8.0 WATER

8.1 INTRODUCTION

This chapter addresses the magnitude of potential impacts to, and the significance of effects on, surface water and/or the groundwater receptors from the proposed development and use of a soil recovery facility (the 'Proposed Development') at Kilmartin, Coynes Cross, Newcastle, County Wicklow (the 'Site', shown by the 'Application boundary' in Figure 7-1)). It considers groundwater levels, flow regime, quality, surface water flows and quality.

The chapter has been prepared by Anna Goodwin and Rhian Llewellyn. Anna has 19 years of experience and holds an MSci in Geology and an MSc in Hydrogeology. She is chartered through the Geological Society of London. Rhian has over ten years of experience and holds a MGeol and a PhD in Earth Science.

8.1.1 TECHNICAL SCOPE

The technical scope of this assessment is to consider the potential impacts and effects of the Proposed Development on the water environment that can be reasonably foreseen as consequences of the normal development and operation of the proposed soil recovery facility. The assessment considers the potential sources of change resulting from Proposed Development activities detailed in the project description (Chapter 3.0) on hydrological (surface water) receptors and hydrogeological (groundwater) receptors.

The assessment also considers the potential effects on people (including health) as a result of predicted changes to water quality, and the potential secondary effects of changes in land quality on water quality. As such, it draws on the assessment presented in Chapter 7.0 (Land, Geology and Soils). Secondary effects on ecology or biodiversity as a result of changes in water quality are considered in Chapter 6.0 (Ecology and Biodiversity).

8.1.2 GEOGRAPHICAL AND TEMPORAL SCOPE

The geographical study area for the assessment covers the Proposed Development area and a buffer zone that extends to 1 km from the Application boundary (see Figure 8-1). This study area allows for the identification of nearby off-site water features that may be affected by changes associated with the Proposed Development.

The temporal scope of the assessment covers the works phase. For the purpose of clarity, this assessment uses the term 'works phase' to describe the period of time comprising the following construction activities:

- Enabling works to provide facilities required for the operation of the soil recovery facility (I.e., entrance upgrades, establishment of office and welfare facilities, etc); and
- The operation of the soil recovery facility (i.e. acceptance of clean soil and stone to Site and its subsequent emplacement within the fill area).

A restoration phase (described in Chapter 3.0), broadly following the work phase (with some temporal overlap), has been scoped out of this assessment due to the nature of the works to be carried out in that project phase project and the short-term nature of the phase having limited potential to impact water.

Figure 8-1 - Water Assessment Study Area (dashed red line shows study area extent)

8.2 LEGISLATIVE AND POLICY CONTEXT

This section describes the legislation and guidance that has been considered when preparing this chapter, and key policy context relevant to water that has guided the focus of the assessment. The overarching EIA legislation under which this assessment is required is addressed separately in Chapter 2.0 (Scope and Methodology).

8.2.1 LEGISLATION AND GUIDANCE

In addition to the Regulations that underpin the EIA process (see Chapter 2.0), this assessment has been made with cognisance to relevant guidance, advice and legislation relating to the water environment, which have been used to steer the focus of the baseline information collection, the categorisation of receptor sensitivities, and the mitigation measures that have been included.

- Local Government (Water Pollution) Act 1977 (as amended) and associated Statutory Instrument Regulations made under that Act outlines the general prohibition of entry of polluting matter to water, the requirement to licence both trade and sewage effluent discharges, licencing of water abstractions, controlling discharges to aquifers, and notification of accidental damages.
- The European Union (EU) Water Framework Directive (WFD) (2000/60/EC) is the European legislation that establishes a framework for the protection of groundwater and surface water, including the establishment of river basin district, the requirement to prevent further deterioration by preventing or limiting inputs of pollutants, reducing the pollution and promoting sustainable

water use. The Groundwater Daughter Directive (GWDD) (2006/118/EC) sits beneath the WFD and relates to water protection and management. It establishes measures to prevent and control groundwater pollution, including criteria for assessing good chemical status and identifying trends.

- The WFD and GWDD have been transposed into Irish law through many Regulations. These Regulations cover governance, the shape of the WFD characterisation, monitoring and status assessment programmes in terms of assigning responsibilities for the monitoring of different water categories, determining the quality elements and undertaking the characterisation and classification assessments. They include, but are not limited to, the following:
  - European Communities (Water Policy) Regulations 2003 and its subsequent amendments;
  - European Communities Environmental Objectives (Surface Waters) Regulations, 2009 and its subsequent amendments;
  - European Communities Environmental Objectives (Groundwater) Regulations, 2010 and its subsequent amendments; and
  - European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations 2011.

Other guidance relating to the EIA process that has been used to guide the assessment of potential impacts to the water environment and the identification of relevant mitigation include:

- Institute of Geologists of Ireland. Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (April 2013).
- The EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (2022) – which presents key topics of interest, high-level information on the interactions that should be considered in relation to EIA legislation, and overviews on the recommended approach to describing the baseline environment, completing impact assessments, describing effects, and addressing mitigation and monitoring.
- Department of Housing, Planning and Local Government. Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018).
- The National Roads Authority Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (2009) in relation to aspects to be considered and assessment approach (including relative receptor importance and cross discipline interactions).
- The National Roads Authority Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan (undated) in relation to impact mitigation.
- CIRIA C532: Control of water pollution from construction sites. Guidance for consultants and contractors (2001).
- CIRIA C741: Environmental Good Practice on Site (2015, Fourth Edition) in relation to source of impact and mitigation.
- CIRIA C750: Groundwater control – design and practice (2016, Second Edition).

- Scottish and Northern Irish Pollution Prevention Guidelines (PPGs) and Guidance for Pollution Prevention (GPPs) – these, although not Irish guidance, provide environmental good practice guidance for activities such as oil and chemical storage, works in or near water, works on construction sites, and dealing with spills and pollution incidents.

8.2.2 POLICY

The National Planning Framework (Project Ireland 2040) includes National Policy Objective 60 to "Conserve and enhance the rich qualities of natural and cultural heritage of Ireland in a manner appropriate to their significance".

The Wicklow County Development Plan 2022-2028 includes a series of water quality and supply objectives. Those that are most relevant to this Site and Proposed Development are considered to be the following:

- CPO13.1 - To ensure and support the implementation of the EU Groundwater Directive and the EU Water Framework Directive and associated River Basin and Sub-Basin Management Plans and Blue Dot Catchment Programme, to ensure the protection, improvement and sustainable use of all waters in the County, including rivers, lakes, ground water, coastal and estuarine waters, and to restrict development likely to lead to a deterioration in water quality.
- CPO13.2 - To prevent development that would pollute water bodies and in particular, to regulate the installation of effluent storage and disposal systems in the vicinity of natural water bodies or development that would exacerbate existing underlying water contamination.
- CPO13.3 - To minimise alterations or interference with river / stream beds, banks and channels, except for reasons of overriding public health and safety (e.g. to reduce risk of flooding); a buffer of generally 25m along watercourses should be provided (or other width, as determined by the Planning Authority having particular regard to 'Planning for Watercourses in the Urban Environment' by Inland Fisheries Ireland for urban locations) free from inappropriate development, with undeveloped riparian vegetation strips, wetlands and floodplains generally being retained in as natural a state as possible.
- CPO13.4 - To ensure that any development or activity with the potential to impact on ground water has regard to the GSI Groundwater Protection Scheme.
- CPO 13.5 - To ensure compliance with and to implement the provisions of the Nitrates Directive in so far as it falls within the remit of the Council to do so.
- CPO 13.9 - To protect existing and potential water resources of the County, in accordance with the EU Water Framework Directive, the River Basin Management Plans, the Groundwater Protection Scheme and source protection plans for public water supplies.

8.2.3 PRE-CONSULTATION

A non-statutory pre-consultation process was carried out with prescribed bodies and other parties over 25 May- 26 June 2023 to seek their comments and observations about the Proposed Development. This process is fully documented in the Pre-Consultation Report accompanying the Strategic Infrastructure Development (SID) application submission. All comments relating to water have been considered in the preparation of this chapter.

Geological Survey Ireland (GSI) responded via letter dated 12 June 2023. In summary, this communication:

- Recommend using various publicly available data sets hosted on the GSI website when conducting the EIAR, planning and scoping processes.
- Advised on appropriate guidelines for conducting an impact assessment.
- Stated that the GSI would appreciate copies of reports detailing site investigation undertaken, if applicable.

The relevant GSI datasets have been considered in the Proposed Development of this assessment and are attributed in the relevant sections below. The recommended guidelines have been considered in the impact assessment.

8.3 PROJECT DESCRIPTION

A full project description is provided in Chapter 3.0 (Project Description). A project description summary is provided below:

The Proposed Development is the establishment and operation of a soil recovery facility within a 17.08 hectare site at Kilmartin, Co. Wicklow (approximately 4 km north-east of Ashford). The soil recovery facility will import up to 2,160,000 tonnes of inert waste, primarily clean soils and stones from construction and development sites. Clean soil and stone will be used to progressively infill a steep-sided natural valley within the Site and raise ground levels to approximately 57mOD, tying in with the surrounding landscape. The infill area covers approximately 14 hectares.

The soil recovery facility will accept up to 100 loads per day on average (maximum 150 in exceptional circumstances) with a projected operational lifespan of up to 10 years depending on market conditions within the construction sector, followed by one year for final restoration and aftercare of the lands.

The Proposed Development will require the following structures be installed and maintained for the operational life of the Soil Recovery Facility: office and welfare facilities, six parking bays for private vehicles, weighbridge and associated weighbridge cabin, one wheel wash and one spray-system wheel wash, two waste inspection bays and one bunded waste quarantine area, hardstanding area (for vehicle movement and storage), surface water drainage infrastructure from hard standing and discharge to ground (including two interceptors and two soakaways), an internal access road, internal haul roads (constructed from recycled aggregates where available), security features including security gates and fencing, and power supply. These structures will be removed from the Site at the end of life point of the soil recovery facility.

Approval will be sought for a connection to the ESB Network for the site office and welfare facilities. Diesel generators will be used to power mobile lighting, if required. Temporary lighting, if required, will be cowled to prevent light spillage.

The temporary relocation of ESB poles within the fill area will be required. This will be subject to prior agreement with ESB.

Wastewater from office and welfare facilities will be managed by a third-party provider, with no connection to foul water mains.

All truck deliveries will access the site via the N11/M11 and Coynes Cross Road, with internal queuing space provided within the Site and no parking on public roads.

The existing land entrance located on R772 will be upgraded and will be retained following the completion of the Proposed Development.

A groundwater abstraction borehole will be installed to supply water for wheel washes, dust suppression, and welfare facilities, and will be retained for monitoring after restoration.

Restoration will return the site to grassland and hedgerow habitat, similar to its pre-development state. Approximately 140 m of fence and hedgerow opposite the entrance will be temporarily removed to improve sightlines during the life of the soil recovery facility and this will be subsequently reinstated. Native species will be used in hedgerow planting. The restored land will revert to agricultural management.

Permission is sought from An Coimisiún Pleanála for a period of up to 10 years, with an additional year for restoration. The Proposed Development will require a waste licence[1] from the Environmental Protection Agency (EPA) and aligns with national and regional policy objectives to provide adequate licensed soil recovery capacity for the Dublin and Wicklow regions.

8.4 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

This section presents the method used to assess the impacts and effects of the Proposed Development on the water environment, and to human health from changes to the water environment. It establishes the stages of the assessment, and the qualitative criteria used to assess impact magnitude and determine the level of effect significance.

8.4.1 QUALITATIVE ASSESSMENT METHOD

The assessment of potential effects has been undertaken using the qualitative assessment method outlined below and is supported by the baseline condition information and the Proposed Development design. The assessment follows a staged approach. A summary of the stages involved is included below:

1. Confirm baseline conditions – determine baseline and develop conceptual site model by consideration of available records and data sets, site reports and published information.
2. Confirm the key receptors and their value/importance.
3. Qualitatively characterise the magnitude of impacts on the receptors – describe what potential changes could occur to each receptor as a result of the Proposed Development, identify source-pathway receptor linkages, and assign the magnitudes of impact. This stage takes into account embedded design mitigation, good practice in construction environment management and pollution prevention.
4. Determine the initial effect significance of each potential impact on each sensitive receptor.

[1] The proposed development will be carried out in accordance with a waste licence from the EPA or in accordance with by-product regulations, Article 27 of the European Communities (Waste Directive) Regulations 2011 (see Section 3.5 in Chapter 3.0: Project Description of this EIAR for further detail).

5. Consider the need for additional mitigation if it is considered necessary to reduce the initial magnitude of the impact and associated effect significance further.

Assess the residual impact magnitude and residual effect significance after all mitigation is applied.

Stages 1 and 2 have been completed using published literature and guidance and available information specific to the Proposed Development, which is presented in Chapter 3.0. For the identification of receptor value/importance that completes Stage 2, and for the description of impact magnitude (Stage 3), a common framework of assessment criteria and terminology has been used based on the EPA's Guidelines on the Information to be Contained in EIARs (EPA, 2022a), with some modifications made to increase clarity. The descriptions for value (sensitivity) of receptors are provided in Table 8-1 and the descriptions for magnitude of impact are provided in Table 8-2.

The potential for an impact to occur at a receptor has been determined using the understanding of the baseline environment and its properties and consideration of whether there is a feasible linkage between a source of impact and each receptor (i.e. a conceptual site model). This follows the method of preliminary assessment that is presented in some of the guidance documents listed in Section 8.2.

Table 8-1 - Environmental value (sensitivity) and descriptions.

