. This may have an effect on the exposed soil and subsoil with implications for the soil surface with regard to stock piling and mobile plant. The trenches will be backfilled shortly after excavation following the installation of each section.

Trenching along a road network will give rise to asphalt waste material. If unproperly managed these materials can pose a risk to the environment due to the presence of Polycyclic Aromatic Hydrocarbons (PAHs).

In the absence of mitigation, the access road and gas pipeline installation would have a ***negative, slight*** and ***temporary*** effect on the existing surface level materials and subsoil.

**Construction of Built Structures**

The construction of the Anaerobic Digestion Plant will result in the conversion of permeable soils to hard standing surfaces. This sealing/ capping of land has a long-term impact on the underlying soil's structure and function to the wider environment. It reduces the water infiltration to the underlying soil/ bedrock and alters the structure and functionality of the soil over time.

The construction of the built structures requires excavations of up to 3.5 m below current ground levels. As is common practice with the construction of foundations a compressed infill gravel base/ pad is required on top of which a concrete blinding is poured. Steel reinforcements will be installed, with shuttering erected around this to facilitate the final concrete pour. Infilling and compaction of excavations around structures is then conducted to ensure structural integrity. The infill material and concrete poses a risk of contaminating the subsoil and bedrock if installed in adverse weather conditions.

In total, the Proposed Development will result in the construction *ca.* 3,482 sq.m of hard standing, inclusive of built structures and concrete/ asphalt aprons.

The use of plant and machinery during the construction stage will involve the use of hydrocarbon-based fuels and oils. There is a risk of contamination to soils and eventual percolation to the underlying bedrock. Hydrocarbons should be stored in bunded facilities, and the use of hydrocarbons should be contained to bunded areas with spills cleaned up immediately.

In the absence of mitigation, the impact of the construction of built structures would have a ***negative, moderate*** and ***long-term*** effect.

**Attenuation Pond**

The Proposed Development includes establishing an attenuation pond to the north of the site which will be used for attenuation of surface water run-off from internal pathways, yards, roofs and the impermeable bunded area. The soil on site is a poorly drained gley soil and may be suitable for creating an impervious barrier to retain the contents of the ponds. The use of such material may mitigate the risk posed to the underlying bedrock aquifer which will be at an increased vulnerability due to a reduction in the overlying burden.

No material will need to be imported to site in order to line the location of the proposed attenuation pond. Excavated material will be re-used on site and may be used in the construction of the proposed attenuation pond. As no importation of soil / clay material is required, the associated risk translocating invasive species and contaminated materials is **not significant**.

The construction of an attenuation pond will result in the degradation of the underlying soil

quality and ensure anaerobic conditions. On the contrary the wetlands will result in the addition of a new Fossitt designated habitat within the locality, (FL8) “Other artificial lakes and ponds”. It is implied, if appropriately managed, wetlands will result in an increase in flora, fauna and biodiversity. Increased food availability may entice burrowing fauna to establish in the locality. Burrowing animals have a positive effect on soil quality on a localised level.

The constructing of the attenuation ponds is foreseen to have a ***negative-neutral*** and ***permanent*** effect.

**Contaminated Soils**

The excavation and construction activities will cause quantities of excavated materials to be reused on site. The Proposed Development is greenfield and historical mapping does not suggest any incidences of land use which might result in the contamination of soils. Furthermore, site investigation and assessments were conducted at the Proposed Development in October 2024 and November 2024 and did not detect any evidence of contaminated soils. It is not anticipated contaminated soils will be encountered during construction activities.

The construction management plan will include a set of procedures to be implemented in the incidence of contaminated soils encountered. Encountering contaminated soils would have a ***negative***, ***not significant*** and ***temporary*** effect.

**Table 7.11** Severity/ Magnitude of Impact during construction phase

| Receptor | Potential Environmental Effects | Quality | Significance | Duration |
|---|---|---|---|---|
| **Topsoil** | Topsoil Removal | ***Negative*** | ***Slight/ Moderate*** | ***Reversible*** |
| | Access Road Adjustments and Gas Pipeline | ***Negative*** | ***Slight*** | ***Temporary*** |
| **Underlying Deposits/ Subsoil** | Construction of Built Structures | ***Negative*** | ***Moderate*** | ***Long-term*** |
| | Excavation/ Subsoil Removal | ***Negative*** | ***Moderate*** | ***Permanent*** |
| | Wetland | ***Negative/ Neutral*** | ***Moderate*** | ***Permanent*** |
| | Contaminated Soils | ***Negative*** | ***Not Significant*** | ***Temporary*** |
| | Access Road Adjustments, Drainage Pipe and Gas Pipeline | ***Negative*** | ***Slight*** | ***Permanent*** |
| **Bed Rock Geology** | Excavation of Bedrock | ***Negative*** | ***Significant*** | ***Permanent*** |

## 7.5.4 Sources - Operational Phase

The operational phase effects anticipated and considered throughout the lifetime of the operation of the facility are outlined in the following paragraphs and summarised in **Table 7.14** .

It is not envisaged that there will be many potential activities that would result in deleterious

effects to soil, land or geology during the operation of the facility.

**Hydrocarbon Contamination**

The Proposed Development will be frequented by hauliers transporting both liquid and solid feedstocks for production of biomethane. There is a possible risk of vehicular accidents on the site which could result in the accidental release of hydrocarbons.

Mobile plant and fixed machinery are a potential source of contamination on site. Accidental leaks or spills of fuels and oils from hydraulics would be the source of such contaminates.

The 1,000 L fuel tank is a source of such contaminants and as such it will be bunded to comply with EPA guidelines.

