

## 8 Hydrology & Hydrogeology

### 8.1 Introduction

This chapter comprises of 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 & Lead Author:**  
Anna Quaid - B.Sc. (Environmental Science), M.Sc. (Applied Environmental Science),  
Current Role: Environmental Consultant. Experience ca. 4 years.
- **Project Scientist and 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: Senior 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 Development. 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 Mayo 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)
- Western River Basin District River Basin Management Plan (DoEHLG)
- Arterial Drainage Maintenance Activities 2022-2027
- Meteorological data from Met Eireann and hydrometric data from the Office of Public Works (OPW)
- County Mayo Strategic Flood Risk Assessment 2022
- Mayo County Development Plan 2021 – 2027
- Landscape Appraisal of County Mayo
- 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 (1978). *The Peatlands of Ireland*.
- 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*.

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- EPA (2022), River Quality Surveys: Biological - Hydrometric Area 30
- 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
- Assimilative Capacity Calculations
- 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 21<sup>st</sup> of 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
<b>Extreme</b>	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
<b>Very High</b>	Attribute has a high quality or value on a regional or national scale	<p>River, wetland or surface water body ecosystem protected by national legislation – NHA status.</p> <p>Regionally important potable water source supplying &gt;2500 homes.</p> <p>Quality Class A (Biotic Index Q4, Q5)</p> <p>Flood plain protecting more than 50 residential or commercial properties from flooding.</p> <p>Nationally important amenity site for wide range of leisure activities.</p>	<p>Regionally Important Aquifer with multiple wellfields</p> <p>Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status</p> <p>Regionally important potable water source supplying &gt;2500 homes</p> <p>Inner source protection area for regionally important water source</p>
<b>High</b>	Attribute has a high quality or value on a local scale	<p>Locally important potable water source supplying &gt;1000 homes Quality Class B (Biotic Index Q3-4)</p> <p>Flood plain protecting between 5 and 50 residential or commercial properties from flooding</p> <p>Locally important amenity site for wide range of leisure activities</p>	<p>Regionally Important Aquifer</p> <p>Groundwater provides large proportion of baseflow to local rivers</p> <p>Locally important potable water source supplying &gt;1000 homes. Outer source protection area for regionally important water source</p> <p>Inner source protection area for locally important water source</p>
<b>Medium</b>	Attribute has a medium quality or value on a local scale	<p>Local potable water source supplying &gt;50 homes</p> <p>Quality Class C (Biotic Index Q3, Q2-3) Flood plain protecting between 1 and 5 residential or commercial properties from flooding</p>	<p>Locally Important Aquifer</p> <p>Potable water source supplying &gt;50 homes</p> <p>Outer source protection area for locally important water source</p>
<b>Low</b>	Attribute has a low quality or value on a local scale	<p>Locally important amenity site for small range of leisure activities</p> <p>Local potable water source supplying &lt;50 homes Quality Class D (Biotic Index Q2, Q1)</p> <p>Flood plain protecting 1 residential or commercial property from flooding</p>	<p>Poor Bedrock Aquifer</p> <p>Potable water source supplying &lt;50 homes</p>

## **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 hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. It is usually dependent on the nature (sandy, gravely, 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 vicinity of the Proposed Development. The extent of sampling requirements as defined by the hydrological sensitivity of the Proposed Development is defined in **Table 8.4**.

**Table 8.4: Summary of Sampling Requirements**

	Vulnerability	Sampling Requirements
<b>Ground Water Protection Scheme (GWPS) exists</b>	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. <sup>1</sup>
	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 <sup>2</sup>	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.
	Aquifer Type	Sampling Requirements
<b>Ground Water Protection Scheme (GWPS) does not exist</b>	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 Zone	Sampling Requirements
<b>Source Protection Areas<sup>3</sup></b>	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.

<sup>1</sup> The classification to Low / Medium / High class as part of GWPS indicates that minimum of 3m soil/subsoil depth can be anticipated

<sup>2</sup> To give a rough picture of "extreme vulnerability" areas we can use: GSI Outcrop data & Teagasc Shallow Rock data

<sup>3</sup> 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

## 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 4.4 ha (10.87 acres) and is situated in Levally, Knockdrimina and Cappacurry, Ballinrobe Co. Mayo. The Proposed Development is situated immediately to the east of an existing farm and lies approximately 2.57km northeast of Ballinrobe town centre.

The underlying geology has a major influence on topographical, hydrogeological, and hydrological features within the vicinity of the Proposed Development, 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

Mayo has a diverse range of landscape types, ranging from rolling hills and lakes to peatlands, grasslands, woodlands, eskers and wetlands. The range of different landscapes found in Mayo 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 Co. Mayo can be divided into roughly four no. 'Landscape Protection Policy Areas' with an addition two no. sub-groups as outlined below, and according to the Mayo County Development plan 2021-2027.

1. Montaine Coastal Zone
2. Lowland Coastal Zone
3. Uplands, Moors, Heath or Bog
  - 3A. Lakeland Sub-area
4. Drumlins and Inland Lowland
  - 4A. Lakeland Sub-area

The site is located in Policy Area 4 (Drumlins and Inland Lowlands). There are occasional pockets of transitional pasture and woodland scrub throughout the gently rolling drumlins. The transitional boundary to the north of Ballinrobe is the division between the large Moy and Corrib water catchments as this has a bearing on visual limits even in low lying terrain. The distinctive set of linear south-east to north-west running lakes disappear to the north of this boundary (Lough Carra and Lough Mask) giving an indication of the change in orientation and scope of the topography outside the boundary of Policy Area 4.

The site is characterised as being gently undulating, in keeping with the Landscape Character Unit description for the area. The Robe River is indistinguishable within the landscape. A peak

in the Proposed Development topography, 32.5m OD, is situated slight east of centre in the Proposed Development with a gradual gradient to 28.5m OD east of centre before rising to 31m OD along the eastern boundary. To the west of the peak the Proposed Development contains characteristic small undulations in the land with a very gentle gradient to the west, with an elevation of 30m OD here.

The proposed approach road will be the existing local road off the R133 to the east of the Proposed Development boundary. The existing local road has a ground level of 37mOD at the junction of the R133 and moderately slopes to a level of 34mOD as it approaches the proposed entrance to the biogas facility. Refer to Topography drawing no. - **2401 Ballinrobe** (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 fluvio-glacial 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 sub glacially as lodgement till over the eroded rock head surface, whilst moraine granular deposits were laid down at the glacier margins. Subsequently, with the progressive retreat of the ice sheet from the region, granular fluvio-glacial deposits were laid down in places by melt waters discharging from the front of the glacier.

The Proposed Development is located within Policy area 4 of the Mayo County Development Plan (CDP) (Drumlins and Inland Lowland). These undulating areas of pasture, woodland and forest are considered to have a generally similar ability to absorb development. Many of these areas are underlain by glacial drumlins and incorporate low-lying lake lands.

The National Soil Survey of Ireland describes this region as comprising principally of Shallow Brown Earths and Rendzinas soils which, under good management, can be very productive. GSI online mapping indicates that the Proposed Development overlies two varying soils dividing the Proposed Development north to south. The predominant soil underlying the Proposed Development is a deep well drained mineral (mainly basic) (BminDW) derived mainly from calcareous parent materials. The soil groups associated with this category are Grey Brown Podzolics, Brown Earths (medium-high base status). The southern extents of the Proposed Development and a section to the northeast are classed as Blanket peat soils.

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,

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the bedrock underlying and surrounding the Proposed Development comprises of calcarenite. This strata dates from the Carboniferous period and would have been formed during the Dinantian series. These sediments are described as medium to thick-bedded pure limestone.

The GSI 1:100,000 Bedrock Solid Geology Map indicates that the Proposed Development lies within the Cong Canal Formation. The pale grey, clean, medium to coarse calcarenite parent material is described as being present in medium to thick beds. Several species of Siphonodendron are present, along with locally forming biostromes. Colonies are commonly silicified.

The nearest fault to the Proposed Development is located approximately 7km away to the East with a Southwest – Northeast trend. A region of mixed lithology located ca. 3km northeast of the Proposed Development reveals various different geological formations. These formations namely the “Ardnasillagh formation”, the “Illaunagappul Formation” and the “Oakport Limestone Formation” that comprises of the Creagh member, the Lough Carra member and the Burrishoole member consist predominately of limestone in forms of dark cherty limestone (Ardnasillagh), thin shale partings (Illaunagappul), fine grained dark limestone (Creagh) and Cross-bedded peloidal limestone (Burrishoole). These formations give evidence of the mapped karstic features in the area.

To the east of the Proposed Development is the Cong Limestone formation consisting of clean thickly bedded pure limestone parent material, The formation is well exposed in a quarry southwest of the Proposed Development (Cong Quarry), and more extensively in pavement areas east of Lough Mask.

## **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 Western River Basin District (WRBD). The basin area extends over some 12,193 km<sup>2</sup> with some 2,700 km of coastline and an extensive offshore area. The WRBD encapsulates practically all of Mayo and Sligo, the Galway Urban District area, significant portions of Galway and Leitrim counties and smaller portions of Roscommon and County Clare. It also includes offshore islands such as the Aran Islands and Inishboffin.

The basin is dominated in the eastern part, east of the great western lakes, principally by well drained karst limestone overlain by grassland generally used for agricultural purposes. This area stores large quantities of groundwater which both feeds into the lake systems and also provides a significant source of drinking water to the region.

A catchment is an area of land where all flowing surface water converges to a single point, such as a river. The District is rich in waters comprising 89 river catchments with over 14,200 km of river. It has both lowland rivers (wide valleys, slow flows) and upland rivers (steep valleys, flashy flows).

The main rivers in the WRBD are the Corrib; draining Lough Corrib, Mask and Carra, the Moy; draining Lough Conn and Cuilin, Owenmore/Ballysadare, Dunkellin and Bonet. The Proposed Development is located within the Corrib Catchment. The Corrib catchment includes the area drained by the River Corrib and all streams entering tidal water between Renmore Point and Nimmo's Pier, Galway, draining a total area of 3,112km. The Corrib catchment is divided into

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19 sub catchments with 97 river waterbodies, 30 lake waterbodies, one transitional waterbody, no coastal waterbodies and 31 groundwater bodies, some of which are illustrated in **Figure 8.2**.

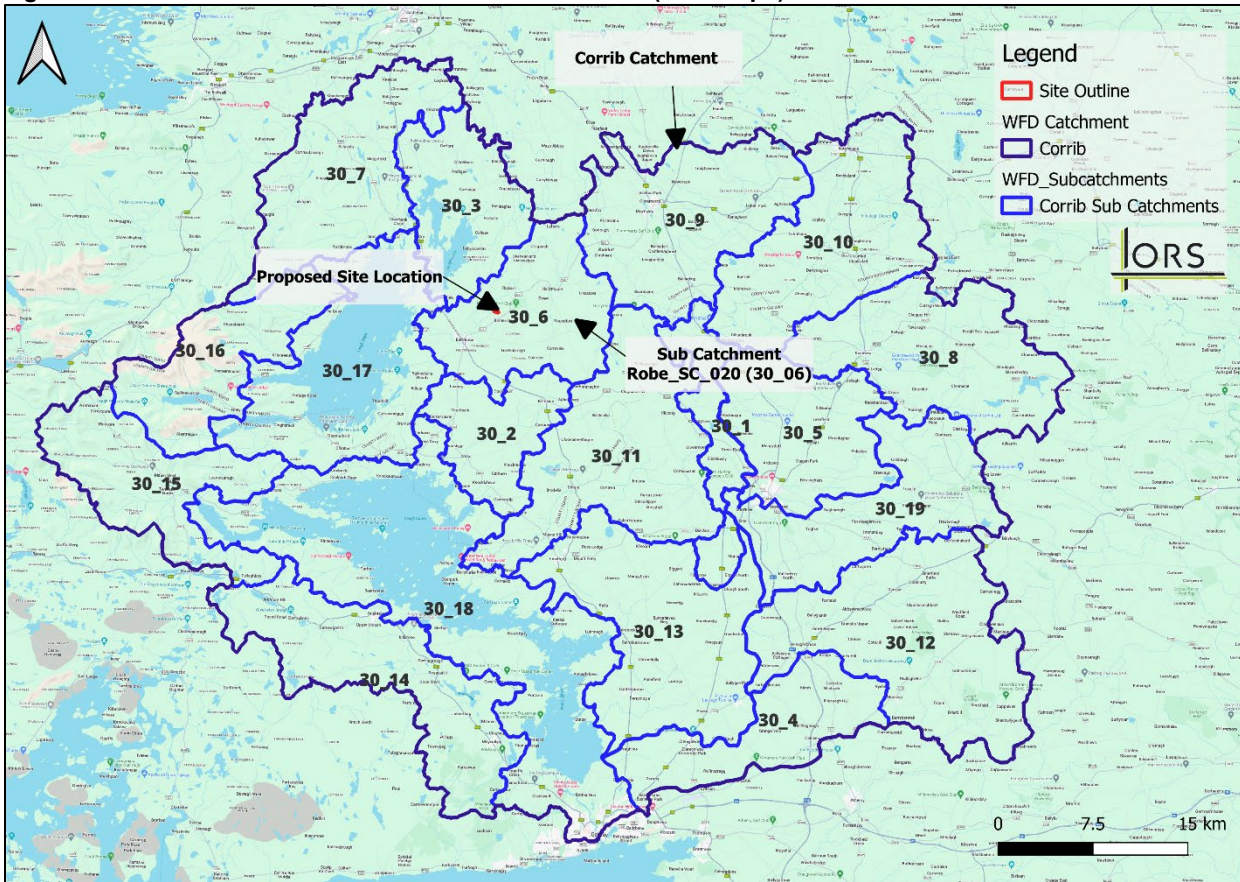
This catchment is characterised by a wide, flat, limestone plain occupying the eastern two-thirds of the catchment which terminates in the large lakes of Corrib and Mask that abut against the igneous granites of Galway and the metamorphic uplands of southwest Mayo. The entire area of this catchment east of the large lakes is karstified and groundwater and surface water are highly interconnected in this region.

The historic source of the River Boyne is Lough Corrib. Lough Corrib is a large freshwater lake located in County Galway. The river flows from the northern end of Lough Corrib, near the town of Oughterard, and continues through Galway City before eventually reaching Galway Bay. The River Robe located ca. 260m west of the Proposed Development has its source in the Sheefry Hills which are part of the broader mountainous region in county Mayo. The River Robe flows eastward through various landscapes, eventually joining the River Moy near Ballinrobe, as it continues its course, the River Moy passes through towns such as Ballina before reaching the Atlantic Ocean at Killala Bay.

There is a total of 97 river water bodies in the Western River Basin District. The main river catchments in the WRBD are the Shannon, the Corrib, and the Erne River catchment. The Corrib catchment comprises 19 sub-catchments with 97 river water bodies, 30 lakes, one transitional, no coastal water bodies, and 31 groundwater bodies, some of which are illustrated in **Figure 8.2 & 8.3**.

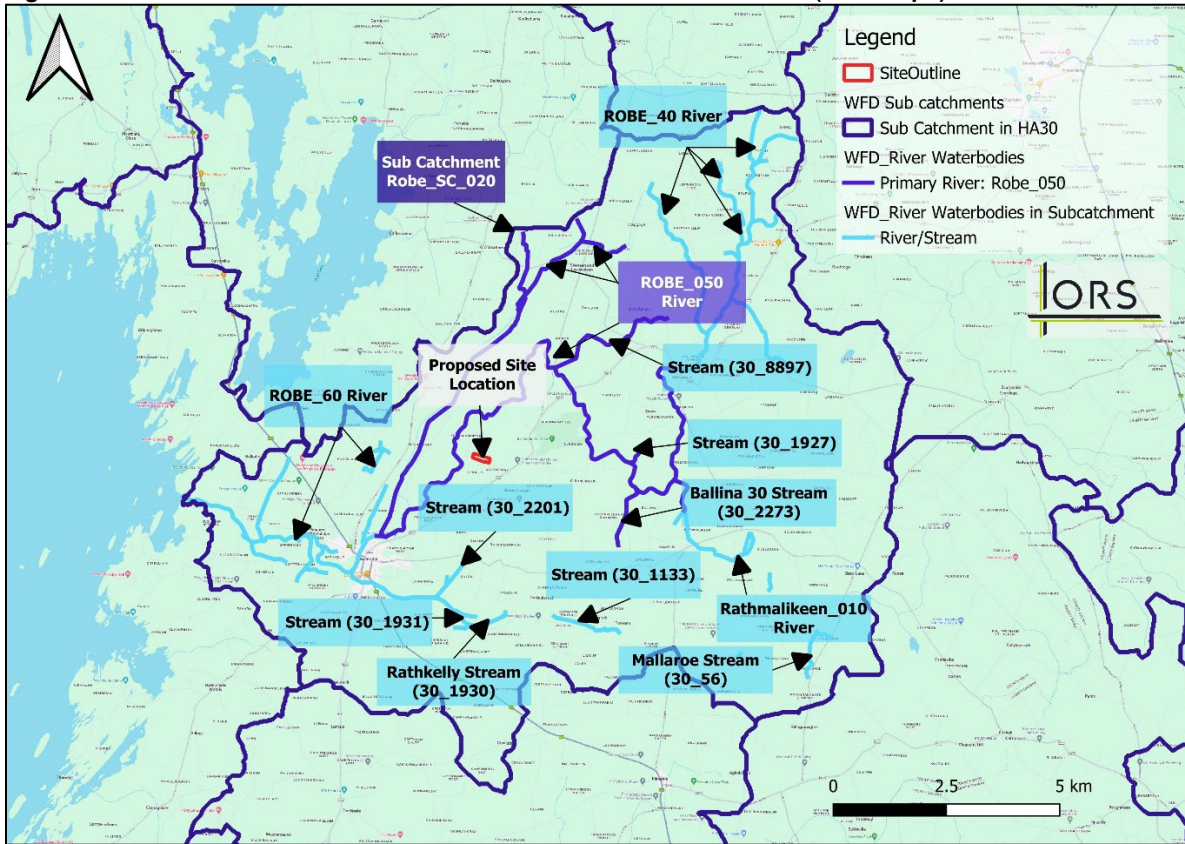
The Proposed Development is situated on the outskirts of Ballinrobe town and located in sub-catchment 30-6, known as the Robe\_SC\_20 sub-catchment.

Figure 8.2: Corrib River Catchment and Sub-Catchments (EPA Maps)



The River Robe is the main hydrological feature in the vicinity of the Proposed Development (EPA name: IE\_WE\_30R010600). This river is 64km in length and it has its source in the Sheefry Hills in the mountainous region of west county Mayo, the River Robe flows eastward through County Mayo, passing through towns such as Ballinrobe, and eventually joining the River Moy. The Moy River, in turn, flows into Killala Bay on the Atlantic coast. The total basin size of this river is 320km<sup>2</sup>. The River Robe system comprises several tributaries including the Ballina\_030 stream & the Rathmalikeen\_010 river both joining east of Ballinrobe, partially illustrated in **Figure 8.3**.

Figure 8.3: Tributaries to the Robe River in the Corrib River Catchment (EPA Maps)



**Local Hydrology**

The main hydrological feature in the vicinity of Ballinrobe town is the Robe River which runs in a generally southerly direction ca. 260m west of the Proposed Development. There is a water course running in a southerly direction from the pig farm located ca. 128m from the closest point of the Proposed Development. The water course discharges into the Robe River ca. 264m southwest of the site (see **Figure 8.5**).

Ballinrobe town is situated on the river Robe located approximately 40 kilometres north of Galway City and about 20 kilometres east of the town of Westport. The section of the Robe River adjacent to the Proposed Development flows in a northwest to southwest direction towards Ballinrobe town centre, ca. 2.6km southwest of the Proposed Development.

One arterial drainage channel is located ca. 248m north of the northern site boundary and is hydrologically connected to the Robe River. The Proposed Development is not hydrologically connected to this arterial drainage channel due to the natural drainage of the site following natural topography and discharging to the Robe river to the west of the Proposed Development.

**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.

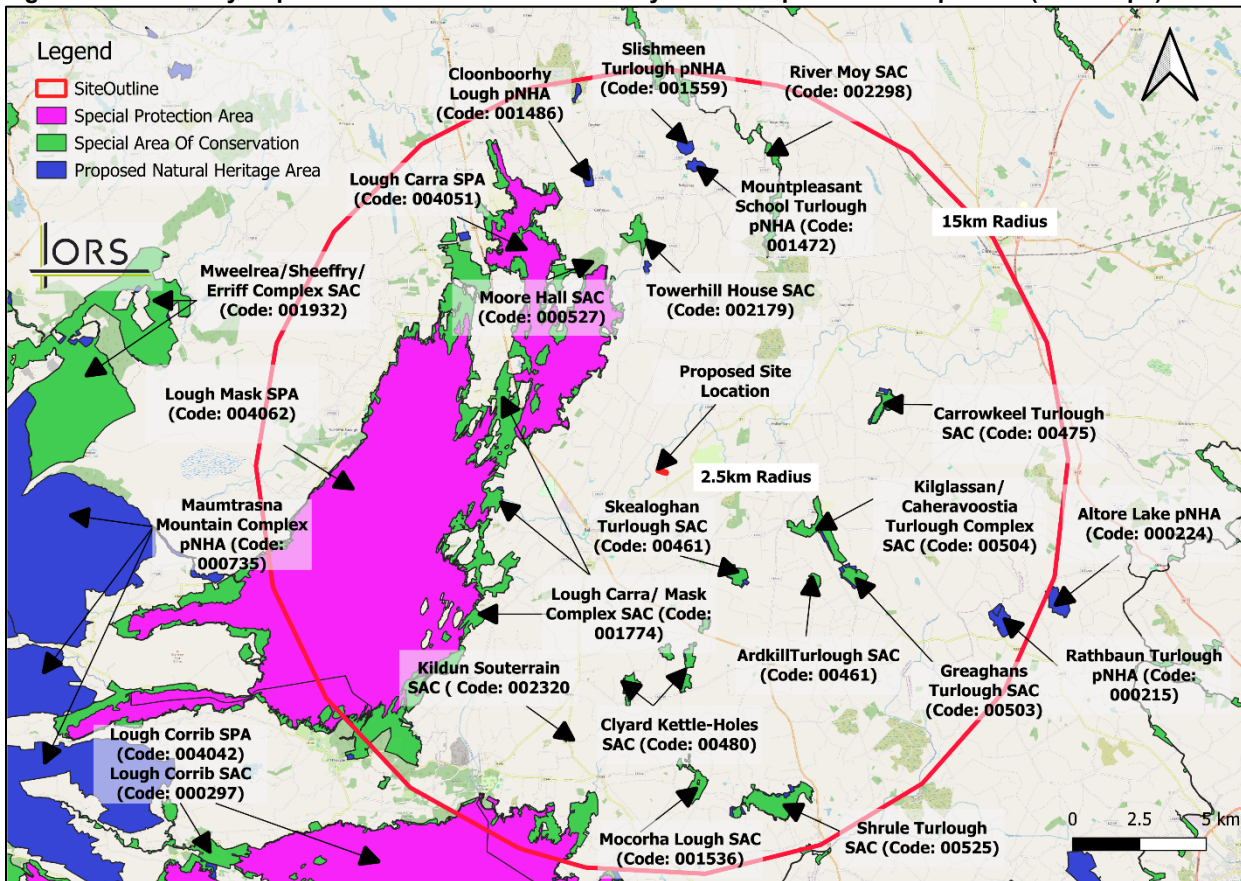
There are seventeen Natura 2000 sites within 15km of this Proposed Development. The location of the site in relation to these designated areas are shown in **Figures 8.4**.

