8 Hydrology & Hydrogeology

8.1 Introduction

This chapter comprises an assessment of the hydrological and hydrogeological environment (collectively known as the water environment) within the site and the surrounding environs. The potential effects posed by the construction and operational phases of the Proposed Development are investigated, and suitable mitigation measures are recommended to minimise effects on the local water receptors.

In terms of Environmental Impact Assessment (EIA):

- "Hydrology" is the study of surface water features.
- "Hydrogeology" is the study of groundwater features.

The objectives of this chapter are.

- To provide a baseline assessment of the receiving water environment in terms of surface water (hydrological) and groundwater (hydrogeological) receptors.
- To identify any potential negative effects 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 effects posed by the Proposed Development.

8.2 Consultation

ORS have been commissioned to assess the potential impacts of the Proposed Development in terms of hydrology and hydrogeology during the construction and operational phases.

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

- **Project Scientist & Co- Author:**
  Anna Quaid - B.Sc. (Environmental Science), M.Sc. (Applied Environmental Science), Current Role: Environmental Consultant. Experience ca. 4 years.

- **Project Scientist & Co-Author:**
  Jack Wilton – B.Sc. (Microbiology), M.Sc. (Environmental Sustainability). Current Role: Environmental Consultant. Experience ca. 2 years

- **Project Scientist & Reviewer:**
  Luke Martin – B.A. (MOD) (Natural Sciences), M.Sc. (Sustainable Energy and Green Technology), CEnv, MIEnvSc. Current Role: Chartered Environmental Consultant. Experience *ca.* 12 years.

- **Project Coordinator & Reviewer:**
  Oisín Doherty – B.Sc. (Geography with Environmental Science), MSc. (Environmental Management), CEnv, MIEnvSc. Current Role: Chartered Environmental Consultant. Experience *ca.* 14 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 hydrology and hydrogeology.

8.3 Assessment Methodology & Significance Criteria

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*.
- 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 & Hydrogeology Chapters in Environmental Impact Statements*.
- NRA, (2008). *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*.
- CIRIA, (2001). C532 - *Control of Water Pollution from Construction Sites – Guidance for consultants and contractors*.

8.3.1 Desktop Study

A desk-based assessment method was used to assess baseline water quality for the receiving environment of the proposed site. The baseline information that is detailed in this section of the assessment was obtained from publicly available information.

The following documents and sources were referenced:

- Aquifer classification and vulnerability identification from the Geological Survey of Ireland (GSI web page)
- Search of GSI and Waterford City and County Council files to determine the location of groundwater wells within a 2km radius
- 1:50,000 Discovery Series Maps and 6” maps (Geohive)
- Water Quality in Ireland 2010-2015 (EPA)
- Water Quality in Ireland 2013-2018 (EPA)
- South Eastern River Basin District River Basin Management Plan (DoEHLG)
- Meteorological data from Met Eireann and hydrometric data from the Office of Public Works (OPW)
- County Waterford Strategic Flood Risk Assessment 2022
- Waterford City and County Development Plan 2022 - 2028
- Reports, maps and data published by the Geological Survey of Ireland (GSI) and the National Soil Survey of Ireland
- General Soil Map of Ireland 2nd Edition, (1980), The National Soil Survey, An Fóras Taluntais
- An Foras Talúntais (1983). Soils of County Waterford
- Reports, maps and data published by the Environmental Protection Agency (EPA).
- UK CIRIA report C552 (2001). (Contaminated Land Risk Assessment: A Guide to Good Practice.

- IFI (2016), Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Watercourses;
- OPW and DoEHLG (2009), The Planning System and Flood Risk Management - Guidelines for Planning Authorities.
- EPA (2022), River Quality Surveys: Biological - Hydrometric Area 16
- Möller, K., & Müller, T. (2012). Effects of anaerobic digestion on digestate nutrient availability and crop growth: a review. Engineering in Life Sciences, 12(3), 242-257.

The following technical reports completed in support of the planning application for the Proposed Development were also consulted to further assess baseline water quality.

- Civil Engineering Design Report
- Site Specific Flood Risk Assessment
- Site Suitability Assessment for onsite domestic wastewater treatment system

8.3.2 Field Survey

Fieldwork commissioned December 2023 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 13th December 2023 to identify hydrological features on site including:

- Drainage patterns and distribution
- Exposures
- Drainage Infrastructure
- Wet ground

8.3.3 Impact Assessment Methodology

Chapter 1: Introduction of the EIAR outlines the impact assessment rationale applied to each chapter of the study. This section describes some further criteria applied to the assessment of hydrological and hydrogeological 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. An approach based on this methodology has been adopted within this report. For each of the contaminant linkages, an estimate is made of;

- The potential severity of the risk;
- The likelihood of the risk occurring.

Hydrological and Hydrogeological Receptor Criteria

The level of sensitivity of hydrological and hydrogeological receptors are based on a number of factors which are summarised in **Table 8.1.**

Table 8.1: Criteria for rating importance of hydrological and hydrogeological attributes (NRA, 2008)

Importance	Criteria	Receptors	
		Hydrological	Hydrogeological
Extreme	Attribute has a high quality or value on an international scale	River, wetland, or surface water body ecosystem protected by EU legislation	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status. Regionally important potable water source supplying >2500 homes. Quality Class A (Biotic Index Q4, Q5) Flood plain protecting more than 50 residential or commercial properties from flooding. Nationally important amenity site for wide range of leisure activities.	Regionally Important Aquifer with multiple wellfields Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source
High	Attribute has a high quality or value on a local scale	Locally important potable water source supplying >1000 homes Quality Class B (Biotic Index Q3-4) Flood plain protecting between 5 and 50 residential or commercial properties from flooding Locally important amenity site for wide range of leisure activities	Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source Inner source protection area for locally important water source
Medium	Attribute has a medium quality or value on a local scale	Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2-3) Flood plain protecting between 1 and 5 residential or commercial properties from flooding	Locally Important Aquifer Potable water source supplying >50 homes Outer source protection area for locally important water source
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities Local potable water source supplying <50 homes Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding	Poor Bedrock Aquifer Potable water source supplying <50 homes

River Water Quality Assessment Criteria

Under the Water Framework Directive and SI 722 of 2003 European Communities (Water Policy) Regulations, the EPA carries out water quality assessments of rivers, transitional and coastal water bodies as part of a nationwide monitoring programme. Data is collected from physico-chemical and biological surveys, sampling both river water and the benthic substrate (sediment). **Table 8.2** summarises the quality classes used to assess the condition of rivers throughout the country.

Table 8.2: Biotic Indices Classification for River Water Quality

Biotic Indices	Community Diversity	Quality	Condition	Quality Status	Quality Class
Q5	High	Good	Satisfactory	Unpolluted	Class A
Q4	Reduced	Fair	Satisfactory	Slightly Polluted - Unpolluted	Class B-A
Q3	Low	Doubtful	Unsatisfactory	Moderately – Slightly Polluted	Class C-B
Q2	Very Low	Poor	Unsatisfactory	Seriously – Moderately Polluted	Class C-D
Q1	Little/None	Bad	Unsatisfactory	Seriously Polluted	Class D

'Biotic Indices' or Quality (Q) Values are indicative of specified groups of macro-invertebrates' sensitivity to pollution. Q-Values are assigned to a waterbody based on the presence or absence of particular species with the Q5 biotic index indicating the least polluted waters and the Q1 biotic index indicating the most polluted waters.

'Quality Class' relates to the potential beneficial use of a water body as summarised in **Table 8.3**.

Table 8.3: Quality Class Descriptions

Quality Class	Description	BOD (mg/l)	Orthophosphate (mg/l)	Dissolved Oxygen (% Sat)
A	Highest water quality with very high amenity value Suitable for abstraction Suitable for game fisheries	<3	~0.015	~100%
B	Variable water quality with considerable amenity value Potential abstraction issues Game fish 'At Risk'	Occasionally exceeds 3mg/l	~0.045	<80% or >120%
C	Doubtful Water Quality with reduced amenity value Advanced Treatment of abstracted water required Coarse fisheries – Fish kills likely	Regularly Exceeds 3mg/l	~0.070	v. unstable
D	Poor to bad water quality with no amenity value Low grade & limited abstraction Fish absent	Levels regularly far in exceedance of 3mg/l	>0.1	Low, approaching 0%

Groundwater Vulnerability Assessment Criteria

Groundwater Vulnerability is a term used to represent the intrinsic geological and hydro geological characteristics that determine the ease with which groundwater may be contaminated by human activities. It is usually dependent on the nature (sandy, gravelly, clay,

etc.,) and depth of soil/subsoil overlying an aquifer (i.e., its shallowness). The travel time, attenuation capacity of the subsoils (i.e., ability to filter contaminants) and the nature of the contaminants are also important elements in determining the vulnerability of groundwater.

In the context of groundwater protection, Groundwater Vulnerability is the most important factor in determining control measures in areas where potentially hazardous discharge to groundwater might take place. This is because the type, permeability and thickness of the soil and subsoil play a critical role in preventing groundwater contamination by acting as a protecting filtering layer over the groundwater.

The extent of site investigation works required to accurately assess the groundwater vulnerability at a site is determined by the sensitivity of hydrogeological receptors within the site vicinity. The extent of sampling requirements as defined by the hydrogeological sensitivity of the site is defined in **Table 8.4**.

Table 8.4: Summary of Sampling Requirements

Ground Water Protection Scheme (GWPS) exists	**Vulnerability**	**Sampling Requirements**
	LOW	Simple walkover survey to confirm what has been established in the GWPS, i.e., no evidence of outcrop, depth to bedrock information from wells, etc.[1]
	MEDIUM	
	HIGH	If walkover survey indicates that the lands do not have sufficient thickness of subsoil (i.e. rock outcrops) then site specific information may be required.
	EXTREME[2]	Regionally Important Aquifers - Prove that 2m depth of soil/subsoil cover exists. Minimum of 1 data point per hectare is required.
		Locally Important and Poor Aquifers – Prove that 1m depth of soil/subsoil cover exists. Minimum of 1 data point per 5 hectares is required.
Ground Water Protection Scheme (GWPS) does not exist	**Aquifer Type**	**Sampling Requirements**
	Locally Important / Poor Aquifers	Prove that 1m depth of soil/subsoil cover exists. Minimum of 1 data point per 5 hectares is required. Site investigation points can be based on existing information. New information only required where existing information is insufficient.
	Regionally Important Aquifers	Prove that 2m depth of soil/subsoil cover exists. Minimum of 1 data point per hectare is required. Site investigation points can be based on existing information. New information only required where existing information is insufficient.
Source Protection Areas[3]	**Source Protection Zone**	**Sampling Requirements**
	Outer	A minimum thickness of 3m of subsoil should be demonstrated at a minimum depth to rock data point frequency of one point per hectare.
	Inner	It is not generally acceptable to land-spread unless there is no alternative area available and that the area has been defined as having moderate vulnerability (i.e. > 10m of moderate permeability subsoil or > 5m of low permeability subsoil) overlying the aquifer. The depth to rock should be demonstrated at a minimum frequency of one point per hectare.

8.4 Description of the Receiving Environment

8.4.1 Background

This section of the chapter provides the baseline information in relation to geology, hydrogeology and hydrology that exists in the vicinity of the Proposed Development. The Proposed Development occupies a total area of 7.7ha and is situated in Curraghnagarraha,

[1] The classification to Low / Medium / High class as part of GWPS indicates that minimum of 3m soil/subsoil depth can be anticipated
[2] To give a rough picture of "extreme vulnerability" areas we can use: GSI Outcrop data & Teagasc Shallow Rock data
[3] In general land-spreading of organic wastes should not be carried out within the source protection area (SPA) of a water supply. However, there are cases where if the subsoil is sufficiently thick it may be deemed acceptable subject to conditions

Reatagh, Curraghballintlea, Carrick-on-Suir, Co. Waterford. The site is situated to the north of a pig farm (Industrial Emissions License: P0573-01) with agricultural land to the north, east and south of the site. A single-lane local road is located beyond the western boundary of the site. The road is adjoined to the south by the R677 regional road, Old Scrouty Road and the Rath Road. The site lies approximately 3km southeast of Carrick-on-Suir.

The underlying geology has a major influence on topographical, hydrogeological and hydrological features within the site vicinity, hence this chapter is closely linked to the previous chapter (**Chapter 7 – Soils & Geology**).

The receiving environment is described below under the following headings:

- Topography
- Drift (Quaternary) Geology
- Bedrock Geology
- Hydrology
- Hydrogeology

8.4.2 Topography

County Waterford has a varied and unique landscape. It includes a diversity of landscape types, ranging from coast and lakes to peatlands, farmlands, fertile lowland valleys, forests and uplands. The range of different landscapes found in Waterford each have varying visual and amenity values, topography, exposure and contain a variety of habitats. Each landscape type also has varying capacity to absorb development relative to its overall sensitivity.

The regional topography of County Waterford can be divided into seven no. “Landscape Character Types” as outlined below, and according to the Waterford City and County Development Plan 2022-2028:

1. Coastal.
2. Farmed Lowlands.
3. Rivers
4. Estuaries.
5. Foothills.
6. Uplands.
7. Settlement.

The site is located within the “Foothills” topographical division, and the topography is described as “Rolling to gently undulating glacial sediments”, in keeping with the Landscape Character Type of the area. The River Suir is a distinct feature in the surrounding environment and runs from west to east, turning southeast where it meanders towards Waterford City. The River Suir continues southeast and eventually discharges into the Celtic Sea at Passage East. The local topography of Curraghnagarraha, Reatagh, Curraghballintlea, Carrick-on-Suir is shaped principally by the Comeragh Mountains which run along the banks of the River Suir from the southeast to the north and follow the course of the river upstream towards the southwest. The landscape is effectively a bowl, formed by the Comeragh Mountains which ring the landscape.

The River Suir is a distinct and a dominant feature within the landscape of northern Waterford. The topography of the site slopes steeply from the southwest to the northeast. A peak in the site topography, 106.5m OD, is situated along the western boundary of the site with a gradual

gradient eastward. This gradient becomes steep towards the centre of the site at 98m OD and continues to gradually fall eastwards to a low of 91.5m OD along the eastern site boundary. The Tinhalla stream, a small waterbody, occurs adjacent to the eastern site boundary and runs southwest underneath the route of the proposed facility access road. The stream runs in a south to north direction where it discharges into the River Suir approximately 1.9km downstream. The topography at the site entrance and location of the proposed facility access road is 102.5m OD. The lands to the south of the entrance, along the route of the access road climb to an elevation of 123m OD along the Old Scrouty Road. Within the field adjacent to the Rold Scrouty Road the lands slope steeply to the northwest. This slope becomes gradual across the field adjacent to the south of the Proposed Development site, with the direction of the slope falling southeast.

A new access road will be constructed and connected to the pre-existing roads in the surrounding landscape. The access road is proposed to be constructed at the southern boundary of the Proposed Development. The ground levels at the site are at their lowest at the northeast corner of the site, 91.5mOD, rising moderately to 102.5m OD at the proposed entrance to the Anaerobic Digestion Facility.

Refer to Topography drawing no. **2308 Carrick on Suir** (Baseline Surveys).

8.4.3 Drift 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 deposited by water from the ice. 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 subglacially 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 site is located with the Foothills of the Comeragh Mountains. The National Soil Survey of Ireland describes this region as comprising Acid Brown Earths and Brown Podzolics soils which, under good management, can be very productive. GSI online mapping indicates that the site overlies two varying soils. The predominant soil underlying the site is a poorly drained mineral (mainly acidic) (AminPD) derived mainly from non-calcareous parent materials. The soil groups associated with this category are Surface Water Gleys and Ground Water Gleys. A northern portion of the site, east of the centre is underlain by a Shallow Poorly Drained mineral (mainly acidic) (AmindSP) derived mainly from non-calcareous parent materials. The soil groups associated with this category are Surface Water Gleys (Shallow) and Ground Water Gleys (Shallow).

In view of the Proposed Development, the soils which are likely to be affected by the development represent a notable resource particularly in a local context. In a regional context, this soil resource is less significant as such soils occur in abundance in the area.

8.4.4 Bedrock Geology

This sub-section deals with bedrock underlying the area. 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.

According to the Geological Survey of Ireland and the National Draft Generalised Bedrock Map, the bedrock underlying and surrounding the subject site comprises of slate. This strata dates from the Early Silurian period and would have been formed during the Llandovery epoch. These sediments are described as Non-calcareous, dark grey slate and greywackes.

The GSI 1:1,000,000 Bedrock Solid Geology Map indicates that the site lies within the Ballindysert Formation. The Devonian sandstone till parent material is described as dark grey slates which are massive and frequently contain thin white silty mudstones.

The nearest fault to the Proposed Development is located approximately 0.37km to the East which runs from North to South. The proposed site is located approximately 0.21km south of an unconformity which runs from East to West and is associated with the Comeragh mountains. The unconformity is associated with the younger Carrigmaclea Formation (Uppder Devonian Sandstone) which is composed of red quartz conglomerates, pebbly sandstones and cross-bedded sandstones. A region of mixed lithology located ca. 1.5km north of the Proposed Development reveals various different geological formations which extend south towards the Proposed Development site. These formations comprise of the aforementioned Carrigmaclea Formation, Porters Gate Formation, Kiltorcan Formation. The Porters Gate Formation consists of Grey flaser-bedded sandstones, linsen, grey mudstones, thin sandstones and thin bioclastic limestones. The Kiltorcan Formation consists of coarse-grained white-yellow sandstone, mudflake conglomerate, red-yellow flaggy sandstone, green silty mudstone and green mudstone.

8.4.5 Hydrology

Regional Hydrology

A river basin is the portion of land drained by a river and its tributaries. A river basin district is the area of land and sea, made up of one or more neighbouring river basins together with their associated groundwaters and coastal waters. The Proposed Development lies within the South Eastern River Basin District (SERBD). The SERBD is one of Ireland's largest river basin districts covering about one fifth of the country with a land area of nearly 13,000km^2 and a further 1,000km^2 of marine waters. The SERBD encompasses all of counties Carlow, Wexford and Kilkenny, most of Waterford, Tipperary and Laois, parts of Kildare, Offaly and Wicklow and a small part of Limerick and Cork. It is bounded to the south by the Celtic Sea, the east by the Irish Sea and has borders with the Eastern District, the Shannon International District and the South Western District.