Strict enforcement of traffic management measures, adherence to standard operating procedures (SOP's) for refuelling and regular inspection of bunds should eliminate the potential for such sources of contamination. In addition, the process area will be bunded which will further reduce the possibility of such chemicals making contact with the local soil and geology.

In the absence of mitigation, hydrocarbon leaks and spills would have a ***negative, moderate*** **to** ***significant*** and ***long-term*** effect.

**Accidental Discharge**

Accidental discharge, spills or leaks of digestate, nutrient rich liquids or solid wastes from the Reception Hall, Digestion Tanks or wastewater treatment system could pose a risk to the local soil. Such nutrient rich substances have a high Biological Oxygen Demand (BOD) and would pose a risk to groundwater and bedrock aquifers, introducing microbial contaminants and threatening aquatic life by consuming available dissolved oxygen in watercourses. The long-term threat to soil is considered to be less than hydrocarbons, as such nutrient rich substances will be biodegraded in the soil and absorbed by flora.

However, excessive volumes can be detrimental to soils, killing off the microbial and microorganism populations and stunting or killing plant growth by inhibiting the absorption of micro-nutrients. The overall effect is dependent on the volume and duration of such nutrient leaks.

In the absence of mitigation, nutrient leaks to the surrounding soil would have a ***negative,*** ***slight*** and ***short-term*** effect.

**Land Spreading of Biobased Fertiliser**

Utilising biobased fertiliser (digestate) offers several scientific benefits over the continued use of raw manures, slurries, and chemical fertilisers. These include balanced nutrient availability, slow-release nutrients, improved soil health and a reduction in pathogens and weeds when compared to slurries and manures. These advantages support sustainable agricultural practices whilst simultaneously improving soil conditioning.

**Balanced Nutrient Availability**: Biobased fertiliser typically contains a balanced mix of essential nutrients, including nitrogen (N), phosphorus (P), potassium (K), and micronutrients

crucial for plant growth. This balanced nutrient profile contrasts with chemical fertilisers, which often supply only specific nutrients. Studies have shown that the diverse nutrient composition of digestate supports comprehensive plant nutrition, contributing to improved crop yields and overall plant health (Möller and Müller, 2012). Digestate is particularly rich in ammonium nitrogen (NH4-N), a form of N that is readily available for uptake by plants (Doyeni et al, 2021).

**Slow-Release Nutrients**: Biobased fertiliser releases nutrients gradually over time as it decomposes in the soil. This gradual release mechanism ensures a sustained supply of nutrients to plants, contrasting with untreated manures, slurries, and chemical fertilisers, which can be prone to leaching or volatilisation. The slow-release nature of digestate reduces the risk of nutrient loss and enhances nutrient uptake efficiency by plants (Yao et al., 2011). Digestion of livestock slurry has also been shown to increase the plant availability of nitrogen in slurry by *ca.* 10%.

**Enhanced Soil Health:** Rich in organic matter, Biobased Fertiliser improves soil structure, promotes water retention and stimulates microbial activity. These soil health benefits contribute to improved nutrient cycling, root development, and overall soil fertility (De Vries et al., 2015).

**Pathogen and Weed Reduction**: Manure and slurry may contain a range of bacterial, viral, and parasitic pathogens and land application of these organic fertilisers typically occurs without prior treatment. In contrast, Anaerobic Digestion, and subsequent pasteurisation of digestate significantly reduces the presence of pathogens and weed seeds, making it safer for agricultural use compared to untreated manures and slurries (Vinnerås et al., 2006).

At full capacity it is proposed that the total tonnages for transportation off-site from the Proposed Development as biobased fertiliser to local agricultural operators will be *ca.* 8,000 tonnes of Digestate Fibre and *ca.* 17,000 tonnes of Digestate Liquid Concentrate. Of the maximum 90,000 tonnes of annual feedstock intake to the site, *ca.* 36,214 tonnes of untreated manures and slurries would normally be land spread locally. Following, digestate treatment and pasteurisation there will be 8,000 tonnes of solid and 17,000 tonnes of liquid biobased fertiliser. This represents a significant reduction, *ca.* 12,214 tonnes per annum, in the hydraulic loading of land spreading locally.

Post pasteurisation, the biobased fertiliser will meet the standard of an EU fertilising product as outlined in Regulation (EC) No 2019/1009 under the criteria outlined for Product Function Category (PFC) 3 B: Inorganic Soil Improver. The proposed operator will apply for End of Waste Criteria. All biobased fertilisers will be used in accordance with S.I. 113 of 2022 European Communities (Good Agricultural Practice for Protection of Waters) Regulations, 2022).

The spreading of the biobased fertiliser on the customer farms will be done in accordance with the specific Nutrient Management Plan for that farm. If appropriately managed, land spreading of biobased fertiliser has the potential to have a **positive**, **slight** and **long-term** effect on nutrient management and soil quality.

**Attenuation Pond**

The existence of the attenuation pond will result in the degradation of the underlying soil quality and result in anaerobic soil conditions in the immediate area. However, the attenuation pond will result in the addition of a new designated habitat within the locality, known as “Other

artificial lakes and ponds". If appropriately managed, the attenuation pond will result in an increase in flora, fauna and biodiversity. Increased food availability may entice burrowing fauna to establish in the locality. At a local level burrowing animals have a positive effect on soil quality.