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 nineteen 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 8.4**.

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 8.4**, below. A summary designated areas with hydrological connectivity to the Proposed Site are detailed in **Table 8.5**.

**Figure 8.4: Summary of protected areas within the vicinity of the Proposed Development. (EPA Maps)**



**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
Lough Mask SPA	004062	8.7km (D/S)	Birds	Hydrological connectivity to both protected areas is via the River Robe ca. 815m North of the site boundary. The river Robe meanders

Lough Carra/ Mask Complex SAC/	001774	8.5km (D/S)	Habitats	eastwards through Ballinrobe and likely discharges into the Lough Carra and Lough Mask complex SAC/pNHA & Lough Mask SPA ca. 3.8km N from the Proposed Development (Hydrological separation distance of 8.5km D/s)
Lough Carra/ Mask Complex pNHA	001774	8.5km (D/S)	Natural Heritage	

## **Site Drainage**

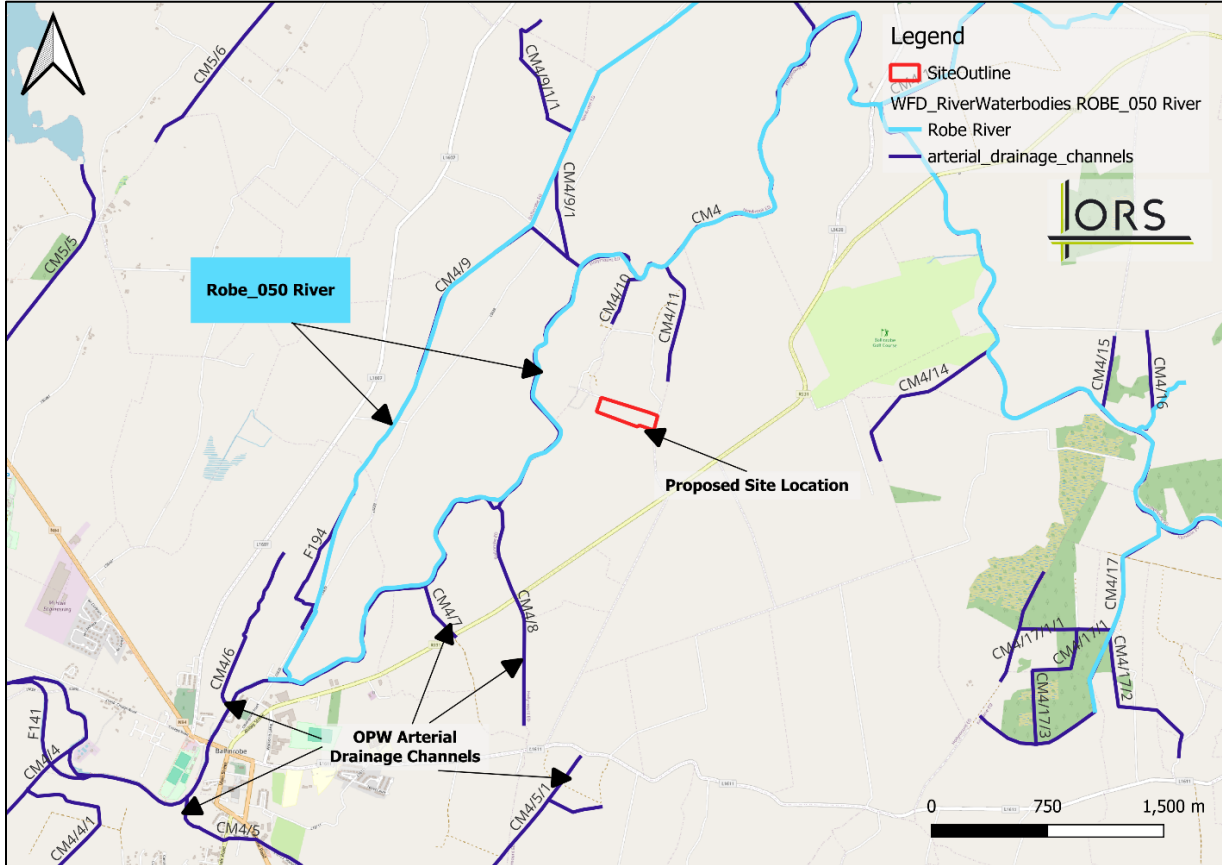
Arterial Drainage Schemes are schemes the OPW has a statutory duty to maintain. Arterial Drainage Schemes were carried out under the Arterial Drainage Act, 1945 to improve land for agriculture and to mitigate flooding. Rivers, lakes, weirs and bridges were modified to enhance conveyance, embankments 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 in the occurrence of a 3 – year flood event, the floodwater would be retained within the banks of the watercourses. This was achieved by lowering water levels during the growing season to reduce waterlogging on the land beside watercourses, a feature 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 CM4/11 is located ca. 193m north of the Proposed Development boundary and is flanked by approximately 60-100m of benefitting lands either side of the channel.

ADS Channels CM4/11 flows in a south-north direction, merging with the Ballinrobe River ca. 807m north of the Proposed Development. The Robe River has also been assigned Arterial Drainage Scheme status, labelled as CM4.

The ADS Channel CM4/11 is unlikely to be hydrologically connected to the Proposed Development due to the site drainage following natural topography and surface water draining to the west of the Proposed Development into the Robe River with flows in a south-westerly direction towards Ballinrobe town.

**Figure 8.5: Proposed Development drainage catchments (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  $Q_{bar}$  or 2.0 l/s/ha, whichever is greater;
- $Q_{bar}$ , calculated in accordance with IH124, is 1.6 l/s.
- The Site area is 3.88 hectares, equivalent to 7.76 l/s.

Accordingly, the maximum permissible rate of discharge of surface water from the Proposed Development will be 7.76 l/s.

## **Mayo County Development Plan 2021– 2027 – Flood Risk Management**

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

### **Flood Risk Policies:**

**INP 9** - To liaise and work in conjunction with Irish Water in the implementation of the Memorandum of Understanding (MOU) for surface water drainage and flood management,

including the separation of foul and surface water drainage networks where feasible and undertake drainage network upgrades to help remove surface water misconnection and infiltration.

**INP 10** - To support, in conjunction with Irish Water, the improvement of storm water infrastructure to improve sustainable drainage and reduce the risk of flooding in urban environments.

**INP 11** - To have regard to the Guidelines for Planning Authorities on the Planning System and Flood Risk Management (DoEHLG/OPW 2009) and Circular PL2/2014 (or as updated), in the preparation of plans and strategies related to development and in the assessment of projects.

**INP 12** - To support the implementation of the recommendations in the Flood Risk Management Plans (FRMP's), including planned investment measures for managing and reducing flood risk.

**INP 13** - To support the implementation of recommendations in the CFRAM Programme to ensure that flood risk management policies and infrastructure are progressively implemented.

#### **Flood Risk Objectives:**

**INO 16** - To support, promote and facilitate the use of green infrastructure, for example green roofs, green walls, planting and green spaces for surface water run-off retention purposes, in the interests of flood mitigation and climate change adaptation.

**INO 17** - To require the use of SuDS to minimise and limit the extent of hard surfacing and paving and require the use of sustainable drainage techniques where appropriate for new development or for extensions to existing developments, in order to reduce the potential impact of existing and predicted flooding risks.

**INO 18** - To ensure new development is adequately serviced with surface water drainage infrastructure, which meets the requirements of the Water Framework Directive, associated River Basin Management Plans and Catchment Flood Risk Assessment Management (CFRAM) Plans.

**INO 19** - To ensure that a flood risk assessment is carried out for any development proposal where a flood risk is identified in accordance with the Planning System and Flood Risk Management (DoEHLG/OPW 2009) and Circular PL2/2014. This assessment shall be appropriate to the scale and nature of risk to the potential development.

**INO 20** - To consult with the OPW in relation to Proposed Developments in the vicinity of drainage channels and rivers for which the OPW are responsible and retain a strip on either side of such channels where required, to facilitate maintenance access thereto.

**INO 21** - To assist the OPW in developing catchment-based Flood Risk Management Plans for rivers in County Mayo and have regard to their provisions/recommendations.

**INO 22** - To protect the integrity of any formal (OPW or Mayo County Council) flood risk management infrastructure, thereby ensuring that any new development does not negatively impact any existing defence infrastructure or compromise any proposed new infrastructure.

**INO 23** - To ensure that where flood risk management works take place that natural heritage, cultural heritage, rivers, streams and watercourses are appropriately protected.

**INO 24** - To consult, where necessary, with Inland Fisheries Ireland, the National Parks and Wildlife Service and other relevant agencies in the provision of flood alleviation measures in the county

**INO 25** - To 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.

**INO 26** - To cooperate with the Office of Public works in the delivery of the Crossmolina Flood Relief scheme and other schemes that may be brought forward in the lifetime of this Plan

**INO 27** - To identify and preserve vulnerable floodplains, wetlands and coastal areas to the maximum possible extent in both urban and rural areas.

## **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 (DoH LG) 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 5km<sup>2</sup> and for which flood maps were not produced under the National CFRAM Programme.

## 3. Geological Survey Ireland Groundwater Flooding

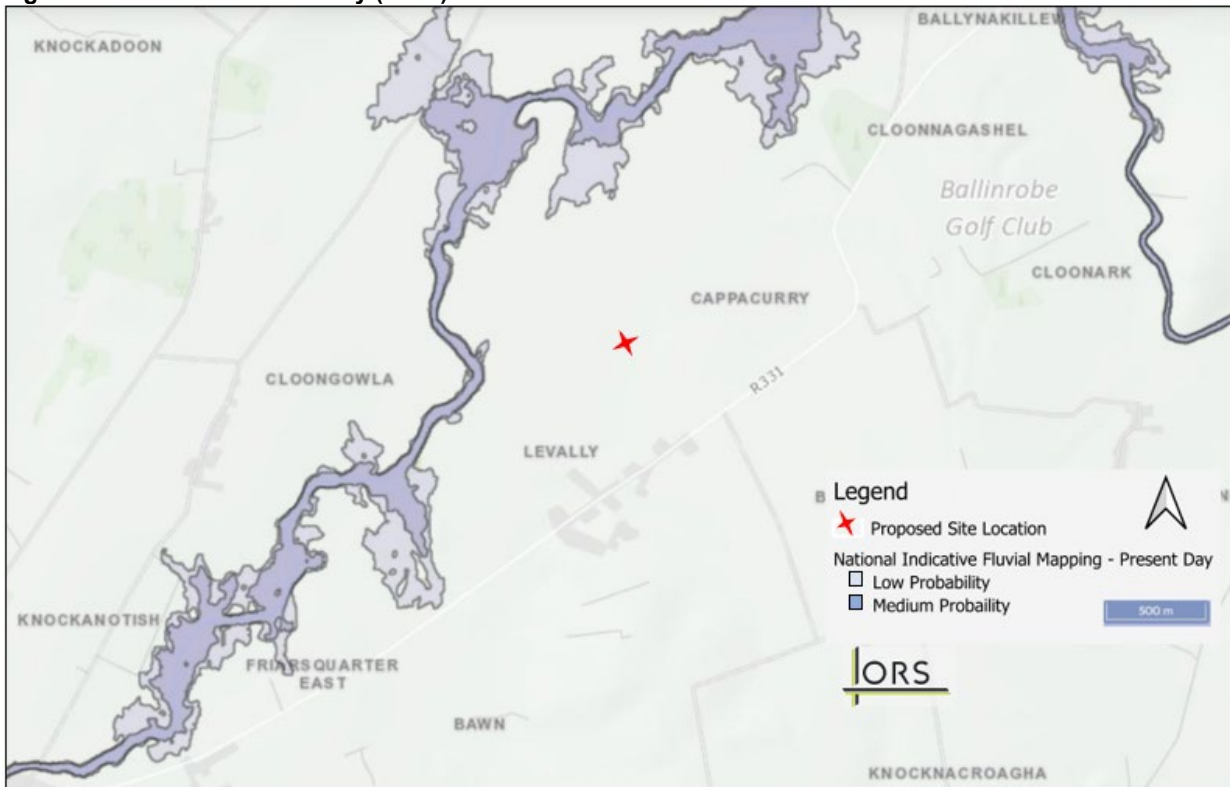
- Probabilistic flood extent of groundwater flooding in limestone regions. These maps are focused primarily (but not entirely) on flooding at seasonally flooded wetlands known as turloughs.

## 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 Proposed Development is presented in **Figure 8.6**.

**Figure 8.6: Flood Risk Summary (OPW)**



According to the County Mayo Strategic Flood Risk Assessment (2022), Levally was not 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 Robe River, ca. 260m west of the Proposed Development as seen in **Figure 8.6**. NIFM data does not indicate that any of the lands within the boundary of the Proposed Development 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 Development.

The Strategic Flood Risk Assessment (SFRA) for Co. Mayo does not indicate a flood risk at the Proposed Development.

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 Proposed Development is located within Flood Zone C.

A Site-Specific Flood Risk Assessment (**Document Ref: 231924-ORS-XX-XX-RP-EN-13d-011**) has been undertaken for the Proposed Development which accompanies the application.

### **Mayo County Development Plan 2021 – 2027 – Water Quality**

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

#### **Water Quality Policies:**

**NEP 17** - To promote public awareness of water quality issues and the measures required to protect surface water, coastal and transitional waters and groundwater bodies from inappropriate and damaging development.

**NEP 18** - To co-operate with the EPA and other authorities in the continued implementation of the EU Water Framework Directive.

**NEP 19** - To protect existing groundwater sources and aquifers in the county and to manage development in a manner consistent with the protection of these resources.

**NEP 20** - To meet our targets to achieve 'good status' in all water bodies in compliance with the Water Framework Directive and to cooperate with the implementation of the National River Basin Management Plan 2018-2021, and subsequent plans.

**NEP 21** - To manage, protect and enhance surface water and ground water quality to meet the requirements of the Water Framework Directive.

**NEP 22** - To encourage the use of catchment-sensitive farming practices, in order to meet Water Framework Directive targets and comply with the River Basin Management Plan.

#### **Water Quality Objectives:**

**NEO 34** - To ensure that the Water Framework Directive, the River Basin Management Plan and any subsequent Water Management Plans are fully considered throughout the planning process.

**NEO 35** - To ensure, through the implementation of the River Basin Management Plan(s) and the associated Programmes of Measures and any other associated legislation or revised plans,

with all relevant stakeholders, the protection and improvement of all drinking waters, surface water, coastal and transitional waters and ground waters throughout the county.

**NEO 36** - To manage in a sustainable manner, the existing groundwater sources and aquifers in the county and manage development in a manner consistent with the sustainable management of these resources, in conformity with the EU Environmental Objectives (Groundwater) Regulations 2010 and the second cycle National River Basin Management Plan 2018-2021, and any subsequent plans and the Groundwater Protection Scheme.

**NEO 37** - To protect groundwater sources through the implementation of the Groundwater Protection Scheme and Source Protection Zones. Development proposals within these zones which have the potential to pose a risk to groundwater will be required to demonstrate that no reasonable alternative site is available and that groundwater quality will be protected to the satisfaction of the Council.

**NEO 38** - To protect both ground and surface water resources and to work with Irish Water to develop and implement Drinking Water Safety Plans, to protect sources of public water supply and their contributing catchment, and to work with the National Federation of Group Water Schemes, in respect of Source Protection Plans for Group Water Schemes to protect these sources.

**NEO 39** - 9 To comply with the Blue Dot Catchments Programme and protect and restore high status water bodies in County Mayo, and ensure all Proposed Development which may have an impact on a high status water quality site will require site specific assessment to determine localised pressures and demonstrate suitable mitigation measures, in order to protect these sites

**NEO 40** - To protect through its regulatory controls and in conjunction with the Local Authority Waters Programme, water bodies with 'high ecological status', to restore water bodies that have fallen below 'high ecological status', to maintain water bodies at 'Good Status' and to mitigate threats to water bodies identified as 'At Risk' i.e. 'Moderate and Poor Status'.

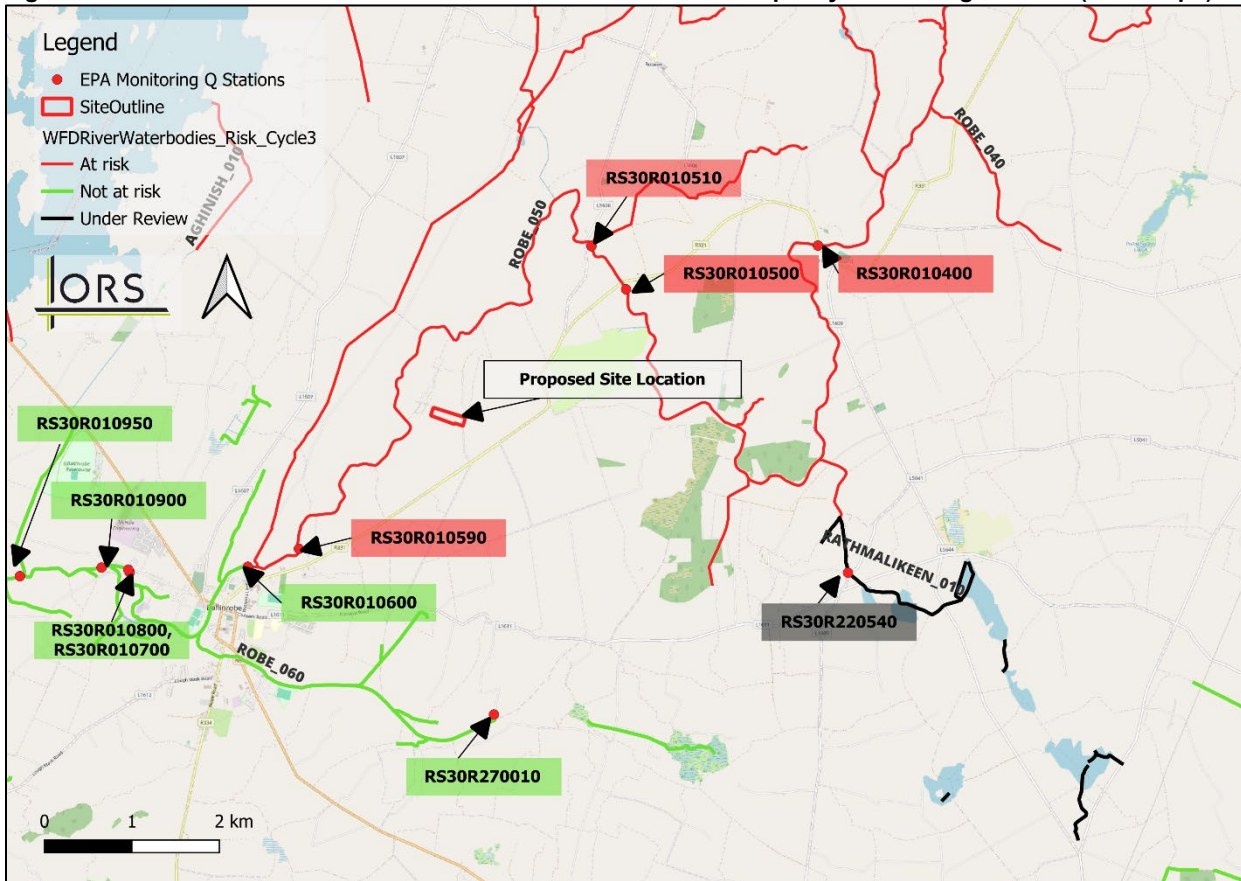
**INO 16** - To support, promote and facilitate the use of green infrastructure, for example green roofs, green walls, planting and green spaces for surface water run-off retention purposes, in the interests of flood mitigation and climate change adaptation.

**INO 18** - To ensure new development is adequately serviced with surface water drainage infrastructure, which meets the requirements of the Water Framework Directive, associated River Basin Management Plans and Catchment Flood Risk Assessment Management (CFRAM) Plans.

## **8.4.6 Biological Water Quality**

Physio-chemical and biological water quality assessments are conducted by the EPA at various sections along the River Robe and its tributaries. Monitoring stations with complete datasets, in close proximity to the Proposed Development are noted in **Figure 8.7**.

**Figure 8.7: Water Framework Directive Risk and locations of water quality monitoring stations (EPA maps)**



National surveys of Irish rivers have taken place on a continuous basis since 1971. The National Rivers Monitoring Programme was replaced by the Water Framework Monitoring Programme from 22 December 2006. 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 7.2** at the beginning of this chapter.

Monitoring stations hydraulically connected to the Robe River are listed in **Table 8.7**, along with their associated Q-Ratings.

**Table 8.7: Biological Q-Ratings for waterbodies hydraulically connected to the River Robe (EPA)**

Station ID	Station Name	Year									
		1971-2000	2000	2001	2003	2006	2009	2012	2015	2018	2020
RS30R010600	Akit Bridge	4	3	-	3-4	4	4	4	4	4-5	4-5
RS30R010700	E. Br N.E. of Sprgvale H	3-4	-	-	-	-	-	-	-	-	-
RS30R010800	ROBE – West Br N.E. of Springvale House	3	-	-	-	-	-	-	-	-	-
RS30R010900	ROBE - 100m d/s Station 0800	3-4	4	-	-	-	-	-	-	-	-
RS30R010950	North of Curragh	3-4	3	-	4	4	4	4	4	4	3-4
RS30R010510	ROBE - Robeen Bridge	4	3	-	4	4	-	-	-	-	-
RS30R010500	ROBE - Foxhall Bridge	4	-	-	-	-	-	-	-	-	-
RS30R010400	Hollymount Bridge	3-4	-	3-4	3	4	3-4	3-4	3-4	3-4	4

The RS30R010600 water monitoring station, named “Akit Bridge” is located 2.7km downstream of the point of hydrological connectivity between the Proposed Development and the Robe river. The station is located in Ballinrobe town. The most recent monitoring cycle has measured a Q-Rating of ‘4-5’, indicating ‘high’ WFD status and a pollution status of ‘unpolluted’ according to the EPA.

The RS30R010950 water monitoring station, named “North of Curragh” has yielded consistent data readings since 2000. The monitoring station is located west of Ballinrobe town, also downstream of the point of hydrological connectivity between the Proposed Development and the Robe River and 1.38km downstream of Ballinrobe WWTP. The most recent data for this location shows the station has a ‘moderate’ WFD status and a pollution status of ‘Unpolluted’ according to the EPA.

The RS30R010510 water monitoring station, named “Robeen Bridge” is located ca. 2.3km north-east of the Proposed Development, upstream of the point of hydrological connectivity between the Proposed Development and the Robe River. This monitoring station has yielded irregular data since the commencement of the river monitoring programme in 1974. The monitoring cycles between 1974 -2006 assigned a Q-Rating of 4 and at one monitoring event a Q-rating of 3, indicating since 2003 a predominately ‘good’ WFD status and a pollution status of ‘unpolluted’.