Value (sensitivity) of receptor / resource	Typical description
High	High importance and rarity, national scale, and limited potential for substitution. For example: Global/European/National designation - or supports an internationally important feature. Human health receptors. Regionally important aquifer with multiple wellfields. Inner source protection area for a regional resource. Regionally important potable water source supplying >2,500 homes (surface water or aquifer). Flood plain protecting more than 50 residential or commercial properties from flooding.
Medium	Medium or high importance and rarity, regional scale, limited potential for substitution. For example: Regionally important sites. Regionally important aquifer. Outer source protection area for a regional resource. Locally important potable water source supplying >1,000 homes (surface water or aquifer). Flood plain protecting between 5 and 50 residential or commercial properties from flooding.
Low	Low or medium importance and rarity, local scale. For example: Locally important aquifer. Outer source protection area for a local resource. Local potable water source supplying >50 homes (surface water or aquifer). Flood plain protecting between 1 and 5 residential or commercial properties from flooding.
Negligible	Very low importance and rarity, local scale.

Value (sensitivity) of receptor / resource	Typical description
	Environmental equilibrium is stable and is resilient to impacts that are greater than natural fluctuations, without detriment to its present character. Poorly productive aquifer. Local potable water source supplying <50 homes (surface water or aquifer). Flood plain protecting 1 residential or commercial properties from flooding.

Table 8-2 - Magnitude of impact and typical descriptions

Magnitude of impact (change)		Typical description
High	Adverse	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. Harm to human health - death, disease, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. Pollution of the water environment, which is defined by: • A breach of, or failure to meet, any statutory quality standard for the water environment at an appropriate pollution assessment point. • A breach of, or a failure to meet, any operational standard adopted by EPA for the protection of the water environment. • Pollution results in an increase in treatment required for an existing drinking water supply. • Pollution results in an increase level of treatment required of water abstracted for industrial purposes. • Pollution results in deterioration in the status of a water body, failure to meet good status objectives defined by the Water Framework Directive, or failure of a protected drinking water area to meet its objectives as defined by the Water Framework Directive. • There is a significant and sustained upwards trend in concentration of pollutants in groundwater being affected by the land in question. • There is a material and adverse impact on the economic, social and/or amenity use associated with a particular water environment.
	Beneficial	Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality.
Medium	Adverse	Loss of resource but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.
	Beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Low	Adverse	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.

Magnitude of impact (change)		Typical description
	Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse	Very minor loss or alteration to one or more characteristics, features or elements.
	Beneficial	Very minor benefit to or positive addition of one or more characteristics, features or elements.

The assessment of impact magnitude considers whether the change that causes the impact is positive or negative, and whether the impact is direct or indirect, short- medium- or long-term, temporary or permanent, and if it is reversible.

For the purposes of this assessment, a direct impact is one that occurs as a direct result of the Proposed Development and is likely to occur at or near the Proposed Development itself. Indirect impacts (or secondary/tertiary impacts) are those where a direct impact on one receptor has another knock-on impact on one or more other related receptor(s) (e.g. the Proposed Development results in a change in groundwater quality, which then has an indirect impact on surface water quality and/or users of the water, such as human health or ecology). Indirect impacts can occur within the study areas or away from the Proposed Development.

For the purposes of this assessment, the following definitions of duration have been used:

- Temporary – impact likely to last less than 2 years without intervention;
- Short term – impact likely to last 2 to 10 years without intervention;
- Medium term – impact likely to last 10 to 15 years without intervention;
- Long term – impact likely to last 15 to 60 years without intervention; and
- Permanent – impact likely to last over 60 years without intervention.

An irreversible impact is defined as a change to the baseline that would not reverse itself naturally. Such impacts will usually be long-term and irreversible, such as changes to the groundwater flow regimes caused by changes to the properties of the subsurface.

A reversible impact is defined as a change to the baseline conditions that would reverse naturally once the source of the impact is exhausted, removed or has stopped. For example, impacts to groundwater quality from contamination only last as long as the source of the impacts is present. If it is removed, groundwater quality may naturally improve or could be remediated.

8.4.2 SIGNIFICANCE CRITERIA

The approach followed to derive effects significance from receptor value and magnitude of impacts (Stage 4) is shown in Table 8-3. Where Table 8-3 includes two significance categories, reasoning is provided in the text if the lower of the two significance categories is selected. A description of the significance categories used is provided in Table 8-4.

Table 8-3 - Significance Matrix

	Magnitude of Impact (Degree of Change)				
Environmental value (Sensitivity)		**Negligible**	**Low**	**Medium**	**High**
	High	Slight	Slight or moderate	Moderate or large	Profound
	Medium	Imperceptible or slight	Slight or moderate	Moderate	Large or profound
	Low	Imperceptible	Slight	Slight	Slight or moderate
	Negligible	Imperceptible	Imperceptible or slight	Imperceptible or slight	Slight

Table 8-4 - Significance categories and typical descriptions

Significance Category	Typical Description
Profound	An effect which obliterates sensitive characteristics.
Large	An effect which, by its character, magnitude, duration or intensity alters a significant proportion of a sensitive aspect of the environment.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Imperceptible	An effect capable of measurement but without significant consequences.

Residual adverse effects of ‘large’ or ‘profound’ significance are considered to be ‘significant’ for the purposes of this assessment.

Following the assessment of the level of effect significance, mitigation measures are presented that will be used to avoid, prevent or reduce the magnitude of the potential impact (Stage 5). The significance of the effect taking into account the mitigation is then assessed (Stage 6) to give the residual effect significance. Any monitoring that will be required to measure the success of the mitigation is also presented in residual impacts and effects tables in Section 8.7 (Stage 7).

The effects of the Proposed Development are also considered cumulatively with those that could foreseeably result from other known developments in the assessment study area that are going through the planning process (see Section 8.10 and Chapter 15.0).

8.5 EXISTING ENVIRONMENT

8.5.1 LAND USE, GEOLOGY AND SOILS

The baseline information with respect to land use, geology and soils is presented in Chapter 7.0. The agricultural land use, both historically and currently, is not known to have included specific contaminative activities. Depending on the use for fertilisers and pesticides, some changes in land quality and related diffuse pollution of the existing water environment might be expected as there might be for many water environments associated with overlying agricultural land used. The existing water quality is discussed further in Sections 8.5.2 and 8.5.3.

8.5.2 GROUNDWATER

8.5.2.1 Regional Hydrogeological Setting Overview

There are two main types of aquifers in Ireland; bedrock aquifers, and sand and gravel aquifers (GSI, 2022a). The majority of bedrock aquifers across the Republic of Ireland that are regionally important are Karstified Limestones. Groundwater flow in these rocks is predominantly through fissures and fractures. The majority of these aquifers are unconfined. Less than 5% of the country is underlain by sand and gravel aquifers (GSI, 2022a). These aquifers have intergranular permeability, are typically relatively thin, and are generally unconfined. Water is usually abstracted from these aquifers from pumping wells or boreholes, although water can naturally seep to the surface via springs.

Aquifers in the region are typically poor (unproductive or generally unproductive except in local zones) or are locally important with moderate productivity in local zones (GSI, undated).

The majority of groundwater flow will take place in the top few metres (GSI, undated) and will flow laterally towards discharge points such as rivers and streams. Deeper groundwater flow is possible in isolated features such as open fractures. Regional groundwater flow paths don't develop because the rocks do not have sufficient transmissivity to transport water over long distances. Typical groundwater flow paths will be in the order of a couple of hundred metres, with discharge occurring to the closest surface water feature.

Regional groundwater contour mapping (GSI, 2022b) suggests elevations around 50 m above Ordnance Datum (m AOD) to 60 m AOD, which is likely to be near ground level.

Regionally, recharge to bedrock aquifers is dominated by diffuse vertical flow through the overlying soils and Quaternary Glacial Till deposits (GSI, undated). Higher recharge occurs in areas with thin or no soil/Quaternary deposits; although the limited aquifer potential of many of the rocks means that storage potential is low and run-off to surface water is high.

8.5.2.2 Local Aquifers and their Properties

The Water Framework Directive Groundwater Body (GWB) over which the Proposed Development is located is the Wicklow GWB (GSI, 2022b). The bedrock is classified as a 'Poor Aquifer' (i.e. the bedrock is generally unproductive except for local zones) (GSI, 2022b). The aquifer classification mapping is shown in Figure 8-2.

The Wicklow GWB was classified as having 'good' Water Framework Directive (WFD) groundwater body status for the 2013-2018 cycle (EPA, 2022b). There are no mapped gravel aquifers (sensitive groundwater bodies) (EPA, 2022b). WFD Groundwater Risk looks at the current water quality and trends and is used to highlight waterbodies that are at risk of deteriorating or being at less than 'Good' status in the future. The Wicklow GWB risk status is currently under review (EPA, 2022b).

Groundwater Vulnerability defines how easily groundwater may be contaminated by human activities. The vulnerability of groundwater is moderate-to-high in the eastern half of the Site where there is superficial deposit cover of Till, and extreme or 'rock at or near surface' in the west where superficial cover is mapped as being less or absent (EPA, 2022a). The aquifer vulnerability mapping is shown in Figure 8-3.

Groundwater recharge is estimated at 100 mm/yr and sub-soil permeability is mapped as moderate (GSI, 2022b).

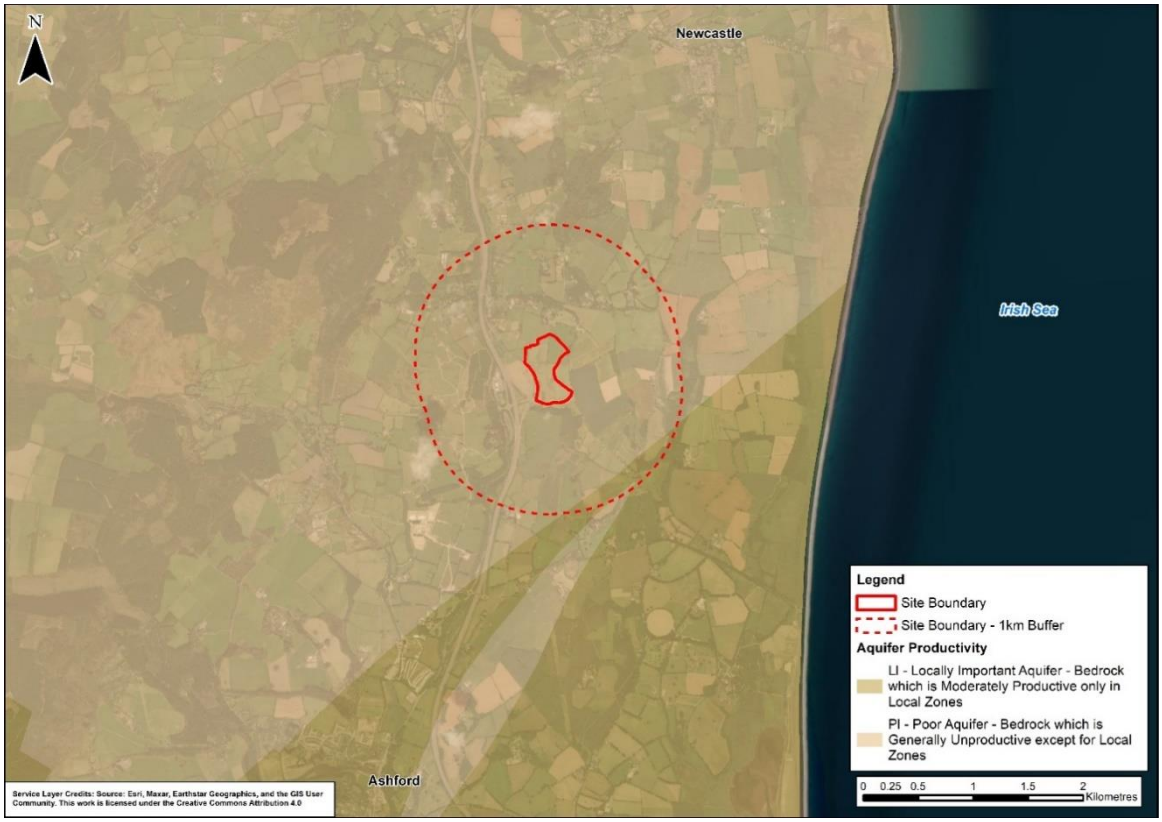

Figure 8-2 - Aquifer Classification (dashed red line shows study area)