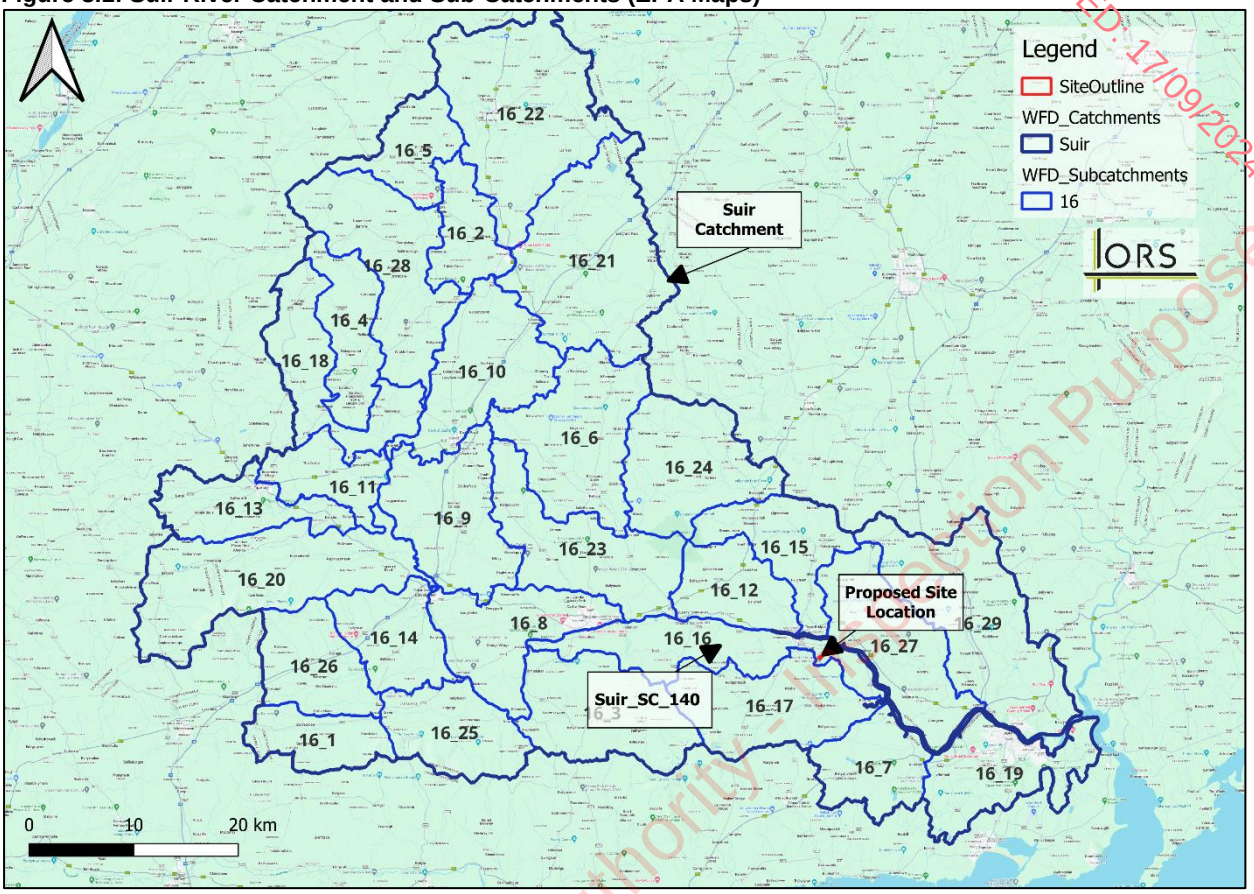
The South Eastern District has very few lakes. The biggest lake, the Knockaderry Reservoir in County Waterford, is less than 30 hectares. The main catchments are the three sister rivers (Barrow, Nore and Suir) and the Slaney, but there are also many smaller catchments along the coastline such as the Owenavorragh, Ballyteigue/Bannow and the Colligan/Mahon. The 1,000

km^2 of marine waters are off Counties Wexford and Waterford and include Waterford Estuary, where the Barrow, Nore and Suir systems flow into the sea, and Wexford Harbour, where the Slaney flows into the sea. The district also includes Dungarvan, Bannow and Rosslare bays plus important coastal lagoons such as Lady's Island and Tacumshin.

A catchment is an area of land where all flowing surface water converges to a single point, such as a river. The Proposed Development is located within the River Suir catchment. The River Suir Catchment drains an area of approximately 3,520km^2, which represents about 4% of the country's land area. At 183km, the Suir is the second longest river in Ireland. It is considered a wide river with bank-to-bank widths ranging from 25-35m in its middle sections. The catchment comprises 168 river bodies, 7 lake waterbodies and 43 groundwater bodies and 4 transitional waterbodies some of which are illustrated in **Figure 8.1** & **8.2**. The catchment is underlain by sedimentary rocks in the south and throughout the catchment and limestone bedrock in the centre and north of the catchment and along the northern banks of the River Suir.

The Proposed Development site in Curraghnagarraha, Reatagh and Curraghballintlea is located in sub-catchment 16_16, known as the Suir_SC_140 sub-catchment.

Figure 8.1: Suir River Catchment and Sub-Catchments (EPA Maps)

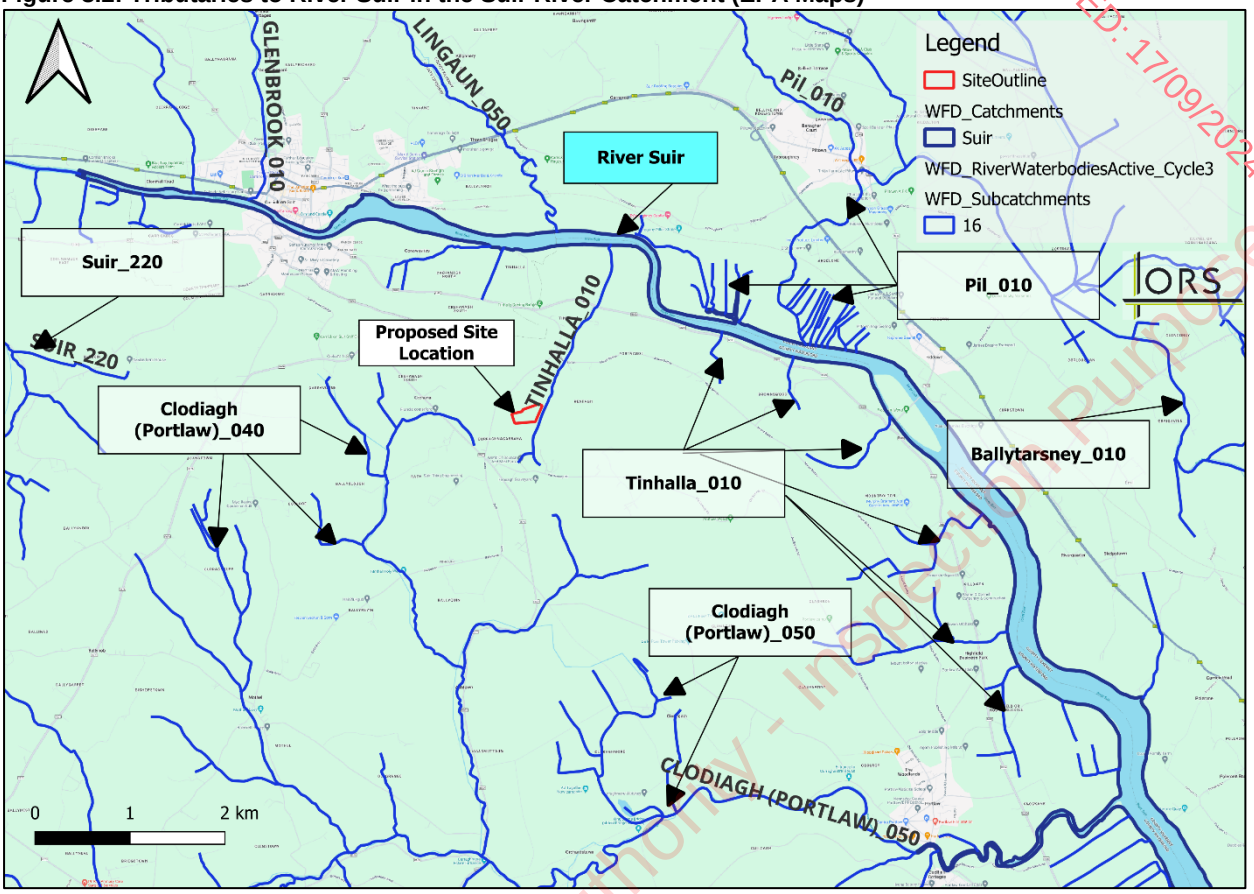


The River Suir is considered a main hydrological feature in the wider vicinity of the Proposed Development. The Suir main channel and its tributaries flow primarily through the counties of Tipperary, Kilkenny and Waterford with some small parts of the catchment in Limerick and Cork. The main urban areas are Thurles and Templemore in the northern part of the catchment, Clonmel and Carrick-on-Suir, in the southern part, with the city of Waterford at the head of the estuary. The river lies largely within the county of Tipperary and forms part of its border with the county of Waterford.

The historic source of the River Suir is Devil's Bit Mountain located in County Tipperary near Moneygall (north of Templemore) and flows in a southerly direction until meeting the Knockmealdown mountain range where the river changes its course northwards. At Knocklofty, the River turns east passing north of the Comeragh Mountains and continues on through Waterford City until it enters the sea at Waterford Harbour. The river is tidal to a point 2.5km upstream of Carrick-on-Suir. From here the Suir rises and flows south, then north and east to join the River Barrow and the River Nore in Waterford Harbour.

The Suir has a number of significant tributaries such as the Drish, Tinhalla, Upper Clodiagh (Thurles), Multeen, Ara, Aherlow / Ara, Tar / Duag, Nier, Anner / Clashawley, Lingaun, Clodiagh (Portlaw), Blackwater / Pollanassa and a number of smaller tributaries including the Mall, Lingaun, Pil and the Glen.

Figure 8.2: Tributaries to River Suir in the Suir River Catchment (EPA Maps)



Local Hydrology

The Tinhalla stream is the main hydrological feature in the immediate vicinity of the site location. The site currently follows natural topography and is drained by this river. The Tinahalla stream originates in the upland areas of County Waterford, typically from a combination of natural springs and runoff from the surrounding hills. The Tinahalla stream flows adjacent to the eastern boundary of the site and discharges into the River Suir *ca*. 1.6km from the site. The section of the River Suir flowing to Carrick-on-Suir and in the proximity to the site flows in a west to east direction and turns southeast towards Waterford City, *ca*. 19.4km southeast of the site. The River Suir eventually outfalls into the sea at Waterford Port, a hydrological distance of *ca.* 37km from the site.

Carrick-on-Suir is located along the northern banks of the River Suir. The town is bisected by the N24 national road which runs from west to east. Residential, commercial and recreational premises are generally arranged in a linear settlement pattern either side of the N24 within the town. In the greater surrounding area the N24 follows the course of the River Suir and is adjoined by agricultural lands along its route.

Protected Areas

The proposed site is not within or immediately adjacent to any site that has been designated as a Special Area of Conservation (SAC) or a Special Protection Area (SPA) under the EU Habitats or EU Birds Directive.

There are eight no. Nature 2000 sites within 15km of this Proposed Development. The location of the site in relation to these designated areas are shown in **Figure 8.3.**

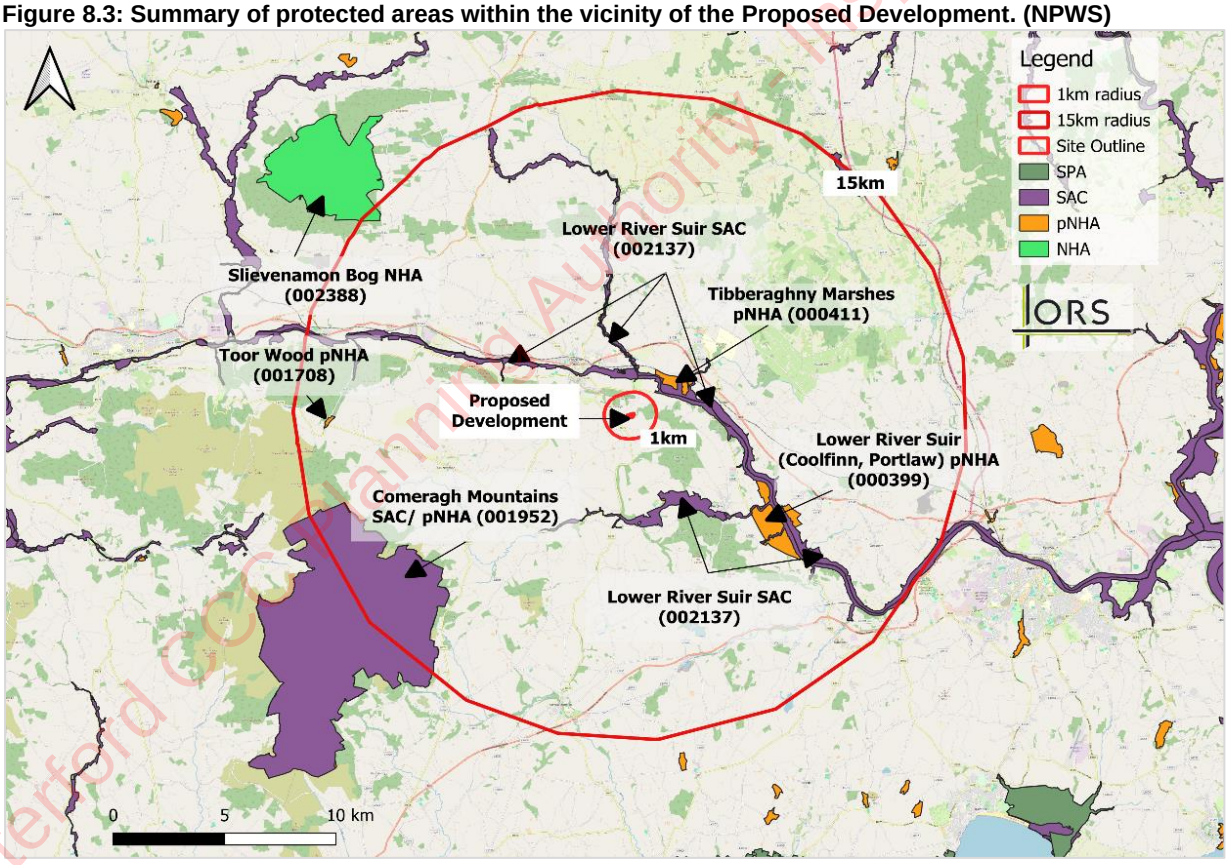
The Proposed Development is not within or immediately adjacent to any nationally designated site, such as a Natural Heritage Area or a proposed Natural Heritage Area. It is within 15km of Six sites that have been designated as proposed Natural Heritage Areas. The location of the Proposed Development in relation to these designated sites are shown in **Figure 8.3**.

An appraisal of the potential effects of the Proposed Development on the constitutive characteristics of European sites identified within 15km of the Proposed Development is set out in the Natura Impact Statement which accompanies the planning application for this project.

A full list and appraisal of the potential effects of the Proposed Development on the constitutive characteristics of European sites identified within 15km of the Proposed Development is set out in the Natura Impact Statement (**Document Ref: 231924-ORS-XX-XX-RP-EN-13d-005**) which accompanies the planning application for this Proposed Development.

Designated areas located within 15km of the Proposed Development are illustrated in **Figure 8.3**, below.

Figure 8.3: Summary of protected areas within the vicinity of the Proposed Development. (NPWS)



Of the two no. sites designated under the Natura 2000 Network (SAC's/SPA's) and six no. sites designated as Natural Heritage Areas (pNHA's/NHA's) in proximity (<15km) to the Proposed Development, three were identified as being hydrologically connected to the Proposed Development, they are listed in **Table 8.5** below.

Table 8.5: Summary designated areas with hydrological connectivity to the proposed site.

Area Name	Area Code	Hydrological Distance	Protected Area Type	Summary of Hydrological Connectivity
Lower River Suir SAC	002137	1.8km (D/S)	Habitats	Hydrological connectivity to the SAC is via the Tinhalla stream located adjacent to the eastern site boundary, which runs from south to north, eventually discharging into the River Suir *ca.* 1.9km downstream.
Tibberaghny Marshes pNHA	00411	2.3km (D/S)	Freshwater Marshes/ Wetland Habitats	Hydrological connectivity to the pNHA is via the Tinhalla stream located adjacent to the eastern site boundary, which runs from south to north, eventually discharging into the River Suir ca. 1.8km downstream. The marshes lie along the River Suir, contributing to the area's biodiversity and ecological health and are located ca. 2.4km downstream of the Proposed Development.
Lower River Suir (Coolfin, Portlaw) pNHA	000399	10km (D/S)	Wetland habitats and associated wildlife.	Hydrological connectivity to the pNHA is via the Tinhalla stream located adjacent to the eastern site boundary, which runs from south to north, eventually discharging into the River Suir ca. 1.8km downstream. The pNHA is located ca. 10km downstream of the Proposed Development.

Site Drainage

The Proposed Development site is bounded by the Tinhalla stream to the east which flows northwards towards the River Suir.

There are two existing small watercourses located to the south of the proposed development that naturally drain the proposed development (see **Figure 8.4**).

These two existing small watercourses require culverts under the access road to allow surface water to maintain its natural drainage course. Please refer to Drawing Ref: **24052-DR-0502** for the locations of the culverts. Culverts are to be sized and designed with final construction documents.

Arterial Drainage Schemes are schemes the OPW has a statutory duty to maintain. Arterial Drainage Schemes were carried out under the Arterial Drainage Act, 1945 to improve land for agriculture and to mitigate flooding. Rivers, lakes, weirs and bridges were modified to enhance conveyance, embankments were built to control the movement of flood water and various other work was carried out under Part II of the Arterial Drainage Act, 1945. The purpose of the schemes was to improve land for agriculture, to ensure that the 3 – year flood was retained in bank this was achieved by lowering water levels during the growing season to reduce waterlogging on the land beside watercourses known as callows. Flood protection in the benefiting lands was increased as a result of the Arterial Drainage Schemes.

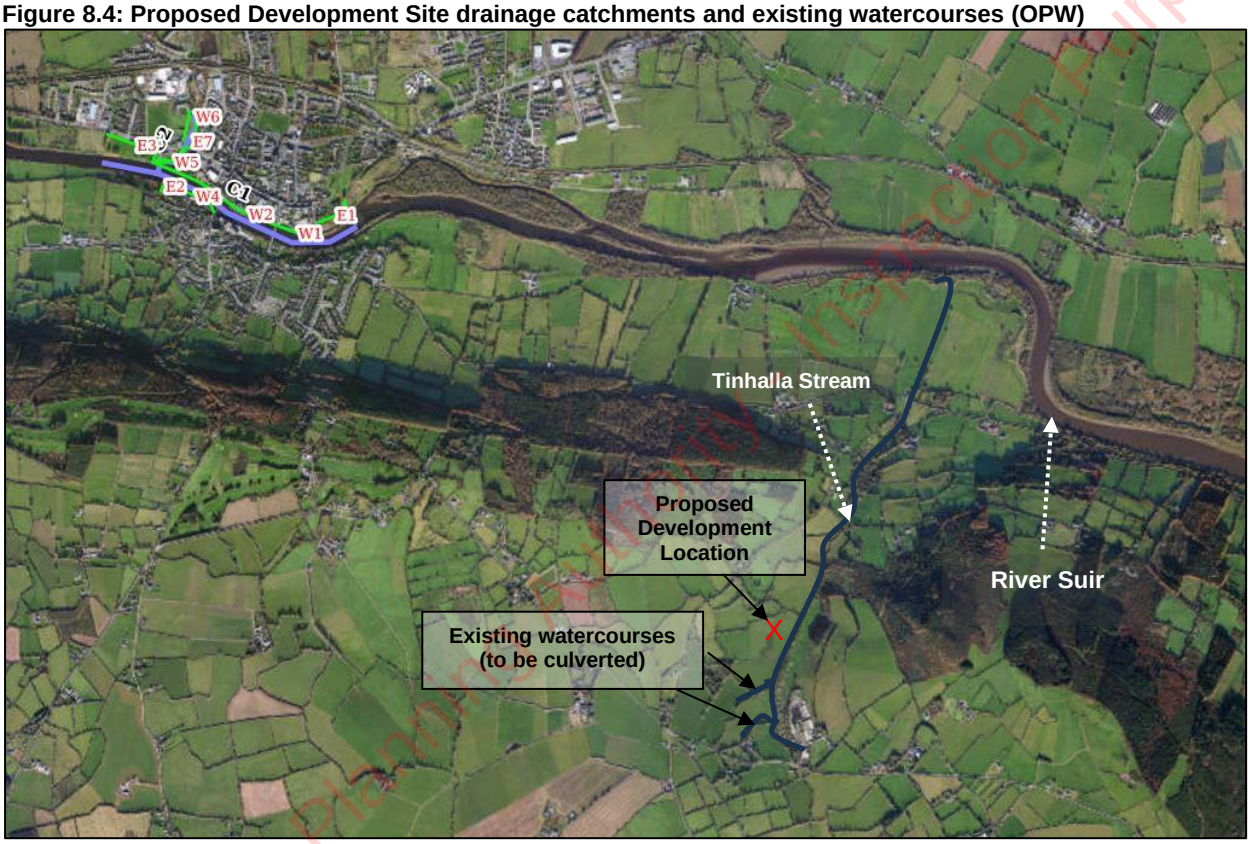
The OPW Arterial Drainage Scheme (ADS) Channel labelled C1 is located *ca.* 2.8km northwest of the proposed site boundary, to the south of Carrick-on-Suir and flows from west to east. There are no indicated benefitting lands on either side of the channel. The River Suir has been assigned Arterial Drainage Scheme status, labelled as C1 and as such the Proposed Development site is potentially hydrologically connected to the Channel C1.