The RS30R010400 water monitoring station, named “Hollymount Bridge” is located ca. 4.5km north-east of the Proposed Development upstream of the point of hydrological connectivity between the Proposed Development and the Robe River. This monitoring station has yielded consistent data since the commencement of the river monitoring programme in 1974. The monitoring cycles between 1974 -2018 fluctuate between a Q-rating of 3/4 indicating ‘moderate’ status. The most recent monitoring event in 2021 presents a Q-rating of 4 indicating ‘good’ WFD status and a pollution status of ‘unpolluted’.

The RS30R010700, RS30R010800 and RS30R010900 water monitoring stations, named “E. Br N.E. of Sprgvale H”, “ROBE – West Br N.E. of Springvale House” and “ROBE - 100m d/s

Station 0800” respectively, are located east of Ballinrobe town downstream of the point of hydrological connectivity between the Proposed Development and the Robe River. All sites have not yielded consistent data since the 1980’s/ 2000’s where the monitoring cycle at all stations showed a ‘moderate’ to ‘good’ WFD status with Q ratings ranging from 3-4.

The RS30R010500 water monitoring station, named “Foxhall Bridge” is located upstream of the point of hydrological connectivity between the Proposed Development and the Robe River. This monitoring station has not yielded consecutive data since the 1980’s where the monitoring cycle at all stations showed a ‘good’ WFD status with an average Q rating of 4.

The Water Framework Directive Report (WFD Cycle 2) for the Robe Sub-Catchment 020, notes that the waterbodies in the Robe Sub-Basin 050 are at risk due to biological status. Physical habitat degradation due to channelisation (hydromorphology issues) is the significant issue impacting Robe\_050.

## 8.4.7 Hydrochemistry Data

The piggery located adjacent to the west of the Proposed Development named ‘DINO Trading Ltd. (EPA Licence no: P0981-01)’ is required to carry out quarterly monitoring of Chemical Oxygen Demand (COD) at the Surface Water Emission Point (SW1) located prior to the field drain on the eastern boundary of the facility, that eventually discharges to the River Robe. The most recent Surface Water Monitoring data taken from the EPA’s annual environmental report (2023) available on the EPA website is present in **Table 8.8** below:

**Table 8.8: EPA Licence no: P0981-01 Monitoring**

Parameter	Date of Monitoring	Measured Value
COD	25/03/2022	<5 mg/l
COD	29/06/2022	9 mg/l
COD	26/09/2022	<5 mg/l
COD	06/12/2022	21 mg/l

An overview of the WFD status of the Robe River is outlined in **Table 8.9**.

**Table 8.9: Description of Receiving Waters – Robe River**

Characteristic	Classification	Status	Interpretation
Receiving Waterbody Name	Robe River	At Risk	Receiving Waters include Lough Carra and Lough Mask Complex. Inputting Waterbody includes Rathmalikeen river.
Waterbody Type	River		-
WFD Status	SW 2016-2021	Moderate	-
Resource	Not Classified		No drinking water abstractions
Biological Status	Macrophyte Status	Good	Both stations in the middle section of the Robe catchment from Hollybrook (0310) to Hollymount (0400) (upstream of the Proposed Development) improved to good ecological conditions, although nutrient enrichment was still obvious. The lower section of the Robe downstream of the Proposed Development continued satisfactory, at high quality but the station
	Invertebrate Status	High	
	Phyto benthos Status	Moderate	
	Fish Status	Moderate	

			0950 downstream of the Proposed Development and west of Ballinrobe town and D/S of the WWTP declined to moderate ecological quality with nutrient enrichment obvious.
Supporting Chemistry Conditions	Oxygenation Conditions	Pass	DO status: Pass  Nitrogen (N) & Phosphorus (P) conditions in recent years indicate eutrophication levels low to none  Water quality nutrients other than N & P deemed to be in compliance with WFD reference values
	Nitrogen	Good	
	Phosphorus	High	
	Other Nutrients	High	
	Specific Pollutant Conditions	Pass	
Hydromorphological Conditions	Water Flow & Substrate	Good	Water flow and substrate suitable for aquatic life
Chemical SW Status	High	Pass	-

## 8.4.8 Hydrogeology

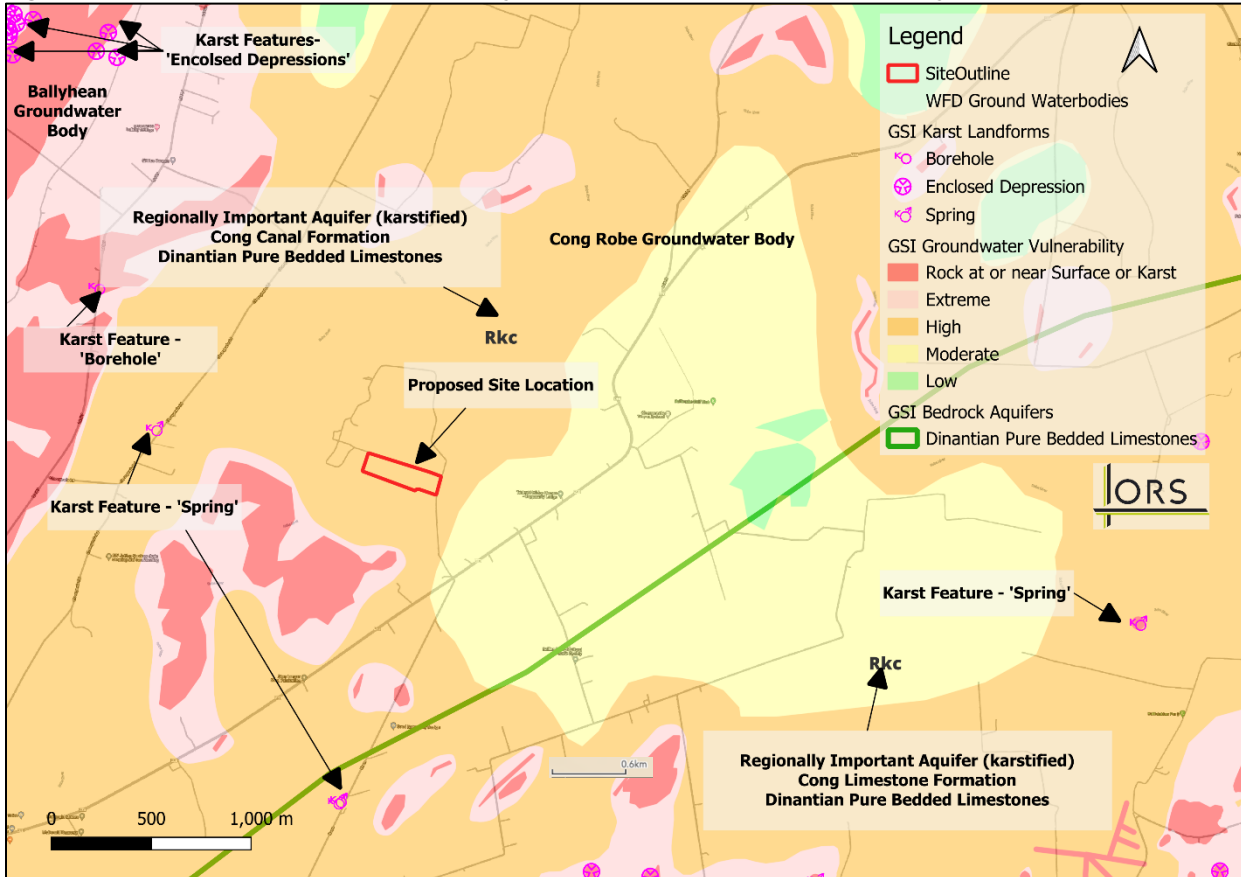
### Regional & Local Hydrogeology

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 Mayo has been mapped for Aquifer Classification. The Proposed Development is situated above the Cong-Robe Groundwater Body which is designated by the Geological Survey of Ireland (GSI) National Draft Bedrock Aquifer Map as a Regionally Important Aquifer (karstified) - (Classification reference - Rkc), as illustrated in **Figure 8.8** below. This aquifer is capable of supplying regionally important supplies (e.g., large public water supplies).

Figure 8.8: Groundwater Bodies & Aquifer Types in Proposed Development 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 8.10**.

Table 8.10: Vulnerability Mapping Criteria

Subsoil Thickness	Hydrogeological Requirements Diffuse Recharge			Point Recharge Swallow Holes	Unsaturated Zone Sand & Gravel Aquifers
	Subsoil Permeability & Type				
	High (Sand & Gravel)	Moderate (Sandy Subsoil)	Low (Clay & Peat)		
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
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Where the overburden is less than 3 metres thick, the Matrix Vulnerability Rating of the aquifer is considered extreme, as indicated in **Table 8.10** (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 Mayo area, there are areas of high, moderate, and extreme vulnerability. The area underlying the Proposed Development itself is classified as being of “High” vulnerability.

Provisional information on the hydrogeological classification of the bedrock beneath the Proposed Development was obtained from the Geological Survey of Ireland (GSI). The medium to thick-bedded pure limestone metasediments beneath the Proposed Development is considered by the GSI to be a Regionally Important (karstified) Aquifer (Classification code: Rkc). According to the GSI Rkc are those aquifers in which the degree of karstification limits the potential to develop groundwater. They have a high ‘flashy’ groundwater throughout, but a large proportion of flow is concentrated in conduits, numerical modelling using conventional programs is not usually applicable, well yields are variable with a high proportion having low or minimal yields. This aquifer category has been assigned taking into account 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 Proposed Development. The nearest Source Protection Area, the Kilmaine Public Water Scheme is located ca. 6.6km southeast of the Proposed Development.

According to the GSI database, there are no groundwater wells located within 2 kilometres of the Proposed Development (**Figure 8.9**). The closest groundwater well is located 3.4km southeast of the Proposed Development. A list of the groundwater wells located within 10km of the Proposed Development is summarised in **Table 8.11**.

**Table 8.11: Groundwater Wells within 10km of the site (GSI Well Database)**

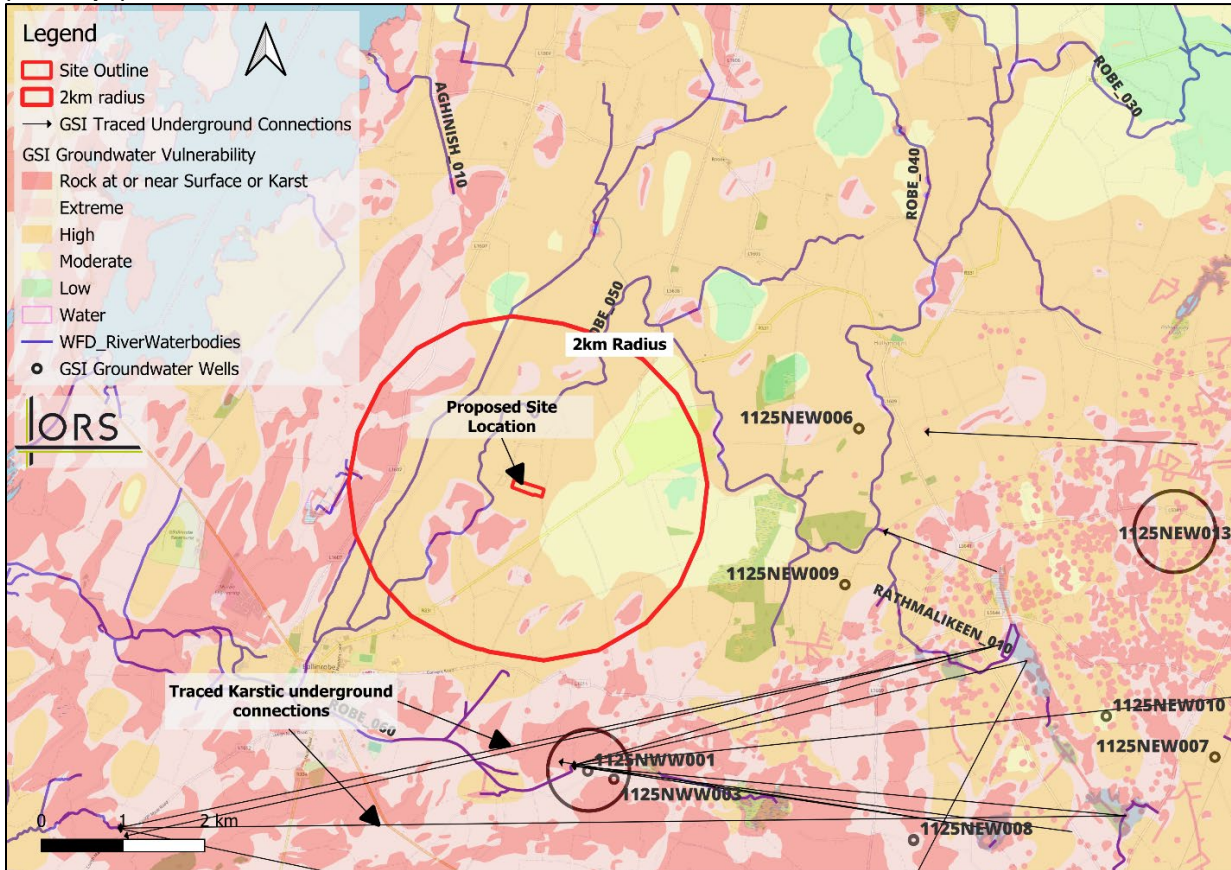
GSI Reference	Easting Northing	Well Type	Depth (m bgl)	Depth to Rock (m)	Well Use	Yield m <sup>3</sup> /d	Proximity to Proposed Development
1125NWW002	522447, 763235	Borehole	20.7	2.4	Agri & domestic	109.1	3.4km SE
1125NWW001	522437, 763223	Borehole	30.5	3.4	Other	98	3.45km SE
1125NWW003	522758, 763125	Borehole	24.1	N/A	Unknown	Unknown	3.6km SE
1125NEW009	525576, 765498	Borehole	30.5	N/A	Other	Unknown	3.9km E
1125NEW006	525767, 767410	Borehole	57.9	4.9	Agri & domestic	32.7	3.9km NE
1125NEW011	526130, 768888	Borehole	64.6	2.4	Agri & domestic	21.8	4.7km E
1125NEW008	526437, 763233	Borehole	30.1	1.2	Other	10.9	6.23km SE

**Figure 8.9** 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 marked in red. Groundwater wells in the vicinity of the Proposed Development are generally moderate to low yielding. The lands on which the Proposed Development location has been proposed have been assigned high vulnerability rating to the east of the site and extreme in the western portion of the site due to encountering bedrock during site investigations. The recorded depth bedrock is encountered for the corresponding wells in this area are generally between 1.2 and 4.9 metres below ground level (mbgl).

Examples of karst landforms are widespread in the Ballinrobe and wider Mayo area. Karstic features are common due to the underlying pure bedded lower carboniferous age limestone bedrock known as the Cong Canal Formation underlying the Proposed Development and the Cong Formation to the east/ southeast of the Proposed Development

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 ‘spring’ located 0.6km to the west of the Proposed Development. **Figure 8.8** above, superimposes the approximate location of karstic features relative to the location of the Proposed Development. There are a number of traced underground karst connections in the wider area, most prominently a number of connections located 3km to the southeast of the Proposed Development (**Figure 8.9**).

**Figure 8.9: Groundwater Vulnerability and location of Groundwater Wells and associated depth to bedrock (GSI Maps)**



Ground investigation works were carried out by a chartered ORS environmental scientist for the Proposed Development at Ballinrobe on the 11<sup>th</sup> of December 2023. The details of each investigation location is presented in **Table 8.12** and the location and depth of the trial pits is shown on **Figure 8.10**.

A site characterisation assessment (percolation assessment) was conducted by Site Assessor Michael Clifford of David McCormack Design on the 4<sup>th</sup> of April 2024. This was undertaken north of TP-02 and encountered bedrock at 2.2m bgl. The Site Suitability Assessment report is presented in **Appendix 8.1**.

The depths of trial pits varied significantly, 0.9m to 3.2m bgl, with bedrock encountered in 1 no. trial pit (TP01) located in the western portion of the site at a depth of 0.9mbgl. Groundwater was encountered in one Trial Pit (TP-04), to the east of the site at 0.8mbgl.

**Table 8.12: Summary of ground conditions at the Proposed Development (ORS)**

Location	Depth (m)	Ground Profile	Comments
<b>TP-01</b>	0.00 – 0.20	Clayey, sandy silty brown loam topsoil (Brown Earth)	End trial pit at 0.8m No water seepage noted
	0.20 – 0.70	Clayey, sandy silty light brown loam (Brown Earth)	
	0.70 – 0.90	Shattered limestone (light grey, pure bedded)	
<b>TP-02</b>	0.00 – 0.65	Clayey, sandy silty brown loam (Brown Earth)	End trial pit at 1.2m No water seepage noted
	0.65 – 1.20	Silty, gravelly grey soil with sub-angular unsorted limestone cobbles/ boulders	
<b>TP-03</b>	0.00 – 0.50	Sandy silty brown loam with some organic matter (Brown Earth)	End trial pit at 3.2m No water seepage noted
	0.50 – 1.60	Silty gravelly sand (grey), occasional sub-round cobble	
	1.60 – 3.20	Silty gravelly sand (grey), frequent cobble	
<b>TP-04</b>	0.0 – 0.10	Loam topsoil with high organic matter content (Brown Earth)	End trial pit at 1.8m Water seepage noted 0.80m
	0.10 – 0.30	Sandy silty light brown/ grey loam	
	0.30 – 0.80	Silty gravelly sand, grey with rust colour (dry), occasional small sub-angular cobble	
	0.80 – 1.10	Silty gravelly sand grey with black mottling (wet)	
	1.10 – 1.80	Dark grey, silty gravel with limestone cobble	

**Figure 8.9: Location of Trial Pits (TP) and Site Characterisation Assessment**



There was variation in the soil profile across all four trial pits. Similarities between profiles was noted. The topsoil in Trial Pits 01 and 02 to the west of the site were notably more clayey than to the east. Soil and subsoil horizons were larger in the east, Trial Pits 03 and 04. The findings of the site investigation correlated with the GSI soil & subsoil database mapping. The predominant soil underlying the proposed site is a mineral derived from calcareous parent materials. The site is characterised by a free draining bedrock (limestone), moderate permeability subsoil overlain by a well-drained topsoil. There is a significant variation in the soil depth from shallow (0.9m) to deep (>3.2m). The topsoil throughout the site is characterised as Brown Earth, consisting of a clayey/sandy silty brown loam. The subsoil, which is only found in Trial Pits 03 and 04, is characterised as a grey silty gravelly sand, with occasional limestone cobble. The underlying bedrock is a shattered limestone which is found at 0.9m and 1.2m bgl in Trial Pits 01 and 02, respectively. The bedrock encountered is described as light grey pure bedded limestone.

There are no mapped currently licensed/unlicensed or historic waste facilities/dump sites within the immediate or wider vicinity of the Proposed Development. The closest facility is located ca. 15km northeast of the Proposed Development on the outskirts of Claremorris town. The facility is a historic (closed) licensed landfill that was operated by Mayo County Council between 1982-1996 (Reg. H0319-01). The historic landfill is located in the same groundwater body as the proposed biogas development (Cong-Robe).

An Environmental Risk Assessment of the historic landfill site conducted by Fehilly Timoney in

2021 concluded that “Based on the results of the updated Tier 3 risk assessment, the site is still classified as a Moderate Risk Classification (Class B). The principal risk identified on the site is the risk posed to the aquifer from migration of leachate from the waste material encountered at the site through groundwater” and that “Estimation of leachate generation at the site indicates that the site may contribute a very small amount of groundwater recharge volume to the wider Clare/Corrib groundwater body, therefore it is not likely to have an impact regionally”. It should be noted that the Fehilly Timoney Tier 3 Assessment concluded that “an engineered landfill cap will be required across the landfill site to reduce rainfall inputs and to mitigate the impacts of leachate generated on site on the underlying aquifer and receptors downgradient”. Due to its significant distance (>15km) and findings of the Fehilly Timoney assessment the historic landfill site is not foreseen to have an effect on the Proposed Development.

## **Mayo County Development Plan 2021 – 2027 – Groundwater Protection**

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

### **Water Quality Policies:**

**NEP 17** - To promote public awareness of water quality issues and the measures required to protect surface water, coastal and transitional waters and groundwater bodies from inappropriate and damaging development.

**NEP 19** - To protect existing groundwater sources and aquifers in the county and to manage development in a manner consistent with the protection of these resources.

**NEP 21** - To manage, protect and enhance surface water and ground water quality to meet the requirements of the Water Framework Directive.

### **Water Quality Objectives:**

**NEO 36** - To manage in a sustainable manner, the existing groundwater sources and aquifers in the county and manage development in a manner consistent with the sustainable management of these resources, in conformity with the EU Environmental Objectives (Groundwater) Regulations 2010 and the second cycle National River Basin Management Plan 2018-2021, and any subsequent plans and the Groundwater Protection Scheme.

**NEO 37** - To protect groundwater sources through the implementation of the Groundwater Protection Scheme and Source Protection Zones. Development proposals within these zones which have the potential to pose a risk to groundwater will be required to demonstrate that no reasonable alternative site is available and that groundwater quality will be protected to the satisfaction of the Council.

## Groundwater Vulnerability Assessment

The Proposed Development 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**

	<b>Aquifer Type</b>	<b>Sampling Requirements</b>
<b>Ground Water Protection Scheme (GWPS) does not exist</b>	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 8.13** overleaf 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 8.13: 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 Development vulnerability rating of High and aquifer classification of – Regionally important Aquifer (karstified); we therefore have a Proposed Development that is classified as (Rk/H) in the east of the site. The western half of the site is classed as Rk/E due to the close proximity of bedrock (0.9-1.2m bgl) as discovered during the site investigations.

**Groundwater Protection Responses**

The Groundwater Protection Responses to the land spreading of organic wastes (see DoE/GSI/EPA publication, 1999) is applicable to this study due to the proposed nature and operational phase of the Proposed Development. The DoE/GSI/EPA states that a ‘Regionally Important Aquifer with a high vulnerability rating is acceptable, subject to normal practice of land spreading’. This refers to areas where Groundwater Protection Schemes do not exist and there is no known groundwater contamination in the area.

**Table 8.13: Vulnerability Rating Summary for Land Spreading of Organic Waste**

Vulnerability Rating	Resource Protection (Aquifer Category)							
	SOURCE PROTECTION AREA		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 <sup>2</sup>	R3 <sup>2</sup>	R3 <sup>1</sup>	R3 <sup>1</sup>	R3 <sup>1</sup>	R3 <sup>1</sup>
High (H)	R4	R2 <sup>1</sup>	R1	R1	R1	R1	R1	R1
Moderate (M)	R3 <sup>3</sup>	R2 <sup>1</sup>	R1	R1	R1	R1	R1	R1
Low (L)	R3 <sup>3</sup>	R2 <sup>1</sup>	R1	R1	R1	R1	R1	R1

R1 Acceptable, subject to normal good practice.

R2<sup>1</sup> Acceptable subject to a maximum organic nitrogen load (including that deposited by grazing animals) not exceeding 170 kg/hectare/yr.

R3<sup>1</sup> Not generally acceptable, unless a consistent minimum thickness of 1 m of soil and subsoil can be demonstrated.

R3<sup>2</sup> Not generally acceptable, unless a consistent minimum thickness of 2 m of soil and subsoil can be demonstrated.