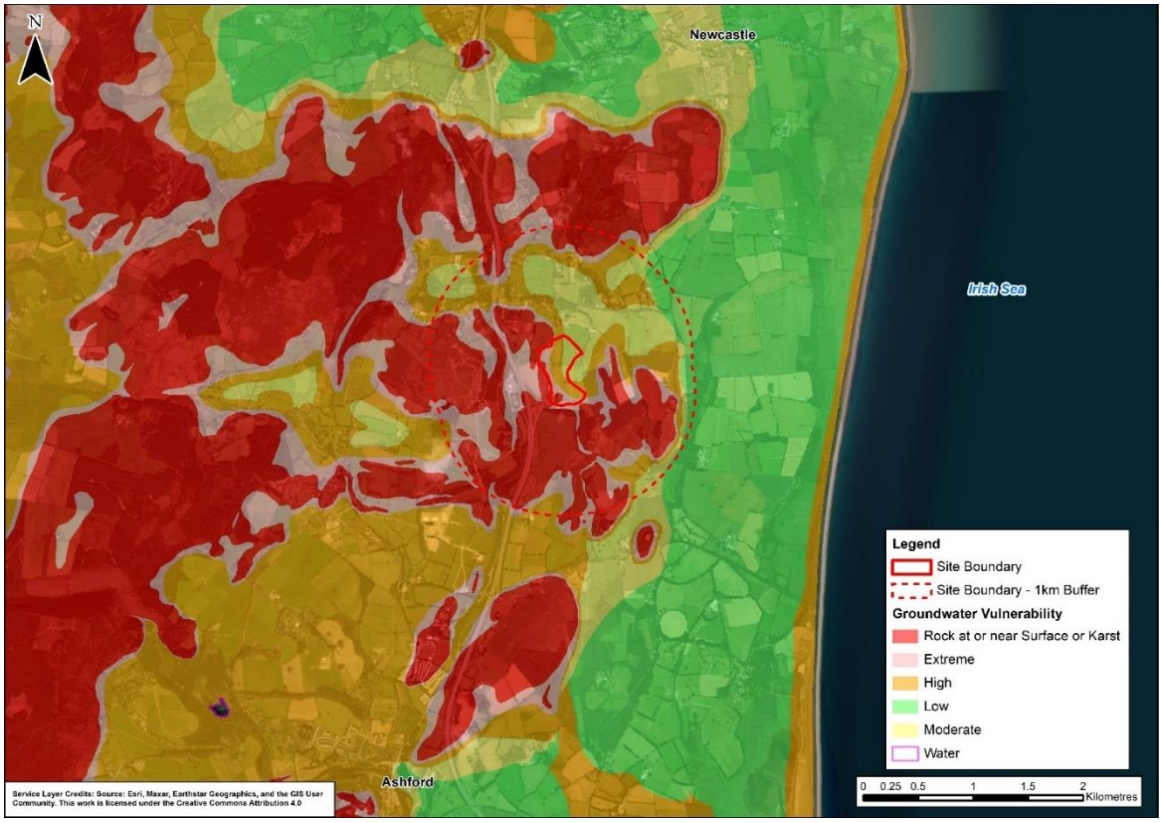

Figure 8-3 - Aquifer Vulnerability (dashed red line shows study area)

8.5.2.3 Local Groundwater Levels and Flows

Three groundwater monitoring boreholes were installed on Site in 2006. Two PVC standpipes were installed in each borehole; one in the superficial deposits and one in the bedrock. Historical groundwater monitoring undertaken at the Site (White Young Green, 2008) indicates the depth to groundwater was around 4 m below ground level (bgl) to 10.5 m bgl. Groundwater elevations were 7.5 m AOD in the north of the Site and 4.5 m AOD in the south, which indicated groundwater flow was towards the south. The locations of the boreholes are shown on Figure 8-4 (an extract of Figure 2.5.5; White Young Green, 2008).

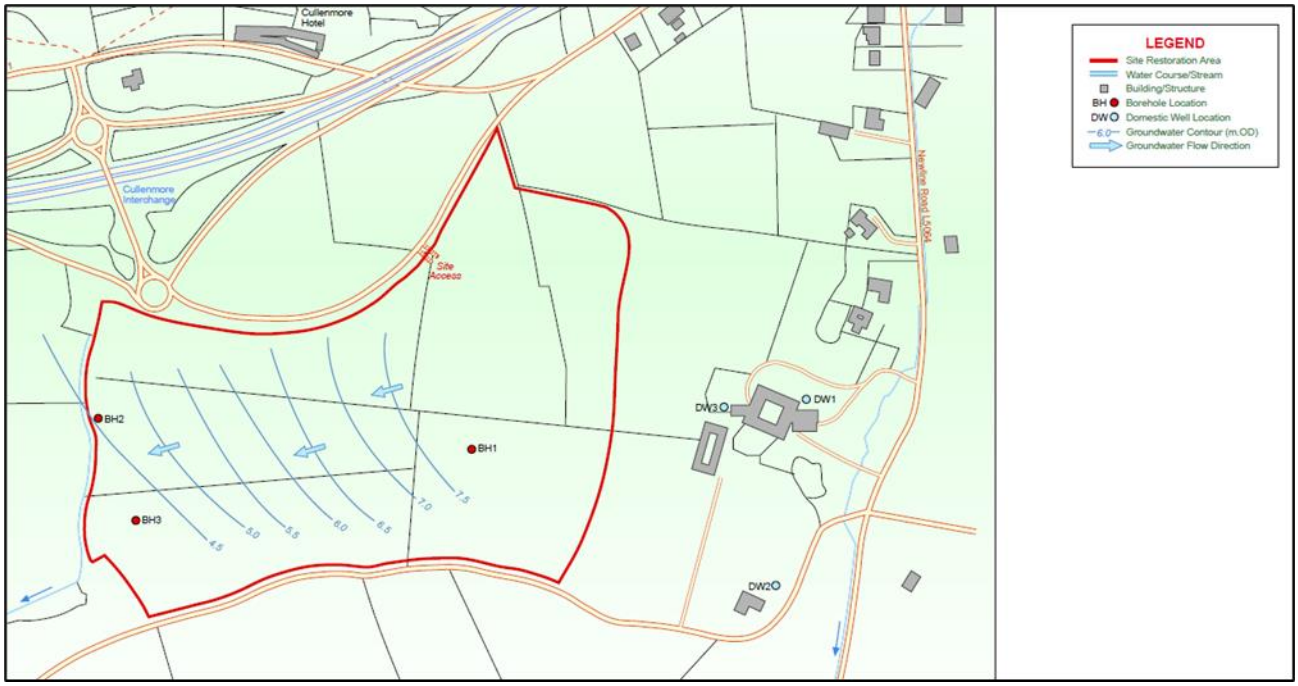

Figure 8-4 - White Young Green Groundwater Monitoring Locations (White Young Green (Ireland) Ltd, 2008)

The same locations were revised in 2016 (IE Consulting, 2017) and the depth to groundwater ranged from 2.36 m below the top of casing (btoc) to 6.23 m btoc.

WSP visited Site on 11 and 17 October 2022 and undertook monitoring at the same three boreholes. The depth to groundwater ranged between 3.08 m btoc (at BH1) and 6.66 m btoc (at BH3). The depth to groundwater was also measured at domestic supply well DW3 as 8.47 m btoc. This is similar to previous depths to groundwater.

The depth to groundwater in each of the two standpipes in each borehole in 2016 and 2022 was either the same or very similar, which indicates that there may be hydraulic continuity between the superficial and bedrock aquifers.

8.5.2.4 Groundwater Flooding

There are no areas of groundwater flooding probability shown on the Geological Surveys of Ireland's Groundwater flooding probability maps (Office of Public Works, 2022).

The central valley feature at the Site is periodically waterlogged in its base, but this could be poor drainage of surface water rather than groundwater flooding. Some of this water will gradually infiltrate to ground as recharge, but some will evaporate or be taken up by vegetation.

8.5.2.5 Local Groundwater Quality

Groundwater quality monitoring and assessment of samples taken once in 2007 and once 2008 from the on-Site boreholes (White Young Green, 2008) concluded that the concentrations of metals and inorganic determinants were typically below the recommended Interim Guideline Values (IGVs) at that time[2] and that water quality was excellent. Elevated faecal coliforms and total coliforms were recorded in all of the boreholes during the first sampling round but were subsequently below the screening standards used. The source of the contamination was considered to be sheep grazing. During the second monitoring round, a slightly elevated concentration of zinc above the IGV was recorded in the sample taken from the deeper standpipe in BH103-D at 0.168mg/l. All other parameters were below the recommended IGV at all other monitoring locations. Analysis of water samples taken from the nearby local domestic supply wells returned concentrations that were all within the EPA IGV. The locations of the domestic supplies are shown on Figure 8-4 (an extract of Figure 2.5.5; White Young Green, 2008).

Field parameter measurements and a further set of samples were taken from the same locations are part of water monitoring work undertaken in 2016 (IE Consulting, 2017).

The field data collected in 2016 is reproduced in Table 8-5. A summary of the 2007, 2008 and 2016 laboratory results for samples collected from the shallow and deep monitoring well standpipes, and from the nearby local domestic supply wells, is presented in Table 8-6.

[2] Interim Guideline Values as were set out in the Table 3.1 of EPA document "Towards Setting Guideline Values for the protection of Groundwater in Ireland" (as stated in White Young Green, 2008)

Table 8-5 - 2016 Groundwater Field Data

Parameter	Location								
	BH1-S	**BH2-S**	**BH3-S**	**BH1-D**	**BH2-D**	**BH3-D**	**DW1**	**DW2**	**DW3**
pH	6.43	5.94	6.14	6.9	6.12	6.47	6.84	7.46	7.8
Temperature (°C)	13	12	11.8	12	12.2	11.8	13.5	12.5	13.1
Electrical Conductivity (uS/cm)	245	344	224	281	341	294	312	345	291
Observations	No odours	No odours	Earthy odour	No odours	No odours	No odours	No odours	No odours	No odours

Table 8-6 - Summary of 2007, 2008 and 2016 Groundwater Quality Monitoring Laboratory Results

Parameter	Location		
	Shallow Standpipes	Deep Standpipes	Domestic Supply Wells
pH	6.5 – 7.54	6.68 – 7.36	6.77 – 7.36
Conductivity (uS/cm)	252 – 424	84 – 417	265 – 350
Ammoniacal Nitrogen as NH4-N (mg/l)	<0.2 – 0.03	<0.2 – 0.2	<0.2 – 0.05
Nitrate as NO3 (mg/l)	10.3 – 22.5	8.6 – 26.7	20.6 – 26.1
Dissolved Oxygen (mg/l)	4.9 – 9	5.3 – 9	4.7 – 9
Chloride (mg/l)	12 – 50.6	19 – 44.6	19 – 26
Potassium (mg/l)	0.2 – 1.4	0.6 – 1.2	0.6 – 1.2
Sodium (mg/l)	13.4 – 22.3	16.5 – 22	17 – 23
Total Organic Carbon (mg/l)	<2 – 5	<2 – 3	<2 – 4
Total Oxidised Nitrogen (mg/l)	1.4 – 7.5	1.9 – 6.8	4.6 – 7.5
Calcium (mg/l)	23.14 – 57.74	32.4 – 48.8	28.3 – 43.42
Cadmium (mg/l)	<0.00003 - <0.001	<0.00003 - <0.001	<0.00003 - <0.001
Chromium (mg/l)	<0.0002 – 0.006	<0.0002 – 0.04	<0.0002 – 0.006
Copper (mg/l)	<0.001 – 0.004	<0.001 - <0.003	0.005 – 0.03
Total Cyanide (mg/l)	<0.01 - <0.05	<0.01 - <0.05	<0.01 - <0.05
Iron (mg/l)	<0.0047 – 0.043	0.0054 – 0.068	0.0048 – 0.024
Lead (mg/l)	<0.0004 - <0.001	<0.0004 – 0.006	<0.0004 – 0.001
Magnesium (mg/l)	3.43 – 6.5	3.897 – 5.9	4.1 – 4.858
Manganese (mg/l)	<0.001 – 0.021	<0.001 – 0.005	<0.001 – 0.0081
Nickel (mg/l)	<0.0002 – 0.0006	<0.0002 – 0.014	<0.0002 – 0.007
Mercury (mg/l)	<0.00001 - <0.00005	<0.00001 - <0.00005	<0.00001 - <0.00005
Sulphate (soluble as SO4) (mg/l)	7.3 – 32.9	7.5 – 27.4	9 – 12.7
Zinc (mg/l)	0.0037 – 0.023	0.003 – 0.168	0.0075 – 0.049
Boron (mg/l)	<0.003 – 0.028	<0.003 – 0.023	<0.003 – 0.089
Total Phenols (mg/l)	<0.01 - <0.1	<0.01 - <0.1	<0.01 - <0.1
Total Solids (mg/l)	159 – 999	146 – 304	27 – 257
Faecal Coliforms (cfu/100ml)	<1 – 3,600	<1 – 206	<1
Total Coliforms (cfu/100ml)	<1 – 1,550,000	<1 – 2,100	<1 – 2

WSP visited Site on 11 and 17 October 2022 and undertook groundwater quality monitoring from the deep standpipes in borehole BH1, BH2 and BH3, which monitor groundwater in the bedrock. Samples were also taken from the domestic supply wells DW1, DW2 and DW3 for laboratory analysis. The field data are presented in Table 8-7 and a summary of the laboratory analysis results is presented in Table 8-8. A sample was also taken from domestic supply well DW3 for laboratory analysis.