The OPW Arterial Drainage Scheme (ADS) Channel labelled C2 is located *ca.* 3.7km northwest

of the proposed site boundary to the west of Carrick-on-Suir. The channel C2 flows north-south direction and discharges into the River Suir *ca.* 3.7km northwest of the Proposed Development site. There are no indicated benefitting lands on either side of the channel.

Embankments have also been constructed parallel to much of the aforementioned channels. The majority of the embankments are located along the North Quay road, along the northern banks of the River at Carrick-on-Suir parallel to the River and adjacent to the adjoining stream located at the west of the town. Benefitting lands associated with the embankment scheme are noted to the east of Carrick-on-Suir along the course of the River to the southeast towards Waterford City.

Figure 8.4: Proposed Development Site drainage catchments and existing watercourses (OPW)



Surface Water Rate of Discharge

The permissible rate of discharge of surface water from the site is determined in accordance with criteria set out in the Greater Dublin Strategic Drainage Study and the CIRIA Suds Manual. Application of the following criterion ensures the Proposed Development will not impact the flood regime in the receiving watercourse:

- Maximum rate of discharge to be Qbar or 2.0 l/s/ha, whichever is greater;
- Qbar, calculated in accordance with IH124, is 17.8 l/s.
- The Site area is 5.43 hectares, equivalent to 10.86 l/s.

Accordingly, the maximum permissible rate of discharge of surface water from the Proposed Development will be 17.8 l/s.

Waterford City & County Development Plan 2022 – 2028 – Flood Risk Management

A review of the Waterford City & County Development Plan was carried out to determine the policies and objectives relevant to the management of flood risk throughout the region.

Flood Risk Policy Objectives:

CS 10 - Environmental Directives

We will require, where appropriate, all plans and projects within Waterford to comply with the requirements of the Strategic Environmental Assessment Directive, the Habitats Directive, Water Framework Directive and Floods Directive.

UTL 10 - Flooding/ SFRA

To reduce the risk of new development being affected by possible future flooding by:

- Avoiding development in areas at risk of flooding,
- Where possible, reducing the causes of flooding to and from existing and future development,
- Increase the application of SuDS such as permeable paving, bioretention/infiltration ponds, swales and Natural Water Retention Measures, and the identification of existing areas which may be suitable for temporary storage/overflow of water during heavy storms,
- Where development in floodplains cannot be avoided, taking a sequential approach to flood risk management based on avoidance, reduction, and adaptation to the risk; and,
- Ensuring that all proposals for development falling within Flood Zones A or B are consistent with the "The Planning System and Flood Risk Management –Guidelines for Planning Authorities 2009", "Climate Action and Low Carbon Development Act" (2021), and any amendment thereof, and the "Waterford Strategic Flood Risk Assessment" (2021) as included in Appendix 13.
- To support the making of Local Area Plan for larger urban centres we will prepare surface water management plans where adequate data exists to support their preparation. Where data is lacking, we will carry out a data review gap analysis and prepare conceptual surface water management plans as an initial step.
- We will support the development of new flood relief schemes by the OPW, in particular those at Aglish, Ballyduff and Dungarvan & Environs while protecting public investment in flood relief schemes as detailed in Section 4.4.3 of the SFRA (Appendix 13).

UTL 11 - Flood Plains

To contribute towards the improvement and/or restoration of the natural flood risk management functions of flood plains subject to compliance with the environmental legislation and availability of resources and ensure each flood risk management activity is examined to determine actions required to embed and provide for effective climate change adaptation as set out in the OPW Climate Change Sectoral Adaptation Plan Flood Risk Management applicable at the time.

Flood Risk Policies:

FM 01 - Waterford City & Council will work with the OPW, LAWPRO and other agencies at a catchment level to identify any measures, such as natural water retention measures, that can have benefits for, water quality, flood risk management and biodiversity objectives.

FM 02 - Waterford City & Council will protect floodplains of river catchments in the County and retain them for their flood protection and natural heritage values.

Wetland Policy Objectives:

BD 15 We will ensure that Waterford's floodplains, wetlands and watercourses are retained for their biodiversity and flood protection values and maintain good ecological status of wetlands and watercourses in support of the provisions of the Water Framework Directive and Ramsar Convention.

Flood Risk

The principal sources of flooding are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains. The receptors can include people, their property and the environment. All three elements as well as the vulnerability and exposure of receptors must be examined to determine the potential consequences.

The Office of Public Works (OPW) and Department of Environment, Heritage and Local Government (DoHLG) published 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' in 2009 (The Guidelines). The Guidelines define the likelihood of flooding as the probability or a frequency of a flood of a given magnitude or severity occurring or being exceeded in any given year. It is generally expressed as the chance of a particular flood level being exceeded in any one year. This return period is described as the Annual Exceedance Probability (AEP). For example, a 1 in 100 or 1% flood is that which would, on average, be expected to occur once in 100 years, though it could happen at any time.

Flood zones are geographical areas within which the likelihood of flooding is in a particular range. There are three types or levels of flood zones defined for the purposes of the Guidelines:

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding).

- **Flood Zone B** – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding).

- **Flood Zone C** – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

In 2018, the Office of Public Works (OPW) launched a new online flood map viewer to provide information on the likelihood of flood risk and the extent of flooding across Ireland. This viewer includes flood risk data derived from several sources including:

1. Catchment Flood Risk Assessment and Management (CFRAM) Programme

- 300 communities at potentially significant flood risk, referred to as Areas for Further Assessment (AFA's).

2. National Indicative Fluvial Mapping (NIFM)

- Predictive' flood maps showing indicative areas predicted to be inundated during a theoretical fluvial flood event with an estimated probability of occurrence.
- Indicative flood maps have been produced for all watercourses that are on the EPA watercourse layers, have a catchment area greater than 5km2 and for which flood maps were not produced under the National CFRAM Programme.

3. Geological Survey Ireland Groundwater Flooding

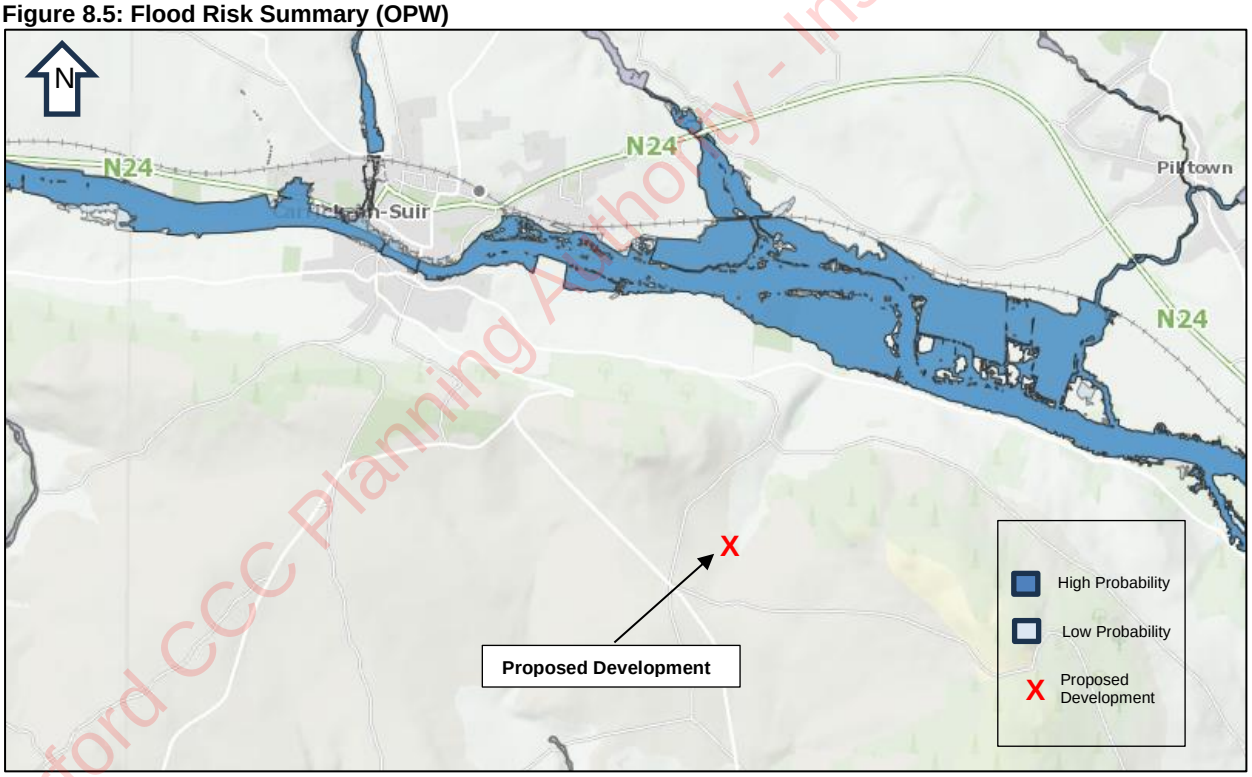
- Probabilistic flood extent of groundwater flooding in limestone regions. These maps are focused primarily (but not entirely) on flooding at seasonally flooded wetlands known as turloughs.

4. Past Flood Events

- A Past Flood Event is defined as the occurrence of recorded flooding at a given location on a given date or on a recurring basis. The event is derived from available flood information documentation including flood event reports, news articles, archive information and photos.

A summary of the above-noted flood risk data as derived from the OPW map viewer within the vicinity of the site is presented in **Figure 8.5**.

Figure 8.5: Flood Risk Summary (OPW)



According to the County Waterford Strategic Flood Risk Assessment (2022) the Proposed Development site was not within the boundaries of an area identified as an Area for Further Assessment (AFA) hence detailed flood risk data derived from the CFRAM programme is not available for the region.

The National Indicative Fluvial Mapping (NIFM) data available for the area surrounding the development notes areas prone to low and medium risk flooding flanking the River Suir, *ca.*

1.6km north of the proposed site. NIFM data does not indicate that any of the lands within the boundary of the proposed site is prone to flooding. There is no record of seasonal groundwater flooding, and there are no documented past flood events within the boundary of the proposed site.

The Strategic Flood Risk Assessment (SFRA) for Co. Waterford does not indicate a flood risk at the proposed site.

The Proposed Development is classified as Highly Vulnerable Development by the Planning System and Flood Risk Management Guidelines and would be best suited to Flood Zone C. Based on evidence provided from the aforementioned sources the development site is located in within Flood Zone C.

Waterford City & County Development Plan 2022 – 2028 – Water Quality

A review of the Waterford City & County Development Plan was carried out to determine the policies and objectives relevant to the preservation and protection of water quality throughout the region.

Core Strategy Policy Objectives:

CS 06 Environmental Directives

We will require, where appropriate, all plans and projects within Waterford to comply with the requirements of the Strategic Environmental Assessment Directive, the Habitats Directive, Water Framework Directive and Floods Directive.

Utility, Energy & Communication Policy Objectives:

UTL 02 – Water Services

To collaborate support and work, in conjunction with Irish Water, to ensure the timely delivery and provision, extension and upgrading of existing and new high quality, climate resilient, water services infrastructure, in order to facilitate the sustainable growth and development of our City and County, in accordance with an ecosystem services and integrated catchment management approach, and the Development Plan Core and Settlement strategies.

UTL – 03 Water Supply & Drinking Water Regulations

We will collaborate with Irish Water in contributing towards compliance with the European Union (Drinking Water) Regulations Drinking Water Regulations 2014 (as amended) and compliance of water supplies with the parameters identified in these Regulations.

All new developments must be satisfactorily served by either a mains water supply, or by a private water supply. The preferred option will always be a public water supply and drainage solution. It will be the responsibility of the developer to demonstrate that any new supply is adequate to serve the Proposed Development and that for domestic use; it is safe to be consumed as drinking water. Groundwater abstractions must comply with EPA policies and guidelines.

UTL – 04 Drinking Water Report for Public Water Supplies

In conjunction with Irish Water, we will have regard to the EPA 2020 publication "Drinking Water Report for Public Water Supplies 2019" (and any subsequent update) in the establishment and maintenance of water sources in the County.

UTL – 05 EPA's Remedial Action List

In conjunction with Irish Water, undertake recommendations made by the EPA arising from any failure to meet drinking water standards and any enlistment on the EPA's Remedial Action List.

UTL 08 – Protection of Water Resources

To work together with Irish Water towards a common goal of protecting our drinking water sources. This will be achieved by:

- Supporting the preparation and implementation of Drinking Water Protection Plans by Irish Water, to protect sources of public water supply, in accordance with the requirements of the Water Framework Directive.
- Having regard to the EPA 2019 publication 'Drinking Water Report for Public Water Supplies 2018' (and any subsequent update) in the establishment and maintenance of water sources in the County in conjunction with Irish Water.
- Protecting both ground and surface water resources including taking account of the impacts of climate change, the cumulative impacts of septic tanks and waste water treatment systems, and to work with and support Irish Water to develop and implement Water Safety Plans to protect sources of public water supply and their contributing catchment.

UTL 09 – Storm and Surface Water Management

To require the use of Nature Based Solutions and Sustainable Drainage Systems to minimise and limit the extent of hard surfacing and paving and require the use of SuDS measures to be incorporated in all new development (including roads and public realm works and extensions to existing developments).

Surface water drainage must be dealt with in a sustainable manner, in ways that promote its biodiversity value, and in ways that avoid pollution and flooding, through the use of an integrated SuDS (including integrated constructed wetlands), where appropriate. This includes runoff from major construction sites.

Development proposals shall be accompanied by a SuDS assessment, which includes details of runoff quantity and quality and impacts on habitat and water quality and shall demonstrate how runoff is captured as close to source as possible with subsequent slow release to the drainage system and watercourse, as well as the incorporation of appropriate measures to protect existing water bodies and remove pollutant materials. The detail of the assessment should be commensurate with the scale of the development proposed.

Storm/ surface water management and run-off design should be carried out in accordance with Sustainable Urban Drainage Systems (SuDS) standards such as:

- The SuDS Manual "(CIRIA, 2015), "Sustainable Drainage: Design and Evaluation Guide" (McCloy Consulting & Robert Bray Associates).
- "Dublin Corporation Storm Water Management Policy Technical Guidelines".
- "Greater Dublin Regional Code of Practice for Drainage Works" incorporating "Greater

Dublin Strategic Drainage Study, Volume 2, New Development" or any future updates; and
- The capacity and efficiency of the strategic road network drainage regimes in County Waterford will be safeguarded for national road drainage purposes.
- Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas: Water Sensitive Urban Design Best Practice Interim Guidance Document 2022 (DHLG&H) and updates of same.

In all instances the use of Nature Based Solutions is preferred to engineered solutions.

UTL 14 – Energy Developments & Human Health

Proposals for energy development should demonstrate that human health has been considered, including those relating to the topics of:

- Noise (including consistency with the World Health Organisation's 2018 Environmental Noise Guidelines for the European Region developments must comply with the Wind Energy Development Guidelines (2006), or any subsequent update/ review of these),
- Shadow Flicker (for wind turbine developments, including detailed Shadow Flicker Study),
- Ground Conditions/Geology (including landslide and slope stability risk assessment),
- Air Quality; and,
- Water Quality.

UTL 21 – Construction and Environmental Plan

Construction Environment Management Plans shall be prepared in advance of the construction of relevant projects and implemented throughout. Such plans shall incorporate relevant mitigation measures which have been integrated into the Plan and any lower tier Environmental Impact Statement or Appropriate Assessment. CEMPs typically provide details of intended construction practice for the Proposed Development, including:

a) location of the sites and materials compound(s) including area(s) identified for the storage of construction refuse.
b) location of areas for construction site offices and staff facilities.
c) details of site security fencing and hoardings.
d) details of on-site car parking facilities for site workers during the course of construction.
e) details of the timing and routing of construction traffic to and from the construction site and associated directional signage.
f) measures to obviate queuing of construction traffic on the adjoining road network.
g) measures to prevent the spillage or deposit of clay, rubble or other debris.
h) alternative arrangements to be put in place for pedestrians and vehicles in the case of the closure of any public right of way during the course of site development works.
i) details of appropriate mitigation measures for noise, dust and vibration, and monitoring of such levels.
j) containment of all construction-related fuel and oil within specially constructed bunds to ensure that fuel spillages are fully contained (such bunds shall be roofed to exclude rainwater).
k) disposal of construction/demolition waste and details of how it is proposed to manage excavated soil, including compliance with 'Best Practice Guidelines for the preparation of Resource Management Plans for Construction & Demolition Waste Projects' EPA: 2021, (or any final updates thereof).
l) a water and sediment management plan, providing for means to ensure that surface water

runoff is controlled such that no silt or other pollutants enter local watercourses or drains.

m) details of a water quality monitoring and sampling plan.

n) if peat is encountered - a peat storage, handling and reinstatement management plan.

o) measures adopted during construction to prevent the spread of invasive species (such as Japanese Knotweed).

p) appointment of an ecological clerk of works at site investigation, preparation and construction phases. and

q) details of appropriate mitigation measures for lighting specifically designed to minimise impacts to biodiversity, including bats.

Water Quality Policy Objectives:

WQ 01 – Water Framework Directive and Associated Legislation

We will contribute towards, as appropriate, the protection of existing and potential water resources, and their use by humans and wildlife, including rivers, streams, wetlands, the coastline, groundwater and associated habitats and species in accordance with the requirements and guidance in the EU Water Framework Directive 2000 (2000/60/EC), the European Union (Water Policy) Regulations 2003 (as amended), the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended), the Groundwater Directive 2006/118/EC and the European Communities Environmental Objectives (groundwater) Regulations 2010 (as amended) and other relevant EU Directives, including associated national legislation and policy guidance (including any superseding versions of same). To support the application and implementation of a catchment planning and management approach to development and conservation, including the implementation of Sustainable Drainage System techniques for new development.

WQ 02 – Achieving High/Good Water Quality Status

In order to maintain water quality at high status and a return to good status for rivers that are not meeting this threshold at present we will:

- Provide for the efficient and sustainable use and development of water resources and water services infrastructure.
- Manage and conserve water resources in a manner that supports a healthy society, economic development requirements and a cleaner environment.
- Ensure that all development does not negatively impact on water quality and quantity, including surface water, ground water, designated source protection areas, river corridors and associated wetlands, estuarine waters, coastal and transitional waters.
- Ensure new development complies with the relevant EPA Code of Practice: Domestic Wastewater Treatment Systems (PE ≤ 10) (2021).or any amendments thereto.
- Screen planning applications according to their Water Framework Directive status and have regard to their status and objectives to achieve ‘good’ status or protect and improve ‘high or good status’. A catchment-based approach shall be applied to the assessment of planning applications which may impact on water quality, and to ensure that the development would not result in a reduction in the water quality status of a waterbody in that catchment.
- Seek to protect, enhance and restore all groundwaters and ensure a balance of abstraction and recharge, with the aim of achieving good groundwater status and to reverse any significant and sustained upward trends in the concentration of pollutants in groundwater.
- Work with the Local Authority Waters Programme and other relevant State agencies and

local communities to achieve the objectives for the Areas for Action1 identified in the River Basin Management Plans 2018-2021 and 2022-2027 to ensure that new development do not result in a deterioration of water quality in these areas.

- Develop the associated Blue Dot Catchment network programme under the River Basin Management Plan 2018-2021 to protect and maintain the excellent quality of 'High' status water bodies.