R3<sup>3</sup> 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**

From desktop and field investigations it can be determined that the Proposed Development is located on a regionally important aquifer of high/ extreme vulnerability with the eastern section of the site being classified as Rk/H. and the western half of the site is classed as Rk/E due to the close proximity of bedrock (0.9-1.2m bgl). Intrusive site investigation works were carried out by ORS in December 2023. This investigation consisted of advancing a total of 5 no. trial pits excavated to a minimum depth of 1.2m below ground level (bgl). Bedrock was encountered in 1 no. trial pit (TP01) located in the western portion of the Proposed Development at a depth of 0.9mbgl. The groundwater protection response recommends that a consistent thickness of 1m of soil / subsoil must be demonstrated overlying regionally important aquifers to ensure that EPA guidelines are being adhered to.

This study has indicated that the Proposed Development is not foreseen to have any detrimental impact on the underlying aquifer or more any wells in the area. The GSI well data has indicated a low density of wells within the area of the Proposed Development

The response matrix would indicate that vulnerability rating assigned to the site would be “R1 - Acceptable, subject to normal good practice.” in the east of the site and: “R3<sup>2</sup> - Not generally acceptable, unless a consistent minimum thickness of 2m of soil and subsoil can be demonstrated.” in the west of the site.

Further trial pits are recommended pre-construction to determine soil depth to the west within the site and installation of impermeable liners under the attenuation ponds.

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. 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.

## 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 development.

Based on the dataset obtained during the desk study, extensive 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 Proposed Development 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 Proposed Development.

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 Proposed Development are summarised in **Table 8.14**.

**Table 8.14 – Receptor Sensitivity**

Receptor	Receptor Importance	Receptor Sensitivity	Rationale
<p><b>Groundwater</b> Cong-Robe Groundwater Body</p>	<p>Local Level</p>	<p>High/Extreme</p>	<p>The Cong-Robe Regionally Important (karstified) Aquifer rendering this groundwater body's importance as significant.</p> <p>The groundwater vulnerability is classified as "High" in the eastern portion of the site and "Extreme" in the western portion of the site according to the GSI map viewer and site investigations that encountered bedrock at 0.9mbgl-1.2mbgl in the western portion of the site. Groundwater was encountered in only one trial pit (TP-04) towards the east of the Proposed Development at 0.8 mbgl. The groundwater table across the remainder of the Proposed Development is adjudged to be &gt;1m below ground level.</p> <p>The response matrix (<b>Table 8.13</b>) would indicate that vulnerability rating assigned to the Proposed Development would be "R1 Acceptable, subject to normal good practice" in the east of the site and "R3<sup>2</sup>" in the western portion of the site. Further trial pits are recommended to determine the depth of soil in the western portion of the site and the installation of impermeable liners under the attenuation ponds.</p>
<p><b>Surface Water</b> Robe River and downstream receptors Lough Carra SPA, Lough Mask SPA and Lough Carra and Lough Mask Complex SAC/pNHA.</p>	<p>EU Level</p>	<p>Extreme</p>	<p>The receiving water body, the Robe River, is likely to be hydrologically connected though the prevalence of the likely flow path of the Robe River being through Ballinrobe town and into the Lough Carra and Lough Mask complex located ca.5.8km from the Proposed Development. This lake complex is protected by EU Legislation, indicative of both SAC &amp; SPA status, hence this receptor's importance and sensitivity is considered to be "Extreme".</p>

### 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 8.15**.

#### **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. 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 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 ecological degradation of aquatic biota.

The subsoil beneath the Proposed Development consists primarily of limestone till consisting of silt-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.

Uncontrolled releases of sediment run-off, ***in the absence of mitigation***, would result in a ***negative, slight to moderate, temporary effect*** on the water quality of the Robe River which is hydrologically connected to the site and the Lough Carra and Lough Mask Complex SAC/pNHA and Lough Mask SPA. No effect is anticipated to groundwater receptors 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 deleterious effect on water quality and aquatic life should any become entrained in the receiving water environment.

The drainage characteristics of the Proposed Development area outlined in **Section 8.4.5** and concluded that the Qbar value for the site of 1.60 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, the ADS channel north of the site and subsequent downstream receptors.

The groundwater vulnerability assessment in **Section 8.4.8** concluded that groundwater vulnerability at the Proposed Development was classed as 'high' due to the shallow depth <10m of moderate permeability loam/silt subsoils beneath the Proposed Development. These 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.

Uncontrolled releases of hydrocarbons, chemicals, or cement, ***in the absence of mitigation***

would result in a **negative, moderate, temporary effect** on the water quality of the Robe River and potentially to downstream receptors Lough Mask SPA and Lough Carra and Lough Mask Complex SAC/ pNHA.

## **Increased Groundwater Vulnerability**

The disturbance of a significant amount of soil required in order to level the Proposed Development 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 7.3.6** concluded that groundwater vulnerability at the Proposed Development is classified as 'high in the east of the site and 'Extreme' in the western portion of the site due to bedrock being encountered at 0.9-1.2mbgl during site investigations. GSI technical site investigations reveal there is a significant variation in the soil depth from shallow (0.9m) to deep (>3.2m).

The preliminary Cut and Fill data (**Drawing Ref: 231924-ORS-ZZ-ZZ-M2-AR**) for the Proposed Development indicates that a total of 30,000 cu. M of subsoil is to be excavated, with 24,000 cu. M to be reused as capping layers and fill. An estimated 6,000 cu. M of surplus subsoil required to be disposed of off-site. An estimated 6,203 cu. M of topsoil is to be excavated, and subsequently reused on site to enhance landscaping areas. Estimated volumes are subject to further ground investigation pre-construction.

An excavation depth of 1.0m bgl for the purposes of site levelling, would increase the vulnerability in particular areas from 'high' to 'extreme'.

The response matrix would indicate that vulnerability rating assigned to the site would be "R1 - Acceptable, subject to normal good practice." in the east of the site and: "R32 - Not generally acceptable, unless a consistent minimum thickness of 2 m of soil and subsoil can be demonstrated." in the west of the site.

Further trial pits are recommended pre-construction to determine soil depth to the west within the site and installation of impermeable liners under the attenuation ponds.

**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 Bedrock Aquifer**

Bedrock was encountered at 0.9mbgl in TP01 located towards the west of the Proposed Development during site investigations. Groundwater was encountered in one Trial Pit (TP-04), to the east of the Proposed Development at 0.8mbgl. As depicted in **Figure 8.9**, groundwater wells in the surrounding area generally encounter bedrock at depths between 1.2m to 4.9mbgl. Given the maximum depths of excavations required to level the site are anticipated at 1.0m bgl, interaction with bedrock is not expected.

The lands on which the Proposed Development location has been proposed have been assigned high vulnerability rating to the east of the site and extreme in the western portion of the site due to encountering bedrock during site investigations.

Further trial pits are recommended pre-construction to determine soil depth to the west within

the site and installation of impermeable liners under the attenuation ponds.

A potential effect of the construction stage could be the exposure of the underlying bedrock. Excavations of up to 1.0m 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 both Attenuation Ponds. 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 0.6m 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 28.6, and 0.3m above the FFL of the bund floor at 28.3m. Foundations and hard core will be a further ca. 0.6m below the FFL. These structures are planned for the east and northeast of the site where the current ground level is nearer the proposed ground level. Maximum excavations to 27.68m OD at the attenuation pond to the east and 28.8m OD to the west. Infilling beneath structures is required to achieve the desired ground level. Refer to the proposed Cut and Fill data in Drawing: **231924-ORS-ZZ-ZZ-M2-AR** and relevant structural site layout drawings as referenced in **Section 2.2, Chapter 2 – Project Description**.

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

### **Passing Bays, Discharge Pipe 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. Similarly, excavations are required for the construction of the passing bays on the adjacent L-56391 tertiary road and to install the gas pipeline to the nearby R331 regional road. In total 3 no. passing bays will be upgraded along the ca. 420m length of the L-56391 tertiary road. This will entail the excavation topsoil and subsoil to facilitate the installation of engineered infill and asphalt surface.

The proposed gas pipeline connecting to the existing Gas Networks Ireland pipeline along the R331 will be installed underneath the existing L56391 tertiary road that provides access to the site. This is an indicative routing of the pipeline to the site and is subject to change pending detailed network modelling and design. Installation of the pipeline will involve temporary excavation work and will result in disturbance of the underlying soil and subsoil. This may have an effect on the exposed soil and subsoil with implications for the soil surface with regard to stock piling and mobile plant. The trenches will be backfilled shortly after excavation following the installation of each section. Trenching along a road network will give rise to asphalt waste material. If improperly managed these materials can pose a risk to the environment due to the presence of Polycyclic Aromatic Hydrocarbons (PAHs).

A discharge pipe running from the western side of the site and discharging directly into the River Robe will be installed. The proposed method of installation is via a "Mole Plough". Mole ploughing is not strictly a trenchless technology but involves creating a narrow temporary trench/ slit in the soil for installing small diameter mains and services.

***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 Proposed Development 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 Proposed Development 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 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 increase in volume and intensity of surface water run-off within a given catchment. The encroachment of 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 Proposed Development to existing watercourses will result in larger 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, moderate and temporary***.

**Table 8.15 – Construction Phase Effects (Unmitigated)**

Receptor	Potential Environmental Effects	Quality	Significance	Duration
<b>Groundwater</b> Cong-Robe Groundwater Body	Excavations Increasing Groundwater Vulnerability	Negative	Slight to 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
<b>Surface Water</b> Robe River and downstream receptors Lough Mask SPA and Lough Carra and Lough Mask Complex SAC/ pNHA.	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

### 8.5.4 Sources - Operational Phase

Potential Operational Phase effects are considered in detail below and summarised in **Table 8.17**.

#### Contaminated Run-off

Run-off from impermeable areas within the Proposed Development 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 and treated discharge from the Proposed Development is to the River Robe located ca. 250m from the site. ***In the absence of suitable design & mitigation measures***, there would be a ***negative, moderate to significant, temporary effects*** on the water quality of the Robe River the west of the site, which is hydraulically connected to Lough Mask SAC/pNHA and the Lough Carra and Lough Mask complex SPA.

#### 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 8). A Site Suitability Assessment conducted by *Donal McCormack 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.

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

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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 Robe River, and to the Cong-Robe Groundwater Body leading to degradation of water quality with negative consequences for aquatic life. Overall, the predicted effects of foul water leakage on hydrological & 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: **231924-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 Robe River and downstream receptors Lough Mask SPA and Lough Carra and Lough Mask Complex SAC/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 Robe River and downstream receptors Lough Mask SPA and Lough Carra and Lough Mask Complex SAC/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.

The digestate treatment system has a design capacity to treat a minimum of 78,000 tonnes of whole digestate per annum. Following treatment of the whole digestate, ca. 8,000 tonnes of digestate fibre, and ca. 17,000 tonnes of liquid digestate concentrate will be produced. The treatment process will recover ca. 53,000 tonnes of clean water which will be reused on site for cleaning, with the remaining volume discharged under licence to the Robe.

The digestate treatment process involves the following stages:

- Screwpress Separation
- Ultrafiltration
- Reverse Osmosis

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. The remaining volume of water will be diverted through an overflow pipe to undergo continuous water quality monitoring. Upon confirmation that the discharge emissions limit values (ELV) are met, the purified water will be released under discharge.

Assimilative capacity calculations and assessment are included in **Appendix 8.2**.

Discharge values following RO are outlined in **Table 8.16** below:

**Table 8.16: Discharge values**

Parameter	Value
Total Oxidised N (mg/l)	60
Ammonal Total N (mg/l)	60
BOD (mg/l)	125
Orthophosphate (mg/l)	3
pH (pH units)	5.5 - 8.5
Nitrate (as N) (mg/l)	60
Nitrate (as NO <sub>3</sub> ) (mg/l)	0
Nitrate (as NO <sub>2</sub> ) (mg/l)	0
Discharge Rate (m <sup>3</sup> /hour)	10

Uncontrolled releases of discharge ***in the absence of mitigation measures*** would result in ***negative, significant, temporary effects*** on the water quality of the Robe River and downstream receptors Lough Mask SPA and Lough Carra and Lough Mask Complex SAC/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 Robe River and downstream receptors Lough Mask SPA and Lough Carra and Lough Mask Complex SAC.

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)<sup>4</sup>.

## 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)<sup>5</sup>. 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 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).<sup>6</sup>

## 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

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<sup>4</sup> 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.

<sup>5</sup> 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.

<sup>6</sup> 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.

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 Ponds**

The development proposes establishing an attenuation ponds to the east and the southwest 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 southwest risks exposing the underlying bedrock and reduces the overburden between the development and underlying regionally important bedrock aquifer.

The constructing of the attenuation ponds *in the absence of mitigation measures* is foreseen to have a **negative-neutral, moderate, and permanent effect**.

**Table 8.17: Operational Phase Effects (Unmitigated)**

<b>Receptor</b>	<b>Potential Environmental Effects</b>	<b>Quality</b>	<b>Significance</b>	<b>Duration</b>
<b>Groundwater</b> Cong-Robe Groundwater Body	Attenuation Ponds	<b>Negative/ Neutral</b>	<b>Moderate</b>	<b>Permanent</b>
<b>Surface Water</b> Robe River and downstream receptors Lough Mask SPA and Lough Carra and Lough Mask Complex SAC/ pNHA.	Contaminated runoff	<b>Negative</b>	<b>Moderate/ Significant</b>	<b>Temporary</b>
	Conversion of permeable Soils to Hardstanding	<b>Negative</b>	<b>Moderate/ Significant</b>	<b>Temporary</b>
	Uncontrolled Releases and Spillages	<b>Negative</b>	<b>Slight/ Moderate</b>	<b>Temporary</b>
	Fire and Resultant Firewater	<b>Negative</b>	<b>Significant</b>	<b>Temporary</b>
	Uncontrolled Release of Discharge	<b>Negative</b>	<b>Significant</b>	<b>Temporary</b>
	Contaminated Runoff	<b>Negative</b>	<b>Moderate</b>	<b>Temporary</b>
<b>Both</b>	Foul Water	<b>Negative</b>	<b>Moderate/ Significant</b>	<b>Short-term</b>
	On-site Flooding	<b>Negligible</b>	<b>Not Significant</b>	<b>Unlikely</b>

## **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: Likely Significant Effects**.

The recommended mitigation measures will outline how risks of potential effects are reduced to negligible.

### **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 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 Proposed Development:

- 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 within the bunded area.
- Only appropriately trained site operatives permitted to refuel the facility and machinery on-site.
- Regular inspections carried out on and machinery for leaks and general condition.

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- Emergency response plan.
- Spill kits readily available throughout the Proposed Development.
- Use of ready-mixed supply of wet cement products.
- Scheduling cement pours for dry days.

## **Increased Groundwater Vulnerability / Excavation of Bedrock Aquifer**

The lands on which the Proposed Development location has been proposed have been assigned high vulnerability rating to the east of the site and extreme in the western portion of the site due to encountering bedrock during site investigations.

Further trial pits are recommended pre-construction to determine soil depth to the west within the site and installation of impermeable liners under the attenuation ponds.

An excavation depth of 1.0 bgl 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.

## **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 Runoff**

The design development of the site is based on eliminating potential contamination and having clearly defined work areas which can be monitored and isolated if required, for example, the bunded area.

Levels and gradients were identified and used to reduce the need for below ground drainage and to maximise surface gravity-based drainage. The site has two Attenuation Ponds which will

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be used for attenuation of surface water and to control the rate of the discharge from the Proposed Development.

It is proposed to take run-off from the roads, yards, roof and the impermeable bunded area and discharge these areas through sediment chambers, oil traps, drainage systems and attenuation ponds. 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 Proposed Development includes:

- Pipes designed for 'small catchment' areas based on a rainfall intensity of 50mm/hr falling on impermeable pavements and surfaces.
- Pipes designed (sized) and selected to have self-cleansing qualities, minimum pipe size will be diameter 100mm, cover depth 1.2m below roads and otherwise 600-1200mm depth.
- Pipe gradients to have minimum 1:500 fall.
- Interception, traps, long term storage, treatment storage and attenuation have been considered and rural area GSDS (Greater Dublin Strategic Drainage Study) has been taken into account.
- All areas apart from the building roofs will be directed through petrol/oil interceptors before passing through the attenuation ponds prior to discharge.
- Class 1 petrol/oil interceptors will be incorporated.
- Where gravity surface water drainage is adopted sediment traps will be installed prior to the interceptors.

## **Foul Water**

A site suitability assessment for domestic on-site wastewater treatment was conducted by Michael Clifford (B. Eng FETAC, Site Assessment) on the 9<sup>th</sup> April 2024.

Based on the population equivalent (PE) for the Proposed Development of 8, the volume of foul water generated from the canteen and office within the Proposed Development was calculated at 0.15 m<sup>3</sup>/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 12 PE.

The overburden consisting of light black clay/ till is determined to be excellent overburden 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 1.0m below the existing elevation of the site in certain places, increasing the vulnerability of the underlying 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)

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- The Proposed Development is designed in accordance to BAT Emissions from Storage. A BAT assessment was conducted to ensure proper plant design and operation.
- Tanks will be designed and constructed to Eurocode 2 Part 2 retaining structures and a Construction Quality Assurance (CQA) plan will validate their proper design and construction.
- Bund capable of holding 110% volume of the largest tank and designed to EN 1992-3:2006 Eurocode 2: Design of concrete structures - Part 3: Liquid retaining and containment.

## **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.

## **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.

- Two attenuation ponds are provided to facilitate the existing gradients on the site. The attenuation ponds are designed both for 1:100-year events and well as to regulate the outflow from the site.
- The attenuation ponds will accommodate the total catchment area capacity and will provide a minimum storage capacity of 1,174m<sup>3</sup>.
- The attenuation ponds will discharge the storm water and are restricted to deliver a max flow less than that of greenfield run off of 5l/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 within 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 ponds 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.

## **Fire and Resultant Firewater**

Having regard to current law and practice, the Proposed Development will require an application for an Industrial Emissions (IE) licence to the EPA. In the event of a grant of licence by the EPA to carry out activities that require such licence, it is expected that 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.
- 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).

## **Uncontrolled Release of Discharge**

Discharge (trade effluent) licence conditions ensure that discharge is treated and controlled in a manner that protects the receiving environment.

- Monitoring frequency and emission limit values (ELV's) for discharge (trade effluent) will be in line with BAT Waste treatment CID and any EPA licence conditions. Trigger levels will be established and agreed with the Agency.
- 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. The remaining volume of water will be diverted through an overflow pipe to undergo continuous water quality monitoring.
- Upon confirmation that the discharge emissions limit values (ELV) are met, the purified water will be released under a discharge license. However, should the ELV not be met, an automated shut-off valve will be activated to prevent discharge, diverting the water back into the processing system.
- The reverse osmosis system will be specified and installed by an appropriately qualified technician and will be subject to regular maintenance, subject to manufacturers recommendations.

## **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 8.18**.

The overall impact anticipated by the construction phase of the project following the implementation of suitable mitigation measures is considered to be ***neutral to negative, 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 8.19**.

The overall impact anticipated by 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 8.18: 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 Robe River and downstream receptors Lough Mask SPA and Lough Carra and Lough Mask Complex SAC/pNHA	Erosion of stockpiles of exposed soils leading to migration of silt into surface water receptors via dust and run-off	Negative	Moderate	Temporary	<ul style="list-style-type: none"> <li>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.</li> <li>Stockpile areas for sands and gravel should be kept to minimum size, well away from storm water drains and gullies leading off-site.</li> <li>Covers are to be provided over soil stockpiles when high wind and inclement weather are encountered if required.</li> </ul>	Neutral, Slight, Temporary
	Groundwater Cong-Robe Groundwater Body	Loose sediments becoming entrained in open excavations and infiltrating downwards into aquifer	Negative	Moderate	Temporary	<ul style="list-style-type: none"> <li>Excavations to be backfilled as soon as possible to prevent any infiltration of contaminants to the subsurface and the aquifer.</li> <li>Landscaping to take place as soon as possible to reduce weathering.</li> </ul>	Neutral, Slight, Temporary
Accidental Spillages of Harmful Substances	Surface Water Robe River and downstream receptors Lough Mask SPA and Lough Carra and Lough Mask Complex SAC/pNHA	Spillage of contaminants such as fuels, oils, chemicals and cement material and subsequent migration into surface water receptors	Negative	Moderate	Temporary	<ul style="list-style-type: none"> <li>Harmful materials such as fuels, oils, greases, paints and hydraulic fluids must be stored in banded compounds well away from storm water drains and gullies. Refuelling of machinery should be carried out using drip trays.</li> <li>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.</li> </ul>	Negative, Slight, Temporary
	Groundwater Cong-Robe Groundwater Bod	Spillage of contaminants becoming entrained in open excavations and infiltrating downwards into aquifer	Negative	Moderate	Temporary	<ul style="list-style-type: none"> <li>Stockpile areas for sands and gravel should be kept to minimum size, well away from storm water drains and gullies leading off-site.</li> <li>Covers are to be provided over soil stockpiles when high wind and inclement weather are encountered if required.</li> </ul>	Neutral, Slight, Temporary
Increased Groundwater Vulnerability	Groundwater Cong-Robe Groundwater Body	An excavation depth of 1.0m bgl would increase the vulnerability in particular areas in the west of the site from 'high' to 'extreme'	Negative	Significant	Long-Term	<ul style="list-style-type: none"> <li>Trial pits to confirm soil depth at the siting of the built structures and ponds required.</li> <li>The entire tank farm area of the Proposed Development will be underlain by an impermeable surface.</li> </ul>	Negative, Slight, Temporary
Excavation of	Groundwater	Potential removal of bedrock	Negative	Significant	Long-Term		Negative,

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
<b>Bedrock Aquifer</b>	Cong-Robe Groundwater Body	in certain parts of the site to create a uniform base.				<ul style="list-style-type: none"> <li>Attenuation ponds to be underlain by an impermeable layer.</li> <li>Excavations to be backfilled as soon as possible to prevent any infiltration of contaminants to the subsurface and the aquifer.</li> <li>Landscaping to take place as soon as possible to reduce weathering.</li> </ul>	<b>Slight, Temporary</b>
<b>Excavation of Contaminated Soils</b>	<b>Surface Water</b> Robe River and downstream receptors Lough Mask SPA and Lough Carra and Lough Mask Complex SAC/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.	<b>Unlikely</b>	<b>Negligible Impact</b>	<b>Unlikely</b>	<ul style="list-style-type: none"> <li>Greenfield site with no previous industrial activities noted at the Proposed Development meaning incidences of contaminated land unlikely</li> <li>Site investigations expected to reinforce this assumption</li> <li>Procedure in place for incidence of contaminated land within CEMP</li> <li>Contaminated soils encountered to be tested, quantified, segregated and transported for disposal by a licenced contractor</li> </ul>	<b>Unlikely, Negligible, Unlikely</b>
	<b>Groundwater</b> Cong-Robe Groundwater Body		<b>Unlikely</b>	<b>Negligible Impact</b>	<b>Unlikely</b>		<b>Unlikely, Negligible, Unlikely</b>
<b>Conversion of Permeable Soils to Hard standing</b>	<b>Surface Water</b> Robe River and downstream receptors Lough Mask SPA and Lough Carra and Lough Mask Complex SAC/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 intensity of surface water run-off within a given catchment.	<b>Negative</b>	<b>Moderate</b>	<b>Temporary</b>	<ul style="list-style-type: none"> <li>Rainwater harvesting.</li> <li>Attenuation ponds are clay lined and used as a biodiversity area</li> <li>Filter drains along verges</li> <li>Tree-pits at localised tree locations</li> <li>Petrol Interceptors</li> <li>Attenuation Ponds will accommodate the total catchment area capacity and will provide a minimum storage capacity of 1107m<sup>3</sup> (designed to accommodate the estimated rainfall events)</li> </ul>	<b>Negative, Slight, Temporary</b>