Table 8-7 - 2022 Groundwater Field Data

Parameter	Location					
	BH1	**BH2**	**BH3**	**DW1**	**DW2**	**DW3**
pH	6.53	6.26	6.47	6.69	6.55	6.57
Specific Conductivity (uS/cm)	607.00	937.19	633.43	190.42	196.66	225.6
Dissolved Oxygen (mg/l)	16.87	8.21	18.19	20.28	9.17	19.75
Oxygen Redox Potential (mV)	+363.7	+402.8	+411.2	+326.3	+322.2	+379.8
Observations	Slightly cloudy No odours or sheen	Cloudy No odours or sheen	Cloudy No odours or sheen	Clear No odours or sheen	Clear No odours or sheen	Clear No odours or sheen
* Temperature probe malfunction – no measurements						

Table 8-8 - Summary of 2022 Groundwater Quality Monitoring Laboratory Results

Parameter	Location	
	Deep Standpipes	**Domestic Supply Wells**
Dissolved Arsenic (ug/l)	<2.5	<2.5
Dissolved Barium (ug/l)	7 – 15	<3 – 7
Dissolved Beryllium (ug/l)	<0.5	<0.5
Dissolved Boron (ug/l)	13 – 16	14 – 17
Dissolved Cadmium (ug/l)	<0.5	<0.5
Total Dissolved Chromium (ug/l)	<1.5 – 1.7	<1.5
Dissolved Copper (ug/l)	<7	<7 – 17
Dissolved Lead (ug/l)	<5	<5
Dissolved Mercury (ug/l)	<1	<1
Dissolved Nickel (ug/l)	<2	<2
Dissolved Selenium (ug/l)	<3	<3
Dissolved Vanadium (ug/l)	<1.5 – 5.1	<1.5

Parameter	Location	
	Deep Standpipes	Domestic Supply Wells
Dissolved Zinc (ug/l)	<3 – 8	8 – 27
EPH (C8-C40) (ug/l)	<10	<10
Chloride (mg/l)	18.7 – 53.4	19.4 – 26.7
Nitrate as NO3 (mg/l)	12 – 26	18.2 – 21
Ortho Phosphate as PO4 (mg/l)	<0.06	<0.06
MRP Ortho Phosphate as PO4 (mg/l)	<0.06	<0.06
Ammoniacal Nitrogen as N (mg/l)	<0.03	<0.03
Hexavalent Chromium (ug/l)	<6	<6
Total Dissolved Chromium III (ug/l)	<6	<6
BOD (Settled) (mg/l)	<1	<1
COD (Settled) (mg/l)	<7	<7
Electrical Conductivity @25C (uS/cm)	325 – 455	287 – 376
Free Ammonia as N (mg/l)	<0.006	<0.006
pH (pH units)	7.26 – 7.41	6.88 – 7.9
Total Dissolved Solids (mg/l)	196 – 289	150 – 194
Total Suspended Solids (mg/l)	165 – 7172	<10

The historical monitoring data and the most recent monitoring data show similar concentration ranges where the same parameters were tested for. These data represent the baseline, pre-development, conditions at the site, and the following generalised statements on the baseline groundwater quality can be made:

- Groundwater has a fairly neutral pH;
- The electrical conductivity indicates fresh water;
- The groundwater presents an oxidising environment;
- Metal concentrations are typically below the laboratory limit of detection or are low;
- No phenols or hydrocarbons have been detected;
- Faecal coliforms are present in groundwater beneath the site, which is likely to be indicative of the agricultural land use; and
- There is no clear difference between the water quality in the superficial deposits and the bedrock.

8.5.3 SURFACE WATER

8.5.3.1 Surface Water Features and Catchments

The Proposed Development is in the Ovoca-Vartry WFD catchment, the Vartry WFD sub-catchment and the Inchanappa_010 sub-basin (EPA, 2022c).

There are no surface watercourses on site. There is a watercourse that flows from west to east approximately 300 m north of the Application boundary (see Figure 8-5). Previous reports about the Site have referred to this as the Coynes Cross Stream. The waterbody name given by the EPA is Dunran Demesne.

There is also a watercourse that flows west to east along the southern boundary of the Site (see Figure 8-5). Previous reports about the Site have referred to this as the Kilmartin Stream. The waterbody name given by the EPA is Cullenmore.

Both the Dunran Demesne and Cullenmore watercourses are defined as having 'Good' WFD waterbody status and their risk status is currently under review (EPA, 2022c).

These two streams converge to become the Dunran Demesne stream about 600 m to the southeast of the Site and flow southwards into Broad Lough (an 'at Risk' WFD transitional waterbody) where they join with the Vartry river and numerous other watercourses before discharging into the Irish Sea at Wicklow.

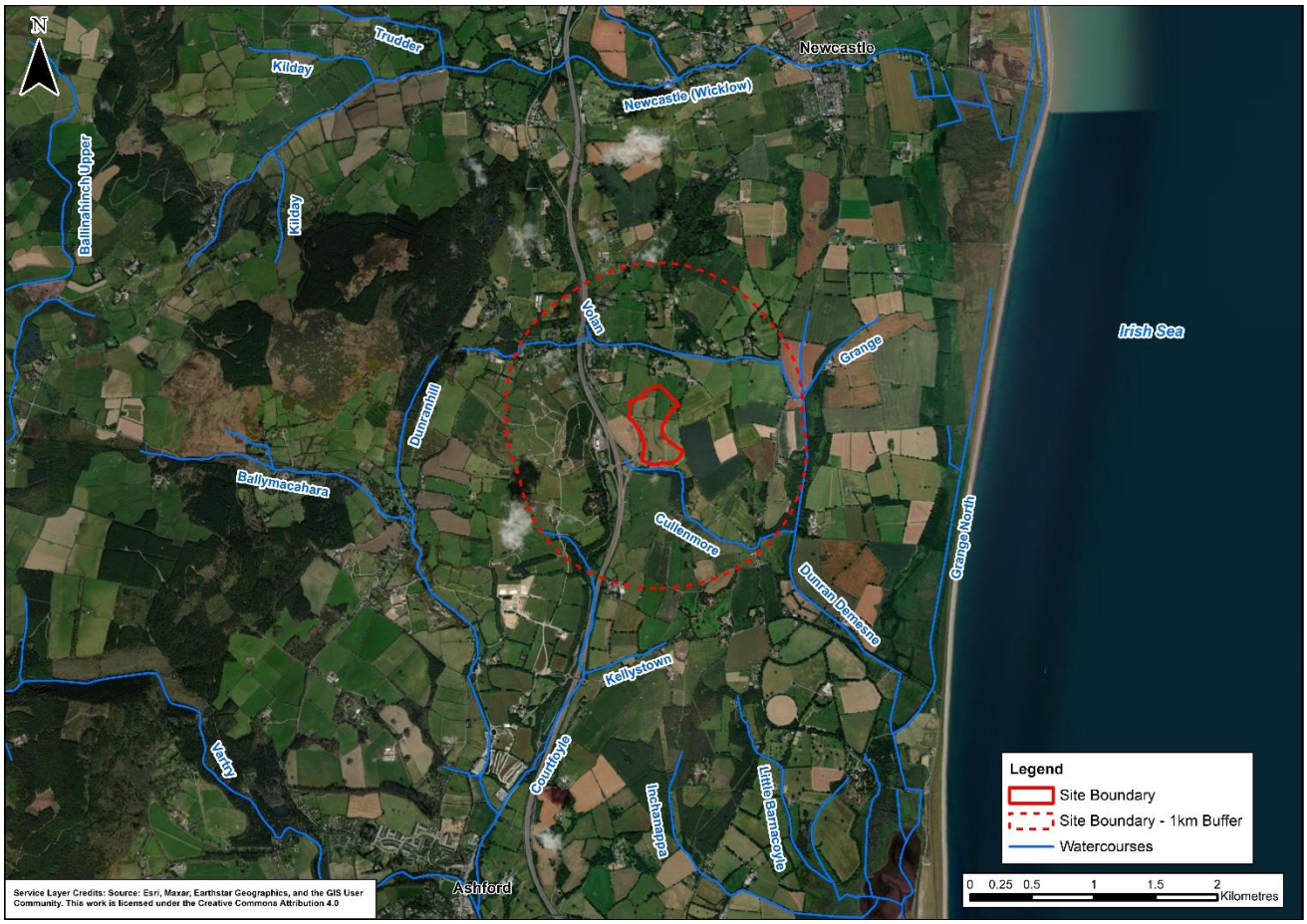

Figure 8-5 - Surface Watercourses (dashed red line shows study area)

8.5.3.2 Existing Flows and Drainage

The Site has a central valley feature that trends north-south. Run-off from the northern part of the valley feature drains to the Coynes Cross stream and run-off from the southern part of the valley drains to the Kilmartin stream. In the central, lowest part of the valley, run-off accumulates and forms

an area of wet ground in the winter. An old French drain was discovered running northwest to southeast across the Site towards the Kilmartin stream.

It is assumed that the local surface watercourses are fed by a combination of surface water run-off and some baseflow from groundwater.

8.5.3.3 Flooding

The Site and wider study area are not mapped as being currently at risk from fluvial flooding (rivers), pluvial flooding (rainfall) or coastal flooding (Office of Public Works, 2022). There are also no records of past flooding events in the immediate vicinity of the Site.

The future flood probability mapping for rivers and coastal flooding (Office of Public Works, 2022) covers two scenarios; a mid-range future scenario that takes into account the potential effects of climate change using an increase in rainfall of 20% and sea level rise of 500mm, and a high-end future scenario that takes account of the potential effects of climate change using an increase in rainfall of 30% and sea level rise of 1,000 mm. The Site and wider study area are not mapped as being at risk of future flooding.

8.5.3.4 Surface Water Quality

Historically, surface water samples were taken from upstream and downstream locations on the Kilmartin and Coynes Cross streams in once in 2006 and once in 2008 (White Young Green, 2008). The locations are shown on Figure 8-6 (an extract of Figure 2.6.1; White Young Green, 2008). Laboratory analysis was completed for the EPA baseline range of parameters for surface waters. White Young Green compared the results to EPA Environmental Quality Standards (EQS) that were applicable in 2008. The results of that comparison indicated the surface water was of good quality and all parameters were below the EQS limits.

Surface water monitoring was undertaken at similar locations in 2016 (IE Consulting 2017). Minor changes were made to the monitoring locations on Coynes Cross Stream due to access issues, so samples were taken at SW1a and SW2a, which are relatively close to SW1 and SW2, respectively.

The field data collected in 2016 is reproduced in Table 8-9. A summary of the 2007, 2008 and 2016 laboratory results for samples collected from the surface water monitoring locations is presented in Table 8-10.

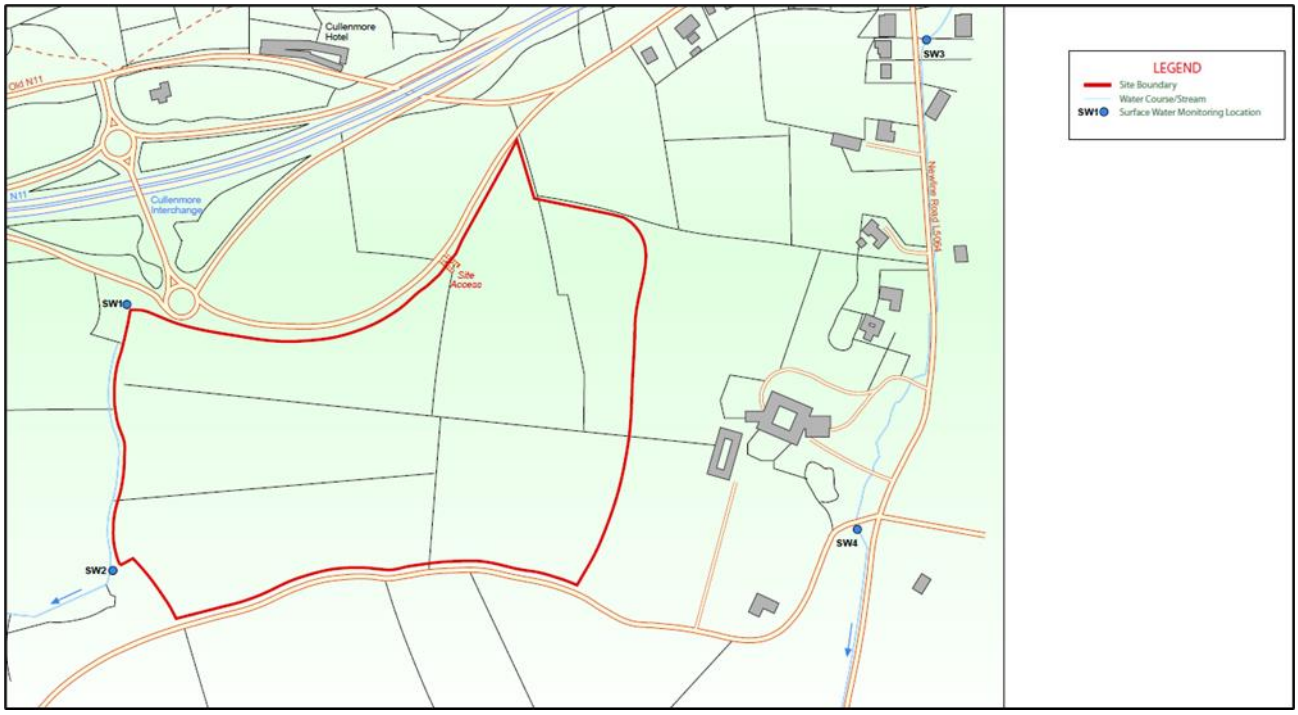

Figure 8-6 - White Young Green Surface Water Monitoring Locations (White Young Green (Ireland) Ltd, 2008)

Table 8-9 - 2016 Surface Water Field Data

Parameter	Location			
	SW1a	**SW2a**	**SW3**	**SW4**
Observations	-	Clean, no odour, some silty residue	Clean, no odour.	-
pH	7.08	7.36	7.6	7.15
Temperature (°C)	16.2	13.1	13.6	13.4
Conductivity (uS/cm)	360	424	297	358