If inappropriately constructed the attenuation pond may pose a risk to the underlying bedrock aquifer. If contaminated materials are discharged into the wetland they may percolate into the underlying locally important bedrock aquifer. From here they can degrade the quality of the aquifer and migrate downgradient to sensitive receptors. As such, the attenuation pond will be lined with an impermeable membrane to limit the risk of contaminants leaching into the underlying locally important bedrock aquifer. There are several recorded boreholes recorded within the 2 km study area as presented in the **Table 7.5** of the **Section 7.4.5**.

In the absence of mitigation measures, the wetland is envisaged to have a **neutral**, **significant** and **permanent effect**.

**Table 7.12** Severity/ Magnitude of Impact during operation phase (in the absence of mitigation)

| Receptor | Potential Environmental Effects | Quality | Significance | Duration |
|---|---|---|---|---|
| **Topsoil** | Nutrient Leaks | **Negative** | **Slight** | **Short-term** |
| | Land Spreading of Digestate | **Positive** | **Slight** | **Long-term** |
| | Attenuation Pond | **Neutral** | **Moderate** | **Permanent** |
| **Bed Rock Geology** | Hydrocarbon Contamination | **Negative** | **Moderate/ Significant** | **Long-term** |

## 7.6 Mitigation Measures and Monitoring

This section highlights the mitigation measures proposed for the operation and construction stages of the Proposed Development to mitigate potential impacts to the near and wider environment.

### 7.6.1 Construction Phase

#### General Mitigation Measures

A Construction Environmental Management Plan (CEMP) will be prepared and implemented by the main contractor during the construction phase. This is a practical document which will include detailed procedures to address the main potential environmental impacts on site, encompassing soil, geology, noise, dust, air quality, surface and ground water, and highlights the proposed construction methods, activities and procedures. Refer to the preliminary CEMP report submitted in conjunction with this EIAR (**Document No.: 241504-ORS-XX-XX-RP-EN-13d-010**). The implementation and compliance with the conditions of the CEMP will be overseen by the Project Supervisor Construction Stage (PSCS) and/or onsite Environmental or Ecological Clerk of Works (ECoW) where necessary. Proposed mitigation measures include;

- Site preparation and construction must be confined to the site only and it must adhere to all the mitigation measures outlined in this Chapter. Work areas should be kept to the minimum area required to carry out the proposed works and this area should be clearly marked out in advance of the proposed works.
- Prior to the commencement of developments on site, the PSCS/ ECoW will ensure that contractors will be made aware of the sensitive receptors identified in this chapter and the

associated mitigation factors. A signed statement saying that they have taken on board the mitigation measures contained herein should be presented to the local authority along with the Notice of Commencement.

- A wheel wash/ power wash facility will be established at the site-setup stage of construction to limit the translocation of sediment onto the local road network, if required and as long as necessary.
- A best practice measure in reducing the risk of the translocation of invasive species all machinery initially arriving to site will be inspected. Any dirty equipment will be refused entry to site.
- All construction waste will be removed from site by a registered contractor to a registered site. Evidence of the movement and safe disposal of the construction waste will be retained and presented to the Local Authority upon request. Removal of the construction waste will occur as soon as possible after construction works.
- Harmful materials such as fuels, oils, greases, paints and hydraulic fluids must be stored in bunded compounds well away from storm water drains, gullies and at least 50m of any waterbody in the site and surroundings. Refuelling of machinery should only take place at petrol stations or, if this is not practicable and refuelling must take place on site, in the case of equipment such as generators, pumps, compressors, or even construction machinery and vehicles, this should be done using drip trays.
- The following Guideline documents should be adhered to:
    - Construction Industry Research and Information Association (CIRIA) (2005) Environmental Good Practice on site (C692).
    - Construction Industry Research and Information Association (2001) Control of Water Pollution from Construction sites, Guidance for Consultants and Contractors (C532).
    - Construction Industry Research and Information Association (2000) Environmental Handbook for Building and Civil Engineering Projects (C512).
    - Environmental Protection Agency (2015) List of Waste and Determining if Waste is Hazardous or Non-Hazardous.
    - Environment Agency et al. (2015) Guidance on the Classification and Assessment of Waste, Technical Guidance WM3.

**Topsoil Removal**

The removal of topsoil is part of the first stage of the construction process. As mentioned above the initial phase will involve the stripping and stockpiling of the topsoil layer. This material will be reused on site as far as possible during the landscaping stage to remediate slopes and soils within the vicinity of the site, including the buffer zone.

Stockpiles in the absence of mitigation measures will be susceptible to erosion by climatic and hydraulic factors.

- Excavated topsoil will be stockpiled in an area abounded by silt fencing to contain/ reduce any sediment run-off during times of inclement weather.
- Driving machinery on topsoil stockpiles is not advised as it damages the soil structure, reduces porosity, and subsequent percolation rates, and can result in ‘smearing’ of the soil surface, which prevents water infiltration into the soil.
- Any excess topsoil will be removed from site and disposed of appropriately.
- Stockpiling and slight compaction of stockpiles to minimise both hydraulic and climatic erosion.
- Running stockpiles in the direction of prevailing wind to minimise windborne erosion rates,

SW-NE. (EPA, 2013).

- Construction of silt fences around topsoil stockpiles to contain sediment run-off.
- Minimise the export of topsoil off site by incorporating in the final landscape design.
- Minimise handling and tracking of material to maintain optimum soil structure.
- Landscaping to take place as soon as possible to reduce exposure of subsoil and topsoil
- stockpiles.
- Works will be avoided during periods of extended rainfall.
- All topsoil generated from site works should be stored within the site until it is required for landscaping. It must not be stored outside the site boundaries and it must not be used for the infilling of any area outside of the site. If there is more topsoil than is needed for landscaping, it must be removed from site by a registered contractor for appropriate use elsewhere. The end location of the topsoil must be identified and records presented to the local authority if requested.