WQ 03 – River Basin Management Plan

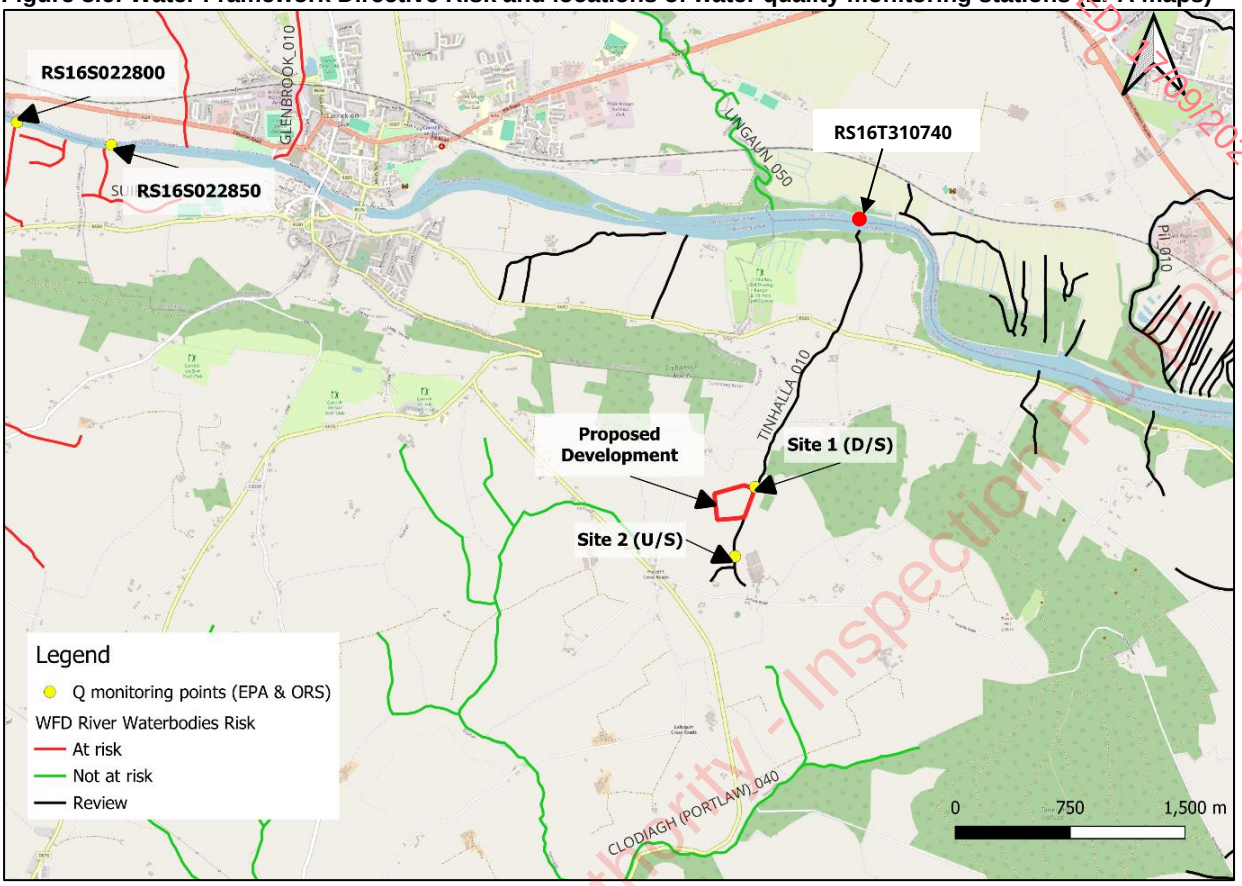
Support the implementation of the relevant recommendations and measures as outlined in the River Basin Management Plan 2018-2021, and associated Program of Measures, or any such plan that may supersede same during the lifetime of the plan. Proposed plans, program and projects shall not have an unacceptable impact on the water environment, including surface waters, groundwater quality and quantity, river corridors and associated woodlands. Also, to have cognisance of, where relevant, the EU's Common Implementation Strategy Guidance Document No. 20 and 36 which provide guidance on exemptions to the environmental objectives of the Water Framework Directive.

8.4.6 Biological Water Quality

There is a lack of recently available biological Q-value data and physio-chemical data along the Tinhalla stream and the receiving waterbody - the River Suir. Due to this inconsistency in monitoring data the current water quality status of these waterbodies is inaccurately represented both upstream and downstream of the Proposed Development.

Due to the lack of data available to inform this assessment, ORS attended site on the 30th of May 2024 to carry out an upstream and downstream Q-value assessment on the Tinhalla stream (the receiving waterbody of the Proposed Development). Samples were also obtained for hydro chemical parameters analysis and were submitted to an accredited laboratory (Fitz Scientific). The Q-value results are presented below, and hydrochemistry data is presented in the following **Section 8.4.7**.

Figure 8.6: Water Framework Directive Risk and locations of water quality monitoring stations (EPA maps)



8.4.6.1 Desk Based Q Value Assessment

As part of the Water Framework Directive (WFD) Monitoring Programme approximately one third of our major rivers and their more important tributaries are surveyed and assessed each year by EPA ecologists. A complete survey cycle is completed every three years. The sites are scored on a five-point system developed by the EPA called the Biological Q-Rating system. Macroinvertebrate data is utilised to ascertain the biological quality of a given river or stream as detailed in **Table 8.2** at the beginning of this chapter.

EPA monitoring stations with available data on the River Suir and which are located at points of hydrological connectivity upstream of the Proposed Development are listed in **Table 8.5** below**,** along with their associated Q-Ratings.

Table 8.5: Biological Q-Ratings for waterbodies hydraulically connected to the River Suir (EPA)

Station ID (EPA & ORS monitoring points)	Station Name	Year								
		1974-2000	2002	2005	2008	2011	2014	2017	2020	2023
RS16S022850	1.5 km u/s Carrick-on-Suir	3	3	3	3	3-4	4	3 (Brackish)	3-4 (Brackish)	3-4
RS16S022800	Coolnamuck Weir (d/s Miloko)	3	-	-	-	-	-	-	-	-

The **RS16S022850** water monitoring station, named "1.5km u/s Carrick-on-Suir" is located 4.8km upstream of the point of hydrological connectivity between the Tinhalla stream adjacent to the eastern boundary of the Proposed Development and the River Suir. The station is located to the west of Carrick-on-Suir. The most recent monitoring cycle has measured a Q-Rating of '3-4 Brackish', indicating 'Moderate' WFD status and a pollution status of 'Moderately polluted' according to the EPA.

The **RS16S022800** water monitoring station, named "Coolnamuck Weir (d/s Miloko)" is located 6.6km upstream of the point of hydrological connectivity between the Tinhalla stream adjacent to the eastern boundary of the Proposed Development and the River Suir. The station is located to the west of Carrick-on-Suir. This monitoring point has not yielded consistent data since 1986 where a Q-rating of '3' was indicated and a pollution status of 'Moderately polluted' according to the EPA.

A new monitoring station (**RS16T310740 -** TINHALLA - Interstitial, Br u/s from River Suir conf.) has recently been installed by the EPA, located *ca.*1.1km north of the proposed development. There is no published data yet, however, this monitoring point should be considered for monitoring purposes during the operational phase of the proposed development.

8.4.6.2 On-Site Q-Value Assessment

ORS attended site on the 31st of May 2024 to carry out a comprehensive Q-value assessment of the receiving waterbody of the Proposed Development (the Tinhalla stream).

Sampling was conducted at 2 sites along the Tinhalla stream as presented in **Figure 8.7** below. Sampling was conducted both upstream (Site 2) and downstream (Site 1), using kick sampling with a sweep net and of standard 1mm fine mesh to catch macroinvertebrates. At each site, three samples were taken to provide a representative profile of each downstream and upstream section. Vegetative characteristics, including macrophytes, were compiled during sampling to provide additional ecological context. Substrate composition and water body characteristics including flow type on the date of sampling, and water depth and width were also measured. Collected specimens were identified to the lowest taxonomic level possible using a taxonomic key and stereoscopic microscope, following standard procedures. Q-values were assigned to identify taxa based on their sensitivity to pollution.

Figure 8.7: Locations of ORS water quality & Q rating monitoring points

ORS Q-value monitoring points along the Tinhalla stream which are located at points of hydrological connectivity both upstream (Site 2) and downstream (Site 1) to the Proposed Development are listed in **Table 8.6** below**,** along with their associated Q-Ratings.

The full Q-value Assessment report is presented in **Appendix 8.1**.

Table 8.6: Biological Q-Ratings for the Tinhalla stream, hydrologically connected to the Proposed Development

ORS monitoring point	Q value result
Site 2 (U/S)	3-4
Site 1 (D/S)	4

Upstream of the proposed development (Site 2) a Q-rating of '**3-4**' indicates 'Moderate' WFD status and a pollution status of 'Slightly polluted' according to the EPA.

Downstream of the proposed development (Site 1) a Q-rating of '**4**' indicates 'Good' WFD status and a pollution status of 'Unpolluted' according to the EPA.

8.4.7 Hydrochemistry Data

ORS attended site on the 31st May 2024 and obtained baseline samples along the Tinhalla stream both upstream (U/S) and downstream (D/S) of the Proposed Development. Samples were sent to an accredited laboratory (Fitz Scientific) and results are presented in **Table 8.9** and **Table 8.10** below:

Table 8.9: Hydrochemistry results (U/S of Proposed Development – Tinhalla stream)

Parameter (U/S)	Unit	Result
Ammonia	mg/l as N	0.05
BOD	mg/l	1.0
COD	mg/l	<5
Nitrate	mg/l	7.92
Nitrite	mg/l	0.032
Nitrogen (Total Oxidised)	mg/l	7.96
Nitrogen (Total)	mg/l	7.8
Oils, Fats, Greases	mg/l	5
pH	pH units	7.88
Orthophosphate	mg/l as P	0.04
Phosphorous (Total)	mg/l as P	0.06
Total Suspended Solids	mg/l	<5

Table 8.10: Hydrochemistry results (D/S of Proposed Development – Tinhalla stream)

Parameter (D/S)	Unit	Result
Ammonia	mg/l as N	0.07
BOD	mg/l	0.6
COD	mg/l	<5
Nitrate	mg/l	7.92
Nitrite	mg/l	0.024
Nitrogen (Total Oxidised)	mg/l	7.94
Nitrogen (Total)	mg/l	7.7
Oils, Fats, Greases	mg/l	3
pH	pH units	7.87
Orthophosphate	mg/l as P	0.04
Phosphorous (Total)	mg/l as P	0.09
Total Suspended Solids	mg/l	<5

According to the Water Framework Directive (WFD) The Tinhalla_010 river has a 'Moderate' WFD status and is 'Under Review' in accordance with meeting WFD objectives.

There is no detailed information/current data available on Catchments.ie for the Tinhalla_010 stream.

According to the Water Framework Directive (WFD) the receiving water body of the Tinhalla_010 stream: the Upper Suir Estuary River has a 'Bad' WFD status and is 'At risk' of not achieving WFD objectives.

The Tinhalla stream (Upper Suir Estuary – Catchments.ie) is outlined in **Table 8.11**.

Table 8.11: Description of Receiving Waters – Upper Suir Estuary (Catchments.ie)

Characteristic	Classification	Status	Interpretation
Receiving Waterbody Name	River Suir / Lower Suir Estuary	At Risk	Receiving Waters include Middle Suir Estuary. Inputting Waterbody includes Tinhalla stream to the east of the Proposed Development.
Waterbody Type	River / Transitional Waterbody		-
WFD Status	SW 2016-2021	Bad	-
Resource	Not Classified		No drinking water abstractions
Biological Status	Macrophyte Status	Unknown	Twenty one sites on the River Suir were sampled in 2023, of which only eight were in satisfactory ecological condition. Of the 12 sites assessed upstream of Cahir, only three were found to be satisfactory with Good ecological quality. Stations 0500 (Rossestown Bridge) and 1500 (Golden Bridge) maintained Good quality and station 1600 (the Bridge near Suirville House) improved to Good quality. The remaining nine stations upstream of Cahir were not satisfactory, with Poor and Moderate quality recorded at all of them, four of which had declined since the previous assessment in 2023.
	Invertebrate Status	Unknown	
	Phyto plankton Status	Bad	
	Fish Status	Good	
Supporting Chemistry Conditions	Oxygenation Conditions	Moderate	DO status: Moderate Orthophosphate (as P) has an indicative Quality of 'high' and trends are stable Nitrogen (as N) has an indicative quality of 'Poor' and an upwards trend in concentrations are observed. Chlorophyll has an indicative quality of 'High' and a downwards trend in concentrations is observed.
	Nitrogen	Poor	
	Phosphorus	Good	
	Other Nutrients	None	
	Specific Pollutant Conditions	Chlorophyll - High	
Hydromorphological Conditions	Water Flow & Substrate	Good	-
Chemical SW Status	High	Failing to achieve good	Benzo(a)pyrene Failure for Chemical Status IE_SE_100_0600

8.4.8 Hydrogeology

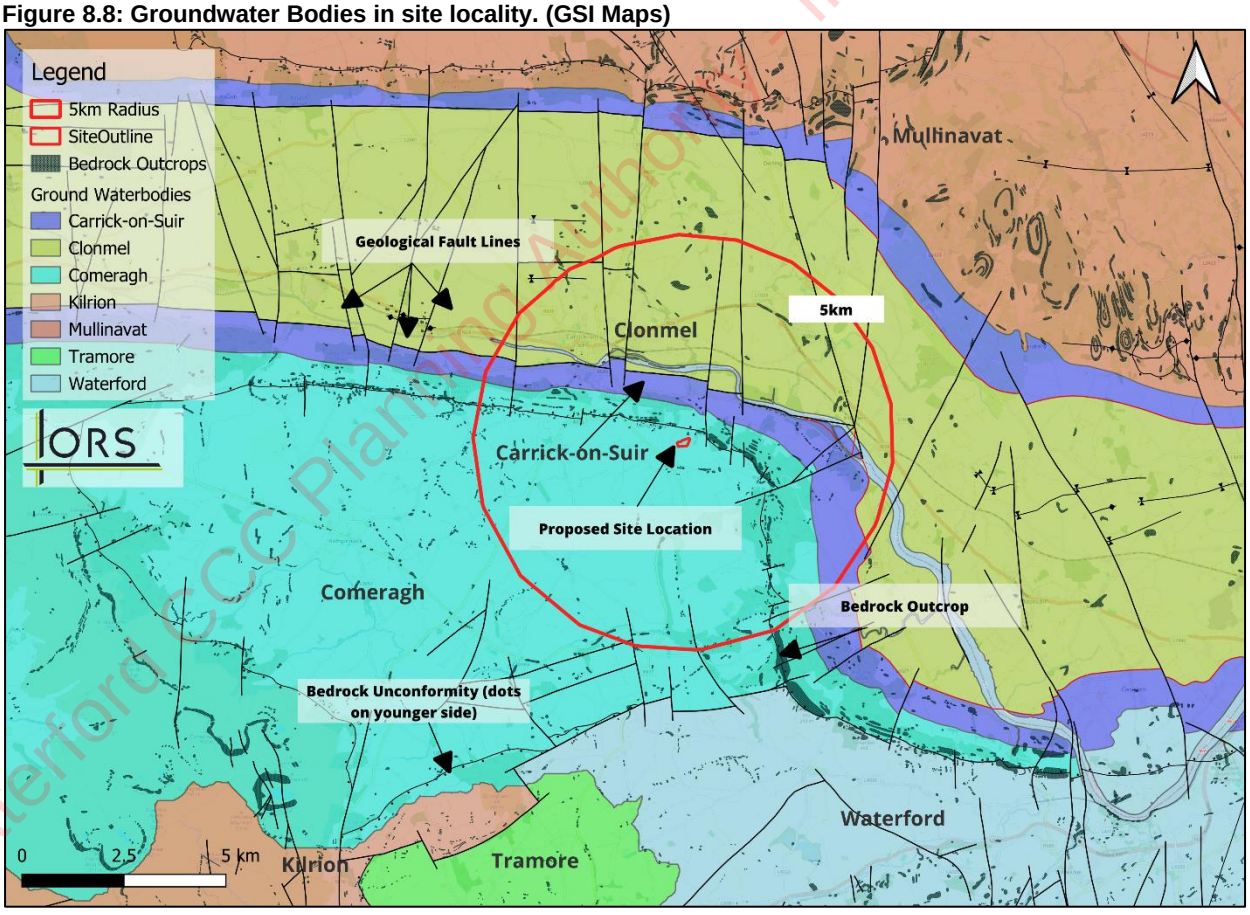
Regional & Local Hydrogeology

Hydrogeology is the study of groundwater, including its origin, occurrence, movement and quality. Rocks which store and transmit groundwater are known as bedrock aquifers. Different bedrock types have differing abilities to store and transmit water, depending on their permeability and fracture intensity. The Geological Survey of Ireland has classified all aquifers in Ireland in three main categories based on potential yield and extent:

- Regionally Important
- Locally Important
- Poor

County Waterford has been mapped for Aquifer Classification. The subject site is situated above the Comeragh Groundwater Body as illustrated in **Figure 8.8** below, which is designated by the Geological Survey of Ireland (GSI) National Draft Bedrock Aquifer Map as a Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones (Classification reference - Ll). This aquifer is capable of supplying locally important supplies (e.g., small public water supplies).

Figure 8.8: Groundwater Bodies in site locality. (GSI Maps)



There are further sub-categories based on the geology of the subsoil, the type of recharge (i.e., either point or diffuse) and the thickness of the unsaturated zone through which potential

contaminants can move. The Geological Survey of Ireland uses a matrix comprising four groundwater vulnerability categories - extreme, high, moderate and low - for mapping purposes and in the assessment of risk to groundwater. The categories are based on the thickness of cover (overburden), which provides some attenuation for contaminants migrating toward the groundwater table from the surface or near subsurface, outlined in **Table 8.12.**

Table 8.12: Vulnerability Mapping Criteria

Subsoil Thickness	Hydrogeological Requirements Diffuse Recharge Subsoil Permeability & Type			Point Recharge	Unsaturated Zone
	High (Sand & Gravel)	Moderate (Sandy Subsoil)	Low (Clay & Peat)	Swallow Holes	Sand & Gravel Aquifers
0-3m	Extreme	Extreme	Extreme	Extreme (30m radius)	Extreme
3-5m	High	High	High	N/A	High
5-10m	High	High	Moderate	N/A	High
>10m	High	Moderate	Low	N/A	High

Where the overburden is less than 3 metres thick, the Matrix Vulnerability Rating of the aquifer is considered extreme, as indicated in **Table 8.12** (i.e., the potential for contamination to reach the aquifer is extremely high). Where the overburden is greater than 10 metres thick and has a low permeability, the vulnerability is considered to be low. According to the GSI Aquifer Vulnerability Map, in the wider Waterford area, there are areas of high, moderate, extreme and X (Rock at or near surface or Karst) vulnerability. The area underlying the proposed site itself has a range of vulnerabilities. The section of the site is classified as being of “Moderate” vulnerability, a central band along the centre of the site is classified as “High”, the eastern section of the site is classified as being of “Extreme” and a portion of the site along the northeastern boundary is described as having a vulnerability of “X”.

Provisional information on the hydrogeological classification of the bedrock beneath the subject site was obtained from the Geological Survey of Ireland (GSI). The Silurian Metasediments comprised of dark grey slates and greywacke beneath the site is considered by the GSI to be a Locally Important Aquifer - Bedrock which is moderately productive only in local zones. This aquifer category has been assigned taking account of the following:

- The overall potential groundwater resources in each rock unit
- The area of each rock unit
- The localised nature of the higher permeability zones (e.g. fractures) in the bedrock unit
- The fact that all bedrock types give enough water for domestic supplies (therefore are called aquifers)

Groundwater abstractions have defined Source Protection Areas around them in order to give an indication of the likelihood of contamination from activities in the area reaching an abstraction point. These have an Inner Protection Area and an Outer Protection Area associated with them.

According to the GSI Source Protection Area map, there are no Source Protection Areas in the vicinity of the site. The nearest Source Protection Area, the Pilltown Fiddown Public Water Scheme is located *ca.* 7.5km northeast of the site.

According to the GSI database, there is a high density of groundwater wells within 2 kilometres of the Proposed Development (**Figure 8.8**). This data is summarised in **Table 8.13**.