Table 8-10 - Summary of 2006, 2008 and 2016 Surface Water Quality Monitoring

Parameter	Location			
	SW1/SW1a	**SW2/SW2a**	**SW3**	**SW4**
pH	7.08 – 7.85	6.96 – 7.73	7.19 – 7.89	7.45 – 8.03
Conductivity (uS/cm)	410 – 420	282 – 471	208 – 386	229 – 336
Ammoniacal Nitrogen as NH4-N (mg/l)	<0.2 – 0.05	<0.2 – 0.05	<0.2 – 0.05	<0.2 – 0.08
Nitrate as NO3 (mg/l)	12.8	12.6	13.1	15.8
Dissolved Oxygen (mg/l)	7.9 – 9	5 – 9	5.4 – 10	6 – 10
Chloride (mg/l)	59.5 – 69	25.6 – 86	22 – 31	22 – 25.5
Potassium (mg/l)	1.6 – 1.9	0.9 – 1.6	0.7 – 2.3	1.1 – 1.3
Sodium (mg/l)	26.4 – 49	17.7 – 51.5	18.5 – 24	18.5 – 18.6
COD (mg/l)	<15 – 9	<15 – 8	<7 - <15	<7 - <15
BOD (mg/l)	<2 – 2	<1 - <2	<1 – 3	<1 – 4
Total Oxidised Nitrogen (mg/l)	1.9 – 2.9	2.8 – 4.2	2.9 – 7.6	3.6 – 5.5
Calcium (mg/l)	31.11 – 42.5	25.62 – 67.6	17.33 – 45	20.53 – 49.63
Cadmium (mg/l)	<0.00003 - <0.001	<0.00003 – <0.001	<0.00003 – <0.001	<0.00003 – <0.001
Chromium (mg/l)	0.0004 – 0.005	<0.0001 – 0.002	<0.0001 – 0.004	0.0001 – 0.004
Copper (mg/l)	<0.001 - <0.003	<0.0001 – <0.003	<0.0001 – <0.003	<0.0001 – <0.003
Iron (mg/l)	0.0168 – 0.019	0.004 – 0.0196	0.0111 – 0.023	0.0114 – 0.028
Lead (mg/l)	<0.0004 - <0.001	<0.0001 – <0.001	<0.0001 – <0.001	<0.0001 – <0.001

Parameter	Location			
	SW1/SW1a	**SW2/SW2a**	**SW3**	**SW4**
Magnesium (mg/l)	6.5 – 48.85	5.048 – 65.83	3.949 – 7.615	3.968 – 6.45
Manganese (mg/l)	0.003 – 0.0081	<0.001 – 0.0362	<0.0001 – 0.0053	<0.0001 – 0.0051
Nickel (mg/l)	<0.001 – 0.0004	<0.0001 – <0.001	<0.0001 – <0.001	<0.0001 – 0.001
Mercury (mg/l)	<0.00001 – 0.00006	<0.00001 – 0.0001	<0.00001 - <0.00005	<0.00001 - <0.00005
Sulphate (soluble as SO4) (mg/l)	13 – 35	18 – 43.2	10 – 107	12 – 18
Zinc (mg/l)	0.0044 – 0.02	0.0049 – 0.038	0.003 – 0.019	0.0057 – 0.014
Alkalinity (as CaCO3) (mg/l)	60 – 96	60 – 160	60 – 160	50 – 130
Total Organic Carbon (mg/l)	<2 – 4	<2 – 5	<2 – 4	<2 – 3
Faecal Coliforms (cfu/100ml)	2,200	2,200	34 – 6,200	31 – 11,800
Total Coliforms (cfu/100ml)	37,000	12,180	2200 – 43,740	430 – 209,240

WSP visited Site on 11 and 17 October 2022 and undertook water quality monitoring at surface water locations as close as possible to those previously monitored by White Young Green. The field data are presented in Table 8-11 and the laboratory analysis results are presented in Table 8-12. The historical monitoring data and the most recent monitoring data show similar concentration ranges where the same parameters were tested for.

Table 8-11 - T2022 Surface Water Field Data

Parameter*	**Location**			
	SW1	**SW2**	**SW3**	**SW4**
Flow status	No flow – standing water only	Flowing	Flowing.	Flowing
Observations	Clear. No odour or sheen	Clear. No odour or sheen	Clear. No odour or sheen	Clear. No odour or sheen
pH	6.48	6.56	6.73	5.82
Conductivity (uS/cm)	243.4	226.9	141.84	Probe malfunction. No measurements.
Dissolved Oxygen (mg/l)	6.84	19.6	21.62	
Oxygen Redox Potential (mV)	+439.7	+416.2	+324.4	+318.2
* Temperature probe malfunction – no measurements				

Table 8-12 - T2022 Surface Water Quality Monitoring Laboratory Results

Parameter	Location			
	SW1	SW2	SW3	SW4
Dissolved Arsenic (ug/l)	<2.5	<2.5	<2.5	<2.5
Dissolved Barium (ug/l)	12	9	8	11
Dissolved Beryllium (ug/l)	<0.5	<0.5	<0.5	<0.5
Dissolved Boron (ug/l)	13	<12	<12	14
Dissolved Cadmium (ug/l)	<0.5	<0.5	<0.5	<0.5
Total Dissolved Chromium (ug/l)	<1.5	<1.5	<1.5	<1.5
Dissolved Copper (ug/l)	<7	<7	<7	<7
Dissolved Lead (ug/l)	<5	<5	<5	<5
Dissolved Mercury (ug/l)	<1	<1	<1	<1
Dissolved Nickel (ug/l)	<2	<2	<2	<2
Dissolved Selenium (ug/l)	<3	<3	<3	<3
Dissolved Vanadium (ug/l)	1.7	<1.5	<1.5	2.2
Dissolved Zinc (ug/l)	33	8	6	<3
EPH (C8-C40) (ug/l)	<10	<10	<10	<10
Chloride (mg/l)	56	45.9	18.2	25.9
Nitrate as NO3 (mg/l)	9.7	13.6	8.2	14.2
MRP Ortho Phosphate as PO4 (mg/l)	<0.06	<0.06	<0.06	<0.06
Hexavalent Chromium (ug/l)	<6	<6	<6	<6

Parameter	Location			
	SW1	SW2	SW3	SW4
Total Dissolved Chromium III (ug/l)	<6	<6	<6	<6
BOD (Settled) (mg/l)	<1	<1	<1	<1
COD (Settled) (mg/l)	8	<7	<7	7
Electrical Conductivity @25C (uS/cm)	381	375	242	332
Free Ammonia as N (mg/l)	<0.006	<0.006	<0.006	<0.006
pH (pH units)	7.24	7.56	7.7	8.02
Total Dissolved Solids (mg/l)	249	239	118	186
Total Suspended Solids (mg/l)	25	143	<10	<10

8.5.4 REGULATED DISCHARGES AND EMISSIONS

There are no wastewater treatment plants or emission points on Site or in the study area. There are no Section 4 discharges to water located within the study area (EPA, 2022b). There is a waste facility with a ceased licence mapped at the Site, which is likely to correspond to a previous application for a soil treatment facility at the same Site.

8.5.5 WATER USERS

The Site is not in a Group Scheme and Public Supply Source protection area (GSI, 2022b and EPA, 2022c). There are no mapped groundwater wells and springs on Site (GSI, 2022b), but there are mapped wells in the study area to the west of the N11 motorway in Kiltimon and Courtfoyle. These are described as being for domestic use and having poor yield. The GSI wells and springs are shown on Figure 8-7.

Studies undertaken as part of a previous planning application (White Young Green, 2008) highlight that some properties in the area are connected to the mains (specifically those to the northwest of the Site and closest to the N11 motorway), whereas others have private water supply wells (as shown on Figure 8-4). The properties to the immediate north of the Site also obtain their water from private water wells, which are not included on the GSI maps. These wells are located hydraulically upgradient of the Site. The nearest dwelling with a private well is located approximately 150 m to the north and is for the Norse family (the developers).

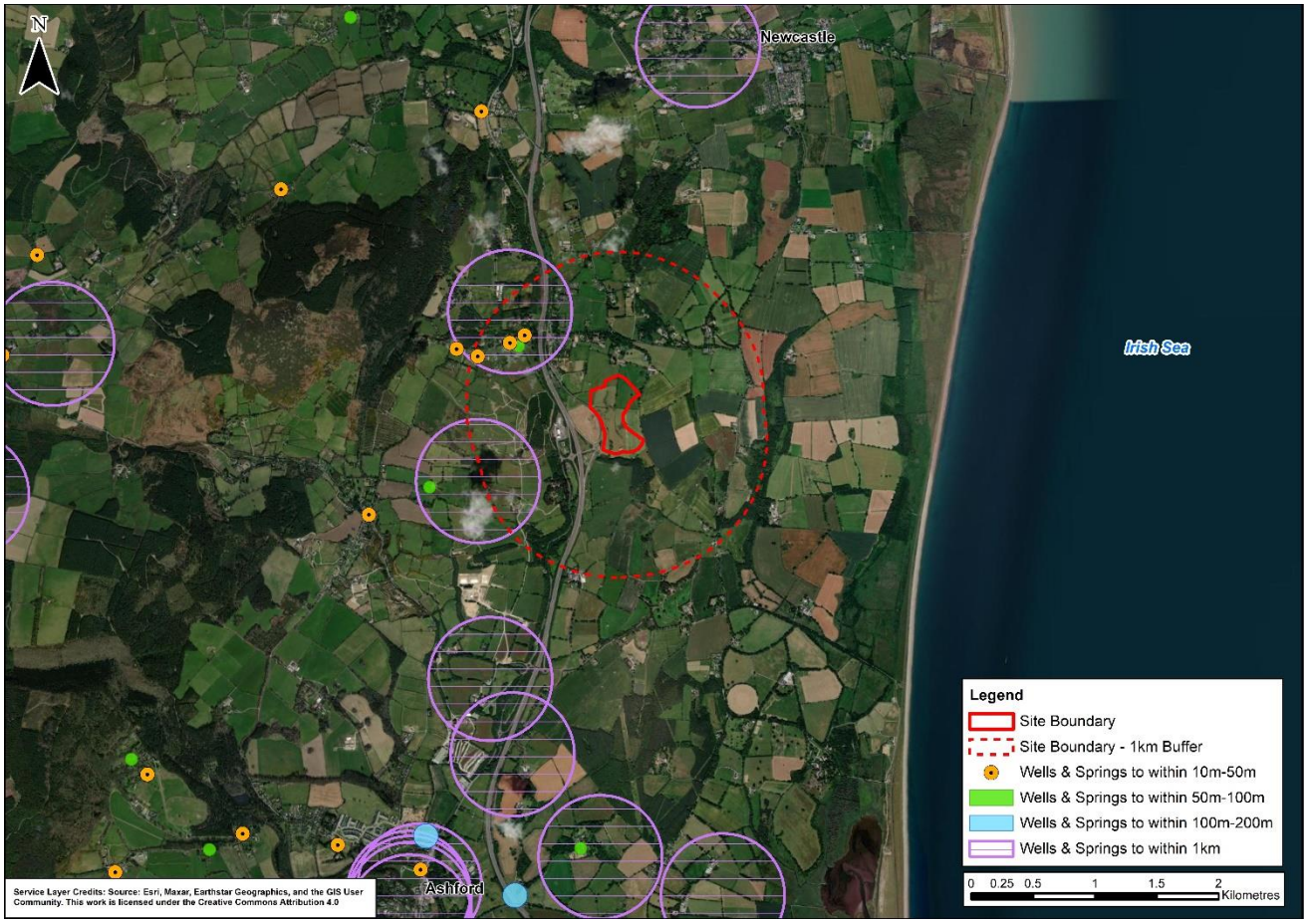

Figure 8-7 - Water Wells (dashed red line shows study area)

8.5.6 DESIGNATED SITES

There are no international designated sites at, or within 1 km of, the Proposed Development (EPA, 2022b). The Murrough Wetlands Special Area of Conservation (SAC) and Murrough Special Protection Area are located over 2 km downstream of the Site (see Figure 8-8).

A wide range of freshwater and brackish marsh habitats occur within the SAC, and, in turn, support the designated birdlife of the SPA. The habitats that are dependent upon freshwater are likely to be supported to some extent by input from the surface watercourses that pass the Proposed Development and feed into other watercourses that flow into/through the SAC. However, there are numerous other freshwater surface watercourses that also feed into these habitats, and the Dunran Demesne input is likely to represent a small proportion of the total catchment input to the Broad Lough, which, in turn, forms only part of the SAC.

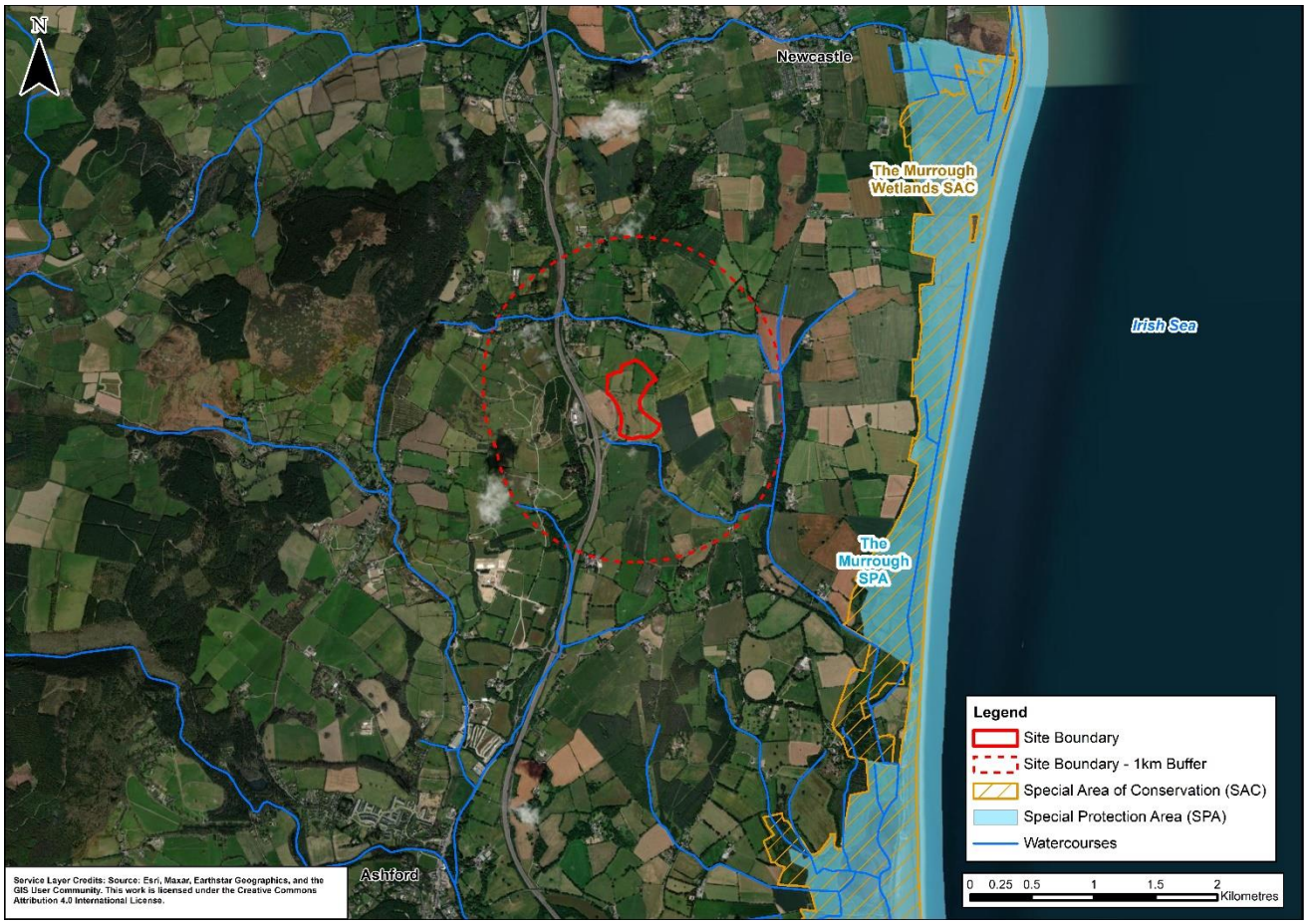

Figure 8-8 - Designated Sites (dashed red line shows study area)

8.5.7 COMMENTARY ON THE FUTURE BASELINE AND CLIMATE TRENDS

Future climate change could alter the water environment at the Site by changing temperatures, recharge rates, changing flood risk and sea levels, and by affecting demand from public water supplies.