**Excavation**

As with all greenfield site construction projects, civil earthworks are the first stage of the construction process. Excavation work to set the site levels, foundation, drainage and buried utilities is essential in facilitating the construction of the built structures. Excavation work will be conducted in stages to minimise the exposure of unprotected soil, subsoil and bedrock.

The development is proposed to be constructed within the range of the existing contours on site. This will limit the extent of significant earth works and greatly reduce the risk of encountering bedrock. Where possible excavated subsoil material will be reworked and used on site. A geotechnical investigation of the site will be required in order to assess the potential of the underlying soil, subsoil and bedrock for reuse.

Temporary excavations which are required for the installation of drainage, gas and buried networks will be excavated and backfilled within as short a timeframe as possible to minimise exposure of surfaces to erosion. Excavation stability is important and deep excavations will employ the use of appropriate excavation techniques (e.g. temporary shoring) to ensure excavation wall stability.

The following measures will help mitigate the impacts during excavation:

- Excavation work will be conducted in stages to minimise the exposure of unprotected soil, subsoil and bedrock.
- Where possible excavated subsoil material will be reworked and used on site.
- A geotechnical investigation of the site will be required in order to assess the potential of the underlying soil, subsoil and bedrock for reuse.
- Stockpiling material in appropriate locations, away from water sources, with a silt fence surrounding it to reduce the rate of run-off from hydraulic conditions.
- Light compaction of stockpiles to minimise the rate of erosion from climatic methods.
- Stockpile heights should be kept to a minimum to ensure stockpile stability and minimise wind borne erosion.
- Excavations will be postponed in high rainfall conditions to reduce the risk of excavation collapse and erosion to soil and subsoil profiles.
- If extreme weather conditions are forecast high sediment stockpiles will be covered to minimise erosion.
- Excavations to be backfilled as soon as possible to prevent any infiltration of contaminants

- to the subsurface and bedrock.
- All temporary excavations will be conducted in a safe manner to ensure sidewall stability and prevent collapse of excavations. Mobile shoring equipment will be utilised to this end where required.
- All long-term soil stockpiles are to be planted with a vegetative cover to bind the soil and improve slope stability.
- Engineered retaining walls are to be installed where required to ensure stability of contiguous and site topography.

**Soil Compaction**

Heavy tracked and wheeled construction vehicles will be in use throughout various stages of the construction process. The soil on site is noted as being un-compacted and soft to firm and of gravelly silty loam texture from 0.4 to 0.8 m bgl. Beyond this, there deep layer of a sorted types of soil, deeper than 2.8 m bgl, and no bedrock has been observed. To reduce compaction during construction the following mitigation measures will be undertaken:

- Construction of a hardcore gravel access road on and around the site.
- Confine site traffic to designated routes.
- Minimise traffic flows on site and establish a construction stage parking compound.
- Avoid the use of oversized machinery when and where possible.
- Prevent movement of vehicles on site during and after periods of rainfall.
- Driving machinery on topsoil stockpiles will be avoided as it damages the soil structure, reduces porosity, and subsequent percolation rates, and can result in ‘smearing’ of the soil surface, which prevents water infiltration.

**Run-Off**

Sediment laden run-off from exposed soil and stockpiles poses a risk to waterways and aquatic life. The main pollutants of site water are silt, fuel/oil, concrete and chemicals. There are a number of steps outlined below to eliminate contamination of site surface water runoff.

- As a standard best practice measure, a silt fencing will be erected along the northern extents of the site to limit accidental discharge of sediments into the Rooaun Stream (Rooaun 10 Stream runs underground in the field adjacent to the proposed site northeast boundary and emerges through a pipe into the Moneylane 10 Stream, located *ca.* 115 m to the northeast of the site). The fencing is to be made of a permeable filter fabric (Hy-Tex Terrastop Premium silt fence, or similar), with the footing of the fencing to be buried into the ground and the visible fencing to be *ca.* 0.5 m high.
- An interceptor trench will be installed in front of the silt fence.
- The silt fence will be visually inspected daily to ensure that they remain functional throughout the construction of the site. Maintenance of the fences will be carried out regularly. Fences will be inspected thoroughly after periods of heavy rainfall.
- Excavated and/or imported material will be stockpiled and silt fencing will be constructed around stockpile locations to contain/ reduce any sediment run-off during times of inclement weather.
- Compacting of stockpiles will reduce the rate of airborne and hydraulic erosion.
- Stockpile areas for sands and gravel should be kept to minimum size, well away from storm water drains and gullies leading off-site.
- Silt Fences to be erected where excavation works are required in close proximity to water

features and along depressions in land where there's increased surface water flow rates.
- Harmful materials such as fuels, oils, greases, paints and hydraulic fluids must be stored in bunded compounds well away from storm water drains and gullies. Refuelling of machinery should be carried out using drip trays.
- A temporary drainage system will be established complete with a settlement pond to remove contaminants from run-off, prior to discharge.
- Temporary staff welfare facilities will be installed on site at the pre-commencement stage. These will include toilet facilities. All foul discharges from welfare facilities will be collected in a septic storage tank. This tank will be regularly emptied, and the contents disposed of at a registered facility.

**Concrete**

The underlying bedrock contains a locally important groundwater body. The major area of the site is overlying a "Moderate" groundwater risk area, and "High" risk along the southwestern border of the site, which implies that the groundwater is, at least, below 5 m bgl overlain the whole site. The site is not located adjacent to a waterbody which is hydrologically connected to a designated SAC.