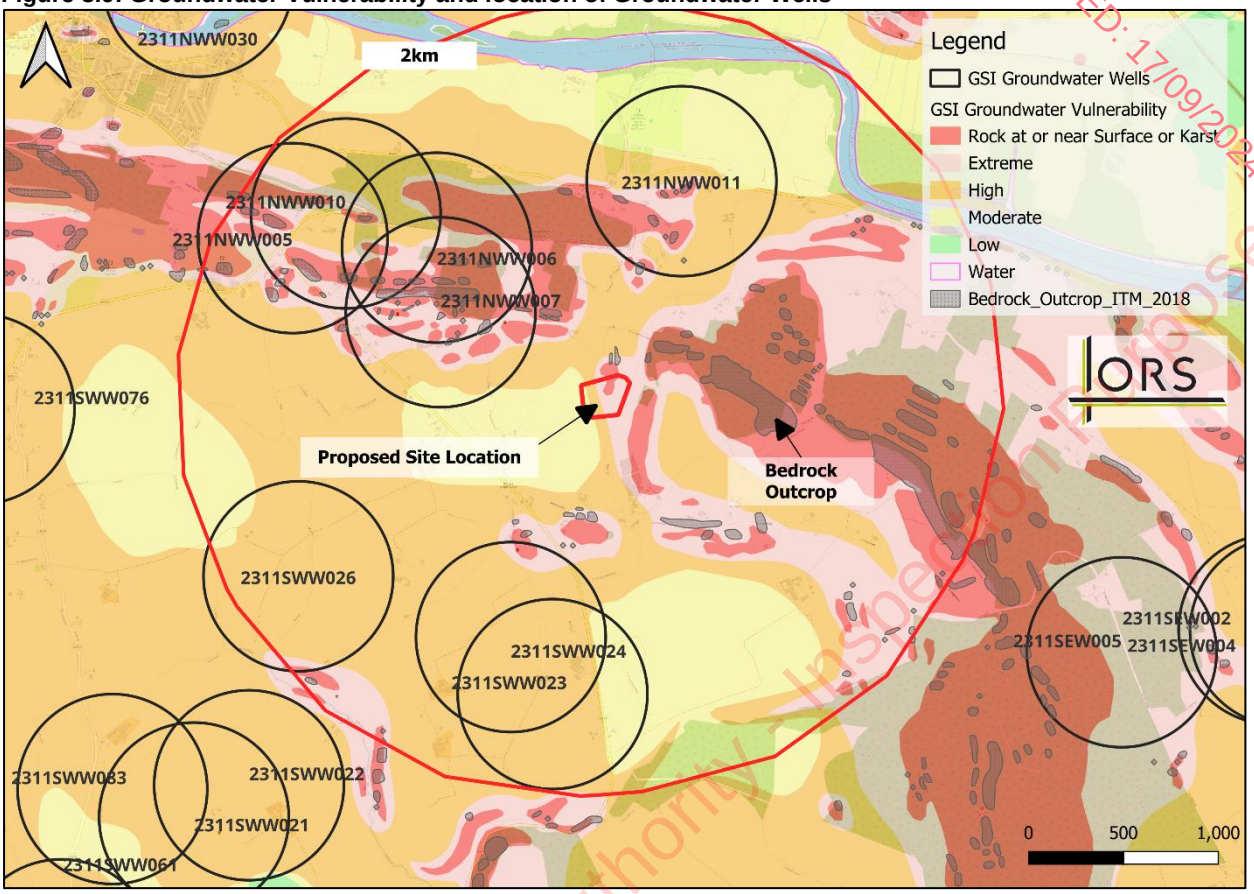
Table 8.13: Groundwater Wells with 2km of the site (GSI Well Database)

GSI Reference	Easting Northing	Well Type	Depth (m bgl)	Depth to Rock (m)	Well Use	Yield m^3/d	Proximity to site
2311NWW011	243000 120700	Borehole	28.1	9.1	Domestic use only	32.7	0.6 km N
2311NWW007	241730 120010	Borehole	22.9	4.6	Domestic use only	43.6	0.36 km NW
2311NWW006	241710 120350	Borehole	18.3	3.1	Domestic use only	43.6	0.59km NW
2311NWW010	241230 120530	Borehole	12.8	4	Domestic use only	76.3	1.09km NW
2311NWW005	240950 120400	Borehole	36.6	3.1	Domestic use only	58.8	1.29km NW
2311SWW026	240980 118620	Borehole	29.3	3.1	NA	32.7	1.12km SW
2311SWW024	242100 118300	Borehole	24.4	3.7	NA	27.3	0.7km S
2311SWW023	242320 118000	Borehole	19.5	3.1	Domestic use only	30	1.06km S
2311SWW084	243050 118950	Borehole	44.2	1.2	Agri & domestic use	49.1	0.65km SE

Figure 8.9 below, superimposes the approximate location of the groundwater wells listed in the table above relative to the groundwater vulnerability rating of the area. The site boundary is roughly marked out in red. Groundwater wells in the vicinity of the site are generally moderate to poor yielding. The lands on which the site location has been proposed have been assigned vulnerability rating ranging from moderate in the east to extreme in the west. A portion of the northeastern section of the site has a been assigned a vulnerability rating of "X" (Rock at or near surface or Karst). The recorded depth bedrock is encountered for the corresponding wells in this area are generally between 1.2 to 9.1 metres below ground level (mbgl).

Karst areas are characterised by landforms of dissolution. Karst aquifers can be particularly vulnerable to pollution and karst features can also give rise to flooding. There are no karstic features located within the proposed boundaries of the Proposed Development or within the immediate vicinity of the Proposed Development. The closest feature is a "Borehole" located *ca.* 4.42km east of the proposed site.

Figure 8.9: Groundwater Vulnerability and location of Groundwater Wells



Ground Investigations

Ground investigation works were carried out by a chartered ORS environmental scientist on the 13th of December 2023. These investigations confirmed the general geology and subsoil conditions corresponded to the conditions indicated in the geological mapping. The location and depth of the trial pits is shown on **Figure 8.10**, and details of each investigation location is presented in **Table 8.14**.

The depths of all trial pits varied slightly, 1.9m to 2.3m bgl. Bedrock was encountered at 1 no. Trial Pit (TP-04) at 1-8mbgl – 2.1mbgl. Groundwater was also encountered in TP04 at 1.8mbgl. This trial pit is located towards the centre of the site.

As stated in **Section 8.4.2** the topography peaks at 107m OD along the western boundary (Trial Pit 2) in the site with a gradual gradient (Trial Pit 3 is in the middle of this gradient) eastwards to a low of 91.5m OD (Trial Pit 4). The site has a gradient from west to east, which becomes slightly more pronounced towards the centre of the site. A gradient exists at the southern boundary of the site which extends towards the piggery and reaches a low of 103m AOD before rising again to 106 at the northern boundary of the piggery.

There was variation in the soil profile across all four trial pits. Some similarities between profiles were also noted. The topsoil across all trial pits were all of a brown in colour overlaying a layer of grey soil with a high CLAY content or in the case of Trial Pit 4, a layer of grey silt with an occasional shale boulder. The topsoil texture in Trial Pit 1 is referred to a clay-silt and Trial Pit 2

is referred to as gley soil. Trial Pits 3 and 4 demonstrated a larger diversity among subsoil horizons in comparison to Trial Pits 1 and 2. The findings of the site investigation correlated with the GSI soil & subsoil database mapping. The predominant soil underlying the Proposed Development is a mineral derived from non-calcareous parent materials. The Proposed Development site is characterised by a poor draining bedrock (slate), low permeability subsoil overlain by a poorly-drained topsoil. There is a slight variation in the soil depth from which is moderately deep (1.9m) to (2.3m). The topsoil throughout the site is characterised as Brown Earth, with a variable texture consisting of CLAY, SILT to GLEY. The subsoil found throughout the trial pits exhibits a variety of characteristics but typically consists of grey clayey-silt. The findings of the trial pits are presented in **Figure 8.10** overleaf. The underlying bedrock across the site is a Silurian dark grey slate. No bedrock was discovered in the Trial Pits 1 - 3. Bedrock in the form of an angular shale bed was discovered at 2.1m bgl in Trial Pit 4. The bedrock encountered are characterised by dark grey slates.

A site characterisation assessment (percolation assessment) was conducted by Site Assessor William Bolger Hynes on the 12th of April 2024. At the centre of the site, where the slope is most pronounced. The assessment encountered bedrock at 1.6m bgl, refer to **Appendix 8.2**.

Table 8.14: Ground profile for each Trial Pit

Location	Depth (m)	Ground Profile	Comments
TP-01	0.0 – 0.25 0.25 – 0.55 0.55 – 2.30	Clay, silt. Brown topsoil Grey clay Cobbles 70mm, round sub-angular occasional shale boulder 200mm	Water infiltration at 2.1m
TP-02	0.00 – 0.25 0.25 – 0.55 0.55 – 1.00 1.00 – 2.00	Grey-brown topsoil. Gley texture Grey. Clay texture. Small cobble 20-50mm. Grey colour, round to sub-angular shape. Brown clay. Boulders, round some sub-angular.	Water infiltration at 0.9m Water level at 2m, 1.5hrs after excavation.
TP-03	0.00 – 0.10 0.10 – 0.60 0.60 – 0.70 0.70 – 1.00 1.10 – 1.20 1.10 – 1.90	Brown topsoil. Grey-brown subsoil. High clay content. Gravel, sand-clay layer. Brown hue. Possibly alluvial. Grey-brown colour. Clay with some cobbles. Black band. Brown-grey clay. Oxidised rock noted. Shale boulders, sub-angular 500mm, some cobbles also	
TP-04	0.00 – 0.25 0.25 – 0.45 0.45 – 1.10 1.10 – 1.80 1.80 – 2.10	Dark brown topsoil. Grey silt. Occasional shale boulder 100mm. Grey-brown clay. Brown-grey clay silt. Angular shale bed.	Water infiltration at 1.8m Bedrock encountered at 1.8m

Figure 8.10: Location and depth of Trial Pits (TP) and Site Characterisation Assessment

Waterford City & County Development Plan 2022 – 2028 – Groundwater Protection

A review of the Waterford City & County Development Plan was carried out to determine the policies and objectives relevant to the preservation and protection of groundwater quality throughout the region.

Core Strategy Policy Objectives:

CS 06 – Environmental Directives

We will require, where appropriate, all plans and projects within Waterford to comply with the requirements of the Strategic Environmental Assessment Directive, the Habitats Directive, Water Framework Directive and Floods Directive.

Utility, Energy & Communication Policy Objectives:

UTL 03 – Water Supply & Drinking Water Regulations

We will collaborate with Irish Water in contributing towards compliance with the European Union (Drinking Water) Regulations Drinking Water Regulations 2014 (as amended) and compliance of water supplies with the parameters identified in these Regulations.

All new developments must be satisfactorily served by either a mains water supply, or by a private water supply. The preferred option will always be a public water supply and drainage solution. It will be the responsibility of the developer to demonstrate that any new supply is

adequate to serve the Proposed Development and that for domestic use; it is safe to be consumed as drinking water. Groundwater abstractions must comply with EPA policies and guidelines.

UTL – 04 Drinking Water Report for Public Water Supplies

In conjunction with Irish Water, we will have regard to the EPA 2020 publication "Drinking Water Report for Public Water Supplies 2019" (and any subsequent update) in the establishment and maintenance of water sources in the County.

UTL – 05 EPA's Remedial Action List

In conjunction with Irish Water, undertake recommendations made by the EPA arising from any failure to meet drinking water standards and any enlistment on the EPA's Remedial Action List.

UTL 08 – Protection of Water Resources

To work together with Irish Water towards a common goal of protecting our drinking water sources. This will be achieved by:

- Supporting the preparation and implementation of Drinking Water Protection Plans by Irish Water, to protect sources of public water supply, in accordance with the requirements of the Water Framework Directive.
- Having regard to the EPA 2019 publication 'Drinking Water Report for Public Water Supplies 2018' (and any subsequent update) in the establishment and maintenance of water sources in the County in conjunction with Irish Water.
- Protecting both ground and surface water resources including taking account of the impacts of climate change, the cumulative impacts of septic tanks and wastewater treatment systems, and to work with and support Irish Water to develop and implement Water Safety Plans to protect sources of public water supply and their contributing

UTL 14 – Energy Developments & Human Health

Proposals for energy development should demonstrate that human health has been considered, including those relating to the topics of:

- Noise (including consistency with the World Health Organisation's 2018 Environmental Noise Guidelines for the European Region developments must comply with the Wind Energy Development Guidelines (2006), or any subsequent update/ review of these),
- Shadow Flicker (for wind turbine developments, including detailed Shadow Flicker Study),
- Ground Conditions/Geology (including landslide and slope stability risk assessment),
- Air Quality; and,
- Water Quality.

Water Quality Policy Objectives:

WQ 01 – Water Framework Directive and Associated Legislation

We will contribute towards, as appropriate, the protection of existing and potential water resources, and their use by humans and wildlife, including rivers, streams, wetlands, the coastline, groundwater and associated habitats and species in accordance with the

requirements and guidance in the EU Water Framework Directive 2000 (2000/60/EC), the European Union (Water Policy) Regulations 2003 (as amended), the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended), the Groundwater Directive 2006/118/EC and the European Communities Environmental Objectives (groundwater) Regulations 2010 (as amended) and other relevant EU Directives, including associated national legislation and policy guidance (including any superseding versions of same). To support the application and implementation of a catchment planning and management approach to development and conservation, including the implementation of Sustainable Drainage System techniques for new development.

WQ 02 – Achieving High/Good Water Quality Status

In order to maintain water quality at high status and a return to good status for rivers that are not meeting this threshold at present we will:

- Provide for the efficient and sustainable use and development of water resources and water services infrastructure.
- Manage and conserve water resources in a manner that supports a healthy society, economic development requirements and a cleaner environment.
- Ensure that all development does not negatively impact on water quality and quantity, including surface water, ground water, designated source protection areas, river corridors and associated wetlands, estuarine waters, coastal and transitional waters.
- Ensure new development complies with the relevant EPA Code of Practice: Domestic Wastewater Treatment Systems (PE ≤ 10) (2021) or any amendments thereto.
- Screen planning applications according to their Water Framework Directive status and have regard to their status and objectives to achieve 'good' status or protect and improve 'high or good status'. A catchment-based approach shall be applied to the assessment of planning applications which may impact on water quality, and to ensure that the development would not result in a reduction in the water quality status of a waterbody in that catchment.
- Seek to protect, enhance and restore all groundwaters and ensure a balance of abstraction and recharge, with the aim of achieving good groundwater status and to reverse any significant and sustained upward trends in the concentration of pollutants in groundwater.
- Work with the Local Authority Waters Programme and other relevant State agencies and local communities to achieve the objectives for the Areas for Action1 identified in the River Basin Management Plans 2018-2021 and 2022-2027 to ensure that new development do not result in a deterioration of water quality in these areas.
- Develop the associated Blue Dot Catchment network programme under the River Basin Management Plan 2018-2021 to protect and maintain the excellent quality of 'High' status water bodies.

Groundwater Vulnerability Assessment

The site is not located within a Source Protection Area, and this vulnerability assessment will be carried as per excerpt of **Table 8.4**, as follows:

Excerpt of Table 8.4 – Summary of Sampling requirements for groundwater vulnerability assessments

	Aquifer Type	Sampling Requirements
Ground Water Protection Scheme (GWPS) does not exist	Locally Important / Poor Aquifers	Prove that 1m depth of soil/subsoil cover exists. Minimum of 1 data point per 5 hectares is required. Site investigation points can be based on existing information. New information only required where existing information is insufficient.
	Regionally Important Aquifers	Prove that 2m depth of soil/subsoil cover exists. Minimum of 1 data point per hectare is required. Site investigation points can be based on existing information. New information only required where existing information is insufficient.

Groundwater resources protection zones are determined by combining the aquifer and vulnerability maps. The aquifer map boundaries, in turn, are based on the bedrock map boundaries and the aquifer categories are obtained from an assessment of the available hydrogeological data. The vulnerability map is based on the subsoils map, together with an assessment of relevant hydrogeological data, in particular indications of permeability and karstification.

The location and management of potentially polluting activities in each groundwater protection zone is calculated by means of a groundwater protection response matrix. The level of response depends on the different elements of risk: the vulnerability, the value of the groundwater (with sources being more valuable than resources and regionally important aquifers more valuable than locally important and so on) and the contaminant loading. By consulting the Response Matrix, it can be determined:

- Development's suitability of purpose
- what kind of further investigations may be necessary to reach a final decision; and
- what planning or licensing conditions may be necessary for that development.

The groundwater protection responses are a means of ensuring that good environmental practices are followed.

The matrix in **Table 8.15** gives the result of integrating the two regional elements of land surface zoning (vulnerability categories and resource protection areas) – a possible total of 24 resource protection zones. In practice this is achieved by superimposing the vulnerability map on the aquifer map. Each zone is represented by a code e.g. Rf/M, which represents areas of regionally important fissured aquifers where the groundwater is moderately vulnerable to contamination. In land surface zoning for groundwater protection purposes, regionally important sand/gravel (Rg) and fissured aquifers (Rf) are zoned together, as are locally important sand/gravel (Lg) and bedrock which is moderately productive (Lm).

Table 8.15: Matrix of Resource Protection Zones from EPA Guidance Notes on Groundwater Protection

Vulnerability Rating	Resource Protection Zones					
	Regionally Important Aquifers (R)		Locally Important Aquifers (L)		Poor Aquifers (P)	
	Rk	Rf/Rg	Lm/Lg	LI	PI	PU
Extreme (E)	Rk/E	Rf/E	Lm/E	LI/E	PI/E	Pu/E
High (H)	Rk/H	Rf/H	Lm/H	LI/H	PI/H	Pu/H
Moderate (M)	Rk/M	Rf/M	Lm/M	LI/M	PI/M	Pu/M
Low (L)	Rk/L	Rf/L	Lm/L	LI/L	PI/L	Pu/L

Combining the proposed site vulnerability ratings of Moderate, High, Extreme and aquifer classification of – Locally Important Aquifer; we therefore have a site that has a range of classifications. From the west the site is classified as (LI/M), the centre (LI/H) and the north/east (LI/E).

Groundwater Protection Responses

The Groundwater Protection Responses (see DoE/GSI/EPA publication, 1999) recommends that a consistent minimum thickness of 1m of soil/subsoil must be demonstrated overlying 'Locally Important Aquifers' and 'Poor Aquifers' to ensure that EPA Guidelines are being adhered too. This refers to areas where Groundwater Protection Schemes do not exist.

Table 8.16: Vulnerability Rating Summary

Vulnerability Rating	SOURCE PROTECTION AREA		Resource Protection (Aquifer Category)					
			Regionally Important Aquifers (R)		Locally Important (L)		Poor Aquifers(P)	
	Inner	Outer	Rk	Rf/Rg	Lm/Lg	LI	PI	Pu
Extreme (E)	R4	R4	R3[2]	R3[2]	R3[1]	R3[1]	R3[1]	R3[1]
High (H)	R4	R2[1]	R1	R1	R1	R1	R1	R1
Moderate (M)	R3[3]	R2[1]	R1	R1	R1	R1	R1	R1
Low (L)	R3[3]	R2[1]	R1	R1	R1	R1	R1	R1

R1 Acceptable, subject to normal good practice.
R2[1] Acceptable subject to a maximum organic nitrogen load (including that deposited by grazing animals) not exceeding 170 kg/hectare/yr.
R3[1] Not generally acceptable, unless a consistent minimum thickness of 1 m of soil and subsoil can be demonstrated.
R3[2] Not generally acceptable, unless a consistent minimum thickness of 2 m of soil and subsoil can be demonstrated.
R3[3] Not generally acceptable, unless no alternative areas are available and detailed evidence is provided to show that contamination will not take place.
R4 Not acceptable

Site Vulnerability Assessment

From desktop and field investigations it can be determined that the site is located on a Locally Important aquifer with a mixture of moderate/high/extreme vulnerability, with the site being classified as LI/M, LI/H and LI/E from west to east. An intrusive site investigation was conducted by ORS in December 2023. This investigation consisted of a total of 4 no. Trial Pits excavated to a minimum depth of 1.9m below ground level (bgl) and a maximum depth of 2.3m bgl. Bedrock was encountered in one of these excavations (TP04) at 1.8m bgl. Groundwater was encountered in TP04 at 1.8mbgl. Similarly, the site suitability assessment encountered bedrock at 1.6m bgl on site. The groundwater protection response recommends that a consistent thickness of 1m of soil / subsoil must be demonstrated overlying Locally Important aquifers to ensure that EPA guidelines are being adhered to.