The climate in Ireland is changing in line with wider global changes. According to the EPA (2022c), temperatures have increased by 0.8°C compared to 1900, and there has been an increase in average annual national rainfall of approximately 60mm (or 5%) between 1981 and 2010.

Based on the most recent climate projections for Ireland (EPA, 2020), summary information presented by the EPA (2022c) and the Irish Meteorological Service (2022) indicate that in Ireland:

- The average annual temperatures are projected to increase by between 1 to 1.2 ºC and 1.3 to1.6 ºC by the middle of this century (2041 to 2060), depending on the emissions trajectory;
- The greatest temperature increase will be in the east of Ireland;
- The number of warm days is expected to increase;
- Summer heat waves are expected to occur more frequently;
- Precipitation is expected to become more variable:
  - Significant reductions are expected in average levels of annual, spring and summer rainfall;
  - A substantial increase is predicted in the frequency of heavy precipitation events in winter and autumn (approx. 20%); and
  - Snowfall is predicated to decrease substantially.
- Sea levels are predicted to rise at the same, or a faster, rate than between 2006 and 2015 (3.6 mm/yr).

Overall, predictions associated with future climate change indicate that the future baseline might involve warmer average summer and winter temperatures, higher sea levels, and changes in rainfall patterns, volume and intensity.

Increases in rainfall intensity could lead to greater run-off, reduced aquifer recharge, increased suspended solids and pollution input to watercourses, and more river flooding. Sea level increases could have economic, social and environmental impacts, and lead to increased coastal erosion, flooding and damage to property and infrastructure. Longer drier periods combined with higher temperatures could lead to increased potential for drought that could also affect future water resource availability. Changes in population (specifically increases) could result in more demand on water resources and water shortages in summer months. Changes in future water resource availability and demand could increase the relative importance of groundwater and surface water that either currently, or could in the future, provide water supplies.

The Proposed Development is unlikely to be directly affected by sea level change.

8.5.8 SELECTION OF SENSITIVE RECEPTORS

Taking account of the above and the receptor classification method described in Section 8.3, the receptors carried forward in this assessment and their assigned importance are presented in Table 8-13.

Table 8-13 - Water receptors

Receptor	Importance and Reasoning
Groundwater – quality and availability.	Low (local supply only, poorly productive aquifer, but cognisant of WDF requirements, and aquifer vulnerable to contamination from human activities due to limited soil and subsoil cover, and groundwater levels near surface)

Receptor	Importance and Reasoning
Surface water – quality and availability.	High (no known supplies, WDF requirements, connection to downstream internationally designated sites)
Humans/Human Health (secondary receptor – existing water users water availability and quality).	High (human receptor, known local supplies)

The zones of influence around the private water supply wells are likely to be fairly small, but the volumes abstracted and the hydraulic properties of the bedrock, and therefore the extent of aquifer that they draw water from, is unknown. Although located up-hydraulic gradient of the Proposed Development, the wells could feasibly draw from groundwater beneath its footprint. Therefore, these water supplies have been conservatively included as receptors of potential changes in water quality or availability that the Proposed Development could result in.

There is no mapped flood risk at the Proposed Development, and it is not mapped as being at risk from future flooding. Therefore, changes in drainage at the Proposed Development that could lead to changes in flood risk have not been considered in this assessment. The potential impact of flooding on the Proposed Development itself has also not been considered.

8.6 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

8.6.1 PROPOSED DEVELOPMENT PLANS

The development proposals are described in Chapter 3.0 (Project Description). Key elements that could present sources of impact to the water environment include the importation of materials for soil recovery, fuel/oil storage and use, use of a wheel wash, surface drainage systems, and the use and maintenance of welfare facilities.

8.6.2 EMBEDDED MITIGATION

This initial assessment of the significance of potential effects resulting from the Proposed Development takes into consideration embedded design, proposed construction and waste management methods, and commonly undertaken good practice mitigation. The elements of the Proposed Development design and good working practices that reduce the potential for impacts to the water environment include the following:

- Vehicle movements outside the area where backfilling will take place will be restricted to dedicated routes or on areas of hardstanding.
- Stockpiles of material will be evaluated and monitored and kept stable to minimise erosion.
- Should there be any requirement to for additional topsoil, this will be imported to site using a suitability licenced third party supplier.
- No deep excavation is planned; only shallow topsoil stripping and land raise. No dewatering of excavations will be required.
- There is no known land contamination at the site. If during works previously unidentified contamination is encountered, work will be undertaken to characterise this and determine if there is a risk to water quality that requires action.
- The land raise, and all temporary operational facilities to enable the soil recovery facility to operate (e.g. haul roads and areas of hard-standing), will be developed using inert soil and

stone/recycled aggregate. Hardstanding at the wheel wash, site entrance apron, quarantine area, and vehicle movement and storage area will be concrete.

- Material acceptance for the imported material will be as per the waste licence (or in accordance with by-product regulations, Article 27 of the European Communities (Waste Directive) Regulations 2011), where relevant). No contaminated soils will be accepted at the facility. Authorised vehicles only will be received. The origin and weight of incoming material will be known. Representative samples will be taken from a certain proportion of loads to make sure they comply with acceptance criteria.
- There will be waste inspection bays and a waste quarantine area that are enclosed on three sides and base-lined with concrete.
- Any waste materials that are deemed to be unacceptable for recovery at the facility on the basis of a visual inspection at the weighbridge or waste inspection bays will be rejected and will be directed away from the Site to an appropriate disposal facility. During emplacement of materials, the site operative will inspect what is being laid down. Suspect or non-compliant material will be transferred to the quarantine area for further inspect and classification. Materials that are not compliant with waste licence requirements (or Article 27 of the European Communities (Waste Directive) Regulations 2011, where relevant) will be removed from the Site for disposal at an appropriate facility.
- There will be no underground storage tanks.
- There will be no on-site concrete batching.
- Any fuels stored onsite will be stored in double skinned tanks in an appropriately bunded storage area. Contained concrete bunds will have a minimum capacity of 110% of the fuel tank. Any pipes and valves associated with storage tanks will be located within a bund. A concrete apron will be constructed adjacent to the tank and vehicles loading or unloading diesel will park on the concrete apron. The edges of the apron will be ramped so that oil spillages occurring during loading or unloading will be contained on the concrete apron. Bunds will be inspected.
- If small quantities of lubricants and hydraulic oil need to be stored on on-site, and these will be stored on a bunded pallet.
- Disposal of spills / leaks collected in bunded areas will be to an appropriate, licensed facility.
- Any refuelling of plant onsite will take place on the hardstanding area and drip traps will be used. Refuelling will be undertaken by a suitably responsible person.
- Spill kits will be maintained on Site to deal with all spills and leaks, and spill training will be provided to relevant staff members.
- Mobile plant parking will be available on the hardstanding for vehicle movement and storage. Drip trays and mats will be placed under parked plant, where required.
- The spray wheel washing facility will be a wet-grate design, located upon concrete hardstanding that will be maintained for the duration of the Proposed Development. The effluent from the wheel wash will be recycled within the system. The final design of the wheel wash will be agreed with local authority. A secondary wheel wash will be used for vehicles entering/exiting the active fill areas.

- All waste from the welfare facilities will be collected by a third-party provider and disposed of to a suitable off-site facility.
- Drinking water will be supplied as bottled water. Water supply for the welfare facilities and wheel wash is intended to be sourced from groundwater through an existing, or new, borehole. The abstraction will be registered with the EPA if it is over 25 m^3/day on any day of the year.
- All hard-standings adjacent to administration buildings, including the waste inspection and quarantine bays, internal haul road, and concrete apron at site entrance will be drained to a surface water drainage system. The run-off from hard-standing will be directed to an interceptor and discharged to a soak pit that will be constructed on site. The interceptor will be maintained, as required.
- Finished areas filling will be capped with the previously stripped topsoil and grassed at the earliest opportunity.
- Any waste removal will be managed and undertaken by a competent contractor appointed by the Main Contractor according to industry standard practice and disposed of accordingly by a licensed waste disposal contractor.
- An EMS (Environmental Management System) will be developed for the Site to support a waste licence application to the EPA and will be in keeping with industry best practice and statutory guidelines. Plans within the EMS will set out how the construction and operation of the Proposed Development will be managed. The plans will include widely used good practice measures to avoid or reduce the potential impact of construction works on workers, members of the public and the environment. These will include, but not be limited to, the following:
  - All construction works will be conducted in accordance with the appropriate site rules.
  - Appropriate Personal Protection Equipment (PPE) will be used by all construction workers.
  - COSHH materials will be labelled clearly, transported with care by competent and trained persons, and stored in dedicated areas in appropriately bunded containers. Any liquid accumulating within the bunds, or secondary containment systems, will be disposed of at a suitably authorised facility.
  - Maintenance checks and procedures will be completed to reduce the potential for leaks and spills from plant and substance storage.
  - Pollution management measures will be implemented to prevent contamination by machinery pollutants, such as fuels, oils and lubricants during construction and operational (i.e. works phase) activities. These measures will be informed by guidance provided in relevant documents, such as the CIRIA guides to environmental good practice on site.
  - Other information on good practice to reduce the potential for environmental pollution that will be considered in the development of management plans includes the following documents developed by the Environment Agency (England and Wales), the Scottish Environment Protection Agency and the Northern Ireland Environment Agency:
    - GPP 1 Understanding your environmental responsibilities - good environmental practices;
    - GPP 2 Above ground oil storage tanks;
    - GPP 3 Use and design of oil separators in surface water drainage systems;

- GPP 5 Works and maintenance in or near water;
- PPG 6 Working at construction and demolition sites;
- GPP 8 Safe storage and disposal of used oils;
- GPP 13 Vehicle washing and cleaning;
- GPP 21 Pollution incident response planning;
- GPP 22 Dealing with spills; and
- GPP 26 Safe storage - drums and intermediate bulk containers.

- The groundwater well for abstraction will be installed by a suitably experience contractor and in line with EPA Well Guidelines. The well will be maintained through the works phase and decommissioned at the closure of soil recovery facility. The quality of water in the well will be analysed and monitored in line with EPA guidelines. It is not anticipated that the facility will have significant water requirements. However, abstraction will be registered with the EPA should 25 cubic meters (25,000 litres) of water or more per day be abstracted (as required by European Union (Water Policy) (Abstractions Registration) Regulations 2018 (S.I. No. 261 of 2018)).

8.7 POTENTIAL EFFECTS

The potential sources of impact that are considered in the assessment of effects on the water environment relate to the following:

- The proposed abstraction of groundwater for welfare and wheel wash water supply;
- The changes in drainage at the Proposed Development that will capture run-off from areas of hard-standing.

Potential impacts considered in the Land, Geology and Soils Chapter (Chapter 7.0) that could have secondary (i.e. knock-on) impacts to water quality and that are considered in this assessment are:

- Soil erosion resulting from soil stripping and stockpiling during the construction activities within the works phase, from plant movement during the works phase, and from the land raising activities during operational activities in the works phase, that could lead to the generation of suspended solids in watercourses that receive drainage from the Proposed Development;
- Importation of material during construction that could be unsuitable for the intended after-use that could lead to leaching of contamination to the land and then into groundwater and surface water downgradient of the Proposed Development;
- Activities or events during works phase that might impact land quality (e.g. leaks and spills from machinery or stored material and substances, or discharges) that could have a feasible pathway to groundwater and surface watercourses that are downgradient of the Proposed development; and
- Mobilisation of existing contamination by construction works (should there be historical contamination at the Proposed Development) that could have a feasible pathway to groundwater and surface watercourses that are downgradient of the Proposed development.