Due to its elevated pH, unset concrete possesses a risk to adjacent soil, surface waters and the underlying groundwater body. The following mitigation measures are proposed to limit the accidental discharge of concrete and to minimise waste.

- Concrete Washout Skip: Chutes of concrete trucks are only to be washed out into an impermeable lined (polythene) skip. The washout water is to be treated prior to discharge.
- The concrete washout skip is to be located to the east of the site, where the overburden is greater.
- Excavations lined with an impermeable liner are not permitted as concrete washout bays.
- Large excess loads of concrete are to be returned to the supplier or poured into concrete block moulds (Betonblock or similar design) in order to minimise waste and reduce the risk of contaminants leaching into the surrounding environment.
- Best practice in bulk-liquid concrete management should be employed on site addressing pouring and handling, secure shuttering, adequate curing times etc.
- Where concrete shuttering is used, measures will be put in place to prevent against shutter failure and control storage, handling and disposal of shutter oils.
- Activities which result in the creation of cement dust will be controlled by dampening down the areas.
- Raw and uncured waste concrete will be disposed of by removal from the site.

**Construction Contaminants**

A wide array of chemicals and materials will be used during the construction of the development. This includes hydrocarbons which can persist in the wider environment for decades. To mitigate the exposure of the surrounding soil and geology to these substances it is proposed to undertake the following:

- Fuels, oils and other environmental deleterious chemicals are to be stored in a bunded well-ventilated chemical stores.
- Use of such chemicals and fuels is to be contained to bunded areas, where possible.
- Fuel bowsers to be located in bunded areas which can cater for 110% of the primary vessel

capacity.
- Any spills or leaks to the soil is to be immediately contained and the soil in question is to be removed by a licensed contractor and disposed of in a registered facility.
- Oil spill containment kits are to be situated near areas of potential spills.
- Regular inspections carried out on plant and machinery for leaks and general condition.
- Use of ready-mixed supply of wet cement products.
- Scheduling cement pours for dry days.
- Maintenance and repair works will be carried out at least 10 m from any collection of surface water.
- No refuelling will be undertaken within 50 m of the Rooaun Stream (the small stream to the northern boundary of the site, which joins the Moneylane 10 stream).
- Ancillary machinery equipment such as hoses, pipes and fittings which contain hydrocarbons will be stored within a bund or drip tray.
- Any repair works required on machinery involving fuel and oil control will be carried out offsite where practical, if not possible then repairs will be undertaken on a clean hardcore area of site. Unless unavoidable, repair works carried out in the field where machinery is operational will use spill trays and absorbent materials to prevent release of contaminants to the ground.
- Daily checks prior to start-up of plant and machinery will minimise the risk of breakdown and associated contamination risks for on-site repairs. Daily pre-start checks will be undertaken and records maintained. A clean site policy and diligent housekeeping will also reduce the potential of hydrocarbon release on-site.

**Importation of Contaminated Materials**

The Proposed Development will involve the importation of gravel and concrete.

- All material will be sourced and transported by registered suppliers.
- All materials will be inspected prior to acceptance on site.
- Any deliveries found to be contaminated will be refused access to deposit on site. Any contaminated materials accidentally deposited on site will be removed immediately from site. If this is not possible then it will be stored in a “quarantine zone”.
- The quarantine zone is to be lined with an impermeable liner which the material will be stored on. A cover will be placed over the liner to avoid hydraulic run-off of contaminated materials. The quarantine zone is to be fenced off and surrounded by silt fencing, as a secondary containment measure.

**Excavation of Contaminated Soils**

The existing site consists of open pastures, greenfield. At no point in the site’s history was there any development present, hence excavation of contaminated soils is unlikely. Nonetheless, during construction:

- All excavated materials will be visually assessed for contamination.
- Any contaminated material detected will be sent for analysis to a suitable environmental laboratory and subsequently quantified, segregated and transported for disposal by a licenced contractor.

### 7.6.2 Operational Phase

The disturbance to soil and geology at the site during the operational phase of the Anaerobic Digestion Facility is not foreseen to result in any significant impacts. The most significant threat to the underlying soil and geology is posed by the uncontrolled release of digestate or manure and the operation of the attenuation pond.

**General Mitigation Measures**

An Environmental Management System (EMS) will be prepared and implemented by the plant management company during the operational phase. This is a practical document which will include detailed procedures to address the main potential effects on surface water and groundwater.

The proposed facility will operate under an Industrial Emissions Licence (IEL) issued by the Environmental Protection Agency (EPA). The licence will contain several conditions which the operator must remain in compliance with for the entire duration of the facility's lifespan. Typical conditions relating to the protection of water receptors include:

- Emissions Limit Values for all emissions including surface water
- Monitoring requirements for surface waters
- Resource use and energy efficiency
- Waste management control and documentation
- Storage and transfer of substances
- Facility management
- Accident prevention and emergency response including fire water retention
- Operational Controls

**Uncontrolled Releases and Spillage**

Mitigation of relevance to the management of uncontrolled releases will include:

- Dedicated hard standing for off-loading areas, with a minimum separation distance from adjacent water courses.
- Use of spill kits, bunded pallets and secondary containment units, as appropriate.
- All bunds sized to contain 110% of the volume of the primary storage vessel.
- Environmental Management Plan (EMP) to include site specific standard operating procedures pertaining to waste management and emergency response.
- There will be no intentional discharge of untreated storm water to surface or ground waters during the operational phase. All stormwater discharges from site will be via the attenuation pond with all areas, with the exception of the roofs, being directed through Class 1 petrol/oil interceptors before passing through the attenuation pond prior to discharge.
- The Digestion Tanks and Digestate Storage tanks will be located within a bunded location to the east of the site, this will act as a secondary containment in the event of loss of tank contents.
- All primary pipelines and bunded structures will be inspected and integrity tested prior to handover from the appointed construction contractor. All works will be installed to Construction Quality Assurance (CQA) plan.