This study has indicated that the Proposed Development will not have any detrimental impact on the underlying aquifer or more importantly any wells in the area. The GSI well data has indicated a high density of wells within the immediate area predominantly designated as domestic use.

The response matrix would indicate that the vulnerability rating assigned to the site would be "**R1**" for the majority of the site from the central portion to the western boundary. Indicating the development location is "*acceptable with respect to groundwater protection*". For the eastern and north eastern portion of the site the response matrix would indicate that the vulnerability rating assigned to the site would be "**R3**[1]" indicating the development location is "*Not generally acceptable, unless a consistent minimum thickness of 1 m of soil and subsoil can be demonstrated*" to the northeast and east of the site.

Further trial pits are recommended pre-construction to determine soil depth to the east/ northeast within the site and the installation of impermeable liners under the attenuation pond.

No land spreading will occur on site. The farms of the customer farmers have been identified. All farmers will use the biobased fertiliser on lands that have an agronomic requirement for fertiliser.

8.5 Likely Significant Effects

The assessment focuses on predicted effects in relation to hydrology and hydrogeology. The

assessment relates to effects occurring during both the construction and operational phases of the proposed development.

Based on the dataset obtained during the desk study, intrusive site investigation, and anecdotal 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 'low, moderate or high' risk to the identified Potential Pollutant Linkages (PPLs).

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'.

The likely potential pollutant linkages identified as a result of this assessment and specific for the site have been provided in the initial 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 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 impact and the likely severity of impact in the context of the site setting and proposed future site use.

The criteria used for the risk assessment classifications as detailed in the CSM table are based on those presented in *CIRIA Report 552*.

8.5.1 Do-Nothing Scenario

If the Proposed Development does not proceed there would be no additional impact on the local water systems. The current rate of surface water run-off 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. Fluvial flooding events would continue as they have historically in this area with the existing floodplains of the River Suir.

Groundwater status would also remain unchanged if the existing land use continued.

8.5.2 Receptor Sensitivity

The sensitivity of the receptors identified during the study of hydrological & hydrogeological features within the vicinity of the site are summarised in **Table 8.17.**

Table 8.17 – Receptor Sensitivity

Receptor	Receptor Importance	Receptor Sensitivity	Rationale
Groundwater Comeragh Groundwater Body	Local Level	High	The Comeragh Aquifer Locally Important Aquifer Bedrock which is Moderately Productive only in Local Zones renders this groundwater body's importance as **important on a local context**. The groundwater vulnerability ranges in classification from "Moderate" to "High" and "Extreme" from west to east across the site according to the GSI map viewer. However, the trial pit excavations have revealed at least 1m of soil/subsoil cover exists, throughout the entire site, and the groundwater table is adjudged to be >1m below ground level. The response matrix (**Table 8.15**) would indicate that vulnerability rating assigned to the site would be "R1 Acceptable, subject to normal good practice", for the western section of the site indicating the development location is acceptable with respect to groundwater protection. The vulnerability rating assigned to the eastern portion of the site would be "R3[1]" not generally acceptable, unless a consistent minimum thickness of 1m of soil and subsoil can be demonstrated.
Surface Water Tinhalla stream/ River Suir and downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA.	EU Level	Extreme	The receiving water body from the local Tinhalla stream that drains the site is the River Suir. This river is protected by EU Legislation and has SAC status. This River is hydrologically connected to downstream receptors Tibberaghny Marshes pNHA Lower River Suir (Coolfin, Portlaw) pNHA (Hydrological separation distance of *ca*. 10km) and

8.5.3 Sources - Construction Phase

The construction phase is likely to yield the most potentially significant effects on the surrounding water environment. Potential construction phase effects are considered in detail below and summarised in **Table 8.18**.

Increased Run-off and Sediment Loading

During the initial stages of the construction phase, enabling works will consist of stripping and removal of a significant layer of topsoil. Extensive earthworks will then follow to level the site and to facilitate the construction of foundations, the installation of services/drainage infrastructure and road construction which will also lead to the removal of extensive vegetation cover. The resulting stockpiles of the displaced soils and sediments, in the absence of suitable mitigation, will be susceptible to erosion during this period. This can create a potential pathway for silt and sediment to migrate off-site into surrounding water courses via wind-blown dust or run-off in times of heavy rain. The potential consequence for surface water receptors in this circumstance is elevated levels of silt and suspended solids. This in turn can lead to water quality degradation, decline in fisheries resources and serious ecological degradation of aquatic biota.

The subsoil beneath the site consists primarily of sandstone drift consisting of clay-sized particles. These sediments present a moderate susceptibility of becoming entrained in surface water run-off and to being blown out of a stockpile by moderate to strong breezes and carry a moderate risk of migrating into surface water receptors.

In the absence of mitigation, uncontrolled releases of sediment run-off would result in a ***negative, slight to moderate, temporary effect*** on the water quality of the River Suir, which is hydraulically connected to the Tinhalla stream adjacent to the eastern boundary of the development. No effect is anticipated to the underlying groundwater body in this instance.

Accidental Spillages of Harmful Substances

During the construction phase, there is a possibility of a spillage of contaminants such as fuels, oils, chemicals and cement material, posing a potential risk to surface and groundwater quality. Fuels, oils and chemicals have a number of hazardous properties, and the constituents of concrete are alkaline and corrosive. Each one of these substances can have a significant deleterious effect on water quality and aquatic life should any become entrained in the receiving water environment.

The drainage characteristics of the site area outlined in **Section 8.4.5** concluded that the Qbar value for the site of 17.8 l/s, meaning in the event of any spillages, contamination would likely become entrained in surface water run-off and migrate into the adjacent surface watercourse, located to the east of the site and subsequent downstream receptors.

There are two existing small watercourses that require culverts under the access road to allow surface water to maintain its natural drainage course. Please refer to Drawing Ref: **24052-DR-0502** for the locations of the culverts. Culverts are to be sized and designed with final construction documents.

The groundwater vulnerability assessment in **Section 8.4.8** concluded that groundwater vulnerability across the site varies due to differences in soil depth. At the western portion of the

site the vulnerability was classed as 'moderate' due to the deep depth >10m of low permeability clayey subsoils beneath the site. The "high" and "extreme" vulnerability of the soils to the centre and eastern portion of the site was due to the shallow depth <3m of soil for which the permeability is not mapped. In the case of the "X" vulnerability portion of the site, bedrock is at or near the surface. The moderate vulnerability conditions offer some protection to groundwater receptors and provide a natural barrier between the potential release of harmful substances and the groundwater body below, impeding vertical migration throughout the soils. In the case of the central and eastern portion of the site the potential for contamination of the groundwater body below is a concern and as such, mitigation measures will need to be established to prevent such an outcome.

In the absence of mitigation, uncontrolled releases of hydrocarbons, chemicals or cement would result in a ***negative, moderate to significant, temporary effect*** on the water quality of the Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA.

Increased Groundwater Vulnerability

The removal and disturbance of a significant amount of soil required in order to level the site is anticipated during the construction phase which carries the potential to increase the vulnerability of a groundwater body to incidences of contamination at surface level.

The groundwater vulnerability assessment in **Section 8.3.6** concluded that groundwater vulnerability throughout the site is classified as "moderate" and "high" across the centre and west/ southwest of the site and "extreme" to the east and northeast of the site.

Excavations of up to 6.3m bgl will be required to reach the finished floor level (FFL) of the Digestion Tanks (53, 54, 55), located in the centre of the site, Digestate Storage Tanks (56, 63) located to the centre/east of the site, Reception Hall (51), located to the west of the site, the bunded areas (8, 9) and the attenuation pond (11) to the northeast of the site. 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.

Excavation works required to bring the site to a consistent finished floor level and lay the foundations and drainage infrastructure will extend to depths of approximately 6.3mbgl extending into grey CLAY- SILT subsoils. The groundwater vulnerability assessment in **Section 8.4.9** concluded that groundwater vulnerability rating to the centre/ west of the site is classified "**R1** – "acceptable with respect to groundwater protection" and **R3**[1]" "Not generally acceptable, unless a consistent minimum thickness of 1 m of soil and subsoil can be demonstrated" to the northeast and east of the site." GSI maps and geotechnical site investigations suggest a subsoil depth of <3m throughout the site.

An excavation depth of 6.3m bgl for the purposes of site levelling, would increase the vulnerability in particular areas from 'high' to 'extreme'

In the absence of mitigation, the removal of soil/subsoil cover during the construction phase would have a ***negative, significant, long-term effect*** on groundwater vulnerability on the Proposed Development site.

Excavation of Bedrock Aquifer

Bedrock was encountered at 1.8m bgl in TP04. Groundwater was encountered in Trial pits TP01 (2.1m bgl), TP03 (0.9m bgl) and TP04 (1.8m bgl). As depicted in **Figure 8.9**, groundwater wells in the surrounding area generally encounter bedrock at depths between 1.2m to 9.1m bgl. Given the maximum depths of excavations required to level the site are anticipated at 6.3m bgl, interaction with bedrock is possible but not expected. Predicted effects will have ***negative, significant, long-term effect*** on hydrogeology.

The site has been assigned a high groundwater vulnerability rating to the east of the site and extreme in the western portion of the site due to encountering bedrock during site investigations.

A potential effect of the construction stage could be the exposure of the underlying bedrock. Excavations of up to 6.3m bgl will be required to reach the finished floor level (FFL) of the Digestion Tanks (53, 54, 55), Digestate Storage Tanks (56, 63), Reception Hall (51), west of 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 (53, 54, 55), Digestate Storage Tanks (56, 63), will all have a FFL of 96.5m. Foundations and hard core will be a further ca. 0.7m below the FFL. These structures are planned for the east and northeast of the site where the currently ground level is nearer the proposed ground level. Maximum excavations of 4m bgl at the attenuation pond to the northeast are required to achieve the desired ground level.

In the absence of mitigation, predicted effects will have ***negative, significant, long-term effect*** on hydrogeology.

Access Road and Gas Pipeline

During the initial stages of the construction phase, enabling works will consist of stripping and stockpiling of topsoil and subsoil at the proposed compound area, as outlined above.

An access road will be constructed to facilitate the connection of the Proposed Development to the surrounding road network. This connection will be constructed at the site entrance, located at the southwest which will join Scrouty Road located to ca. 500m south of the site. See **Figure 8.10 and 8.11**.

Figure 8.10: Proposed route of the facility access road

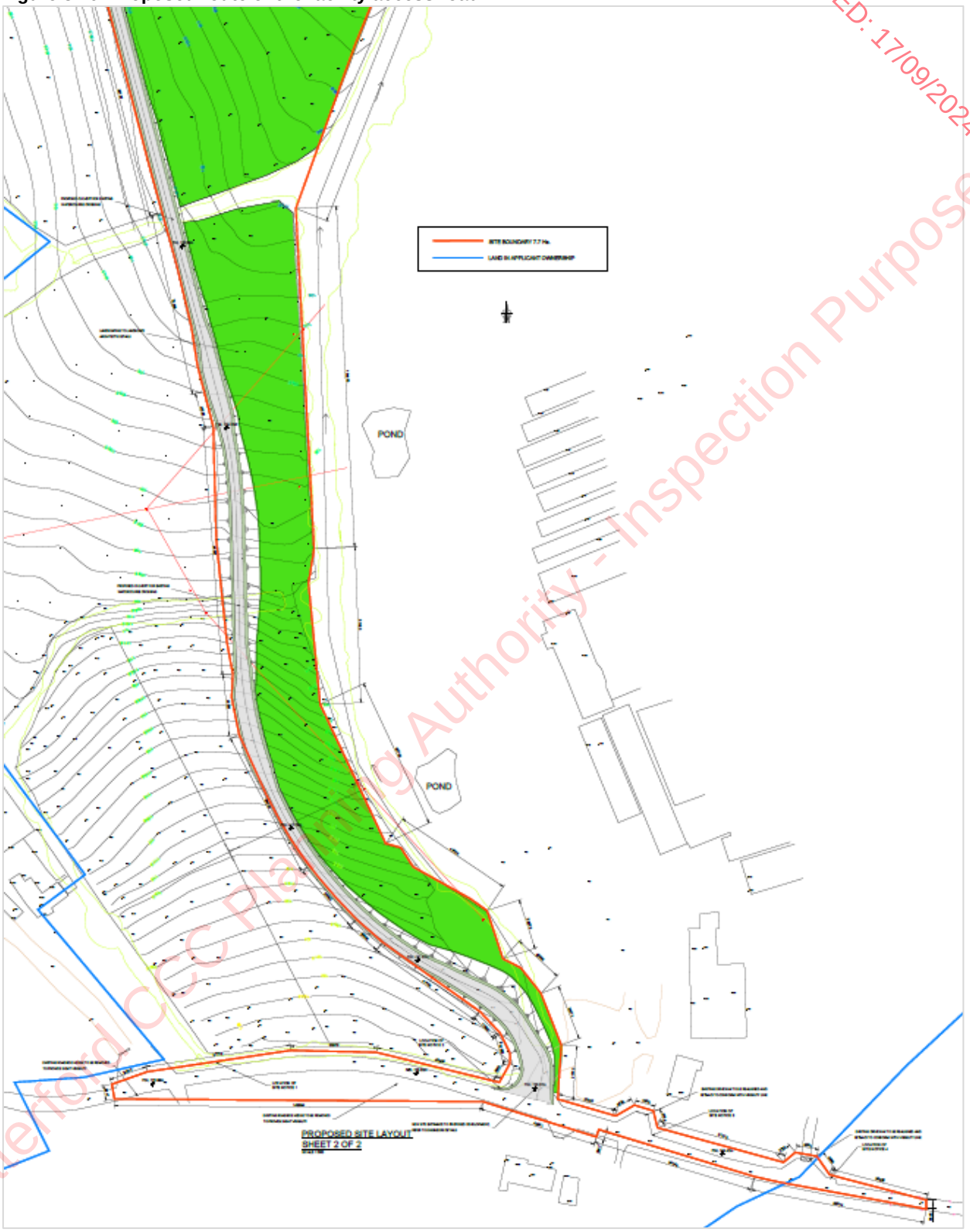
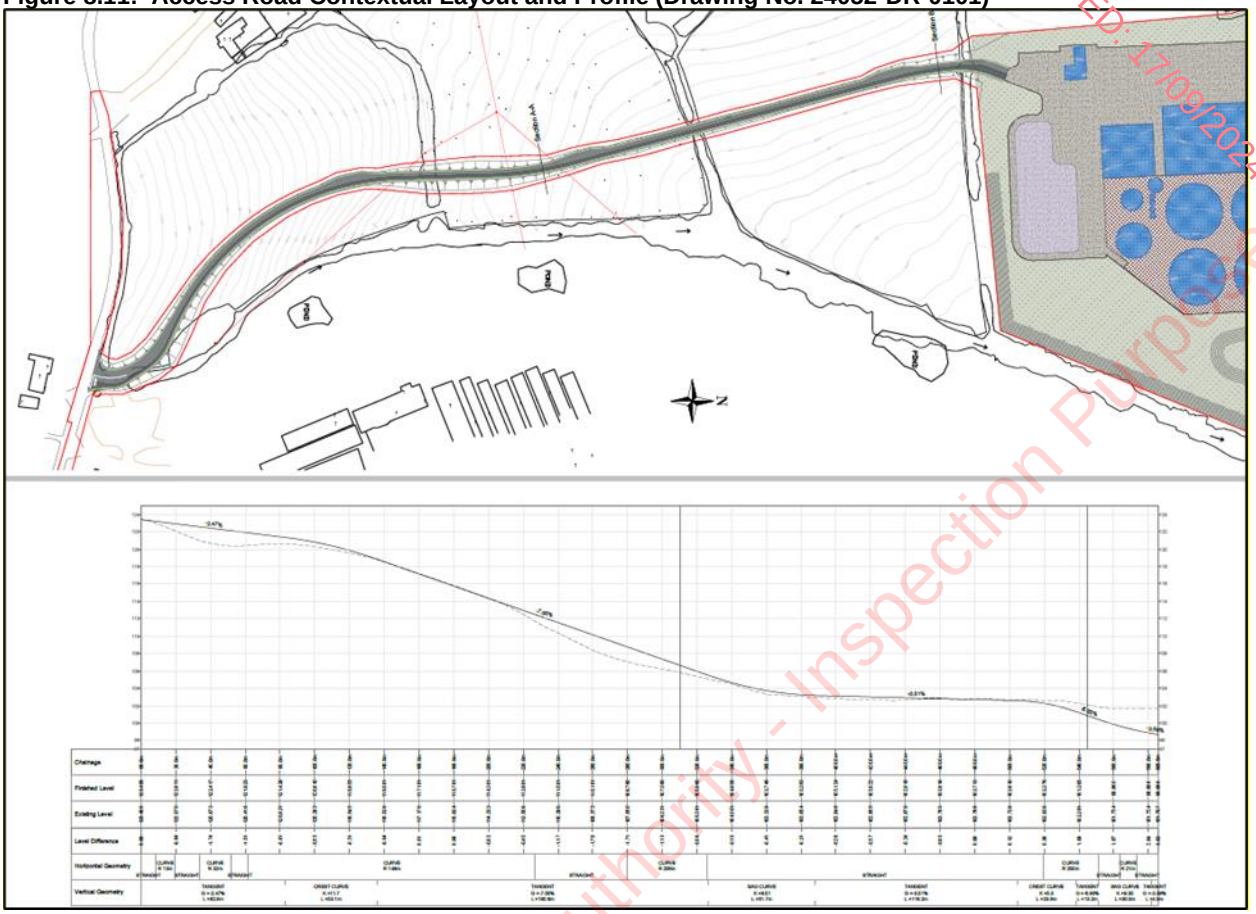


Figure 8.11: Access Road Contextual Layout and Profile (Drawing No. 24052-DR-0101)



The proposed gas pipeline connecting to the existing Gas Networks Ireland pipeline along the R680 will be installed underneath the new facility access road, the Scrouty Road and the L4031 local road. This is an indicative routing of the pipeline to the site and is subject to change pending detailed network modelling and design. The final pipeline will be designed, consented and delivered by Gas Networks Ireland in accordance with the following standard: *I.S. 328 2021 Gas transmission — Pipelines and pipeline installations*.

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 removal of soil/subsoil cover during the construction phase would have a **negative, significant, long-term effect** on groundwater vulnerability at the Proposed Development site.

Excavation of Contaminated Soils

The excavation and construction activities will cause quantities of excavated materials to be reused on site or removed from site for disposal or recovery. The site is a greenfield site and

historical mapping does not suggest any incidences of land use which might result in the contamination of soils. Furthermore, a geotechnical site investigation conducted at the site in December 2023 did not detect any evidence of contaminated soils. It is not anticipated contaminated soils will be encountered during construction activities hence no adverse effects on the groundwater or surface water quality are expected as a result of contaminated soils.

The Outline Construction Environmental Management Plan (**Document Ref: 231924-ORS-XX-XX-RP-EN-13d-010**) will include a set of procedures to be implemented in the incidence of contaminated soils encountered nonetheless despite ***negligible impact or lack of significance*** to hydrogeology and hydrology

Conversion of Permeable Soils to Hard standing

The construction phase will involve the gradual conversion of the existing greenfield site to areas of hardstanding. Under this scenario, the risk of flooding within the receiving catchment will increase due to an increase in impervious land area and associated drainage systems, which leads to a large increase in volume and intensity of surface water run-off within a given catchment. The encroachment of urban development onto existing flood plains can lead to a reduction in flood storage capacity, with a resultant increase in flood risk both upstream and downstream.

The increase in impervious area means that a greater proportion of the incident rainfall will appear in the drainage system as surface run-off. The provision of sealed pipes to convey run-off from the site to existing watercourse will result in larger (concentrated) volumes being discharged at point locations within a shorter duration, thereby increasing flood risks.