8.7.1 WORKS PHASE - ENABLING WORKS IMPACTS

This section includes the consideration of potential sources of impact that could take place only within construction activities associated with enabling works during the works phase, or originate in the enabling works, but may also be present during the operation of the soils recovery facility (referred to as 'operational activities'). Where a source of impact may also be present during operational activities of the facility, this is stated at the start of the assessment of operational impacts and shown in the evaluation of initial impacts and effects that is presented in Table 8-14.

Water supply is required for the wheel wash and welfare facility (non-drinking water). It is intended that this comes from a new groundwater abstraction that would need to be installed and initiated during the works phase (as part of the enabling works). Large abstractions, or many small abstractions, if not managed correctly, can adversely impact the water environment and mean that it can no longer support abstraction demands from the human population or the needs of the wider water environment. There is currently no abstraction licensing system in Ireland. Under the European Union (Water Policy) (Abstractions Registration) Regulations 2018, abstractions of more than 25 m^3/day need to be registered with the EPA. This volume was set based on a technical assessment of the level of risk posed to water resources. The EPA considers that abstraction volumes below 25 m^3/day are unlikely to have a significant negative impact on the water environment. Therefore, abstractions below 25 m^3/day do not require consideration when assessing the cumulative impact of abstractions on rivers, lakes and groundwater levels (EPA, 2023). The EPA indicates that a housing development of 42 households would require this sort of volume of water each day (EPA, 2023). The volume of water required for the Proposed Development has not been confirmed, but it is assumed that the Proposed Development will require notably less given that the wheel wash water will be recycled. Therefore, the proposed abstraction is unlikely to need to be registered with the EPA. Based on the EPA's approach to small abstractions, it is predicted that the proposed groundwater abstraction is likely to have no more than a 'low (adverse)' localised potential impact on the water environment (i.e. groundwater availability or baseflow to nearby surface watercourses) and on secondary local water uses.

Changes to recharge/drainage regimes at the Proposed Development during the works phase (as part of the enabling works) will include the capture and management of run-off from new areas of hard-standing that are put in place in the early stages of site development. The surface water run-off from the access road, car parking, and hard paved areas will be collected in the site drainage system and directed via a silt trap and oil interceptor to a soak pit to be constructed on site for discharge to groundwater. The water that is discharged will remain in the same water catchment as it would have if it had been recharged to groundwater pre-development. The potential impact to the availability of groundwater and secondary local water supply users are predicted to be 'negligible (adverse)'.

Soil stripping and stockpile development during site preparation could generate loose material that gets transported by run-off and leads to increased suspended solids in the neighbouring surface watercourses. Plant movement over soils could also present a source of increased suspended solids. The EMS will include pollution prevention measures to limit suspended solid generations. The stockpile management protocols will be put in place to limit erosion and suspended solid generation. Plant movement will be focused on areas of hardstanding or confirmed to other designated working areas only. The proposed drainage systems for areas of hard-standing and to intercept run-off from the Proposed Development area that will be put in place at the works phase

(as part of the enabling works) will include features to reduce the suspended solids that could enter the water environment. The potential impact to the surface water quality is predicted to be 'negligible (adverse)'.

Although not currently intended, if material is imported as part of the construction process, leaching from the import and use of contaminated materials has the potential to impact existing land quality and, in turn, impact water quality (i.e. groundwater or surface water via groundwater or run-off). The embedded mitigation associated with assessment of the suitability and quality of any imported materials means the potential impacts on water quality and the quality of local water supplies are predicted to be 'negligible (adverse)'.

Fuel and other substance leaked or spilled from stored substances or from machinery/equipment could affect the chemistry of the soil and general land quality, and in turn, through leaching and groundwater flow, water quality (i.e. groundwater or surface water via groundwater or run-off). There will be no underground tanks, no septic tanks, no concrete batching, fuel will be stored in double skinned tanks in bunded areas, small quantities of potential polluting substances will be stored on bunded pallets, refuelling will take place in dedicated areas and drip trays will be used, spill kits and spill training will be provided, waste from the welfare facility will be disposed of off-site, other waste will be disposed of by a competent contractor, the EMS and maintenance and management procedures will be followed. The potential impacts on water environment quality (all surface water and groundwater receptors) and the quality of local water supplies are predicted to be 'negligible (adverse)'.

Wheel washing will be used to reduce the deposition of material on surrounding roads. The water will be reused within the wheel washes. The sludge that collects in the wheel washes has the potential to become contaminated with material washed off the vehicles. If this was to be discharged or leak to ground and in turn be transported into groundwater and with groundwater to surface water, or be discharged directly to the water environment, this could affect the chemistry of the water environment. Without management, localised water quality changes could occur. The potential impacts on the water environment quality (all surface water and groundwater receptors) and the quality of local water supplies are predicted to be 'low (adverse)'.

Current and historical land use is agricultural. There is no evidence to suggest the current contamination of the land or water environment other than potential transient diffuse water pollution from sheep grazing. There are no planned deep excavations and only the top thin layer of soils will be stripped during construction and stored. The potential for construction works to encounter and mobilise existing contamination is considered to be limited. Work will be undertaken to assess previously unidentified contamination if it is encountered during construction. Therefore, the potential impacts on land quality, and in turn the quality of the water environmental and local water supplies, are predicted to be 'negligible (adverse)'.

8.7.2 WORKS PHASE – SOIL RECOVERY FACILITY OPERATIONAL IMPACTS

Many of the same source of impact identified in the enabling works activities also apply to the operational activities and have not been reconsidered here (e.g. abstraction; welfare waste; wheel washes; storage, transport and use of fuels and other potentially polluting substances – i.e. leaks and spills).

Changes to drainage regimes at the Proposed Development during soil recovery facility operational activities of the works phase will include the capture and management of run-off from the working

areas of filling. Cut-off drains in the Proposed Development area will intercept rainfall run-off, which will pass through a settlement lagoon prior to discharge to the local drainage network (i.e. the Kilmartin and/or Coynes Cross streams). Water that is intercepted before entry to the working area will also be directed to the local drainage network. There may be a slight reduction in recharge to groundwater when water is directed to surface drainage, but recharge may currently be low/slow as indicated by water logging and the clayey nature of the subsoils. The water that is discharged will remain in same catchment as it would have if it had been pre-development recharge to groundwater from rainfall or run-off to surface water. The potential impact to water availability in the water environment and secondary local water supply users is predicted to be 'negligible (adverse)'.

There is potential for increases in suspended solids in run-off and their discharge into surface watercourses during operational activities where the areas of filling will have sloped faces and plant are moving around in the working areas. The slope faces will be designed to limit erosion and suspended solid generation. Cut-off drains in the Proposed Development area will intercept rainfall run-off, which will pass through a settlement lagoon located at the low point of each drain. The water will then discharge to the local drainage network (i.e. the Kilmartin and/or Coynes Cross streams). It is also proposed to install cut-off drains or swales along the eastern and western boundaries, which will intercept surface water drainage coming into the site from areas outside the site and divert it to the streams directly without entering the working areas. Finished areas of the restoration project will be capped with topsoil and grassed at the earliest opportunity. This combined embedded mitigation will reduce the potential for generating increased suspended solids. The potential impact to the surface water quality is predicted to be 'negligible (adverse)'.

Import of contaminated material for filling could impact land quality, and in turn, due to leaching and groundwater flow, impact water quality. Infill materials will be inert and should not cause pollution of the groundwater or surface water environments if acceptance protocols adhered to. Material acceptance for the imported material will be as per the licence[3]. No contaminated soils will be accepted at the facility. There will be load inspection and quarantine/removal (if required). The Operational Management Plan that details material inspection protocols will be followed. Therefore, the potential impacts on water quality and secondary local water supply users are predicted to be 'negligible (adverse)'.

At the end of the operation of the soil recovery facility, the soils stripped during the construction activities will be replaced. The Proposed Development is currently occupied by agricultural land. There is not intended to be any change in land use. Therefore, there are no predicted changes in the potential for that land use to pollute the water environment. The potential impacts on water quality and secondary local water supply users are predicted to be 'negligible (adverse)'.

8.7.3 EVALUATION OF EFFECT SIGNIFICANCE

The evaluation of effects takes into account the predicted impact magnitude combined with receptor sensitivity. The evaluation of effect significance from each of the initial impacts (taking account of embedded mitigation) discussed above is presented in Table 8-14.

[3] Or in accordance with by-product regulations, Article 27 of the European Communities (Waste Directive) Regulations 2011, where relevant. See Section 3.5 in Chapter 3.0: Project Description of this EIAR for further detail.

Table 8-14 - Evaluation of Initial Impacts and their Effect Significance

Project Phase (Activities)	Receptor	Sensitivity	Source of Potential Impact/Description of Change*	Impact Magnitude*	Level of Effect *
Works Phase (Enabling Works Construction Activities Only)	Groundwater (quality)	Low	Import of potentially contaminated construction materials leading to change in groundwater quality	Negligible (adverse)	Imperceptible
			Disturbance and mobilisation of existing ground contamination leading to change in groundwater quality	Negligible (adverse)	Imperceptible
	Surface water (quality)	High	Increased suspended solid generation due to soil stripping, stockpiling and plant movement.	Negligible (adverse)	Slight
			Import of potentially contaminated construction materials leading to change in groundwater quality that may support surface water	Negligible (adverse)	Slight
			Disturbance and mobilisation of existing ground contamination leading to change in groundwater quality that may support surface water	Negligible (adverse)	Slight
	Local water supply users	High	Import of potentially contaminated construction materials leading to change in groundwater quality	Negligible (adverse)	Slight
			Disturbance and mobilisation of existing ground contamination leading to change in groundwater quality	Negligible (adverse)	Slight
Works Phase (Construction)	Groundwater (quantity)	Low	Proposed new groundwater abstraction reducing groundwater availability in aquifer	Low (adverse)	Slight
			Change in drainage regime (increased hard-standing) that could reduce recharge to groundwater	Negligible (adverse)	Imperceptible

Project Phase (Activities)	Receptor	Sensitivity	Source of Potential Impact/Description of Change*	Impact Magnitude*	Level of Effect *
	Groundwater (quality)	Low	Potential change in groundwater quality due to substance leaks and spills (various sources – see text)	Negligible (adverse)	Imperceptible
			Discharge of wheel washing water/sludge leading to change in groundwater quality	Low (adverse)	Slight
	Surface water (flows)	High	Proposed new groundwater abstraction reducing baseflow.	Low (adverse)	Slight (small volume abstraction anticipated)
	Surface water (quality)	High	Potential change in water quality due to substance leaks and spills (various sources – see text)	Negligible (adverse)	Slight
			Discharge of wheel washing water/sludge leading to change in water quality	Low (adverse)	Moderate (conservative – discharge type and location, if any, unknown)
	Local water supply users	High	Proposed new groundwater abstraction potentially drawing groundwater from the same aquifer as existing local supplies.	Low (adverse)	Slight (small volume abstraction anticipated)
			Change in drainage regime (increased hard-standing) that could reduce recharge to groundwater and water supply availability.	Negligible (adverse)	Slight
			Substance leaks and spills (various sources – see text)	Negligible (adverse)	Slight
			Discharge of wheel washing water/sludge leading to change in groundwater quality	Low (adverse)	Moderate (conservative – discharge type and location, if any, unknown)
	Groundwater (quantity)	Low	Change in drainage regime (intercepted water directed to surface water) that could reduce recharge to groundwater.	Negligible (adverse)	Imperceptible
	Groundwater (quality)	Low	Import of potentially contaminated fill materials leading to change in groundwater quality	Negligible (adverse)	Imperceptible

Project Phase (Activities)	Receptor	Sensitivity	Source of Potential Impact/Description of Change*	Impact Magnitude*	Level of Effect *
Works Phase (Operation Only[4])			Potential change in water quality due to change in land use	Negligible (adverse)	Imperceptible
	Surface water (flows)	High	Change in drainage regime (intercepted water directed to surface water) that could alter the relationship between groundwater fed baseflow and input from run-off.	Negligible (adverse)	Slight
	Surface water (quality)	High	Increased suspended solid generation due to fill material emplacement.	Negligible (adverse)	Slight
			Import of potentially contaminated fill materials leading to change in groundwater quality that may support surface water.	Negligible (adverse)	Slight
			Potential change in water quality due to change in land use	Negligible (adverse)	Slight
	Local water supply users	High	Change in drainage regime (intercepted water directed to surface water) that could reduce recharge to groundwater and water supply availability.	Negligible (adverse)	Slight
			Import of potentially contaminated fill materials leading to change in groundwater quality.	Negligible (adverse)	Slight
			Potential change in water quality due to change in land use	Negligible (adverse)	Slight
* Taking account of embedded mitigation					

[4] Includes construction activities required for the emplacement of fill during the operation of the soil recovery facility

8.7.4 'DO-NOTHING' SCENARIO

In the event that the Proposed Development does not progress (i.e. the Site remains unchanged), it is assumed that the land use will not change and there are unlikely to be new impacts on the water environment.

8.8 MITIGATION AND MONITORING

8.8.1 MITIGATION

Additional mitigation and/or management is intended to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment. The initial assessment of potential effects (taking into account embedded mitigation) has not identified any significant adverse effects (i.e. those that have been evaluated as 'large' or 'profound'). However, to further mitigate the initial effects associated with water quality the following additional mitigation will take place:

- Any sludge collected from wheel washes will be tested and either used as part of the soils recovery process (if the quality is acceptable) or disposed of to an appropriate licensed waste disposal facility.

Taking account of this additional mitigation, the potential impact to water quality and secondary water users is predicted to be reduced to 'negligible (adverse)'.

8.8.2 MONITORING

Potential failure of operational processes and drainage systems that are proposed to manage and limit the generation of loose material and associated generation of suspended solids are considered to be the most likely risk to the surface water environment.