**Land Spreading of Biobased Fertiliser**

To mitigate the risk to soil, groundwater and surface water features the following measures will be complied with:

- In order to avoid any reductions in water quality within the catchment as a whole, all biobased fertilisers must be used in accordance with S.I. 113 of 2022 European Communities (Good Agricultural Practice for Protection of Waters) Regulations, 2022).
- The spreading of the biobased fertiliser on the customer farms must be done in accordance with the specific Nutrient Management Plan for that farm.
- Application of biobased fertiliser to be conducted in compliance with the Nitrates Action Programme (e.g. prohibited periods and nitrogen application rates).
- All biobased fertiliser is to be pasteurised prior to removal from the site to comply with Regulation (EU) 142/2011 on Animal By-Products in Organic Fertilisers.

### 7.6.3 Decommissioning Phase

The decommissioning phase will entail similar activities to the construction phase. The construction stage mitigation measures outlined in **Section 7.6.1** above will be undertaken to limit and avoid effects to the underlying soil from compaction and contamination. The goal of the decommissioning phases is to render the Proposed Development safe both physically and environmentally so that it no longer poses a risk to the surrounding population and environment. A Closure, Restoration and Aftercare Management Plan (CRAMP) will be developed as a condition of the industrial emission licences and in compliance with the Guidance to Licensees on Surrender, Cessation and Closure of Licensed sites set by the EPA (2012).

## 7.7 Cumulative Effects

Within the European Commission - Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions, dated May 1999, cumulative effects are described as "impacts that result from incremental changes caused by other development, plans or projects together with the Proposed Development or developments".

The cumulative effects of the proposed construction and operation of an Anaerobic Digestion Facility (herein referred to as the Proposed Development) on a site located in the townlands of Moneylane, Arklow, Co. Wicklow with other developments in the area is reviewed in this section with specific regard to the local and regional Land, Soil and Geology.

Excavated soils will be reused and repurposed for landscaping purposes and for the construction of earth berms on site. There will be no disposal of excess soil and subsoil from site to licensed facilities and so the Proposed Development will not have an effect on capacity at such sites. This will result in a neutral effect on such sites.

## 7.8 Residual Effects

According to Environmental Protection Agency guidelines, Residual Impact is described as ‘the degree of environmental change that will occur after the proposed mitigation measures have taken place.’ The mitigation strategy above recommends actions which can be taken to reduce or offset the scale, significance and duration of the effects on the surrounding land, soil and

geology.

The purpose of this assessment is to specify mitigation measures where appropriate to minimise the 'risk factor' to all aspects of the soil and geological environment such as to minimise the potential for contamination effect to soil, groundwater or aquifers and reduce the risk of erosion and sediment run-off, etc. This 'risk factor' is reduced or offset by recommending the implementation of a mitigation strategy in each area of the study. On the implementation of this mitigation strategy, the potential for impact will be lessened.

A site-specific Construction Environmental Management Plan (CEMP) will be devised and implemented throughout the duration of the construction phase. This document will contain all the necessary procedures required to prevent and minimise any environmental risks posed by the project on the surrounding environment.

### 7.8.1 Construction Phase

A summary of the predicted impacts associated with the construction phase in terms of quality, significance, and duration, along with the proposed mitigation measures and resulting residual impacts are summarised in **Table 7.13** .

The overall impact anticipated by the construction phase of the project following the implementation of suitable mitigation measures is considered to be ***neutral to negative***, ***slight to significant*** and ***temporary to permanen*t**.

### 7.8.2 Operational Phase

A summary of the predicted impacts associated with the operational phase in terms of quality, significance, and duration, along with the proposed mitigation measures and resulting residual impacts are summarised in **Table 7.14**

The overall impact anticipated by the operational phase of the project following the implementation of suitable mitigation measures is considered to be ***positive to neutral***, ***imperceptible to slight***, and ***temporary to long-term***.

**Table 7.13** Summary of predicted construction phase impacts, mitigation measures and residual impact

| Potential Source | Environmental Receptor | Impact Description | Quality | Significance | Duration | Mitigation | Residual Impact |
|---|---|---|---|---|---|---|---|
| **Topsoil Removal** | Topsoil<br>Soil structure, soil microorganism population, adjacent waterways | Erosion of stockpiles of exposed soils leading to migration of silt, clay and other sediment into surface water receptors via dust and run-off. Damage to soil structure | ***Negative*** | ***Moderate*** | ***Reversible*** | • Silt fencing and interceptor trench to be installed along the eastern extents of the site<br>• Stockpiles of topsoil to be used in landscaping works as soon as is practicable<br>• Silt fence erected along catchment lines<br>• Silt fences to be installed around stockpile locations to reduce run-off rates and to prevent vehicles driving on stockpiles, damaging soil structure<br>• Slight compaction of stockpiles to minimise run-off and airborne erosion<br>• Running stockpiles in direction of prevailing wind, to reduce windborne erosion<br>• Minimise handling of material<br>• Keep stockpile heights low to minimise compaction and windborne erosion<br>• Topsoil is to remain within the site Proposed Development<br>• Wheel wash/ Power hose facility will be available on site to limit the migration of sediment off-site via vehicles, during the construction phase, if required<br>• Machinery will be clean on arrival to site, and will undergo inspection<br>• Site welfare facilities will be established prior to removal of topsoil | ***Neutral, Slight, Reversible*** |