Table 8.19: 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 Robe River and downstream receptors Lough Mask SPA and Lough Carra and Lough Mask Complex SAC/pNHA	Run-off from impermeable areas within the Proposed Development discharging into surface water bodies	Negative	Moderate to Significant	Temporary	<ul style="list-style-type: none"> <li>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.</li> <li>Drainage systems will be designed to attenuate excess surface water runoff with suitable storage volumes</li> <li>Reduction of outflow rate to below the existing greenfield runoff rate before discharging into the Robe River from attenuation ponds.</li> <li>Installation of Sustainable Urban Drainage Systems (SuDS) features such as sediment chambers, oil traps into drainage ditches and attenuation ponds</li> </ul>	Neutral, Slight, Long-term
	Groundwater Cong-Robe Groundwater Body	Run-off from impermeable areas within the Proposed Development infiltrating downwards through soils into aquifer	Negative	Moderate to Significant	Temporary	<ul style="list-style-type: none"> <li>The digestion process area will be completely bunded and constructed to Eurocode standard (BS EN 1992-3)</li> </ul>	Neutral, Imperceptible, Long-term
Foul Water	Surface Water Robe River and downstream receptors Lough Mask SPA and Lough Carra and Lough Mask Complex SAC/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	<ul style="list-style-type: none"> <li>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</li> <li>Programme of inspection and maintenance to ensure any defects are repaired</li> </ul>	Negative, Slight, Long-term

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
	<b>Groundwater</b> Cong-Robe Groundwater Body	Leakage of untreated foul water and infiltration downwards through sediments into aquifer	<b>Negative</b>	<b>Moderate to Significant</b>	<b>Short-Term</b>	<ul style="list-style-type: none"> <li>The wastewater treatment plant will comprise a secondary treatment system, followed by a soil polishing filter. The overburden consisting of light black CLAY/ TILL is determined to be excellent overburden available to support Groundwater Protection Responses (GWPR). 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.l</li> <li>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.</li> </ul>	<b>Negative, Slight, Long-term</b>
<b>Increased Groundwater Vulnerability</b>	<b>Groundwater</b> Cong-Robe Groundwater Body	The proposed Finished Floor Levels (FFL's) will be up to 1.0m below the existing elevation of the site in certain places, increasing the vulnerability to the underlying aquifer from 'High' to 'Extreme'.	<b>Negative</b>	<b>Significant</b>	<b>Long-Term</b>	<ul style="list-style-type: none"> <li>The tank farm area will be completely bunded and constructed to Eurocode standard (BS EN 1992-3:2006)</li> </ul>	<b>Negative, Slight, Long-term</b>
<b>Uncontrolled Releases &amp; Spillage of biobased fertiliser and Feedstocks</b>	<b>Surface Water</b> Robe River and downstream receptors, Lough Mask SPA and Lough Carra and Lough Mask Complex SAC/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	<b>Negative</b>	<b>Slight to Moderate</b>	<b>Temporary</b>	<ul style="list-style-type: none"> <li>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</li> </ul>	<b>Neutral to Negative, Slight, Long-term</b>

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
	<b>Groundwater</b> Cong-Robe Groundwater Body	potential risk to surface and groundwater quality.	<b>Negative</b>	<b>Slight to Moderate</b>	<b>Temporary</b>	<p>eutrophication, safeguarding aquatic ecosystems and maintaining water quality.</p> <ul style="list-style-type: none"> <li>• Dedicated hard standing for off-loading areas, with a minimum separation distance from adjacent water courses.</li> <li>• Use of spill kits, banded pallets and secondary containment units, as appropriate.</li> <li>• All bunds sized to contain 110% of the volume of the primary storage vessel.</li> <li>• Environmental operating plan to include site specific standard operating procedures pertaining to waste management and emergency response.</li> <li>• There will be 2 no. discharge points from the Proposed Development during operational phase:               <ol style="list-style-type: none"> <li>1. Treated process water (from the nutrient recovery process)</li> <li>2. Discharge from the attenuation ponds i.e. stormwater</li> </ol> </li> <li>• The digestion process area (tank farms) will be completely banded &amp; constructed to Eurocode standard (BS EN 1992-3:2006)</li> <li>• All bunds and pipelines (foul &amp; process) will be subject to integrity assessments every 3 years by a suitably qualified engineer.</li> </ul>	<b>Neutral to Negative, Slight, Long-term</b>
<b>Fire and Resultant Firewater</b>	<b>Surface Water</b> Robe River and downstream receptors, Lough Mask SPA and Lough Carra and Lough Mask Complex SAC/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”.	<b>Negative</b>	<b>Significant</b>	<b>Temporary</b>	<ul style="list-style-type: none"> <li>• A Firewater Risk Assessment will be prepared. Adequate firewater retention capacity is installed and maintained on-site in the event of a worst-case scenario fire event.</li> <li>• All retention infrastructure systems will be automatically activated in the event of a fire alarm being triggered.</li> </ul>	<b>Negative, Slight, Short-Term</b>
	<b>Groundwater</b> Cong-Robe Groundwater Body	Firewater is known to contain several harmful substances, as detailed in <b>Section 7.4.4.</b>	<b>Negative</b>	<b>Significant</b>	<b>Temporary</b>		<b>Negative, Slight, Short-Term</b>

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
<b>On-Site Flooding</b>	<b>Surface Water</b> Robe River and downstream receptors Lough Mask SPA and Lough Carra and Lough Mask Complex SAC	The Proposed Development is not located within a Flood Zone.	<b>Unlikely</b>	<b>Negligible Impact</b>	<b>Unlikely</b>	<ul style="list-style-type: none"> <li>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</li> <li>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.</li> </ul>	<b>Unlikely, Negligible, Temporary</b>
<b>Conversion of Permeable Soils to Hard standing</b>	<b>Surface Water</b> Robe River and downstream receptors, Lough Mask SPA and Lough Carra and Lough Mask Complex SAC	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 runoff within a given catchment.	<b>Negative</b>	<b>Significant</b>	<b>Long-Term</b>	<ul style="list-style-type: none"> <li>Sustainable Urban Drainage Systems (SuDS) such as such as sediment chambers, oil traps into drainage ditches and attenuation ponds included.</li> <li>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.</li> </ul>	<b>Neutral, Slight, Long-term</b>
<b>Land Spreading of biobased fertiliser</b>	<b>Surface Water</b> Robe River and downstream receptors, Lough Mask SPA and Lough Carra and Lough Mask Complex SAC	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 aquifer	<b>Positive</b>	<b>Slight</b>	<b>Long Term</b>	<ul style="list-style-type: none"> <li>Nutrient management plans to avoid excess fertiliser application</li> <li>Farmers to comply with the Nitrates Action Plan</li> <li>“Lay-off” period of 21 days for grazing or harvesting following application</li> <li>Biobased fertiliser will be pasteurised in accordance with Regulation (EU) 142/2011 on use of animal by products as organic fertiliser.</li> </ul>	<b>Positive, Imperceptible, Temporary</b>
<b>Attenuation Ponds</b>	<b>Groundwater Cong-Robe Groundwater Body</b>	Discharge of contaminated materials into the attenuation ponds may have the potential to percolate into the underlying	<b>Negative</b>	<b>Moderate</b>	<b>Permanent</b>	<ul style="list-style-type: none"> <li>Installation of Sustainable Urban Drainage Systems (SuDS) features such as filter drains and petrol interceptors</li> </ul>	<b>Neutral, Moderate, Long-term</b>

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
		aquifer.				<ul style="list-style-type: none"> <li>Impermeable membrane liner will be installed under the attenuation ponds to prevent percolation of contents into the underlying regionally important karst aquifer.</li> </ul>	

## 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 – Robe River 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.

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 Robe River to the west of the Proposed Development and downstream receptors Lough Mask SPA and Lough Carra and Lough Mask Complex SAC; and a Regionally Important aquifer beneath the Proposed Development named the Cong-Robe 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 8.18** and **Table 8.19**.

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

The overall impact anticipated by 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***.

## **Appendix 8.1 – Site Suitability Assessment**

# SITE CHARACTERISATION FORM

## COMPLETING THE FORM

**Note:** This form requires the latest version of Adobe Acrobat Reader and on PC's Windows 7 or later. Windows XP produces errors in calculations

### Step 1:

Goto Menu Item **File, Save As** and save the file under a reference relating to the client or the planning application reference if available.

#### Clear Form

Use the **Clear Form** button to clear all information fields.

### Notes:

All calculations in this form are automatic.

Where possible information is presented in the form of drop down selection lists to eliminate potential errors.

Variable elements are recorded by tick boxes. In all cases only one tick box should be activated.

All time record fields must be entered in twenty four hour format as follows: HH:MM

All date formats are DD-MM-YYYY.

All other data fields are in text entry format.

This form can be printed out fully populated for submission with related documents and for your files. It can also be submitted by email.

**Section 3.2** In this section use an underline \_\_\_\_\_ across all six columns to indicate the depth at which changes in classification / characteristics occur.

**Section 3.4** Lists supporting documentation required.

**Section 4** Select the treatment systems suitable for this site and the discharge route.

**Section 5** Indicate the system type that it is proposed to install.

**Section 6** Provide details, as required, on the proposed treatment system.

# APPENDIX A: SITE CHARACTERISATION FORM

File Reference:

## 1.0 GENERAL DETAILS (From planning application)

Prefix:  First Name:  Surname:

Address:  Site Location and Townland:

Number of Bedrooms:  Maximum Number of Residents:

Comments on population equivalent

Proposed Water Supply:  
Mains  Private Well/Borehole   Group Well/Borehole

## 2.0 GENERAL DETAILS (From planning application)

Soil Type, (Specify Type):

Subsoil, (Specify Type):

Bedrock Type:

Aquifer Category: Regionally Important  Locally Important  Poor

Vulnerability: Extreme  High  Moderate  Low

Groundwater Body:  Status

Name of Public/Group Scheme Water Supply within 1 km:

Source Protection Area: ZOC  SI  SO  Groundwater Protection Response:

Presence of Significant Sites  
(Archaeological, Natural & Historical):

Past experience in the area:

Comments:

(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, and/or any potential site restrictions).

**Note:** Only information available at the desk study stage should be used in this section.

## 3.0 ON-SITE ASSESSMENT

### 3.1 Visual Assessment

Landscape Position:

Slope: Steep (>1:5)  Shallow (1:5-1:20)  Relatively Flat (<1:20)

Slope Comment

Surface Features within a minimum of 250m (Distance To Features Should Be Noted In Metres)

Houses:

Existing Land Use:

Vegetation Indicators:

Groundwater Flow Direction:

Ground Condition:

Site Boundaries:

## 3.0 ON-SITE ASSESSMENT

### 3.1 Visual Assessment (contd.)

Roads:

Outcrops (Bedrock And/Or Subsoil):

Surface Water Ponding:

Lakes:

Beaches/Shellfish Areas:

Wetlands:

Karst Features:

Watercourses/Streams:\*

\*Note and record water level

## 3.0 ON-SITE ASSESSMENT

### 3.1 Visual Assessment (contd.)

Drainage Ditches:\*

Springs:\*

Wells:\*

Comments:

(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, the suitability of the site to treat the wastewater and the location of the proposed system within the site).

\*Note and record water level

**3.2 Trial Hole** (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m):

Depth from ground surface to bedrock (m) (if present):

Depth from ground surface to water table (m) (if present):

Depth of water ingress:  Rock type (if present):

Date and time of excavation:   Date and time of examination:

Depth of Surface and Subsurface Percolation Tests	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m	<input type="text"/>					
0.2 m	<input type="text"/>					
0.3 m	<input type="text"/>					
0.4 m	<input type="text"/>					
0.5 m	<input type="text"/>					
0.6 m	<input type="text"/>					
0.7 m	<input type="text"/>					
0.8 m	<input type="text"/>					
0.9 m	<input type="text"/>					
1.0 m	<input type="text"/>					
1.1 m	<input type="text"/>					
1.2 m	<input type="text"/>					
1.3 m	<input type="text"/>					
1.4 m	<input type="text"/>					
1.5 m	<input type="text"/>					
1.6 m	<input type="text"/>					
1.7 m	<input type="text"/>					
1.8 m	<input type="text"/>					
1.9 m	<input type="text"/>					
2.0 m	<input type="text"/>					
2.1 m	<input type="text"/>					
2.2 m	<input type="text"/>					
2.3 m	<input type="text"/>					
2.4 m	<input type="text"/>					
2.5 m	<input type="text"/>					
2.6 m	<input type="text"/>					
2.7 m	<input type="text"/>					
2.8 m	<input type="text"/>					
2.9 m	<input type="text"/>					
3.0 m	<input type="text"/>					
3.1 m	<input type="text"/>					
3.2 m	<input type="text"/>					
3.3 m	<input type="text"/>					
3.4 m	<input type="text"/>					
3.5 m	<input type="text"/>					

Likely Subsurface Percolation Value:

Likely Surface Percolation Value:

**Note:** \*Depth of percolation test holes should be indicated on log above. (\*Enter Surface or Subsurface at depths as appropriate).  
 \*\* See Appendix E for BS 5930 classification.  
 \*\*\* 3 samples to be tested for each horizon and results should be entered above for each horizon.  
 \*\*\*\* All signs of mottling should be recorded.

**3.2 Trial Hole (contd.)** Evaluation:

--

**3.3(a) Subsurface Percolation Test for Subsoil**

**Step 1: Test Hole Preparation**

**Percolation Test Hole**

	1	2	3
Depth from ground surface to top of hole (mm) (A)			
Depth from ground surface to base of hole (mm) (B)			
Depth of hole (mm) [B - A]			
Dimensions of hole [length x breadth (mm)]	x	x	x

**Step 2: Pre-Soaking Test Holes**

Pre-soak start	Date			
	Time			
2nd pre-soak start	Date			
	Time			

Each hole should be pre-soaked twice before the test is carried out.

**Step 3: Measuring  $T_{100}$**

Percolation Test Hole No.	1	2	3
Date of test			
Time filled to 400 mm			
Time water level at 300 mm			
Time (min.) to drop 100 mm ( $T_{100}$ )			
Average $T_{100}$			

If  $T_{100} > 480$  minutes then Subsurface Percolation value  $>120$  – site unsuitable for discharge to ground

If  $T_{100} \leq 210$  minutes then go to Step 4;

If  $T_{100} > 210$  minutes then go to Step 5;

**Step 4: Standard Method** (where  $T_{100} \leq 210$  minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	$\Delta t$ (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	$\Delta t$ (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	$\Delta t$ (min)
1									
2									
3									
Average $\Delta t$ Value									
	Average $\Delta t/4 =$ [Hole No.1] <input type="text"/> ( $t_1$ )			Average $\Delta t/4 =$ [Hole No.2] <input type="text"/> ( $t_2$ )			Average $\Delta t/4 =$ [Hole No.3] <input type="text"/> ( $t_3$ )		

Result of Test: Subsurface Percolation Value =  (min/25 mm)

Comments:

**Step 5: Modified Method** (where  $T_{100} > 210$  minutes)

Percolation Test Hole No.	1					
Fall of water in hole (mm)	Time Factor = $T_f$	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = $T_m$	$K_{fs} = T_f / T_m$	T-Value = $4.45 / K_{fs}$
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value	T- Value Hole 1 = ( $T_1$ )		<input type="text"/>		

Percolation Test Hole No.	2					
Fall of water in hole (mm)	Time Factor = $T_f$	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = $T_m$	$K_{fs} = T_f / T_m$	T-Value = $4.45 / K_{fs}$
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value	T- Value Hole 2 = ( $T_2$ )		<input type="text"/>		

Result of Test: Subsurface Percolation Value =

(min/25 mm)

Percolation Test Hole No.	3					
Fall of water in hole (mm)	Time Factor = $T_f$	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = $T_m$	$K_{fs} = T_f / T_m$	T-Value = $4.45 / K_{fs}$
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value	T- Value Hole 3 = ( $T_3$ )		<input type="text"/>		

Comments:

### 3.3(b) Surface Percolation Test for Soil

#### Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)			
Depth from ground surface to base of hole (mm)			
Depth of hole (mm)			
Dimensions of hole [length x breadth (mm)]	x	x	x

#### Step 2: Pre-Soaking Test Holes

Pre-soak start	Date			
	Time			
2nd pre-soak start	Date			
	Time			

Each hole should be pre-soaked twice before the test is carried out.

#### Step 3: Measuring $T_{100}$

Percolation Test Hole No.	1	2	3
Date of test			
Time filled to 400 mm			
Time water level at 300 mm			
Time to drop 100 mm ( $T_{100}$ )			
Average $T_{100}$			

If  $T_{100} > 480$  minutes then Surface Percolation value  $>90$  – site unsuitable for discharge to ground

If  $T_{100} \leq 210$  minutes then go to Step 4;

If  $T_{100} > 210$  minutes then go to Step 5;

**Step 4: Standard Method (where  $T_{100} \leq 210$  minutes)**

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	$\Delta T$ (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	$\Delta T$ (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	$\Delta T$ (min)
1									
2									
3									
Average $\Delta T$ Value									
	Average $\Delta T/4 =$ [Hole No.1] <input type="text"/> ( $T_1$ )			Average $\Delta T/4 =$ [Hole No.2] <input type="text"/> ( $T_2$ )			Average $\Delta T/4 =$ [Hole No.3] <input type="text"/> ( $T_3$ )		

Result of Test: Surface Percolation Value =  (min/25 mm)

Comments:

**Step 5: Modified Method (where  $T_{100} > 210$  minutes)**

Percolation Test Hole No.	1					
Fall of water in hole (mm)	Time Factor = $T_f$	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = $T_m$	$K_{fs} = T_f / T_m$	T-Value = $4.45 / K_{fs}$
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value	T- Value Hole 1 = ( $T_1$ )		<input type="text"/>		

Percolation Test Hole No.	2					
Fall of water in hole (mm)	Time Factor = $T_f$	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = $T_m$	$K_{fs} = T_f / T_m$	T-Value = $4.45 / K_{fs}$
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value	T- Value Hole 2 = ( $T_2$ )		<input type="text"/>		

Result of Test: Surface Percolation Value =  (min/25 mm)

Percolation Test Hole No.	3					
Fall of water in hole (mm)	Time Factor = $T_f$	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = $T_m$	$K_{fs} = T_f / T_m$	T-Value = $4.45 / K_{fs}$
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value	T- Value Hole 3 = ( $T_3$ )		<input type="text"/>		

Comments:

**3.4 The following associated Maps, Drawings and Photographs should be appended to this site characterisation form.**

1. Discovery Series 1:50,000 Map indicating overall drainage, groundwater flow direction and housing density in the area.
2. Supporting maps for vulnerability, aquifer classification, soil, subsoil, bedrock.
3. North point should always be included.
4. (a) Scaled sketch of site showing measurements to Trial Hole location and
  - (b) Percolation Test Hole locations,
  - (c) wells and
  - (d) direction of groundwater flow (if known),
  - (e) proposed house (incl. distances from boundaries)
  - (f) adjacent houses,
  - (g) watercourses,
  - (h) significant sites
  - (i) and other relevant features.
5. Site specific cross sectional drawing of the site and the proposed layout<sup>1</sup> should be submitted.
6. Photographs of the trial hole, test holes and site including landmarks (date and time referenced).
7. Pumped design must be designed by a suitably qualified person.

<sup>1</sup> The calculated percolation area or polishing filter area should be set out accurately on the site layout drawing in accordance with the code of practice's requirements.

## 4.0 CONCLUSION of SITE CHARACTERISATION

Integrate the information from the desk study and on-site assessment (i.e. visual assessment, trial hole and percolation tests) above and conclude the type of system(s) that is (are) appropriate. This information is also used to choose the optimum final disposal route of the treated wastewater.

Slope of proposed infiltration / treatment area:

Are all minimum separation distances met?

Depth of unsaturated soil and/or subsoil beneath invert of gravel (or drip tubing in the case of drip dispersal system)

Percolation test result: Surface:

Sub-surface:

Not Suitable for Development

Suitable for Development

### Identify all suitable options

1. Septic tank system (septic tank and percolation area) **(Chapter 7)**
2. Secondary Treatment System **(Chapters 8 and 9)** and soil polishing filter **(Section 10.1)**
3. Tertiary Treatment System and Infiltration / treatment area **(Section 10.2)**

### Discharge Route <sup>1</sup>

## 5.0 SELECTED DWWTS

Propose to install:

and discharge to:

Invert level of the trench/bed gravel or drip tubing (m)

Site Specific Conditions (e.g. special works, site improvement works testing etc.)

<sup>1</sup> A discharge of sewage effluent to "waters" (definition includes any or any part of any river, stream, lake, canal, reservoir, aquifer, pond, watercourse or other inland waters, whether natural or artificial) will require a licence under the Water Pollution Acts 1977-90. Refer to Section 2.4.

## 6.0 TREATMENT SYSTEM DETAILS

### SYSTEM TYPE: Septic Tank Systems (Chapter 7)

Tank Capacity (m <sup>3</sup> )	<input type="text"/>	Percolation Area		Mounded Percolation Area	
		No. of Trenches	<input type="text"/>	No. of Trenches	<input type="text"/>
		Length of Trenches (m)	<input type="text"/>	Length of Trenches (m)	<input type="text"/>
		Invert Level (m)	<input type="text"/>	Invert Level (m)	<input type="text"/>

### SYSTEM TYPE: Secondary Treatment System (Chapters 8 and 9) and polishing filter (Section 10.1)

#### Secondary Treatment Systems receiving septic tank effluent (Chapter 8)

Media Type	Area (m <sup>2</sup> )*	Depth of Filter	Invert Level
Sand/Soil	<input type="text"/>	<input type="text"/>	<input type="text"/>
Soil	<input type="text"/>	<input type="text"/>	<input type="text"/>
Constructed Wetland	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other	<input type="text"/>	<input type="text"/>	<input type="text"/>

#### Packaged Secondary Treatment Systems receiving raw wastewater (Chapter 9)

Type	<input type="text"/>
Capacity PE	<input type="text"/>
Sizing of Primary Compartment	<input type="text"/> m <sup>3</sup>

#### Polishing Filter\*: (Section 10.1)

Surface Area (m <sup>2</sup> )*	<input type="text"/>	Option 3 - Gravity Discharge Trench length (m)	<input type="text"/>
Option 1 - Direct Discharge Surface area (m <sup>2</sup> )	<input type="text"/>	Option 4 - Low Pressure Pipe Distribution Trench length (m)	<input type="text"/>
Option 2 - Pumped Discharge Surface area (m <sup>2</sup> )	<input type="text"/>	Option 5 - Drip Dispersal Surface area (m <sup>2</sup> )	<input type="text"/>

### SYSTEM TYPE: Tertiary Treatment System and infiltration / treatment area (Section 10.2)

Identify purpose of tertiary treatment	Provide performance information demonstrating system will provide required treatment levels	Provide design information
<input type="text"/>	<input type="text"/>	<input type="text"/>

#### DISCHARGE ROUTE:

Groundwater <input type="checkbox"/>	Hydraulic Loading Rate * (l/m <sup>2</sup> .d)	<input type="text"/>	Surface area (m <sup>2</sup> )	<input type="text"/>
Surface Water ** <input type="checkbox"/>	Discharge Rate (m <sup>3</sup> /hr)	<input type="text"/>		

\* Hydraulic loading rate is determined by the percolation rate of subsoil

\*\* Water Pollution Act discharge licence required

## 6.0 TREATMENT SYSTEM DETAILS

### QUALITY ASSURANCE:

---

Installation & Commissioning

On-going Maintenance

## 7.0 SITE ASSESSOR DETAILS

Company:

Prefix:  First Name:  Surname:

Address:

Qualifications/Experience:

Date of Report:

Phone:  E-mail

Indemnity Insurance Number:

Signature: \_\_\_\_\_

# **Site Suitability Assessment for the location of On-Site Wastewater Treatment and Management**

**Planning Ref:**        **New Application**

**Customer:**         **Nephin Renewable Gas**

**Site Address:**      **Levally, Ballinrobe, Co. Mayo**

**Agent/Architect:**   **Donal McCormack Design**

Revision:	Population Equivalent	Date:
-	8	9/4/2024

## 1.0 Certification

I certify that a full and complete site assessment and evaluation, has been completed at the request of Donal McCormack Design on behalf of their client. Testing and assessment has been carried in accordance with the requirements of EPA Code of Practice Wastewater Treatment Manuals Treatment Systems for Single Houses (p.e.< 10).