Pre-construction works, it is recommended that at least a further two rounds of surface water quality monitoring is completed at the upstream and downstream Coynes Cross and Kilmartin stream monitoring locations to help establish baseline conditions.

During works phase, a protocol of weekly visual inspection that compares the appearance of surface water upstream and downstream of site discharge points will be implemented to allow identification of discharges that could be increasing suspended solid content.

Ongoing sampling and analysis of surface water at the same locations will be undertaken during works phase. Monitoring will include suspended solids, as well as general quality parameters pH, temperature, electrical conductivity, total dissolved solids, ammonia, chloride and biological oxygen demand. This will be undertaken quarterly (or if the weekly visual inspection of the surface watercourses indicates a potential emission from the proposed activities). The monitoring data will be compared to the baseline to show where management of the Proposed Development has been effective or pick up early indications of concerns and help identify actions (in agreement with the regulator) to reduce the impacts to surface water.

Monitoring of the water environment, the associated reporting requirements, and an action plan (should a release be identified), will be detailed within the licence/permit documentation.

For the groundwater well to be installed for abstraction, it is recommended that:

- Abstracted volumes from the groundwater well (m^3/day) are recorded.
- Regular visual impaction of abstracted groundwater is carried out.

- Sampling and testing of the well (including recording groundwater levels) will be undertaken on a biannual (ie. twice yearly) basis.
- Groundwater samples will be tested for a range of physical and chemical parameters in order to assess water quality and detect possible contamination arising from proposed recovery activities.

Monitoring will be carried as per the requirements of any waste licence issued by the EPA.

8.9 RESIDUAL EFFECTS

A summary of the sources of impact, predicted magnitudes of residual impact (accounting for embedded mitigation and additional mitigation) and subsequent residual effect significance is presented in Table 8-15. In all cases the residual effect is not greater than slight and therefore **Not Significant**.

Table 8-15 - Evaluation of Predicted Residual Impacts and their Effect Significance

Project Phase (activities)	Receptor (importance)	Potential Source of Impact	Direct or Indirect	Duration*	Reversible or Irreversible	Summary of Combined Mitigation (embedded and additional)	Residual Magnitude of Impact (direction)	Residual Effect Significance
Works Phase (Construction Only)	Groundwater quality (low)	Import of potentially contaminated construction materials	Indirect	Permanent	Reversible	Material acceptance procedures.	Negligible (adverse)	Imperceptible (not significant)
		Disturbance and mobilisation of existing ground contamination	Indirect	Permanent	Reversible	Procedure for dealing with previously unidentified contamination during construction.	Negligible (adverse)	Imperceptible (not significant)
	Surface water quality (high)	Increased suspended solid generation	Direct	Short term	Reversible	EMS will include pollution prevention measures to limit suspended solid generation. Follow stockpile management protocols. Designated plant movement areas. Hard-standing drainage systems include silt trap. Visual inspection and monitoring of watercourses that neighbour site – data analysis and instigation of action plan if required.	Negligible (adverse)	Slight (not significant)
		Import of potentially contaminated construction materials	Indirect	Permanent	Reversible	Material acceptance procedures.	Negligible (adverse)	Slight (not significant)

Project Phase (activities)	Receptor (importance)	Potential Source of Impact	Direct or Indirect	Duration*	Reversible or Irreversible	Summary of Combined Mitigation (embedded and additional)	Residual Magnitude of Impact (direction)	Residual Effect Significance
		Disturbance and mobilisation of existing ground contamination	Indirect	Permanent	Reversible	Procedure for dealing with previously unidentified contamination during construction.	Negligible (adverse)	Slight (not significant)
	Local water supply users (high)	Import of potentially contaminated construction materials	Indirect	Permanent	Reversible	Material acceptance procedures.	Negligible (adverse)	Slight (not significant)
		Disturbance and mobilisation of existing ground contamination	Indirect	Permanent	Reversible	Procedure for dealing with previously unidentified contamination during construction.	Negligible (adverse)	Slight (not significant)
Works Phase (Enabling Works and Soil Recovery Facility Operation)	Groundwater quantity (low)	Proposed new groundwater abstraction	Direct	Short term	Reversible	None - anticipated low volume that does not required EPA registration or local authority authorisation.	Low (adverse)	Slight
		Change in drainage regime (increased hard-standing)	Direct	Permanent (no current plans to remove changes)	Reversible	Drainage designed to intercept potentially contaminated water and pass it through interceptors and silt traps before discharge back to groundwater.	Negligible (adverse)	Imperceptible
	Groundwater quality (low)	Substance leaks and spills (various	Indirect	Permanent	Reversible	No underground tanks (fuel or septic). No concrete batching. Appropriate substance storage. Refuelling protocols. Spill	Negligible (adverse)	Imperceptible

Project Phase (activities)	Receptor (importance)	Potential Source of Impact	Direct or Indirect	Duration*	Reversible or Irreversible	Summary of Combined Mitigation (embedded and additional)	Residual Magnitude of Impact (direction)	Residual Effect Significance
		sources – see text)				procedures and traning. Waste management. Good practice pollution prevention measures. Waste management procedures. Follow procedures in the EMS. See main text for detail.		
		Discharge of wheel washing water/sludge	Direct (or indirect if discharge to land)	Permanent	Reversible	Water will be recycled within the system. Sludge tested before disposal as part of the soils recovery process or to an appropriate licensed waste disposal facility. No used water or settled solids will be disposed of to land or water without prior consent of the EPA. Final design will be agreed with local authority.	Low (adverse)	Imperceptible
	Surface water flows (high)	Proposed new groundwater abstraction	Indirect	Short term	Reversible	None - anticipated low volume that does not required EPA registration or local authority authorisation.	Low (adverse)	Slight (small volume abstraction anticipated)
	Surface water quality (high)	Substance leaks and spills (various sources – see text)	Indirect	Permanent	Reversible	No underground tanks (fuel or septic). No concrete batching. Appropriate substance storage. Refuelling protocols. Spill procedures and traning. Waste management. Good practice pollution prevention measures. Waste management procedures. Follow procedures in the EMS. See main text for detail.	Negligible (adverse)	Slight

Project Phase (activities)	Receptor (importance)	Potential Source of Impact	Direct or Indirect	Duration*	Reversible or Irreversible	Summary of Combined Mitigation (embedded and additional)	Residual Magnitude of Impact (direction)	Residual Effect Significance
		Discharge of wheel washing water/sludge	Direct (or indirect if discharge to land)	Permanent	Reversible	Water will be recycled within the system. Sludge tested before disposal as part of the soils recovery process or to an appropriate licensed waste disposal facility. No used water or settled solids will be disposed of to land or water without prior consent of the EPA. Final design will be agreed with local authority.	Low (adverse)	Slight
	Local water supply users (high)	Proposed new groundwater abstraction	Indirect	Short term	Reversible	None - anticipated low volume that does not required EPA registration or local authority authorisation.	Low (adverse)	Slight (small volume abstraction anticipated)
		Change in drainage regime (increased hard-standing)	Indirect	Permanent (no current plans to remove changes)	Reversible	Drainage designed to intercept potentially contaminated water and pass it through interceptors and silt traps before discharge back to groundwater.	Negligible (adverse)	Slight
		Substance leaks and spills (various sources – see text)	Indirect	Permanent	Reversible	No underground tanks (fuel or septic). No concrete batching. Appropriate substance storage. Refuelling protocols. Spill procedures and traning. Waste management. Good practice pollution prevention measures. Waste management procedures. Follow procedures in the EMS. See main text for detail.	Negligible (adverse)	Slight

Project Phase (activities)	Receptor (importance)	Potential Source of Impact	Direct or Indirect	Duration*	Reversible or Irreversible	Summary of Combined Mitigation (embedded and additional)	Residual Magnitude of Impact (direction)	Residual Effect Significance
		Discharge of wheel washing water/sludge	Indirect	Permanent	Reversible	Water will be recycled within the system. Sludge tested before disposal as part of the soils recovery process or to an appropriate licensed waste disposal facility. No used water or settled solids will be disposed of to land or water without prior consent of the EPA. Final design will be agreed with local authority.	Low (adverse)	Slight
Works Phase (Soil Recovery Facility Operation Only)	Groundwater quantity (low)	Change in drainage regime (intercepted water directed to surface water	Direct	Permanent (no current plans to remove changes)	Reversible	Cut-off drains will intercept rainfall run-off from filling areas. Water will pass through settlement lagoon prior to discharge to local surface water network. Receiving watercourses same as pre-development.	Negligible (adverse)	Imperceptible
	Groundwater quality (low)	Import of potentially contaminated fill materials	Indirect	Permanent	Reversible	Inert material only. Material acceptance and quarantine procedures.	Negligible (adverse)	Imperceptible
		Change in land use	Indirect	Permanent	Reversible	Returned to grassed farmland (original use) after filling.	Negligible (adverse)	Imperceptible
	Surface water flows (high)	Change in drainage regime (intercepted water directed	Direct	Permanent (no current plans to remove changes)	Reversible	Discharge of intercepted water to same catchment.	Negligible (adverse)	Slight

Project Phase (activities)	Receptor (importance)	Potential Source of Impact	Direct or Indirect	Duration*	Reversible or Irreversible	Summary of Combined Mitigation (embedded and additional)	Residual Magnitude of Impact (direction)	Residual Effect Significance
		to surface water)						
	Surface water quality (high)	Increased suspended solid generation	Direct	Short term	Reversible	Operational management plan will include pollution prevention measures to limit suspended solid generation. Follow stockpile and working face management protocols. Designated plant movement areas. Limit surface water run-off coming onto the working site. Hard-standing drainage systems include silt trap. Cut-off drains pass through settlement lagoon before discharge. Visual inspection and monitoring of watercourses that neighbour site – data analysis and instigation of action plan if required.	Negligible (adverse)	Slight
		Import of potentially contaminated fill materials	Indirect	Permanent	Reversible	Inert material only. Material acceptance and quarantine procedures.	Negligible (adverse)	Slight
		Change in land use	Indirect	Permanent	Reversible	Returned to grassed farmland (original use) after filling.	Negligible (adverse)	Slight
	Local water supply users (high)	Change in drainage regime (intercepted water directed	Indirect	Permanent (no current plans to	Reversible	Cut-off drains will intercept rainfall run-off from filling areas. Water will pass through settlement lagoon prior to discharge to local surface water network. Receiving	Negligible (adverse)	Slight

Project Phase (activities)	Receptor (importance)	Potential Source of Impact	Direct or Indirect	Duration*	Reversible or Irreversible	Summary of Combined Mitigation (embedded and additional)	Residual Magnitude of Impact (direction)	Residual Effect Significance
		to surface water)		remove changes)		watercourses same as pre-development.		
		Import of potentially contaminated fill materials	Indirect	Permanent	Reversible	Inert material only. Material acceptance and quarantine procedures.	Negligible (adverse)	Slight
		Change in land use	Indirect	Permanent	Reversible	Returned to grassed farmland (original use) after filling.	Negligible (adverse)	Slight

8.10 CUMULATIVE EFFECTS

Effects that have been identified within the technical assessment for the works phase of the Proposed Development are mitigated by design or good practice. Appropriate design or good practice reduces the impact magnitude to 'very low' or 'negligible' and the effects are considered to be **Not Significant**.

There are unlikely to be additional combined / interaction effects on the water environment from impacts linkages (i.e. via other pathways) considered in other topics as a result of the Proposed Development alone.

The cumulative effects associated with other permitted / under construction third-party developments have been considered in Chapter 15 of this EIAR.

8.11 DIFFICULTIES ENCOUNTERED

No difficulties were encountered in undertaking the assessment of impacts and effects on the water environment. All developments have the potential for encountering previously unidentified contamination, but this has been addressed in the embedded mitigation.

8.12 REFERENCES

Environmental Protection Agency (EPA), 2020: High-resolution Climate Projections for Ireland – A Multi-model Ensemble Approach, September 2020.

Environmental Protection Agency (EPA), 2022a: Environmental Protection Agency Guidelines on the information to be contained in Environmental Impact Assessment Reports, August 2022

Environmental Protection Agency (EPA), 2022b: Online Mapping - https://gis.epa.ie/EPAMaps/ accessed 25 April 2023

Environmental Protection Agency (EPA), 2022c: Online Water Mapping - https://gis.epa.ie/EPAMaps/Water accessed 25 April 2023

Environmental Protection Agency (EPA), 2023: Water Abstraction. https://www.epa.ie/our-services/licensing/freshwater--marine/water-abstraction, accessed 25 April 2023.

Geological Survey Ireland (GSI), 2022a: Geological Survey Ireland https://www.gsi.ie/en-ie/data-and-maps/Pages/Groundwater.aspx, accessed 25 April 2023.

Geological Surveys of Ireland (GSI), 2022b: Spatial Resources Online Mapping - https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 accessed 25 April 2023

Geological Survey Ireland (GSI), undated: Wicklow GWB: Summary of Initial Characterisation.

IE Consulting, 2017: Baseline Groundwater and Surface Water Concentrations, Coynes Cross Ltd, Kilmartin, Coynes Cross Co. Wicklow. Report IE1236-1893, issue 1, revision 2.0, dated 16 January 2017.

Irish Meteorological Service, 2022: New Climate Projections - https://www.met.ie/epa-climate-projections-2020, accessed 25 April 2023.

Office of Public Works, 2022: Online Flood mapping. https://www.floodinfo.ie/map/floodmaps/. Accessed 25 April 2023.

White Young Green (Ireland) Ltd, 2008: Kilmartin Land Restoration Project Environmental Statement. Report reference CE04561, dated March 2008.