| Potential Source | Environmental Receptor | Impact Description | Quality | Significance | Duration | Mitigation | Residual Impact |
|---|---|---|---|---|---|---|---|
| **Excavations/ Subsoil Removal** | Subsoil<br>Adjacent waterways,<br>Underlying Locally Important Aquifer | Reduction in subsoil horizon by up to 3.5 m will increase groundwater vulnerability and threaten Aquifer.<br>Migration of silt into adjacent lands and waterways via dust and run-off | ***Negative*** | ***Moderate*** | ***Permanent*** | • Stockpiling material in appropriate locations, away from water sources, with silt fencing surrounding it to retard the rate of erosion from hydraulic conditions.<br>• Light compaction of stockpiles to minimise the rate of erosion from airborne and hydrological methods.<br>• Stockpile heights should be kept to a minimum to ensure stockpile stability and minimise wind borne erosion.<br>• Excavations will be postponed in high rainfall conditions to reduce the risk of excavation collapse and erosion to soil and subsoil profiles.<br>• If extreme weather conditions are forecast high sediment stockpiles will be covered/ dampened to minimise erosion.<br>• Excavations to be backfilled as soon as possible to prevent any infiltration of contaminants to the subsurface and bedrock.<br>• Excavate and backfill temporary excavations within a short timeframe to minimise exposure to erosion and contamination<br>• Installation of silt fencing to capture hydraulic erosion<br>• Risk of contaminating underlying exposed material 'naturally' mitigated by the presence of the of the low permeability subsoil throughout the Proposed Development<br>• "Mole Plough" installation method for piping proposed where applicable. | ***Neutral, Slight, Permanent*** |
| | Bedrock<br>Locally Important Aquifer | Exposure of bedrock, and/or excavation of bedrock | ***Negative*** | ***Significant*** | ***Permanent*** | | ***Neutral, Moderate, Temporary*** |
| **Access Road Adjustments, Drainage Pipe and Gas Pipeline** | Topsoil and Subsoil<br>Underlying Geology<br>Moderately Productive Aquifer | Exposure and removal of soil and subsoil.<br>Stockpiling of excavated and imported material.<br>Migration of silt into adjacent lands<br>Contamination of subsoil and underlying geology | ***Negative*** | ***Slight*** | ***Permanent*** | • "Mole Plough" installation method for piping proposed where applicable.<br>• Excavations to be backfilled as soon as possible to prevent any infiltration of contaminants to the subsoil<br>• Landscaping to take place as soon as possible to reduce weathering | ***Neutral, Slight, Long-term*** |

| Potential Source | Environmental Receptor | Impact Description | Quality | Significance | Duration | Mitigation | Residual Impact |
|---|---|---|---|---|---|---|---|
| | | | | | | • Installation of drainage headwall to be undertaken outside of the closed season for instream works (October 1st to June 30th) | |
| **Construction of Built Structures** | Topsoil, Subsoil and Bedrock | Conversion of permeable soil into hard standing.<br>Compaction of soil and subsoil from plant machinery<br>Contamination of subsoil and bedrock from hydrocarbons, concrete, etc. | ***Negative*** | ***Moderate*** | ***Long-term*** | • Access Road Adjustments to confine plant machinery to designated routes.<br>• Construction of site car park to reduce traffic and compaction on site<br>• Chemicals/ hydrocarbons to be stored and used in bunded areas.<br>• Spill kits to be located throughout site.<br>• Scheduling and use of ready mixed concrete on site<br>• Chutes of concrete trucks are only to be washed out into an impermeable lined (polythene) skip which will be located in the east of the site.<br>• Excess concrete is to be returned to the supplier here possible. If not possible it will be poured into concrete block moulds (Betonblock or similar) to minimise waste and reduce the risk of contaminants leaching into the surrounding environment<br>• Best practice concrete handling measures will be employed.<br>• Temporary site welfare facilities will be established All foul effluent from welfare facilities will be collected in a septic tank prior to disposal at a register waste facility | ***Neutral, Slight, Long-term*** |
| **Attenuation Pond** | Subsoil and Bedrock | Anaerobic soils.<br>Percolation of contaminants into the underlying locally important aquifer | ***Negative/ Neutral*** | ***Significant*** | ***Permanent*** | • No soils will be imported to site.<br>• Any contaminated materials will be refused entry to site<br>• Quarantine zone will be available to isolate any contaminated soils identified. The area will have an impermeable linear, cover and surrounded by silt fencing<br>• The pond will be lined with an impermeable geotextile liner to limit percolation of the contents into the underlying groundwater | ***Neutral, Slight, Permanent*** |

| Potential Source | Environmental Receptor | Impact Description | Quality | Significance | Duration | Mitigation | Residual Impact |
|---|---|---|---|---|---|---|---|
| **Excavation of Contaminated Soils** | Topsoil, Subsoil and Bedrock | Excavated materials, intended to be reused on-site for landscaping purposes and establishment of earth berms. Potential for soils to contain contaminants from accidental spillages or legacy contamination and leach into surface water receptors | ***Negative*** | ***Not Significant*** | ***Permanent*** | • Greenfield site with no previous industrial activities noted at the site meaning incidences of contaminated land unlikely<br>• No contaminants identified during site investigations<br>• Procedure in place for incidence of contaminated land within CEMP<br>• Contaminated soils encountered to be tested, quantified, segregated and transported for disposal by a licenced contractor<br>• Quarantine zone will be available to isolate any contaminated soils identified. The area will have an impermeable linear, cover and surrounded by silt fencing | ***Positive, Slight, Short-term*** |