In the absence of mitigation, the predicted effects of the Proposed Development resulting in an increase of flood risk to the receiving catchment are ***negative, significant and long-term.***

Table 8.18 – Construction Phase Effects (Unmitigated)

Receptor	Potential Environmental Effects	Quality	Significance	Duration
Groundwater Comeragh Groundwater Body	Excavations Increasing Groundwater Vulnerability	**Negative**	**Moderate**	**Temporary**
	Accidental Spillages of Harmful Substances	**Negative**	**Moderate**	**Temporary**
	Increased Groundwater Vulnerability	**Negative**	**Significant**	**Long-Term**
	Excavation of Bedrock Aquifer	**Negative**	**Significant**	**Long-Term**
	Excavation of Contaminated Soils	**Unlikely**	**Negligible Impact**	**Unlikely**
Surface Water Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny	Increased Run-off and Sediment Loading	**Negative**	**Moderate**	**Temporary**
	Accidental Spillages of Harmful Substances	**Negative**	**Moderate**	**Temporary**
	Excavation of Contaminated Soils	**Unlikely**	**Negligible Impact**	**Unlikely**
	Conversion of Permeable Soils to Hard standing	**Negative**	**Moderate**	**Temporary**

Marshes pNHA.				

8.5.4 Sources - Operational Phase

Potential operational phase effects are considered in detail below and summarised in **Table 8.20.**

Contaminated Run-off

Run-off from impermeable areas within the Proposed Development site such as roads and car parking areas are likely to contain potentially polluting substances such as hydrocarbons, heavy metals and sodium chloride arising from de-icing of these surfaces during winter months.

Discharge of stormwater from the Proposed Development is to the attenuation pond located at the northeast corner of the site which will discharge to the Tinhalla stream adjacent to the eastern site boundary.

There will be no discharge of process (trade effluent) water from the Proposed Development. The digestate treatment process will recover ca. 53,000 tonnes of clean water which will be reused on site for cleaning, with the remaining volume returned to the process as a feeding liquid.

In the absence of suitable design & mitigation measures, there would be a ***negative, moderate to significant, temporary effects*** on the water quality of the Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA

Foul Water

A domestic scale wastewater treatment plan is proposed to cater for the foul water arising from staff facilities on-site only (Population Equivalent 'PE' of 2). The accompanying site suitability assessment has concluded that the soils at the site have sufficient absorption capacity for the installation of a percolation area suited for this PE.

The inherent risk associated with wastewater treatment systems is leakage of untreated foul water. This situation can arise from poor construction methods, inadequate maintenance and failure to scale the system to an appropriate projected population equivalent.

During incidences of leakage foul water would likely follow preferential pathways created by permeated backfill and infiltrate into the site drainage system ultimately impacting both surface water and groundwater receptors. Adverse effects associated with foul water leakages consist of contamination relating to the of the following:

- Pathogens, (E. Coli etc.)
- Elevated levels of ammonia and nitrate
- Elevated levels of phosphorus

In the absence of suitable design and mitigation measures, such leakages could lead to eutrophication within the Tinhalla stream and possibly the River Suir and to the Comeragh Groundwater Body leading to degradation of water quality with negative consequences for

aquatic life. Overall, the predicted effects of foul water leakage on hydrological and hydrogeological receptors are ***negative, moderate to significant and short-term.***

On-Site Flooding

A flood event occurring on the Proposed Development would cause the Sustainable Urban Drainage Infrastructure (SuDS) to become overwhelmed, creating additional pathways for potential contaminants to migrate off-site into downstream receptors along with elevated flow rates.

The Proposed Development is not located in a Flood Zone, according to the OPW and the likelihood of flooding occurring on the site are unlikely. Please refer to Site Specific Flood Risk Assessment (Document Ref: **231926-ORS-XX-XX-RP-EN-13d-011**) which accompanies the application.

Overall, ***in the absence of suitable design and mitigation measures*** the predicted effects of the occurrence a flood event on hydrological receptors is ***negligible, not significant,*** and **unlikely** to hydrogeology and hydrology***.***

Conversion of Permeable Soils to Hard standing

The operational phase will see a significant portion of the existing greenfield site converted to areas of hardstanding. Under this scenario, the risk of flooding within the receiving catchment will increase due to an increase in impervious land area and associated drainage systems, which leads to an increase in volume and intensity of surface water run-off within a given catchment.

The increase in impervious area means that a greater proportion of the incident rainfall will appear in the drainage system as surface run-off. The provision of sealed pipes to convey run-off from the Proposed Development to existing watercourse will result in larger (concentrated) volumes being discharged at point locations within a shorter duration, thereby increasing flood risks.

In the absence of mitigation, the predicted effects of the Proposed Development resulting in an increase of flood risk to the receiving catchment are ***negative, significant, and long-term.***

Uncontrolled Releases and Spillages

During the operational phase, there is a possibility of leakage or spillage of biobased fertiliser or feedstocks via vehicle movements or from a failure of a tank or feed line. While such substances are significantly less hazardous than fuels, oils, chemicals, and cement material, the still pose a potential risk to surface and groundwater quality. Biobased fertiliser or animal slurries in high quantities can have a deleterious effect on water quality and aquatic life should any become entrained in the receiving water environment.

Uncontrolled releases of biobased fertiliser, feedstock, hydrocarbons, chemicals or cement, ***in the absence of mitigation measures***, would result in ***negative, slight to moderate, temporary effects*** on the water quality of the Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA.

Fire and Resultant Firewater

Appropriate storage facilities will be provided for combustible and flammable materials (i.e. fuel) required for the operation of the Proposed Development.

In the event of a fire, significant quantities of water resources will be utilised to quench the fire. Water used to quench a fire is known as “firewater”. Firewater is known to contain the following harmful substances:

- Products of combustion
- Extinguishing foam / fluid
- Hazardous substances (fuels, oils & chemicals)

Due to the presence of these hazardous substances, firewater poses a significant risk to surface and groundwater quality.

Uncontrolled releases of firewater ***in the absence of mitigation measures*** would result in ***negative, significant, temporary effects*** on the water quality of the Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA

Uncontrolled Release of Discharge

The Proposed Development includes digestate treatment using separation, ultrafiltration, and reverse osmosis to recover the water content within the digestate.

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 Proposed Development, ca. 53,500 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. 28,500 tonnes per annum, in the hydraulic loading of land spreading locally

The digestate treatment process involves the following stages:

- Screwpress Separation
- Ultrafiltration
- Reverse Osmosis

The Reverse Osmosis (RO) system will maintain a steady maximum outflow volume of $10m^3$ per hour. Following the RO stage, the purified water generated by the process will be stored in a balance tank before being reused onsite for cleaning activities and returned to the process as a feeding liquid. No process water will be discharged off-site.

Uncontrolled releases of discharge ***in the absence of mitigation measures*** would result in ***negative, significant, temporary effects*** on the water quality of the Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA.

Landspreading of Biobased Fertiliser

The biobased fertiliser produced will be a rich source of nutrients that will be used by customer farmers for the fertilisation of their land. In the worst-case scenario and in absence of mitigation, any inappropriate land-spreading of the biobased fertiliser could lead to impacts upon the receiving waters in local catchments and it can result in eutrophication, algal blooms, fish kills and loss of biodiversity. Designated habitats and species can be impacted upon. There is a greater risk when groundwater vulnerability at the lands for spreading is high, or when land-spreading is undertaken close to drains or streams. In these situations, the Pollution Impact Potential for both phosphates and / or nitrates is high.

The farms of the customer farmers have been identified; however, these will be subject to local change on an annual basis. All farmers will use the biobased fertiliser on lands that have an agronomic requirement for fertiliser. Spreading will be done in accordance with the specific Nutrient Management Plan for the farm and in accordance with S.I. 113 of 2022. Records for the movement of all biobased fertiliser will be kept.

Inappropriate land spreading ***in the absence of mitigation measures*** would result in ***negative, significant, temporary effects*** on the water quality of the Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA

The positive benefits of using the biobased fertiliser produced must also be considered, as this provides an alternative to the land-spreading of liquid slurry. Using biobased fertiliser presents several scientific advantages over the continued use of untreated manures, slurries, or chemical fertilisers, particularly concerning plant nutrient availability and the mitigation of nutrient leaching into watercourses. The benefits are outlined below.

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 biobased fertiliser supports comprehensive plant nutrition, contributing to improved crop yields and overall plant health (Möller and Müller, 2012)[4].

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 biobased fertiliser reduces the risk of nutrient loss and enhances nutrient uptake efficiency by plants (Yao et al., 2011)[5]. Analysis has shown that approximately 80% of the total nitrogen in biobased fertiliser is present as readily available nitrogen. Digestion of livestock slurry has also been shown to increase the plant availability of

[4] Möller, K., & Müller, T. (2012). Effects of anaerobic digestion on biobased fertiliser nutrient availability and crop growth: a review. Engineering in Life Sciences, 12(3), 242-257.
[5] Yao, R., Li, G., Xie, H., Zhao, B., & Liu, H. (2011). *Release characteristics of nutrients from aerobic composted swine manure in soil. Journal of Soils and Sediments*, 11(1), 103-111.

nitrogen in slurry by *ca*. 10%.

Compared to untreated manures and slurries, biobased fertiliser poses a lower risk of nutrient leaching into watercourses. The balanced nutrient composition and slow-release nature of biobased fertiliser minimise the likelihood of excess nutrients washing away into streams or groundwater. This reduction in nutrient leaching coupled with land spreading best practice helps mitigate water pollution and eutrophication, safeguarding aquatic ecosystems and maintaining water quality (Möller and Müller, 2012).

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).[6]

Biobased Fertiliser Usage

At full capacity the total tonnages for transportation off-site as biobased fertiliser to local agricultural operators are summarised below:

- Biobased fertiliser Fibre - 8,000 tonnes
- Biobased fertiliser Liquid Concentrate - 17,000 tonnes

Of the maximum 90,000 tonnes of annual feedstock intake, circa 42,000 tonnes of untreated manures and slurries would normally be land spread locally. Following the AD, pasteurisation, and biobased fertiliser treatment there will be 8,600 tonnes of solid and 17,000 tonnes of liquid biobased fertiliser. This represents a significant reduction in the hydraulic loading of land spreading locally of circa 16,000 tonnes per annum.

Post-pasteurisation the biobased fertiliser will meet the standard of an EU fertilising product under Regulation (EC) No 2019/1009 under the criteria outlined for Product Function Category (PFC) 3 B: Inorganic Soil Improver. The operator will apply for End of Waste status upon grant of permission.

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 on accordance with the specific Nutrient Management Plan for that farm.

Attenuation Pond

The Proposed Development includes an attenuation pond to the northeast of the site which will be used for attenuating surface water run-off from roads, yards, roofs and the impermeable bunded area. Excavation of the pond to the northeast risks exposing the underlying bedrock and reduces the overburden between the development and underlying locally important bedrock aquifer.

The construction of the attenuation pond ***in the absence of mitigation measures*** is foreseen

[6] De Vries, J. W., Groenestein, C. M., & Kool, P. L. (2015). *Effects of anaerobic digestion and composting on reducing the environmental impact of pig manure*. Journal of Environmental Management, 162, 230-237.

to have a **negative-neutral, moderate,** and **permanent effect.**

Table 8.20 Operational Phase Effects (Unmitigated)

Receptor	Potential Environmental Effects	Quality	Significance	Duration
Groundwater Comeragh Groundwater Body	Attenuation Ponds	**Negative/ Neutral**	**Moderate**	**Permanent**
Surface Water Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA.	Contaminated runoff	**Negative**	**Moderate/ Significant**	**Temporary**
	Conversion of permeable Soils to Hardstanding	**Negative**	**Moderate/ Significant**	**Temporary**
	Uncontrolled Releases and Spillages	**Negative**	**Slight/ Moderate**	**Temporary**
	Fire and Resultant Firewater	**Negative**	**Significant**	**Temporary**
	Uncontrolled Release of Discharge	**Negative**	**Significant**	**Temporary**
	Contaminated Runoff	**Negative**	**Moderate**	**Temporary**
Both	Foul Water	**Negative**	**Moderate/ Significant**	**Short-term**
	On-site Flooding	**Negligible**	**Not Significant**	**Unlikely**

8.6 Mitigation Measures

Mitigation measures proposed in this section relate primarily to the preservation of the existing subterranean drainage regime, the protection of groundwater receptors and the protection of surface water receptors.

Mitigation Measures proposed in this section are in response to the risks identified in **Section 8.5.**

8.6.1 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 effects on surface water and groundwater.

Increased Run-off and Sediment Loading

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. The below recommendations are advised with reference to the Eastern Regional Fisheries Board recommendations for protection of adjacent water courses during the construction phase:

- 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 oil interceptors and settlement ponds to remove contaminants from run-off, prior to surface water discharge off-site.
- Stockpile areas for sands and gravel should be kept to minimum size, well away from storm water drains and gullies leading off-site.
- Covers are to be provided over soil stockpiles when high wind and inclement weather are encountered if required.

Accidental Spillages of Harmful Substances

The following measures will minimise the risk of a release of fuels, oils, chemicals or cement products at the site:

- Establishment of bunded oil and chemical storage areas.
- Refuelling of mobile plant in designated areas provided with spill protection.
- Fuel bowsers to be located in bunded areas which can cater for 110% of the primary vessel capacity or 25% of the total volume of the substance which could be stored withing the bunded area.
- Only appropriately trained site operatives permitted to refuel plant and machinery on-site.
- Regular inspections carried out on plant and machinery for leaks and general condition.
- Emergency response plan.
- Spill kits readily available throughout the site.
- Use of ready-mixed supply of wet cement products.
- Scheduling cement pours for dry days.

Increased Groundwater Vulnerability / Excavation of Bedrock Aquifer

The site has been assigned a moderate vulnerability rating at the western portion of the site, a high vulnerability rating at the centre of the site and an extreme vulnerability rating to the northeast/ east of the site.

An excavation depth of 6.3 mbgl would increase the vulnerability in particular areas of the Proposed Development from 'high' to 'extreme'. Mitigation measures to ensure maximum protection of groundwater include:

- Excavations to be backfilled as soon as possible to prevent any infiltration of contaminants to the subsurface and the aquifer.
- Landscaping to take place as soon as possible to reduce weathering.
- Further trial pits are recommended pre-construction to determine soil depth to the east/northeast of the Proposed Development.
- Installation of impermeable liners is recommended under the attenuation ponds.

Excavation of Contaminated Soils

It is not anticipated contaminated soils will be encountered during construction activities hence no adverse effects on the groundwater or surface water quality are expected as a result of contaminated soils.

- Procedure in place for incidence of contaminated land within CEMP

- Contaminated soils encountered to be tested, quantified, segregated and transported for disposal by a licenced contractor

Conversion of Permeable Soils to Hard standing

The construction phase will involve the gradual conversion of the existing greenfield site to areas of hardstanding.

The following measures will be implemented in the construction phase to minimise an increase of flood risk to the receiving catchment:

- The rate of discharge to the stream will be restricted to a maximum permissible rate of 17.8 lit/sec. This rate is calculated in accordance with criteria defined in the Greater Dublin Strategic Drainage Study ['GDSDS'] to ensure the proposed development will not affect the flow / flood regimes in the receiving environment
- Floor levels upstream of the storage areas are at least 500mm above the top water level in the detention basins for the 100-year event.
- Overtopping does not occur during rainfall events ranging from 30 minutes to 1440 minutes. No risk of flooding of adjacent areas.
- Attenuation Pond will accommodate the total catchment area capacity and will provide a minimum storage capacity of 1151.8 m3 (designed to accommodate the estimated rainfall events)

In-Stream Works (Culverted Drain)

There are two existing small watercourses that require culverts under the access road to allow surface water to maintain its natural drainage course. Please refer to Drawing Ref: **24052-DR-0502** for the locations of the culverts. Culverts are to be sized and designed with final construction documents.

In stream works should adhere to Inland Fisheries Ireland, Guidance Document entitled: "*Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (2016)*" Contact should be made with IFI at the earliest possible stage regarding the installation of the culverts.

8.6.2 Operational Phase

General Mitigation Measures

An Environmental Management System (EMS) will be prepared and implemented by the operator 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 Development 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:

- Site specific trigger levels will be established and agreed with the EPA.
- 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

Contaminated Run-off

Compared to untreated manures and slurries, biobased fertiliser poses a lower risk of nutrient leaching into watercourses. The balanced nutrient composition and slow-release nature of biobased fertiliser minimise the likelihood of excess nutrients washing away into streams or groundwater. This reduction in nutrient leaching coupled with land spreading best practice helps mitigate water pollution and eutrophication, safeguarding aquatic ecosystems and maintaining water quality.

The $Qbar_{rural}$ calculations are outlined in the Civil Engineering report which accompanies this application.

The rate of discharge to the stream will be restricted to a maximum permissible rate of 17.8 lit/sec. This rate is calculated in accordance with criteria defined in the Greater Dublin Strategic Drainage Study ['GDSDS'] to ensure the proposed development will not affect the flow / flood regimes in the receiving environment.

It is proposed to take run-off from the roads, yards, roof and the impermeable bunded area and discharge these areas through sumps in gullies, silt manholes, filter drains, drainage systems and an attenuation pond. The system is designed to accommodate the 1:100-year rainfall event plus normal design parameter of +20% based on a combination of duration and volume.

Design criteria adopted for the development include:

- Drainage systems will be designed to attenuate excess surface water runoff with suitable storage volumes
- Reduction of outflow rate to below the existing greenfield runoff rate before discharging into the Tinhalla stream from attenuation pond.
- Sumps in gullies and manholes collect silts in run-off from roads
- Where feasible, run-off will discharge to filter drains. The filter material will treat run-off before its entry to pipes
- Class 1 discharge bypass separator treats surface water for hydrocarbons run-off before its discharge to the attenuation pond
- All surface water run-off will discharge to the attenuation pond. The floor of the basin will be shaped to allow for the retention of silts in the pond.
- Regular inspection and maintenance of all treatment measures to remove accumulated silts and disposed of to an appropriately licenced landfill
- The digestion process area will be completely bunded and constructed to Eurocode standard (BS EN 1992-3)

A model for the surface water drainage system was designed using AutoDesk Infodrainage. Details of this model are provided in **Technical Note Ref: 24052-TN-SUDS**. The results of design calculations for the critical 1% AEP rainfall events are provided in **Technical Note Ref: 24052-TN-SUDS.**

Foul Water

A domestic scale wastewater treatment plant (EuroTank BAF P6 EN12566/3 SR66 Certified Secondary Wastewater Treatment system with Tertiary Treatment via EuroTank TER3 P6 Packaged Tertiary Treatment unit on infiltration area of min 60m^2) is proposed to cater for the foul water arising from staff facilities on-site only (Population Equivalent 'PE' of 2). A Site Suitability Assessment conducted by *Bolger-Hynes Architectural Design* in line with the EPA Code of Practice for onsite domestic wastewater treatment systems (2022) has concluded that the soils at the Proposed Development have sufficient absorption capacity for the installation of a percolation area suited for this PE.

Based on the design population for the proposed 10 workers, the population equivalent (PE) for the Proposed Development is calculated at PE2. The volume of foul water generated from the Proposed Development was calculated at 30 litres/day. The proposed treatment system will produce an effluent with a standard compliant with SR66 the percolation area be designed on the hydraulic loading of 6 PE.

The overburden consisting of grey CLAY/ SILT is determined to be 'suitable for percolation purposes' and available to support Groundwater Protection Responses (GWPR). The wastewater treatment plant will comprise a secondary treatment system, followed by a soil polishing filter. The trenches will be dug 500mm wide and will achieve a minimum separation distance between the trenches of 2m spacing (2.5m centre to centre) and to a depth of 850mm.

The treatment plant will be specified and installed by an appropriately qualified technician and will be subject to regular desludging and maintenance, subject to manufacturers recommendations.

Increased Groundwater Vulnerability

The proposed Finished Floor Levels (FFL's) will be up to 6.3m below the existing elevation of the site in certain places, increasing the vulnerability of the underlying locally important aquifer from 'High' to 'Extreme'. Mitigation measures to ensure maximum protection of groundwater include

- The site bunding is designed in accordance with IPC Guidance Note on storage and Transfer of Materials for Scheduled Activities (EPA, 2004)
- The tank farm area will be bunded in its entirety to ensure enough containment is provided in the unlikely event of a leak.
- The bund will be impermeable and provide the required storage volume i.e., a minimum of 110% of the largest single tank volume.
- 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 operating plan to include site specific standard operating procedures pertaining to waste management and emergency response.
- All bunds and pipelines (foul & process) will be subject to integrity assessments every 3 years by a suitably qualified engineer.