I further certify that I was present on the above named site for the duration of time as indicated on the enclosed characterization form. This report is a true and accurate account of the tests carried out by me in accordance with the above manual requirements as part of the assessment of the site suitability for effluent disposal.

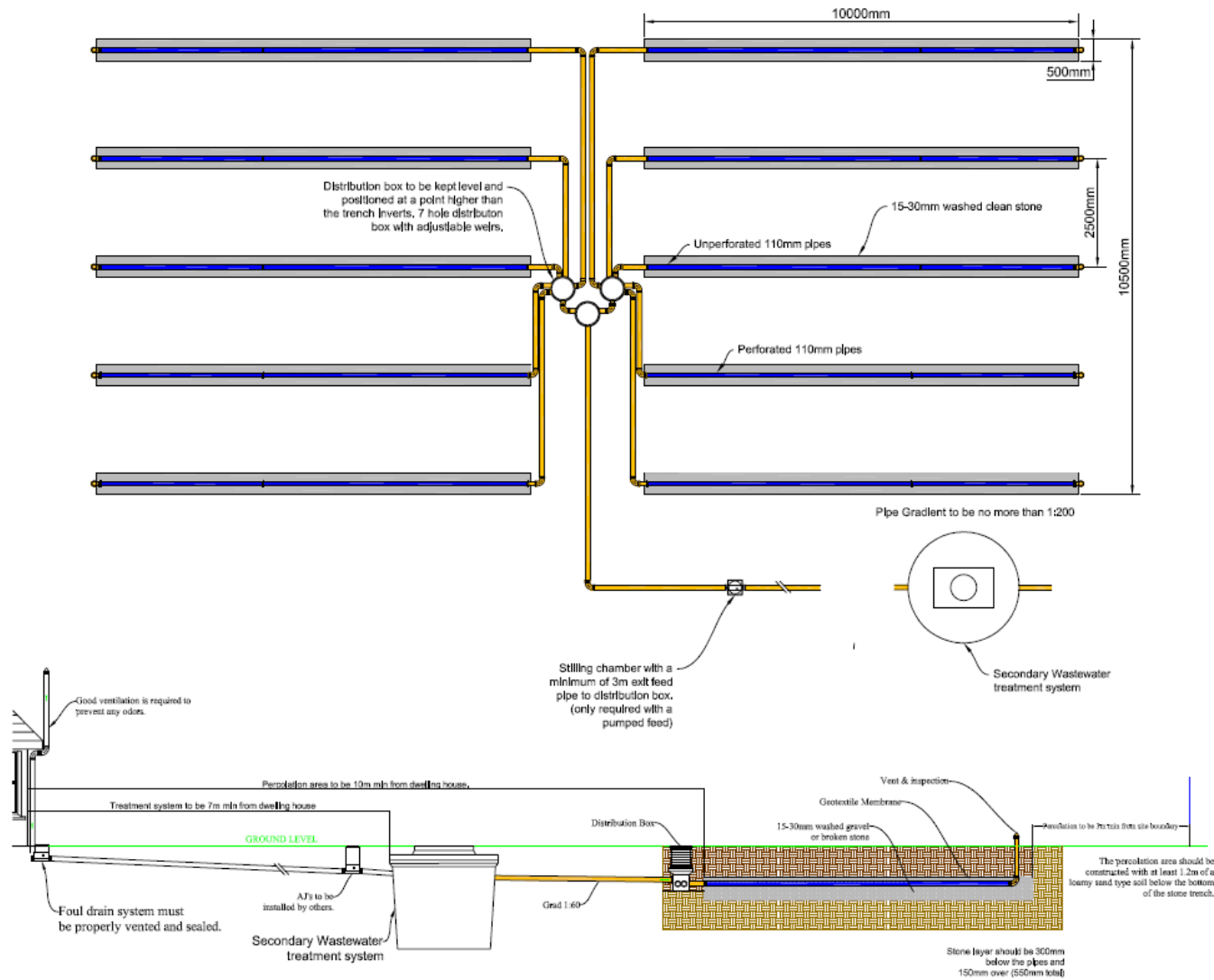
All opinions, conclusions and recommendations contained in this report are based on existing site conditions, knowledge obtained during the desk study and on site investigation work. I did not take into account any impact of future variations in these conditions, as a result of any activity carried out on site, or on neighboring areas, which may have an effect on the site characteristic.

## 2.0 General

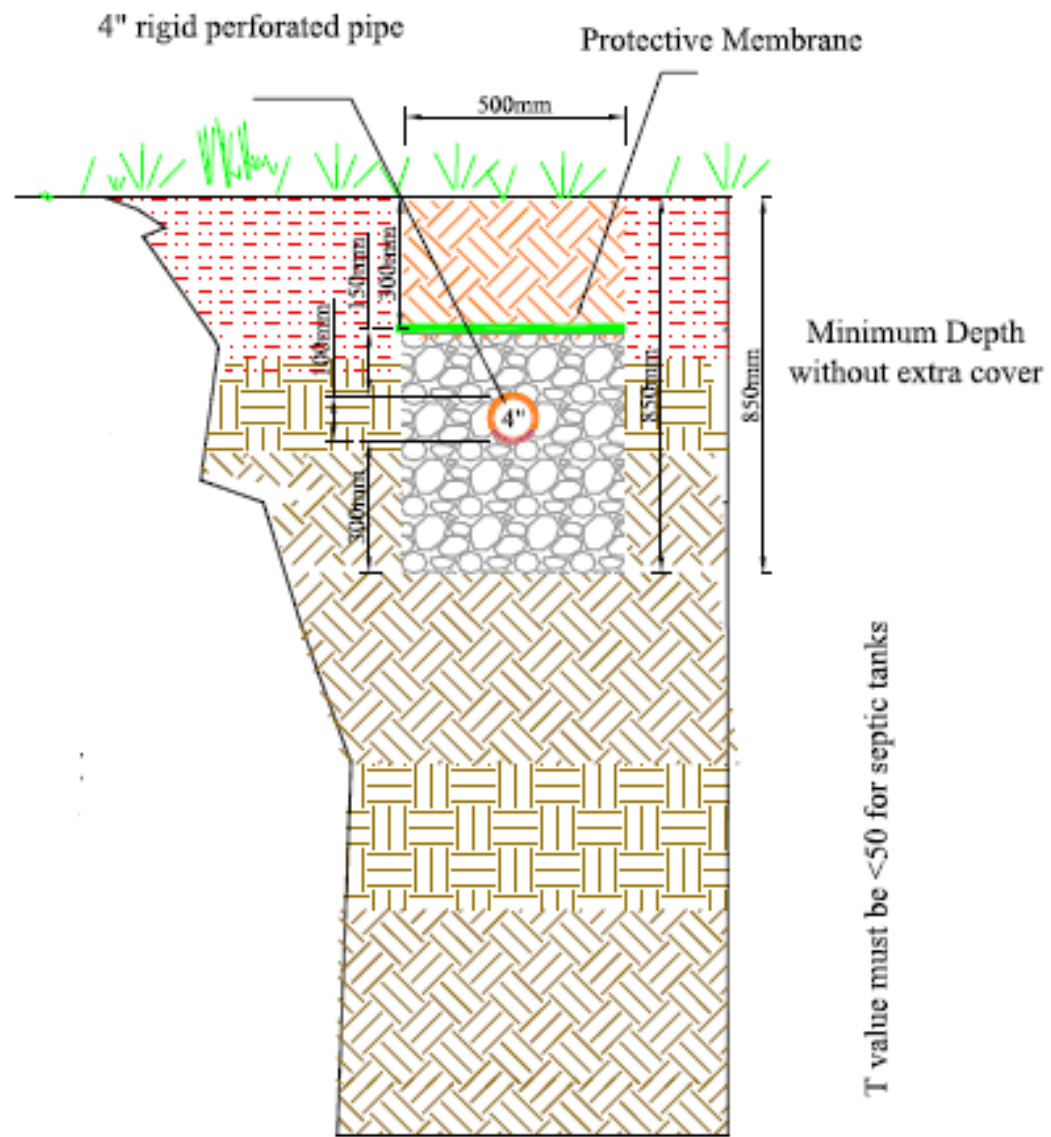
In the compilation of this report, site characterization and associated recommendations for On Site Wastewater Treatment Systems, the following publications have been consulted:

- ↗ Environmental Protection Agency CODE OF PRACTICE WASTEWATER TREATMENT MANUALS TREATMENT SYSTEMS FOR SINGLE HOUSES.
- ↗ GROUNDWATER PROTECTION SCHEMES. Department of the Environment and Local Government, Environmental Protection Agency, Geological Survey of Ireland, published 1999;
- ↗ S.R.6; 1991, septic tank systems, Recommendations for Domestic Effluent Treatment and Disposal from a Single DWELLING House, National Standards Authority of Ireland.
- ↗ FAS Training Course Manuals Volumes 1 & 2, Site Suitability Assessment for On-Site Wastewater Management;
- ↗ Teagasc Ireland: Great Soil Groups Maps.
- ↗ Generalized geology of Ireland Maps 2004

Sketch of site showing measurement to Trial Hole location and Percolation Test Hole locations, wells and direction of groundwater flow (if known), proposed house (incl. distances from boundaries) adjacent houses, watercourses, significant sites and other relevant features. North point should always be included.



### TRENCH VERTICAL SECTION



## Appendix: Site Photographs



Trial Hole characteristics



T1



T2



T3



T1 Charged



T2 Charged



T3 Charged

GSI Mapping Levally, Ballinrobe, Co. Mayo

**BedrockLithology500k:**

Unit Name	64, Marine shelf facies; Limestone & calcareous shale
Unit Description	
Age Bracket	Palaeozoic, Carboniferous, Mississippian

[Zoom to](#) ...

**Bedrock Aquifer**

AquiferCat	Rkc
Aquifer Description	Regionally Important Aquifer - Karstified (conduit)
Area (km2)	7,062.74

[Zoom to](#) ...

(1 of 2) **National Groundwater Vulnerability Ireland**

Vulnerability Category	X
Vulnerability Description	Rock at or near Surface or Karst

[Zoom to](#) ...

**TEAGASC\_Soils\_50K\_IE26\_ITM:TLs**

Parent Material	TLs
Parent Material Name	Till derived chiefly from limestone
Parent Material Description	Limestone till (Carboniferous)
Soil Group	Grey Brown Podzolics, Brown Earths(medium-high base status)
IFS Soil Code	BminDW
IFS Soil Description	Derived from mainly calcareous parent materials
County	MAYO
Category	Deep well drained mineral (Mainly basic)
Legend	BminDW - Deep well drained mineral/Mainly basic

[Zoom to](#) ...



## SITE SUITABILITY REPORT FOR A PROPRIETARY SEWAGE TREATMENT SYSTEM

**Clients:** **Nepin Renewable Gas**  
Phone: *n/a*  
Email:

**AGENT:** **Michael Clifford B.Eng. Fetac (Site Assment )**  
Phone: 086 8564714;  
Email: [m.clifford@hotmail.com](mailto:m.clifford@hotmail.com)

**Site Address:** **Levalley  
Ballinrobe  
Co. Galway**

**Assessor:** **Micháel O'Clubháin**  
Schath na Mara  
Tuskey East  
Barna  
Co. Galway  
Phone: 086 8564714;  
Email: [m.clifford@hotmail.com](mailto:m.clifford@hotmail.com)

**Preparation Date:** 09/04/2024

**File Reference:** (DOM7513)



Coleraine,  
Clara Road,  
Tullamore,  
Co. Offaly

Tel: +353 (0)57 93 26000  
Fax: +353 (0)57 93 26060

E-mail: [info@molloyprecst.com](mailto:info@molloyprecst.com)  
Web: [www.molloyprecst.com](http://www.molloyprecst.com)

Directors: *Donal Molloy  
Dolores Molloy*

**PROPOSED SEWAGE TREATMENT SYSTEM DETAILS**

**PROPOSED SYSTEM:** Chieftain SBR sewage treatment system (8 PE) or (12PE)

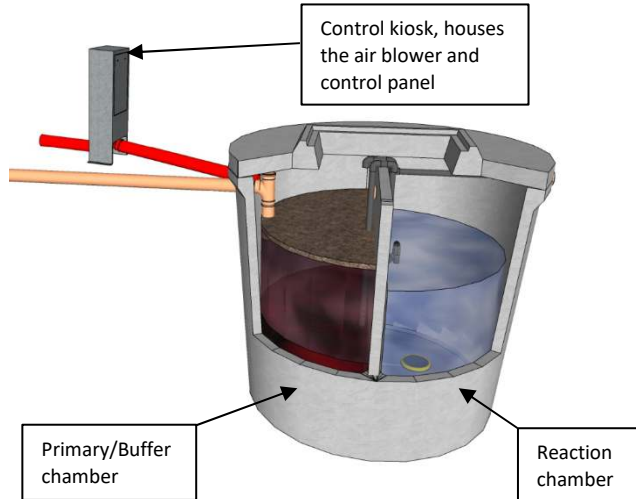
**Certification:** EN12566-3, SR66 (PIA2020-SR66-1909-1055)

**HOW DOES AN CHIEFTAIN SBR SEWAGE TREATMENT SYSTEM WORK?**

The Chieftain SBR sewage treatment system uses sequencing batch reactor (SBR) technology to achieve the required treatment standards and ensure low running costs. This system has two chambers: a primary/buffer chamber and a reaction chamber.

**The primary/buffer chamber** is used to separate gross solids and “fats oils and greases” (FOG) from a typical house. This chamber also buffers shock loads (e.g. morning showers) and allows the reaction chamber process sewage over a 24-hour period.

**The reaction chamber** treats sewage to the required standard using bacteria and oxygen. SBR technology operates the air blower optimally, introducing oxygen only when required, limiting running costs. SBR technology achieves this in a four-phase cycle, which is repeated 4 times daily:



**1**  
**Fill**



A batch of sewage is transferred from the primary/buffer chamber into the reaction chamber using our airlift system. Airlift technology uses an air blower (used for aeration also) to push water through the pipework from one chamber to the other.

**2**  
**React**



When a batch is transferred into the reactor the Chieftain SBR uses bacteria (in the form of a sludge) already in the reactor to degrade the contaminants. Bacteria require oxygen to thrive and efficiently remove impurities to the required levels. To prevent excess sludge in the reaction chamber, a small portion is transferred to the primary/buffer chamber using airlift technology during each cycle.

**3**  
**Settle**



During the settle phase, the sludge is allowed to settle to the bottom of the reaction chamber. This creates a layer of treated water at the top of the chamber and a layer of sludge at the bottom (for use in the next cycle).

**4**  
**Discharge**



During the discharge phase, the treated water is removed from the top of the chamber. This can be achieved with Airlift technology when using a gravity percolation system; or a mechanical pump if using a pressurised percolation system or a tertiary treatment system

**PROPOSED SEWAGE TREATMENT SYSTEM DETAILS**

<p><b>TECHNOLOGY:</b></p>	<p><b>Molloy Environmental Systems Chieftain SBR (Sequencing Batch Reactor), (Ref: EPA, CoP, 2021)</b></p>
<p><b>SYSTEM FEATURES:</b></p>	
<ul style="list-style-type: none"> <li>• Delivery, installation, and commissioning by Molloy Environmental Systems trained personnel</li> <li>• An alarm system indicates pump overload/underload and high-water events</li> <li>• The precast concrete tank is installed underground and will not give rise to any noticeable noise nuisance or any unpleasant odours once the system is correctly vented and maintained</li> <li>• High quality and discreet galvanised steel control kiosk</li> <li>• A certificate of conformance will be issued by the commissioning technician; on the condition that the sewage treatment system has been correctly installed and the relevant civil works have been correctly carried out. (certification is confined to Molloy Environmental Systems installed components only)</li> </ul> <p>[ALL CIVIL WORKS BY OTHERS]</p>	
<p>A service team of trained technicians are available to service and maintain each system. It is recommended that the system is serviced once per year. De-sludging frequency can be identified by the technician</p>	<p><b>8PE SECTION</b></p> <p><b>8PE PLAN</b></p>

**SITE PARAMETERS**

This report presents an opinion on the on-site soil polishing filter construction based on the percolation test results/relevant information supplied by **MICHAEL CLIFFORD** at **MICHÁEL O' CLUBHÁIN**. The assumptions, though reasonable, are given for guidance only and no liability can be accepted for changes in conditions not revealed by the percolation test results or by any other information provided. The recommendations in this report are based on the following parameters:

REPORT DATE:	04/04/2024	
PERCOLATION VALUES:	P value: n/a	T value: 25.44 min/25mm
WATER TABLE:	n/a	
BEDROCK:	2.2m BGL	
PROPOSED NUMBER OF BEDROOMS:	6	which is equal to 8 P.E.
REQUIRED MINIMUM CONSTRUCTED PERCOLATION AREA:	96m of 0.5m wide percolation trench.	e.g. 10 of 10m trenches (Nearest kit)

**8PE/150LIT/DAY = 1200 LIT. DOSING FOR T>20≤40 = 25 LIT/DAY/M2 = 12M TRENCH/PE = 96M TRENCHES. AS PER THE EPA COP 2021 TABLE 10.1 OPTION 3**

**REFER TO CONDITIONS INDICATED IN THE SCR BY MICHÁEL O' CLUBHÁIN.**

AQUIFER CATEGORY:	<b>Rk</b>
VULNERABILITY RATING:	<b>X</b>
VULNERABILITY RESPONSE:	<b>R2^2</b>

**ACCEPTABLE SUBJECT TO NORMAL GOOD PRACTICE AND THE FOLLOWING ADDITIONAL CONDITION:**

**1. THERE IS A MINIMUM THICKNESS OF 2 M UNSATURATED SOIL/SUBSOIL BENEATH THE INVERT OF THE PERCOLATION TRENCH OF A SEPTIC TANK SYSTEM**

**OR**

**1. A SECONDARY TREATMENT SYSTEM AS DESCRIBED IN SECTIONS 8 AND 9 IS INSTALLED, WITH A MINIMUM THICKNESS OF 0.3 M UNSATURATED SOIL/SUBSOIL WITH P/TVALUES FROM 3 TO 75 (IN ADDITION TO THE POLISHING FILTER WHICH SHOULD BE A MINIMUM DEPTH OF 0.9 M), BENEATH THE INVERT OF THE POLISHING FILTER (I.E. 1.2 M IN TOTAL FOR A SOIL POLISHING FILTER).**

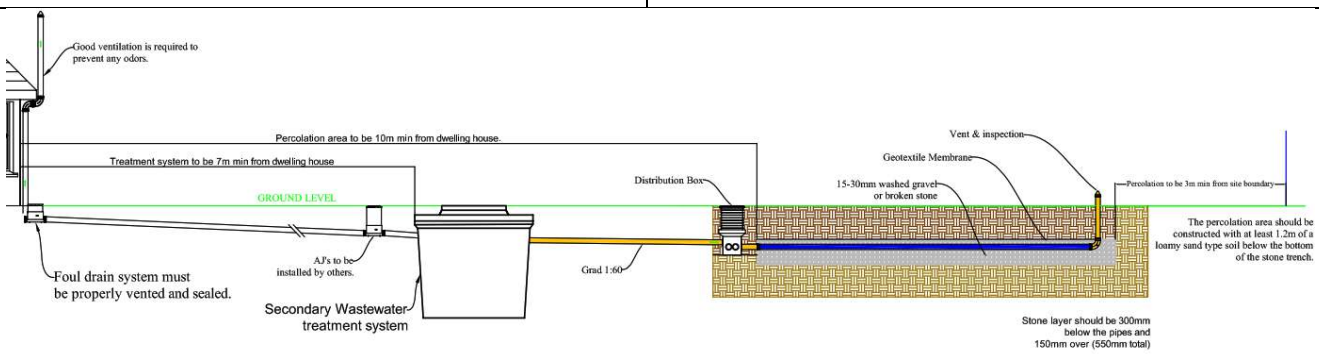
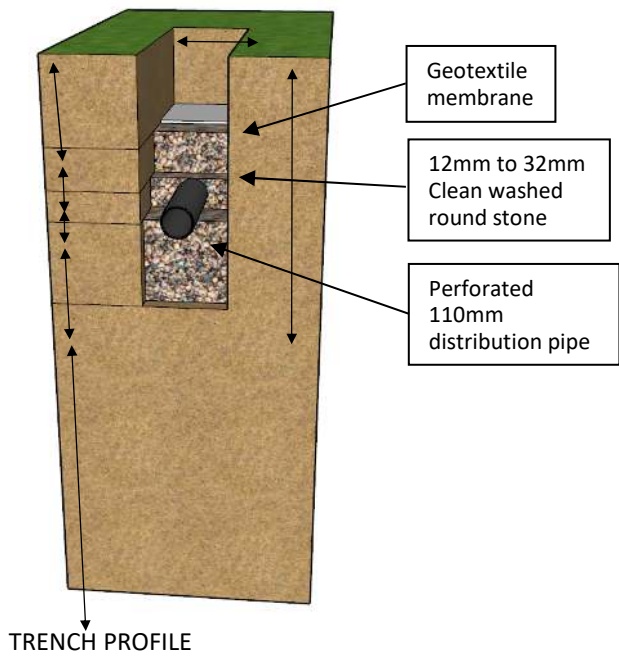
The location of the soil polishing filter should be in accordance with the planning permission granted. The EPA CoP 2021 table 6.2 in Appendix c below sets out details on the minimum separation distances in meters for the sewage treatment system and the soil polishing filter/percolation areas.