**Table 7.14** Summary of predicted operational phase impacts, mitigation measures and residual impact

| Potential Source | Environmental Receptor | Impact Description | Quality | Significance | Duration | Mitigation | Residual Impact |
|---|---|---|---|---|---|---|---|
| **Hydrocarbon Contamination** | Topsoil | Accidental release from vehicular crash, leaks from hydraulics, fuel tanks, fuel stores, bunds into the surrounding soil | ***Negative*** | ***Moderate to Significant*** | ***Long-term*** | • Drainage systems will be designed to attenuate excess surface water runoff with suitable storage volumes<br>• Reduction of outflow rate to below the existing greenfield runoff rate before discharging<br>• Installation of Sustainable Urban Drainage Systems (SuDS) features such as Sumps in gullies and catchpits collect silts in run-off from roads, filter drains, discharge bypass separator and an attenuation pond.<br>• Environmental Management System<br>• Bunded production area<br>• Regular inspection of bunds<br>• TOC monitors and automated valve shut offs to avoid contamination accidentally being discharged from site. | ***Neutral, Imperceptible, Long-term*** |
| | Subsoil and Bedrock Moderately Productive Aquifer | Accidental releases outlined above percolating downwards into lower soil horizon and bedrock aquifer | ***Negative*** | ***Moderate to Significant*** | ***Long-term*** | | ***Neutral, Imperceptible, Long-term*** |
| **Nutrient Leaks** | Topsoil | Accidental discharges of high BOD demanding digestate/ feedstock/ sewage into soil. Poses threat to adjacent surface water | ***Negative*** | ***Moderate*** | ***Short-term*** | • All sewage/ pipe/ tank infrastructure to be installed in accordance with the relevant industry standards and pressure tested/CCTV surveyed prior to commissioning to ensure absence of defects<br>• Programme of inspection and maintenance to ensure any defects in tanks or bunds are repaired | ***Neutral, Imperceptible to slight, Short-term*** |
| | Subsoil and Bedrock Moderately Productive Aquifer | Leakage of high BOD sources outlined above into lower soil horizon and bedrock aquifer | ***Negative*** | ***Slight*** | ***Short-term*** | • The process area on site will be completely bunded. This will catch and retain and spills preventing percolation into the lower horizons<br>• TOC monitors and automated valve shut offs to avoid contamination accidentally being discharged from site | ***Neutral, Imperceptible to slight, Permanent*** |
| **Land Spreading of Digestate** | Topsoil, Watercourses Animal welfare | Application of processed digestate to agricultural land Transmissible diseases | ***Negative*** | ***Significant*** | ***Temporary*** | • Biobased fertilisers will be used in accordance with S.I. 113 of 2022 European Communities (Good Agricultural Practice for Protection of Waters) Regulations, 2022). | ***Positive, Imperceptible, Temporary*** |

| Potential Source | Environmental Receptor | Impact Description | Quality | Significance | Duration | Mitigation | Residual Impact |
|---|---|---|---|---|---|---|---|
| | | | | | | • Nutrient management plans to avoid excess fertiliser application<br>• Farmers to comply with the Nitrates Action Plan<br>• Biobased fertiliser will be pasteurised in accordance with Regulation (EU) 142/2011 on use of animal by products as organic fertiliser | |
| **Attenuation Pond** | Subsoil and Bedrock Moderately Productive Aquifer | Discharge of contaminated materials into the wetland may have the potential to percolate into the underlying aquifer | ***Neutral*** | ***Moderate*** | ***Permanent*** | • Installation of Sustainable Urban Drainage Systems (SuDS) features such as Sumps in gullies and catchpits collect silts in run-off from roads, filter drains, discharge bypass separator and an attenuation pond.<br>• Environmental Operating Plan<br>• Impermeable membrane liner will be installed under the ponds to limit percolation of contents into the underlying locally important aquifer | ***Neutral, Moderate, Long-term*** |

## 7.9 Monitoring

The Construction Environmental Management Plan (CEMP) and Environmental Management System (EMS) will include provision for the monitoring of construction and operational related activities including the following:

- Water Quality Monitoring of the surface water receptors adjacent to the Proposed Development boundary and discharge point
- Daily inspections for housekeeping and Proposed Development cleanliness
- Continuous noise, vibration and dust monitoring
- Dust Suppression on dry days or during concrete cutting
- Risk assessment for the prevention of fuel spillages
- Monitoring of stockpiles to determine if further measures are required to prevent erosion
- Daily inspection of concrete washout and waste management facilities

Daily site inspections to ensure procedures outlined within the CEMP are adhered through throughout the site.

## 7.10 Summary of Significant Effects

The receptors for this assessment are considered to be shallow soils, the underlying drift, bedrock geology and waters. Whilst the Proposed Development has the potential to cause detriment to the sensitive receptors identified, the recommended mitigation measures will ensure that the risk of potential impacts are reduced to ***slight to moderate***.

## 7.11 Statement of Significance

The significance of effect upon shallow soils, drift deposits, and bedrock geology have been assessed for both during the construction and operational phases. The results of the assessment are presented on **Table 7.11** and **Table 7.12** .

Where a potential effect has been identified, the significance of effect upon these receptors ranges from slight to moderate.

Where a potential effect has been identified, mitigation measures have been provided which if implemented reduces the effect of significance to ***imperceptible*** *to* ***moderate.*** The mitigation steps are presented in **Section 7.6** and summarised in **Table 7.13** and **Table 7.14 .**

**APPENDIX 7.1**

**APPENDIX 7.2**