On-Site Flooding

The existing flood risk to the Proposed Development is negligible with the proposed site located in 'Flood Zone C'. No specific mitigation measures to alleviate flood risk to the site are recommended.

The proposed stormwater management system is designed in accordance with industry standards and is projected to emulate the current greenfield runoff rates calculated at the site.

Increase in Flood Risk to Receiving Catchment

Drainage systems will be designed to attenuate excess surface water runoff with suitable attenuation volumes for the site and reduce the outflow rate to below the estimated greenfield rate before discharging.

- An attenuation pond is provided to facilitate the existing gradients on the site. The attenuation pond is designed for a 1:100-year event and well as to regulate the outflow from the site.
- The attenuation pond will accommodate the total catchment area capacity and will provide a minimum storage capacity of 1,151.8m^3.

The attenuation pond will discharge the storm water and a flow control valve at the outfall from the basin will deliver a max flow less than that of greenfield run off of 17.8l/s.

Uncontrolled Releases and Spillage

An Environmental Management System (EMS) will be implemented and accredited to ISO: 4001:2015. The Proposed Development 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. Conditions of relevance to uncontrolled releases will include:

- 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 or 25% of the total volume of the substance which could be stored withing the bunded area (in compliance with Guidance to storage and Transfer of Materials for Scheduled Activities, EPA 2004)
- EMS to include site specific standard operating procedures pertaining to waste management and emergency response.
- Impermeable membrane liner will be installed under the attenuation pond to limit percolation of contents into the underlying regionally important karst aquifer.
- The entire tank farm area of the Proposed Development will be bunded.
- The Reception Hall, Digestate Storage building and Nutrient Recovery Building will each be self-bunded.
- All bunds and underground pipelines (foul and process) will be subject to integrity assessments every 3 years by a suitably qualified engineer.
- Ongoing monitoring of stormwater discharge to the Tinhalla stream.

Fire and Resultant Firewater

The Proposed Development 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.

The conclusions and recommendations of the Firewater Risk Assessment Report will ensure that fire response and firewater retention are adequately scaled for the size of the facility. The operator of the facility will be obliged to ensure:

- Adequate firewater retention capacity is installed and maintained on-site in the event of a worst-case scenario fire event.
- Firewater retention will be the containment bund and underground tank in the reception building.
- All retention infrastructure systems will be automatically activated in the event of a fire alarm being triggered.
- All retention tanks, etc., shall be maintained empty, or at least to a point where the required retention capacity is available.
- Bunds and tanks will be constructed to Eurocode standard (BS EN 1992-3:2006).

8.7 Cumulative Effects

8.7.1 Interactions

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

Hydrology and Hydrogeology is linked with Land, Soils and Geology as discussed in **Chapter 7** of this EIAR. In terms of hydrogeology specifically, the recharge capacity at the Proposed Development will be diminished as a function of surface sealing, which has the potential to adversely enhance flood events downstream of the Proposed Development. This is addressed in the above sections in regard to flood risk assessment and mitigation i.e. attenuation and SUDs.

Hydrology is linked with Biodiversity as discussed in **Chapter 5**. With the successful implementation of adequate mitigation measures potential hazards will be managed and the likelihood of environmental incidents occurring is very low. Any potential impacts are therefore resolved or minimised.

8.7.2 Potential Cumulative Impacts

Construction Phase

The phasing/commencement of any other future permitted developments in the locality could potentially result in the scenario where a number of other construction sites are in operation at the same time as the Proposed Development. Considering the mitigation measures outlined in this report and the expected residual effect pending successful implementation of those measures, the development is not considered to significantly contribute to cumulative adverse impacts to the associated hydrological network.

Operational Phase

In the absence of mitigation measures, surface sealing (paving, buildings on previously exposed ground), reduction in recharge to groundwater, and rapid transmission of runoff to surface water systems has the potential to significantly contribute to the cumulative / catchment hydrological response to rainfall.

Considering the mitigation measures outlined in this report and the expected residual effect pending successful implementation of those measures, the development is not considered to significantly contribute to cumulative adverse impacts to the associated hydrological network.

8.8 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 hydrological and hydrogeological features.

The purpose of this assessment is to specify mitigation measures where appropriate to minimise the 'risk factor' to all aspects of the water environment such as to minimize the potential for hydrocarbons to contaminate the streams or groundwater, reduce the risk of erosion and 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.

8.8.1 Construction Phase

A summary of the predicted effects associated with the construction phase in terms of quality, significance, and duration, along with the proposed mitigation measures and resulting residual effects are summarised in **Table 8.21**.

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

8.8.2 Operational Phase

A summary of the predicted effects associated with the operational phase in terms of quality, significance, and duration, along with the proposed mitigation measures and resulting residual effects are summarised in **Table 8.22.**

The overall impact anticipated during the operational phase of the project following the implementation of suitable mitigation measures is considered to be ***neutral***, ***slight***, and ***short-term*** to ***long-term***. There are no uncontrolled emissions anticipated as a result of the Proposed Development.

Table 8.21: Summary of predicted construction phase effects, mitigation measures and residual impact

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
Increased Run-off and Sediment Loading	**Surface Water** Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA	Erosion of stockpiles of exposed soils leading to migration of silt into surface water receptors via dust and run-off	***Negative***	***Moderate***	***Temporary***	• A temporary drainage system will be established complete with oil interceptors and settlement ponds to remove contaminants from run-off, prior to discharge off-site. • Stockpile areas for sands and gravel should be kept to minimum size, well away from storm water drains and gullies leading off-site. • Covers are to be provided over soil stockpiles when high wind and inclement weather are encountered if required.	***Neutral, Slight, Temporary***
	Groundwater Comeragh Groundwater Body Locally Important Aquifer	Loose sediments becoming entrained in open excavations and infiltrating downwards into aquifer	***Negative***	***Moderate***	***Temporary***	• Excavations to be backfilled as soon as possible to prevent any infiltration of contaminants to the subsurface and the aquifer. • Landscaping to take place as soon as possible to reduce weathering.	***Neutral, Slight, Temporary***
Accidental Spillages of Harmful Substances	**Surface Water** Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA	Spillage of contaminants such as fuels, oils, chemicals and cement material and subsequent migration into surface water receptors	***Negative***	***Moderate***	***Temporary***	• 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 oil interceptors and settlement ponds to remove contaminants from run-off, prior to discharge off-site. • Stockpile areas for sands and gravel should be kept to minimum size, well away from storm water drains and gullies leading off-site. • Covers are to be provided over soil stockpiles when high wind and inclement weather are encountered if required.	***Negative, Slight, Temporary***
	Groundwater Comeragh Groundwater Body Locally Important Aquifer	Spillage of contaminants becoming entrained in open excavations and infiltrating downwards into aquifer	***Negative***	***Moderate***	***Temporary***		***Neutral, Slight, Temporary***
Increased Groundwater Vulnerability	**Groundwater** Comeragh Groundwater	An excavation depth of 6.3m bgl would increase the vulnerability in particular areas	***Negative***	***Significant***	***Long-Term***	• Trial pits to confirm a minimum of 1m depth of subsoil exists at the siting of the built structures and ponds required, specifically to the northeast/	***Negative, Slight, Temporary***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
	Body Locally Important Aquifer	in the west of the site from 'high' to 'extreme'				east of the site where the vulnerability rating is classed as "R3[1] –Not generally acceptable, unless a consistent minimum thickness of 1 m of soil and subsoil can be demonstrated."	
Excavation of Bedrock Aquifer	**Groundwater** Comeragh Groundwater Body Locally Important Aquifer	Potential removal of bedrock in certain parts of the site to create a uniform base.	***Negative***	***Significant***	***Long-Term***	• The entire tank farm area of the Proposed Development will be underlain by an impermeable surface. • Attenuation ponds to be underlain by an impermeable layer. • Excavations to be backfilled as soon as possible to prevent any infiltration of contaminants to the subsurface and the aquifer. • Landscaping to take place as soon as possible to reduce weathering.	***Negative, Slight, Temporary***
Excavation of Contaminated Soils	**Surface Water** Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA	The existing site consists of open pastures. At no point in the site's history there was any development present, hence excavation of contaminated soils is unlikely.	***Unlikely***	***Negligible Impact***	***Unlikely***	• Greenfield site with no previous industrial activities noted at the Proposed Development meaning incidences of contaminated land unlikely • Site investigations expected to reinforce this assumption • Procedure in place for incidence of contaminated land within CEMP • Contaminated soils encountered to be tested, quantified, segregated and transported for disposal by a licenced contractor	***Unlikely, Negligible, Unlikely***
	Groundwater Comeragh Groundwater Body Locally Important Aquifer		***Unlikely***	***Negligible Impact***	***Unlikely***		***Unlikely, Negligible, Unlikely***
Conversion of Permeable Soils to Hard standing	**Surface Water** Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA	The construction phase will involve the gradual conversion of the existing greenfield site to areas of hardstanding. Under this scenario, the risk of flooding within the receiving catchment will increase due to an increase in impervious land area and associated drainage systems, which leads to a large increase in volume and	***Negative***	***Moderate***	***Temporary***	• The rate of discharge to the stream will be restricted to a maximum permissible rate of 17.8 lit/sec. This rate is calculated in accordance with criteria defined in the Greater Dublin Strategic Drainage Study ['GDSDS'] to ensure the proposed development will not affect the flow / flood regimes in the receiving environment • Floor levels upstream of the storage areas are at least 500mm above the top water level in the detention basins for the 100-year event.	***Negative, Slight, Temporary***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
		intensity of surface water run-off within a given catchment.				• Overtopping does not occur during rainfall events ranging from 30 minutes to 1440 minutes. No risk of flooding of adjacent areas. • Attenuation Pond will accommodate the total catchment area capacity and will provide a minimum storage capacity of 1151.8 m3 (designed to accommodate the estimated rainfall events)	
In-Stream Works (Culverted Drain)	**Surface Water** Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA	Construction works have the potential to significantly impact both in the short and long term on fisheries resources if they are not carried out in an environmentally sensitive manner.	***Negative***	***Moderate***	***Long-term***	• In stream works should adhere to Inland Fisheries Ireland, Guidance Document entitled: "Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (2016)" Contact should be made with IFI at the earliest possible stage regarding the installation of the culverts. • The culverts will be designed and executed in an environmentally sensitive manner.	***Negative, Slight, Temporary***

Table 8.22: Summary of predicted operational phase effects, mitigation measures and residual impact

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
Contaminated Run-off	**Surface Water** Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA	Run-off from impermeable areas within the Proposed Development discharging into surface water bodies	***Negative***	***Moderate to Significant***	***Temporary***	• Compared to untreated manures and slurries, biobased fertiliser poses a lower risk of nutrient leaching into watercourses. The balanced nutrient composition and slow-release nature of biobased fertiliser minimise the likelihood of excess nutrients washing away into streams or groundwater. This reduction in nutrient leaching coupled with land spreading best practice helps mitigate water pollution and eutrophication, safeguarding aquatic ecosystems and maintaining water quality.	***Neutral, Slight, Long-term***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
						• Drainage systems will be designed to attenuate excess surface water runoff with suitable storage volumes • Reduction of outflow rate to below the existing greenfield runoff rate before discharging into the Robe River from attenuation ponds. • 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.	
	Groundwater Comeragh Groundwater Body Locally Important Aquifer	Run-off from impermeable areas within the Proposed Development infiltrating downwards through soils into aquifer.	***Negative***	***Moderate to Significant***	***Temporary***	• The digestion process area will be completely bunded and constructed to Eurocode standard (BS EN 1992-3)	***Neutral, Imperceptible, Long-term***
Foul Water	**Surface Water** Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA	Leakage of untreated foul water and infiltration via preferential pathways to site drainage system and subsequent discharge to surface water receptors	***Negative***	***Moderate to Significant***	***Short-Term***	• All sewage infrastructure to be installed in accordance with the relevant industry standards and pressure tested/CCTV surveyed prior to commissioning to ensure absence of defects • Programme of inspection and maintenance to ensure any defects are repaired	***Negative, Slight, Long-term***
	Groundwater Comeragh Groundwater Body Locally Important Aquifer	Leakage of untreated foul water and infiltration downwards through sediments into aquifer	***Negative***	***Moderate to Significant***	***Short-Term***	• The wastewater treatment system will comprise a EuroTank BAF P6 EN12566/3 SR66 Certified Secondary Wastewater Treatment system with Tertiary Treatment via Eurotank TER3 P6 Packaged Tertiary Treatment unit on infiltration area of min 60m2.The overburden consisting of grey CLAY/ SILT is determined have sufficient absorption capacity to support Groundwater Protection Responses (GWPR). The trenches will be dug 500mm wide and will achieve a minimum separation distance between the	***Negative, Slight, Long-term***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
						trenches of 2m spacing (2.5m centre to centre) and to a depth of 850mm. • The treatment plant will be specified and installed by an appropriately qualified technician and will be subject to regular desludging and maintenance, subject to manufacturers recommendations.	
Increased Groundwater Vulnerability	**Groundwater** Comeragh Groundwater Body Locally Important Aquifer	The proposed Finished Floor Levels (FFL's) will be up to 6.3m below the existing elevation of the site in certain places, increasing the vulnerability to the underlying aquifer from 'High' to 'Extreme'.	***Negative***	***Significant***	***Long-Term***	• The tank farm area will be completely bunded and constructed to Eurocode standard (BS EN 1992-3:2006)	***Negative, Slight, Long-term***
Uncontrolled Releases & Spillage of biobased fertiliser and Feedstocks	**Surface Water** Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA	During the operational phase, there is a possibility of leakage or spillage of biobased fertiliser or feedstocks via vehicle movements or from a catastrophic failure of a tank or feed line. While such substances are significantly less hazardous than fuels, oils, chemicals and cement material, the still pose a potential risk to surface and	***Negative***	***Slight to Moderate***	***Temporary***	• Compared to untreated manures and slurries, fertiliser poses a lower risk of nutrient leaching into watercourses. The balanced nutrient composition and slow-release nature of biobased fertiliser minimise the likelihood of excess nutrients washing away into streams or groundwater. This reduction in nutrient leaching coupled with land spreading best practice helps mitigate water pollution and eutrophication, safeguarding aquatic ecosystems and maintaining water quality.	***Neutral to Negative, Slight, Long-term***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
	Groundwater Comeragh Groundwater Body Locally Important Aquifer	groundwater quality.	***Negative***	***Slight to Moderate***	***Temporary***	• Dedicated hard standing for offloading 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 operating plan to include site specific standard operating procedures pertaining to waste management and emergency response. • There will be no discharge of process water (trade effluent) off-site. • The treatment process will recover ca. 53,000 tonnes of clean water which will be reused on site for cleaning, with the remaining volume returned to the process as a feeding liquid. • Stormwater discharge from the attenuation pond to the Tinahalla stream shall be monitored in accordance with facility licence conditions. • The digestion process area (tank farm) will be completely bunded & constructed to Eurocode standard (BS EN 1992-3:2006) • All bunds and pipelines (foul & process) will be subject to integrity assessments every 3 years by a suitably qualified engineer.	***Neutral to Negative, Slight, Long-term***
Fire and Resultant Firewater	**Surface Water** Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA	Given the presence of flammable substances on the site, there is a risk of fire prevalent at the facility, during the operational phase. In the event of a fire, significant quantities of water resources will be utilised to quench the fire. Water used to quench a fire is known as “firewater”. Firewater is known to contain several harmful substances, as detailed in **Section 7.4.4.**	***Negative***	***Significant***	***Temporary***	• A Firewater Risk Assessment will be undertaken, subject to requirements of the EPA. • Adequate firewater retention capacity is installed and maintained on-site in the event of a worst-case scenario fire event. • All retention infrastructure systems will be automatically activated in the event of a fire alarm being triggered.	***Negative, Slight, Short-Term***
	Groundwater Comeragh Groundwater		***Negative***	***Significant***	***Temporary***		***Negative, Slight, Short-Term***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
	Body Locally Important Aquifer						
On-Site Flooding	**Surface Water** Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA	The Proposed Development is not located within a Flood Zone.	***Unlikely***	***Negligible Impact***	***Unlikely***	• The proposed Finished Floor Levels are above the estimated 1 in 1000-year return period fluvial flood event placing the units within Flood Zone C • The proposed stormwater management system is designed in accordance with industry standards and is projected to emulate the current greenfield runoff rates calculated at the site.	***Unlikely, Negligible, Temporary***
Conversion of Permeable Soils to Hard standing	**Groundwater** Comeragh Groundwater Body Locally Important Aquifer	The operational phase will see large swathes of the existing greenfield site converted to areas of hardstanding. Under this scenario, the risk of flooding within the receiving catchment will increase due to an increase in impervious land area and associated drainage systems, which leads to a large increase in volume and intensity of surface water run-off within a given catchment.	***Negative***	***Significant***	***Long-Term***	• Sustainable Urban Drainage Systems (SuDS) such as such as Sumps in gullies and catchpits collect silts in run-off from roads, filter drains, discharge bypass separator and an attenuation pond. • Drainage systems will be designed to attenuate excess surface water runoff with suitable storage volumes for the Proposed Development and reduce the outflow rate to below the estimated greenfield rate before discharging.	***Neutral, Slight, Long-term***
Land Spreading of biobased fertiliser	**Surface Water** Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny	Application of processed biobased fertiliser to agricultural land. Reduction in chemical fertiliser use, pathogen and diseases which may be contained and spread in untreated manures Discharge of contaminated materials into the attenuation ponds may have the potential to percolate into the underlying	***Positive***	***Slight***	***Long Term***	• Nutrient management plans to avoid excess fertiliser application • Farmers to comply with the Nitrates Action Plan • “Lay-off” period of 21 days for grazing or harvesting following application • Biobased fertiliser will be pasteurised in accordance with Regulation (EU) 142/2011 on use of animal by products as organic fertiliser.	***Positive, Imperceptible, Temporary***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
	Marshes pNHA	aquifer					
Attenuation Pond	**Groundwater** Comeragh Groundwater Body Locally Important Aquifer	Discharge of contaminated materials into the attenuation ponds may have the potential to percolate into the underlying aquifer.	***Negative***	***Moderate***	***Permanent***	• The attenuation pond is designed for a 1:100 year event and well as to regulate the outflow from the site. • 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.	***Neutral, Moderate, Long-term***

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8.9 Monitoring

The Construction Environmental Management Plan (CEMP) and Environmental Operating Plan (EOP) and the Industrial Emissions Licence (IEL) will include provision for the monitoring of construction related activities including the following:

- Water Quality Monitoring of the surface water receptors adjacent to the site boundary – Tinhalla Stream U/S and D/S
- Daily inspections for housekeeping and site cleanliness
- 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 site inspections to ensure procedures outlined within the CEMP are adhered through throughout the Proposed Development.

The site may be subject to inspection by the Environmental Protection Agency (EPA) who will critically assess the site's compliance with Surface Water Regulations (S.I. No. 77/2019)

Monitoring for the Proposed Development will be conducted in line with BAT Waste treatment CID and conditions set out in the proposed EPA licence. Monitoring results will be reported to the EPA annually. The site will be subject to inspection by the Environmental Protection Agency who will critically assess the site's compliance with the conditions of the Industrial Emissions licence (IEL).

8.10 Summary of Significant Effects

The receptors for this assessment are considered to be local surface water receptors named the Tinhalla stream, the River Suir and further downstream receptors Lower River Suir SAC/ pNHA and Tibberaghny Marshes pNHA and a locally Important aquifer beneath the Proposed Development named the Coomeragh Groundwater Body. Whilst the development proposals have the potential to cause detrimental effects to sensitive receptors identified, the recommended mitigation measures will ensure that the risk of potential effects are reduced to negligible.

8.11 Statement of Significance

The significance of impact 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 8.21** and **Table 8.22**.

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

The overall impact anticipated during the operational phase of the project following the implementation of suitable mitigation measures is considered to be ***neutral*** to ***negative***, ***slight***, and ***short-term*** to ***long-term***.