**SOIL POLISHING FITLER DETAILS**

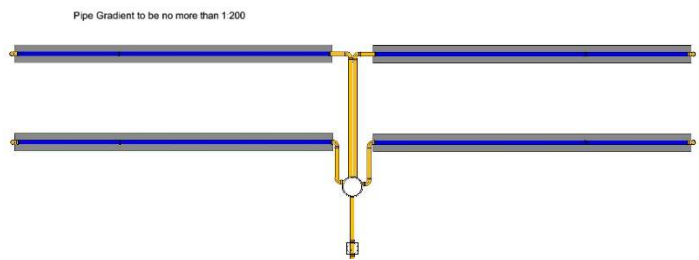
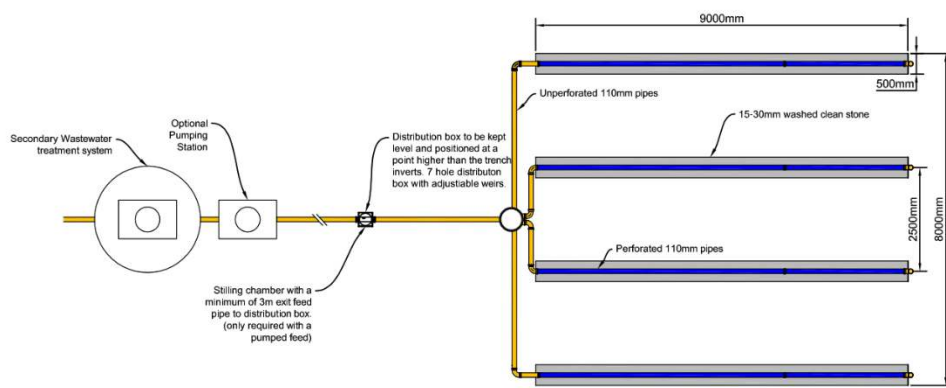
RECOMMENDED TRENCH DETAILS:	100m
-----------------------------	------

Trench Section:

Legend	Item	
A	Trench width	500mm
B	Minimum soil cover depth	300mm
C	Stone cover over pipe	150mm
D	Depth of pipe	110mm
E	Depth of stone under pipe	300mm
F	Minimum depth before reaching a water table or bedrock	R1 0.9m R2 <sup>1</sup> 0.9m R2 <sup>2</sup> 1.2m
G	Minimum invert depth from ground level and requiring extra cover	550mm



GENERIC SYSTEM SECTION



## TRENCH CONSTRUCTION

- See the attached Generic drawing in Appendix C and use as guide for construction.
- Dig the trenches 500 mm wide and achieve a minimum separation distance between the trenches of 2m spacing (2.5m centre to centre) and to a depth 850mm deep as per the **SCR by Micháel O' Clubháin**.
- Check the suggested profile diagram shown with the generic trench layout drawing attached.
- The maximum length of each trench should not exceed 10m. The base of the trenches should be almost level. The clean stone (sized 12mm to 32mm) used to fill the trench to a depth of 250mm is used to form the 1:200 gradient necessary. **See the site plan drawing, provided by the site engineers, for guidance.**
- Ensure that the Distribution box is kept perfectly level and is situated at the highest position in the trench network and bedded in the soil only, so that the surrounding area of the distribution box is free from stones. In addition, the connecting un-slit distribution pipes from the distribution box are also laid in soil free of the clean stones. These un-slit distribution pipes are in turn connected to the slit percolation pipes (see accompanying diagram for details).
- It is recommended to use long radius bends in the trench network to facilitate rodding out at a future date.
- The slit pipes are laid on the stones in the trenches as indicated on the accompanying drawing. Ensure the pipes are at a gradient of no more than 1:200 away for the distribution manhole. Secure the distribution pipes with more stones until covered.
- The distribution pipes must be rigid, 100mm in diameter and no more than 10m in length, with perforations of at least 10mm in diameter, or slits, positioned at 5 o'clock and 7 o'clock, spaced no more than 300mm apart. Wastewater flows out through orifices in the percolation pipes into a gravel underlay, which acts both to distribute and provide a medium for initial treatment of the effluent. The effluent then percolates into the soil/subsoil, where it undergoes further biological, physical, and chemical interactions that treat the contaminants.
- For effective treatment, the wastewater should enter the soil; if the base or walls of the percolation trench are compacted or glazed or otherwise damaged during excavation, they should be scratched with a steel tool such as a rake to expose the natural soil surface. It is equally important that the wastewater remains long enough in the soil; the hydraulic loading and the rate of flow into the sides and base of the trench control the residence time.
- Cover the stones with geotextile membrane or plastic sheet to prevent ingress of clay/silt etc. In turn, cover the membrane or sheet with 300mm of soil. No deep rooting plants should be allowed to interfere with the distribution pipes of the percolation area.
- All rows must be ventilated at both ends i.e. the distribution manhole end and the opposite end to the manhole. Join all trench end vents together, if necessary and locate the vent in a secure vandal proof area, preferably using a u-shaped down turned vent pipe.
- Soakaways for rain water and surface water should not be located in the vicinity of the treatment system or percolation area (min. 10 m), if possible.

## SYSTEM GUARANTEE

Molloy Environmental Systems fully guarantees the sewage treatment system as suitable for the development in question. The system must be installed as per the manufacturer's guidelines and commissioned by trained personnel. To ensure the efficient treatment of the wastewater the following is recommended:

- The soil polishing filter is installed as per the supplied installation guidelines (issued with the pipework kit)
- The sewage treatment system is installed as per the supplied precast concrete tank installation guidelines
- Only domestic sewage, which includes all effluent from the kitchen, toilets, bathroom, showers, appliances, should be discharged to the sewage treatment system
- No rainwater, surface water etc., should be discharged to the sewage treatment system
- Excessive fats, oils and greases should be removed upstream of the system
- Care should be taken not to discharge large materials such as rags etc. Into the system
- An adequate ventilation system should be installed by others (a 4-5m minimum high vent stack should be installed depending on site conditions. A taller vent stack should be installed where possible or necessary). Please refer to your site engineer for specification

- Urinals and any other automatically flushing apparatus should be operated in a water conservative manner and only operate during the occupied time.
- Good practice would be to monitor all water usage, using a water meter. This would alert the caretaker of unusual excessive water usage and hence a leak
- It is advisable to avoid excessive use of detergents and household cleaning agents and to use the phosphate free alternative products

Molloy Environmental Systems provides a 2-year warranty to remedy any fault in products provided:

- That the fault is due to defects in design, materials or workmanship
- That the fault is reported to Molloy Environmental Systems during the guarantee period
- That the product has been used only under the conditions described in the care and maintenance instructions, and in applications for which it is intended
- That all service and repair is carried out by Molloy Environmental Systems personnel as per the maintenance requirements
- Therefore, this warranty does not apply to faults resulting from lack of maintenance, inadequate civil works, repair works carried out improperly or normal wear and tear
- Furthermore, Molloy Environmental Systems disclaims any liability in case of physical injuries, material or economic damages for those mentioned above

**Note: The recommendation in this report are only recommendations, as Molloy Environmental Systems do not assess materials or supervise the percolation construction, they cannot be held responsible for incorrectly constructed or failed percolation systems. Notwithstanding the percolation test results, or the recommendations based on the percolation test results given above, it is essential that the client, or prospective site occupier, is fully satisfied that the position chosen on the site, and imported soil (if applicable) chosen for percolation, is capable of soaking away the full amount of treated water that the household will produce each day and that any imported soil is suitable for the percolation**

Visit Ireland's most extensive percolation demonstration and training facility at Molloy Environmental Systems, Clara Road, Tullamore, Co. Offaly.

- See how to install your percolation area properly
- See full scale percolation areas and soil polishing filter with cross sections
- See every type of percolation system, soil polishing filter and tertiary system used in Ireland
- All demonstrations are fully operational
- Avail of the expertise of our specialists in sewage treatment

Please contact me should you require any additional information.

Yours sincerely,

A handwritten signature in black ink that reads "M F Cahill".

**Michael F. Cahill**  
Technical Manager

APPENDIX A- CHIEFTAIN SBR EN12566-3 AND SR66 CERTIFICATE



## TREATMENT PERFORMANCE RESULTS

**Molloy Environmental Systems**  
 Coleraine, Clara Road, Tullamore, Co. Offaly, Ireland  
**EN 12566-3**  
 Results corresponding to EN 12566-3 and S.R. 66  
 PIA2020-SR66-1909-1055  
**Chieftain SBR**  
 SBR system in concrete tanks

Nominal organic daily load	0.37 kg/d		
Nominal hydraulic daily load	1.20 m <sup>3</sup> /d		
Material	Concrete		
Watertightness	Pass		
Structural behaviour (Crushing resistance)	Pass (also wet conditions)		
Durability	Pass		
Treatment efficiency (nominal sequences)		Efficiency	Effluent
		COD	94.6 % 45 mg/l
		BOD <sub>5</sub>	98.2 % 6 mg/l
		NH <sub>4</sub> -N	98.4 % 0.7 mg/l
		SS	96.5 % 14 mg/l
Number of desludging	Not more than once		
Electrical consumption	0.85 kWh/d		

Performance tested by:

**PIA – Prüfinstitut für Abwassertechnik GmbH**  
 (PIA GmbH)  
 Hergenrather Weg 30  
 52074 Aachen, Germany

This document replaces neither the declaration of performance nor the CE marking.

Notified Body  
 No.: 1732


Certified according to  
 ISO 9001:2016



Verschitz / Werbiter April 2020

Page 1 of 15

**APPENDIX B- MAINTENANCE CONTRACT**

MAINTENANCE CONTRACT AGREEMENT FOR A MOLLOY ENVIRONMENTAL SYSTEMS SECONDARY SEWAGE TREATMENT SYSTEM		
<b>NAME:</b>	<b>Nephin Renewable Gas</b> Phone: <i>n/a</i> Email:	<p style="text-align: center;"><b>TERMS AND CONDITIONS</b></p> <ul style="list-style-type: none"> <li>Molloy Environmental Systems trained service technicians will conduct the servicing of the designated sewage treatment system in a safe and efficient manner in accordance with the Molloy Environmental System company safety statement</li> <li>The site occupier/owner should ensure that the site is accessible and safe</li> <li>This contract does not bind Molloy Environmental Systems to effluent quality; however, every effort will be made to advise the occupier and to make any adjustments to the plant that will ensure the best possible effluent quality</li> <li>The occupier should ensure that all manholes pertaining to the sewage treatment system are accessible</li> <li>Access to the control panel is required. (if access to the control panel is not available at the time of a service call, the service will proceed without that component of the service)</li> <li>Access to a water tap is needed to clean components during the service</li> <li>It is advisable that children and pets are not present in the vicinity of the sewage treatment system during servicing (open manholes present a significant risk of injury or drowning)</li> <li>The service visit includes the items and visits that are paid for and indicated on the maintenance contract only</li> <li>Replacement, broken or unserviceable parts will be charged for additionally</li> <li>Breakdowns, alarms, etc. requiring a call out, are subject to the charges below</li> <li>This maintenance contract only covers the sewage treatment system. It does not extend to any fowl sewer pipework or blockages or house fittings external to the sewage treatment system. It does not cover any problems relating to soil polishing filters, percolation systems, soakaways etc.</li> <li>A call out request, that occurs close to a due service call date, may be combined with the service by mutual agreement</li> </ul> <p>Failure to have the system serviced, on an annual basis, will invalidate any current warranty after the first 12 months of operation</p> <p>Call out costs are €100 per visit plus mileage @ €0.75 per km from Tullamore and €40 per hour for every hour after the first hour, all plus vat at 13.5%</p> <p>Access and mutually acceptable times must be arranged beforehand. No access at the time of an arranged call will incur the full callout charge.</p> <p>Please mark the services required on the signed document and return to Molloy Environmental Systems with payment with VAT for the required services. The counter-signed document will be returned with a receipt</p> <p>Optional laboratory testing of effluent on request</p>
<b>SITE ADDRESS:</b>	<b>Levalley</b> <b>Ballinrobe</b> <b>Co. Galway</b>	
<b>SITE ID</b>	TBC	
Molloy Environmental Systems undertake to service the secondary sewage treatment system as follows: <ul style="list-style-type: none"> <li>Sludge level in the primary settlement tank (to determine de-sludging frequency)</li> <li>Sequential batch reactor (SBR) sludge volume check (settled sludge volume – SSV30)</li> <li>System test run through the control panel and check alarm log</li> <li>Adjustment of system settings on the control panel where necessary</li> <li>Issue a maintenance report of tests when completed</li> </ul>		
<b>ANNUAL CHARGE</b>	€310 per annum including VAT for one call  Payable in advance. Renewable yearly. Call out charges are at our standard rates plus parts and mileage. Equipment under warranty is dependent on Molloy Environmental Systems servicing the system as advised. As a minimum the system should be serviced once annually.	
<b>FIRST SERVICE CALL DUE AFTER:</b>	TBC	
<b>SECOND SERVICE CALL DUE AFTER:</b>	TBC	
<b>SECOND SERVICE CALL DUE AFTER:</b>	TBC	
<b>DISCLAIMER:</b>	Molloy Environmental Systems cannot take responsibility for the effluent quality as the treatment achieved will depend on household input, good system operation and maintenance. Molloy Environmental Systems cannot take responsibility for equipment damage owing to flooding/unfavourable site conditions.	
Signed: <div style="text-align: center; margin-top: 20px;">   <b>Donal Molloy</b>  <b>Manging Director</b>  <b>Molloy Environmental Systems</b> </div> Date: 09/04/2024	Signed: <div style="text-align: center; margin-top: 20px;"> <b>Nephin Renewable Gas</b> </div> Date:	
Prices valid for 1 year – VAT @ 13.5% - see terms & conditions, this contract is not valid until both the system and the service have been paid for in full		

### Treatment System Related Tables form the EPA CoP 2021

Table 6.2 extract, distancing requirements.  
Refer to the full table for well distancing and other features.

Watercourse/stream	10
Open drain or drainage ditch	10
Adjacent tank/plant and percolation area, polishing filter or infiltration area	10
On-site dwelling house	7 (tank/plant)
	10 (free water surface constructed wetland)
	10 (infiltration/treatment area)
Neighbouring dwelling house	7 (tank/plant)
	25 (free water surface constructed wetland)
	10 (infiltration/treatment area)
Surface water soakaway <sup>a</sup>	5
Road	4
Slope break/cuts	4
Trees <sup>b</sup>	3
Site boundary	3

**Table 10.1:** Infiltration/treatment area and trench length design for tertiary treatment, per PE

Percolation values (PVs)	Pumped or underlying gravity discharge (Options 1 and 2)	Gravity discharge into 500 mm wide trenches (Option 3)	Low-pressure pipe distribution into 300 mm wide trenches (Option 4)	Drip dispersal system (Option 5)	Tertiary infiltration area (Option 6)
	Area required per person (m <sup>2</sup> )	Trench length required per person (m)	Trench length required per person (m)	Area required per person (m <sup>2</sup> )	Area required per person (m <sup>2</sup> )
3 ≤ PV ≤ 20	≥7.5	≥6	≥6	≥5	≥3.75
21 < PV ≤ 40	≥15	≥12	≥12	≥14	≥7.5
41 < PV ≤ 50	≥30	≥17	≥17	≥16	≥15
51 < PV ≤ 75	≥50	≥19	≥19	≥22	≥25
76 < PV ≤ 90	–	–	≥28	≥34	–
91 < PV ≤ 120	–	–	–	≥54	–

### APPENDIX C

**Table E2:** Recommended Minimum Distance between a Receptor and a Percolation Area or Polishing Filter

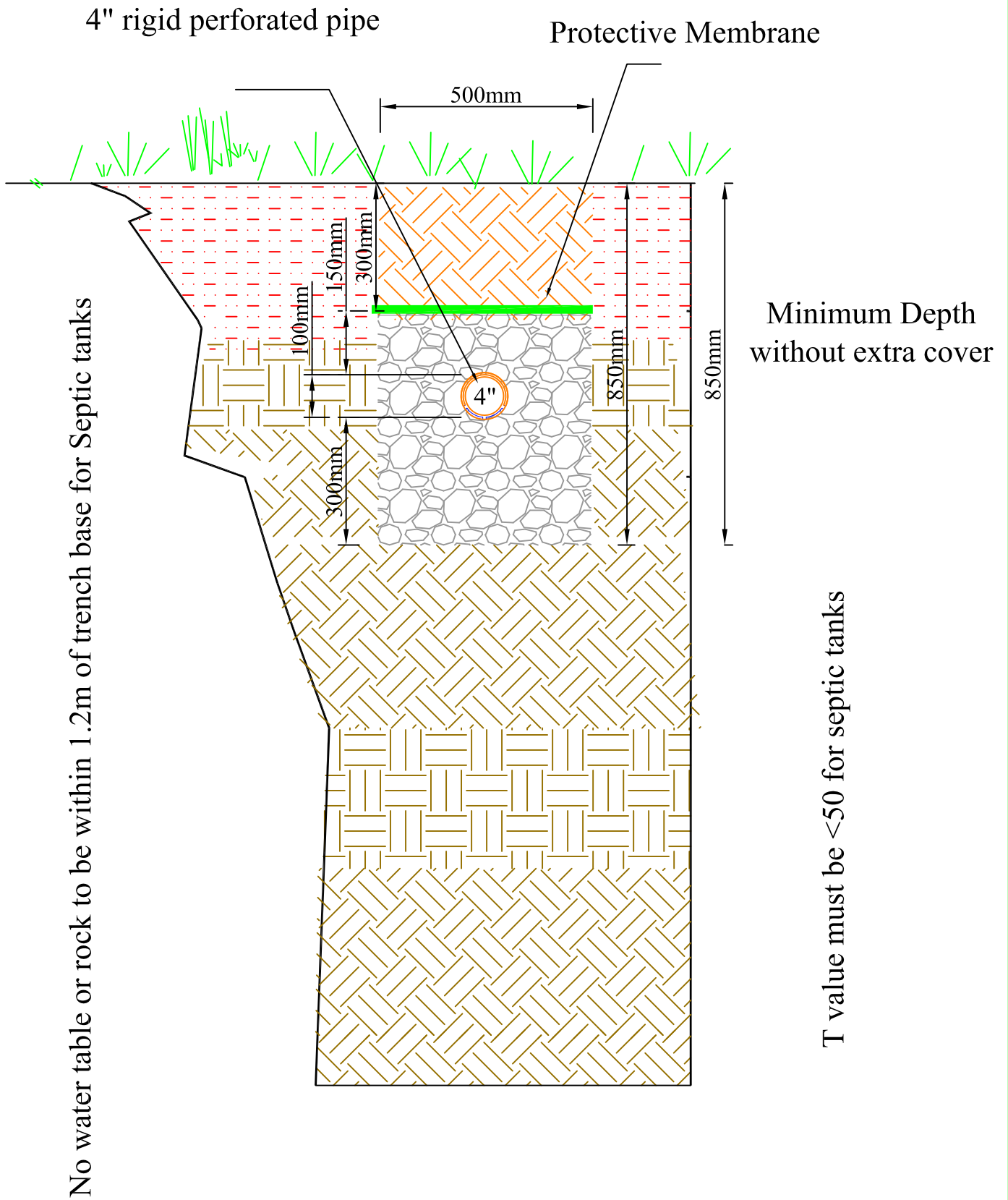
Percolation value <sup>a</sup>	Type of soil/subsoil <sup>b</sup>	Depth of soil/subsoil (m) above bedrock (see notes 1, 2, 3, 4 and 6)	Minimum distance (m) from receptor to percolation area or polishing filter <sup>e</sup>				
			Public/group water supply abstraction points/wells	Karst feature	Down-gradient domestic well or flow direction is unknown (see note 5)	Domestic well alongside (no gradient)	Up-gradient domestic well
>30	CLAY; sandy CLAY (e.g. clayey till); SILT/CLAY, sandy SILT/CLAY	1.2 >3.0	60	15	40 30	25	15
10–30	SILT; sandy SILT; clayey SAND; clayey, silty GRAVEL (e.g. sandy till)	1.2 >8.0	60	15	45 30	25	15
<10	SAND; GRAVEL; silty SAND	2.0c 2.0d >8.0d	60	15	60 40 30	25	15

- a) The percolation value (expressed as min/25 mm) is the time taken for the water level to drop a specified distance in a percolation test hole.
- b) BS 5930 descriptions.
- c) Water table 1.2–2.0 m.
- d) Water table > 2.0 m.
- e) The distance from the percolation area or polishing filter means the distance from the periphery of the percolation area or polishing filter and not the centre.

**Notes:**

1. Depths are measured from the invert level of the percolation trench.
2. Depths and distances can be related by interpolation, e.g. when the thickness of sandy CLAY is 1.2 m, the minimum recommended distance from the well to percolation area is 40 m; when the thickness is 3.0 m, the distance is 30 m; distances for intermediate depths can be approximated by interpolation.
3. When bedrock is shallow (<2 m below the invert of the trench), greater distances may be necessary when there is evidence of the presence of PFPs (e.g. cracks, roots) in the subsoil.
4. When the minimum subsoil thicknesses are less than those given above, site improvements and systems other than systems as described in Chapters 8 and 9 may be used to reduce the likelihood of contamination.
5. If effluent and bacteria enter bedrock rapidly (within 1–2 days), the distances given may not be adequate when the percolation area is in the ZOC of a well. Further site-specific evaluation is necessary.
6. When bedrock is known to be karstified or highly fractured, greater depths of subsoil may be advisable to minimise the likelihood of contamination.

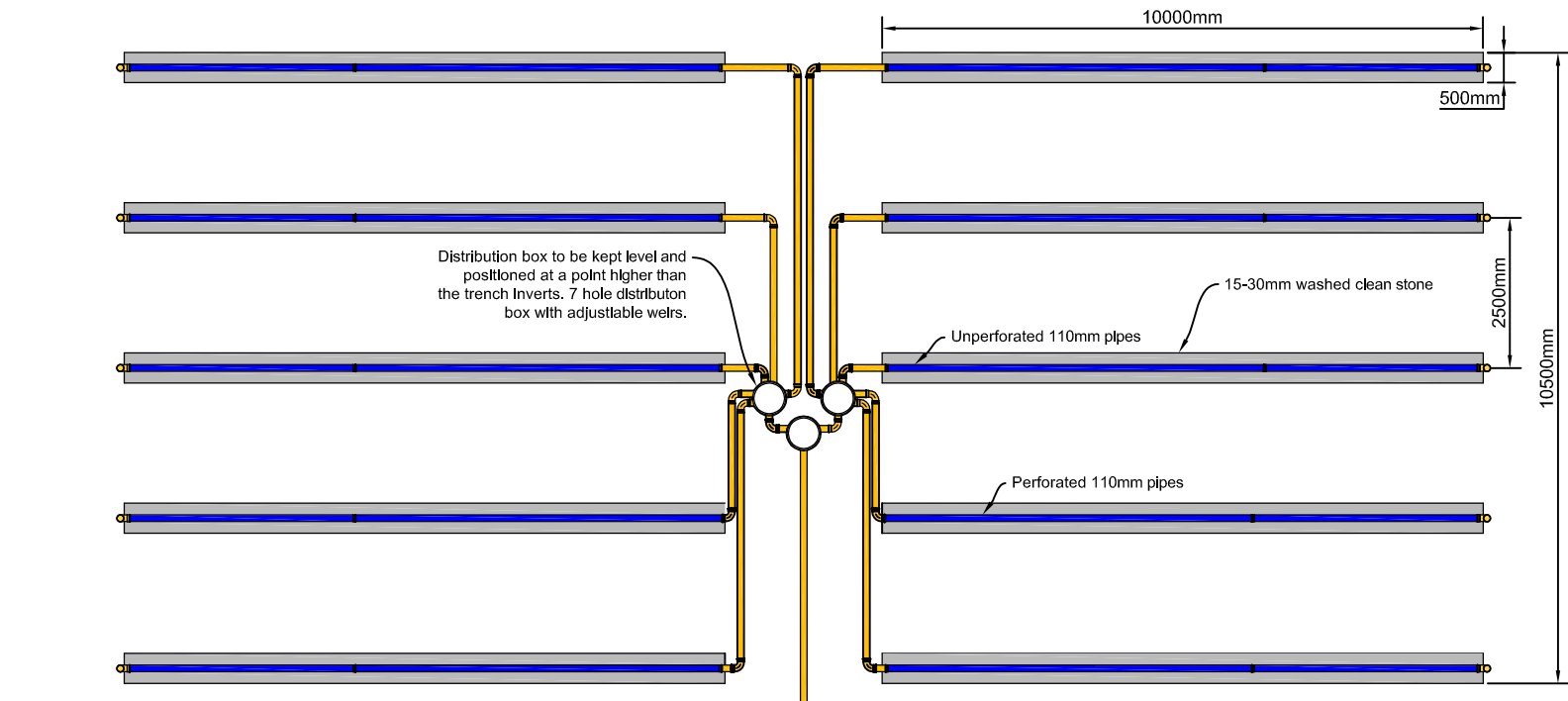
# Standard Trench Section



Clara Road, Tullamore, Co. Offaly, Ireland  
 Tel: 057 9326000 info@molloyprecast.com  
 Fax: 057 9326060 www.molloyprecast.com

**Note:** Observe all safety regulations in regard to excavation and lifting requirements. Never leave opening uncovered or unattended at any time.  
**Note:** Specify any specific requirements prior to ordering. All civil works by customer.  
**Note:** Do not scale from this drawing. Only for illustration purposes.

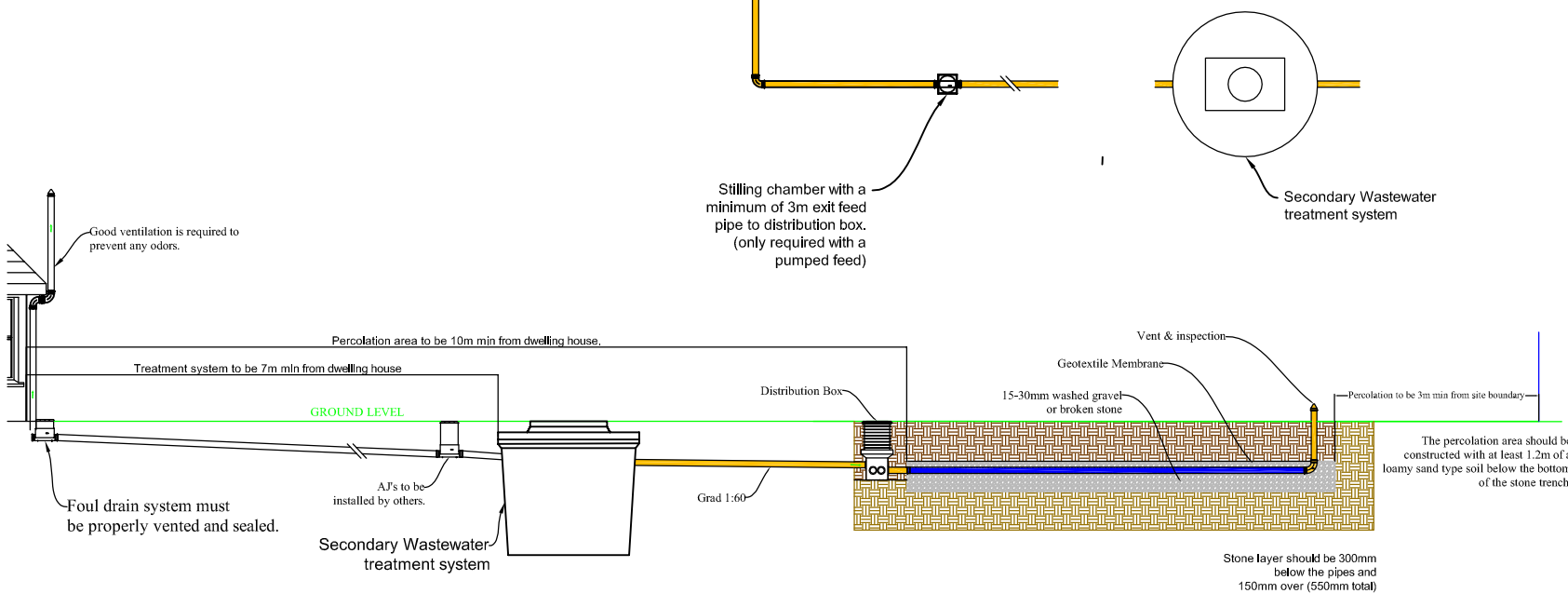
<b>Tank Type:</b>	_____	<b>Title:</b>	_____
<b>Tank Size:</b>	_____	<b>Date:</b>	_____
<b>Height:</b>	_____	<b>Dr. No.:</b>	_____
<b>Volume:</b>	_____	<b>Drawn By:</b>	_____
<b>Weight:</b>	_____		
(Tank Dim: ± 20mm. Weight: ± 30Kg.)		This drawing is ©. All rights reserved.	



- Notes:**
- This drawing is ©. All rights reserved.
  - Do not scale from this drawing. Only for illustration purposes.
  - Specify any specific requirements prior to ordering. All civil works by customer.
  - Observe all safety regulations in regard to excavation and lifting requirements. Never leave opening uncovered or unattended at any time.
  - The depth of the infiltration surface is an important consideration in maintaining adequate subsoil aeration and frost protection in cold climates. The maximum depth should be limited, if possible, to no more than 1m below final graded surface to adequately reerate the soil and satisfy the daily oxygen demand of the applied wastewater. (EPA US 4.4.3)
  - Tanks must be positioned so that they are never the focus of surface water ingress.
  - For contoured sites with significant slopes, consult Molloy Environmental Systems, as the trenches should follow the contours and require special construction techniques to maintain even distribution.
  - Percolation design as per EPA CoP 2009.
  - Perforated Pipe - Blue
  - Unperforated Pipe Yellow

Minimum separation details  
EPA 2009 CoP Table 6.1

	Tanks	Percolation
Water Course	10m	10m
Well	10m	15-60m
Lake	50m	50m
Boundary	3m	3m
Road	4m	4m
House	7m	10m



**MOLLOY**  
ENVIRONMENTAL SYSTEMS

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QUALITY: ISO 9001:2015 NSAI Certified  
ENVIRONMENT: ISO 14001:2015 NSAI Certified  
HEALTH & SAFETY: ISO 45001:2018 NSAI Certified

CIRI 2018/2019

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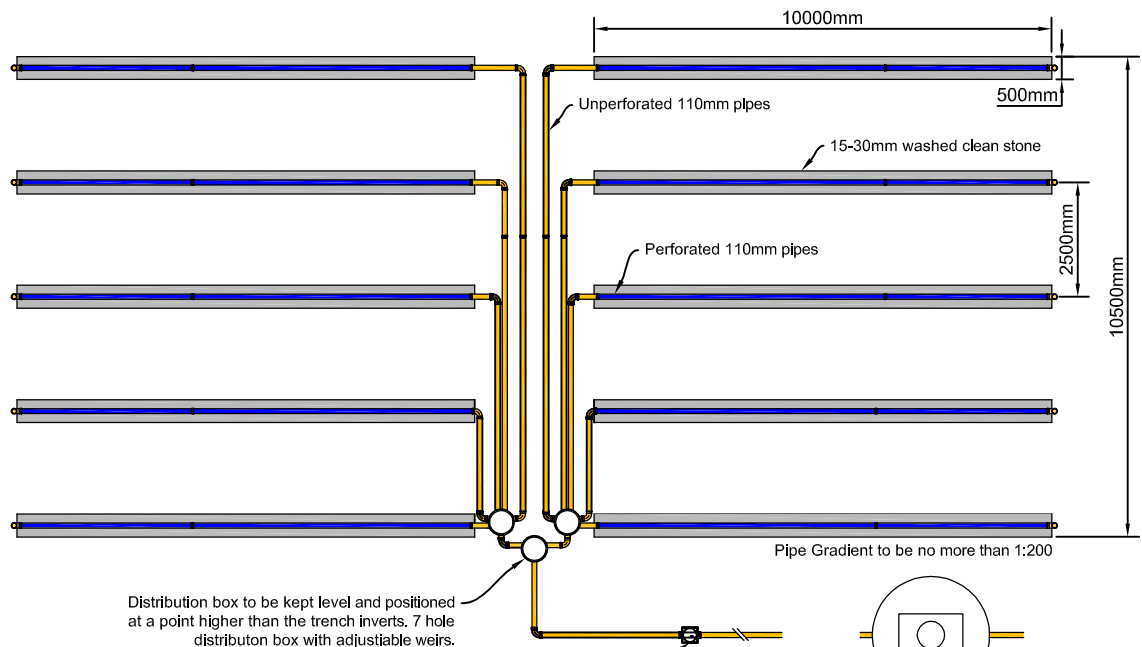
**Title:** 93m WWTS Tank Trench Percolation

**PE:** 8 PE @ PV <51 or 5 PE @ PV <76

**Drq. no.:** TP-WWTS-93-01-210219

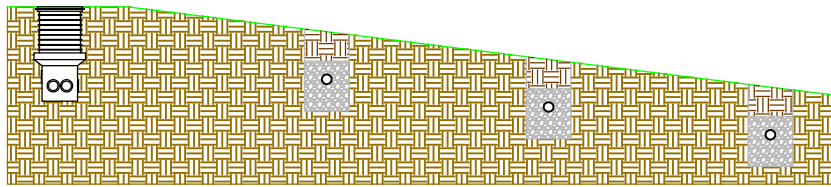
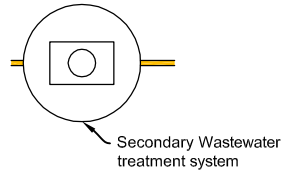
**Date:** 21/02/2019

**Drawn by:** SF **Checked by:** KR

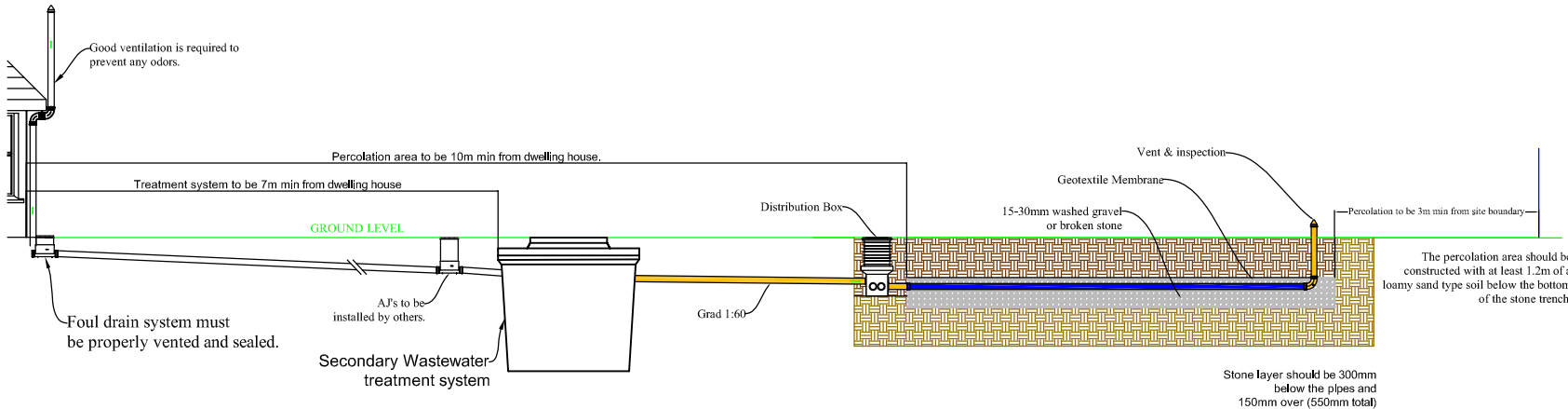


Distribution box to be kept level and positioned at a point higher than the trench inverts. 7 hole distributor box with adjustable weirs.

Stilling chamber with a minimum of 3m exit feed pipe to distribution box. (only required with a pumped feed)



Typical Contour Section



Stone layer should be 300mm below the pipes and 150mm over (550mm total)

- Notes:**
- This drawing is ©. All rights reserved.
  - Do not scale from this drawing. Only for illustration purposes.
  - Specify any specific requirements prior to ordering. All civil works by customer.
  - Observe all safety regulations in regard to excavation and lifting requirements. Never leave opening uncovered or unattended at any time.
  - The depth of the infiltration surface is an important consideration in maintaining adequate subsoil aeration and frost protection in cold climates. The maximum depth should be limited, if possible, to no more than 1m below final graded surface to adequately re-aerate the soil and satisfy the daily oxygen demand of the applied wastewater. (EPA US 4.4.3)
  - Tanks must be positioned so that they are never the focus of surface water ingress.
  - For contoured sites with significant slopes, consult Molloy Environmental Systems, as the trenches should follow the contours and require special construction techniques to maintain even distribution.
  - Percolation design as per EPA CoP 2009.
  - Perforated Pipe - Blue
  - Unperforated Pipe Yellow

Minimum separation details  
EPA 2009 CoP Table 6.1

	Tanks	Percolation
Water Course	10m	10m
Well	10m	15-60m
Lake	50m	50m
Boundary	3m	3m
Road	4m	4m
House	7m	10m

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CIRI 2018/2019  
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**Drq. no.:** TP-WWTS-93-02-210219  
**Date:** 21/02/2019  
**Drawn by:** SF **Checked by:** KR

## 6.0 TREATMENT SYSTEM DETAILS

### SYSTEM TYPE: Septic Tank Systems (Chapter 7)

Tank Capacity (m <sup>3</sup> )	<input type="text"/>	Percolation Area		Mounded Percolation Area	
		No. of Trenches	<input type="text"/>	No. of Trenches	<input type="text"/>
		Length of Trenches (m)	<input type="text"/>	Length of Trenches (m)	<input type="text"/>
		Invert Level (m)	<input type="text"/>	Invert Level (m)	<input type="text"/>

### SYSTEM TYPE: Secondary Treatment System (Chapters 8 and 9) and polishing filter (Section 10.1)

#### Secondary Treatment Systems receiving septic tank effluent (Chapter 8)

Media Type	Area (m <sup>2</sup> )*	Depth of Filter	Invert Level
Sand/Soil	<input type="text"/>	<input type="text"/>	<input type="text"/>
Soil	<input type="text"/>	<input type="text"/>	<input type="text"/>
Constructed Wetland	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other	<input type="text"/>	<input type="text"/>	<input type="text"/>

#### Packaged Secondary Treatment Systems receiving raw wastewater (Chapter 9)

Type	<input type="text"/>
Capacity PE	<input type="text"/>
Sizing of Primary Compartment	<input type="text"/> m <sup>3</sup>

#### Polishing Filter\*: (Section 10.1)

Surface Area (m <sup>2</sup> )*	<input type="text"/>	Option 3 - Gravity Discharge Trench length (m)	<input type="text"/>
Option 1 - Direct Discharge Surface area (m <sup>2</sup> )	<input type="text"/>	Option 4 - Low Pressure Pipe Distribution Trench length (m)	<input type="text"/>
Option 2 - Pumped Discharge Surface area (m <sup>2</sup> )	<input type="text"/>	Option 5 - Drip Dispersal Surface area (m <sup>2</sup> )	<input type="text"/>

### SYSTEM TYPE: Tertiary Treatment System and infiltration / treatment area (Section 10.2)

Identify purpose of tertiary treatment

Provide performance information demonstrating system will provide required treatment levels

Provide design information

#### DISCHARGE ROUTE:

Groundwater	<input type="checkbox"/>	Hydraulic Loading Rate * (l/m <sup>2</sup> .d)	<input type="text"/>	Surface area (m <sup>2</sup> )	<input type="text"/>
Surface Water **	<input type="checkbox"/>	Discharge Rate (m <sup>3</sup> /hr)	<input type="text"/>		

\* Hydraulic loading rate is determined by the percolation rate of subsoil

\*\* Water Pollution Act discharge licence required

## 6.0 TREATMENT SYSTEM DETAILS

### QUALITY ASSURANCE:

---

Installation & Commissioning

On-going Maintenance

## 7.0 SITE ASSESSOR DETAILS

Company:

**Appendix 8.2 – Assimilative Capacity Assessment**



## Assimilative Capacity

Background Concentrations (Cback)						
	BOD5	Total Oxidised Nitrogen	Total Ammonia	Ortho P	Nitrate(as N)	Nitrite (as NO2)
<b>Ballinrobe (Robe river)</b>	1.28333	0.948425	0.028643	0.027945	0.891607	0.006685

Assimilative Capacity Calculations						
	BOD AC cal	TON AC Calc	Total Ammonia AC Calc	Ortho P AC Calc	Nitrate as N AC Calc	Nitrite as NO2
Max permissible conc. (EQS) (mg/l)	2.60	N/A	0.14	0.04	8.00	N/A
AC (kg/day)	3392.36	N/A	286.91	18.18	18314.56	N/A
Total Amount Discharge to River (kg/day)	3306.47	N/A	73.80	72.00	47186982.25	N/A
Capacity Impact %	0.88	N/A	0.42	6.60	0.00	N/A
Mass Balance	1.3	0.95	0.03	0.03	0.00	0.00
<b>OK TO DISCHARGE?</b>	<b>Ok to discharge</b>	N/A	<b>Ok to discharge</b>	<b>Ok to Discharge</b>	<b>Ok to Discharge</b>	N/A

Discharge Flow (m3/day)	Flow (L)	Flow (m3/s) (95%ile Flow m3/sec)
<b>2576473.9</b>	<b>2576473920</b>	<b>29.82025</b>

SW REGS S.I. No. 77/2019					
Quality	Quality	Nitrate (as N)	Orthophosphate	Ammonia-Total N	BOD
	High River Quality	4	0.025	0.09	N/A
	Good River Quality	8	0.035	0.14	2.6

Flow (m3/s) (95%ile Flow m3/sec) From Catchments.ie	
Flow	Robe
NATQ1 (m³/s)	34.106
NATQ5 (m³/s)	21.861
NATQ10 (m³/s)	16.178
NATQ20 (m³/s)	10.445
NATQ30 (m³/s)	7.509
NATQ40 (m³/s)	5.667
NATQ50 (m³/s)	4.281
NATQ60 (m³/s)	3.178
NATQ70 (m³/s)	2.27
NATQ80 (m³/s)	1.568
NATQ90 (m³/s)	0.909
NATQ95 (m³/s)	0.664
NATQ99 (m³/s)	0.371
NATAMF (m³/s)	6.922
NATMMF1 (m³/s)	12.698
NATMMF2 (m³/s)	10.114
NATMMF3 (m³/s)	7.909
NATMMF4 (m³/s)	4.986
NATMMF5 (m³/s)	3.777
NATMMF6 (m³/s)	2.598
NATMMF7 (m³/s)	1.956
NATMMF8 (m³/s)	2.866
NATMMF9 (m³/s)	3.836
NATMMF10 (m³/s)	6.624
NATMMF11 (m³/s)	10.709
NATMMF12 (m³/s)	12.244
<b>F</b>	<b>29.82025</b>

Mass Balance Calcs (mg/l) T	
Total Oxidised N	0.949733792
Ammonia- Total N	0.029106042
BOD	1.294853224
Orthophosphate	0.028408107
Nitrate (as N)	0.891523954
Nitrite (as NO2)	0.006684377

Discharge from RO (mg/l)	
Total Oxidised N	15
Ammonia- Total N	5
BOD	125
Orthophosphate	5
pH	6.2
Nitrate (as N)	0
Nitrate (as No3)	0
Nitrite (as N)	0
Nitrite (as NO2)	0

Discharge Rate (m3/h)	10
Discharge Load (m3/day)	240

Discharge Load (kg/day) - Parame mg/l	
Total Oxidised N	3.6
Ammonia- Total N	1.2
BOD	30
Orthophosphate	1.2
pH	N/A
Nitrate (as N)	0
Nitrate (as No3)	0
Nitrite (as N)	0
Nitrite (as NO2)	0

### Formula 1

$$\text{Assimilative capacity} = (C_{\text{max}} - C_{\text{back}}) \times F95 \times 86.4 \text{ kg/day}$$

Where:

$C_{\text{max}}$  = maximum permissible concentration (EQS – 95%ile value) (mg/l)

$C_{\text{back}}$  = background upstream concentration (mg/l mean value)

F95 = the 95%ile flow in the river (m<sup>3</sup>/s)

Note: (60x60x24)/1000 = 86.4

### Formula 2

$$\text{Assimilative capacity} = (C_{\text{max}} - C_{\text{back}}) \times \text{DWF} \times 86.4 \text{ kg/day}$$

where:

$C_{\text{max}}$  = maximum permissible concentration (EQS - 95%ile value) (mg/l)

$C_{\text{back}}$  = background upstream concentration (mg/l mean value)

DWF = dry weather flow in the river (m<sup>3</sup>/s)

Background Concentrations (C) mg/l						
	BOD5	Total Oxidised Nitrogen	Total Ammonia	Ortho P	Nitrate(as N)	Nitrite (as NO2)
Ballinrobe (Robe river)	1.28333	0.948425	0.028643	0.027945	0.891607	0.006685

Proposed Discharge from RO (c) mg/l						
	BOD5	Total Oxidised Nitrogen	Total Ammonia	Ortho P	Nitrate(as N)	Nitrite (as NO2)
RO Discharge	125	15	5	5	0	0

Mass Balance Calculation						
	BOD5	Total Oxidised Nitrogen	Total Ammonia	Ortho P	Nitrate(as N)	Nitrite (as NO2)
Mass Balance Calculation (mg/l)	1.294853224	0.949733792	0.029106042	0.028408107	0.891523954	0.006684377
Impact %	0.90	0.14	1.62	1.66	-0.01	-0.01

F95	29.82025 m3/s	F
Discharge Rate	0.002778 m3/s	f

### Calculation 2 – Mass Balance

This formula is used to calculate the concentration of a parameter in the receiving water downstream of the discharge. This downstream concentration may then be compared directly with the water quality standard (EQS) to determine whether the discharge will cause an exceedance of the EQS value.

Mass balance Equation:

$$T = \frac{FC + fc}{F + f}$$

where:

- F is the river flow upstream of the discharge (95%ile flow m<sup>3</sup>/sec);
- C is the concentration of pollutant in the river upstream of the discharge (mean concentration in mg/l);
- f is the flow of the discharge (maximum flow in flow m<sup>3</sup>/sec);
- c is the maximum concentration of pollutant in the discharge (mg/l);
- T is the concentration of pollutant downstream of the discharge.