7 HYDROLOGY

7.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) provides a description of the hydrology and hydrogeology (water) environment within and immediately surrounding the site of the Proposed Development and an assessment of the potential impacts of the Proposed Development on hydrology and hydrogeology and sets out any required mitigation measures where appropriate.

The principal objectives of this chapter are to identify:

- Hydrological and hydrogeological characteristics of the receiving environment at the site of the Proposed Development.
- Potential impacts that the Proposed Development may have on the receiving water environment.
- Potential constraints that the environmental attributes may place on the Proposed Development.
- Required mitigation measures which may be necessary to minimise any adverse impacts related to the Proposed Development.
- Evaluate the significance of any residual impacts.

7.1.1 Quality Assurance and Competency of Experts

This Chapter of the EIAR has been prepared by Gareth Carroll BA, BAI, MIEnvSc, a Principal Consultant of Enviroguide with over 11 years' experience of environmental assessment of brownfield and greenfield sites.

This Chapter was reviewed by Patrick Higgins BSc, MSc, MIEnvSc, CEnv who is Technical Director of the Contaminated Land and Hydrogeology Division of Enviroguide and has over 18 years' experience in preparing environmental assessments for a range of project types and geological and hydrogeological site settings.

7.2 Study Methodology

7.2.1 Relevant Legislation and Guidance

The methodology adopted for the assessment has regard to the relevant guidelines and legislation including:

- Council Directive 2006/118/EEC, 2006. On the protection of groundwater against pollution and deterioration. European Parliament and the Council of European Communities.
- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy with amendments 2455/2001/EC, 2008/32/EC and 2008/105/EC (Water Framework Directive (WFD)).
- European Commission, 2022. WFD Reporting Guidance 2022. Final Draft V4.

- Local Government, October 2021. No. 1.1977. Local Government (Water Pollution (Amendment) Act.
- Local Government, October 2007. No. 30.2007. Water Services Act 2007.
- Local Government, July 1990. No. 21.1990. Local Government (Water Pollution) (Amendment) Act, 1990.
- Local Government, March 1977. No. 01/1977. Local Government (Water Pollution) Act, 1977 with amendments.
- S.I. No. 722/2003 – European Communities (Water Policy) with amendment S.I. No. 413/2005.
- S.I. No. 489/2011 – European communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011.
- S.I. No. 122/2010 – European Communities (Assessment and Management of flood Risks) Regulations 2010 including amendment S.I. No. 495/2015.
- S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009 including amendments S.I. No. 327/2012, S.I. No. 386/2015 and S.I. No. 77/2019.
- S.I. No. 9 of 2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010 including amendments S.I. No. 149 of 2012 and S.I. No. 366 of 201.
- WFD Working Group, 2005. Guidance on the Assessment of the Impact of Groundwater Abstractions (WFD, 2005).

Other guidance used in the assessment of potential impacts on the receiving water environment are referenced where relevant in this EIAR Chapter and include:

- Construction Industry Research and Information Association, 2001. Control of Water Pollution from Construction Sites (CIRIA – C532).
- Construction Industry Research and Information Association, 2015. Environmental Good Practice on Site Guide (CIRIA – C741).
- Construction Industry Research and Information Association, 2016. Groundwater Control: Design and Practice (CIRIA – C750).
- Dún Laoghaire Rathdown County, 2022. Dún Laoghaire-Rathdown County Development Plan 2022-2028.
- Department of the Environment, Heritage and Local Government, Environmental Protection Agency and Geological Survey of Ireland, 1999. Groundwater Protection Schemes (DEHLG/EPA/GSI, 1999).
- Department of the Environment, Heritage and Local Government, 2009. Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DEHLG, 2009).
- Department of Housing, Planning and Local Government, August 2018. Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DHPLG, 2018).
- Environmental Protection Agency, 2014. Guidance on the Authorisation of Direct Discharges to Groundwater.
- Environmental Protection Agency, 2013. Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites.
- Environmental Protection Agency, 2013. Storage and Transfer of Materials for Scheduled Activities.

- Environmental Protection Agency, May 2022. Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022).

7.2.2 Phased Approach

A phased approach was adopted for this EIAR in accordance with Environmental Protection Agency (EPA) and Institute of Geologists of Ireland (IGI) guidelines as set out above and is described in the following sections.

Element 1: An initial assessment and impact determination stage was carried out by Enviroguide to establish the project location, type and scale of the Proposed Development, the baseline conditions, and the type of hydrological and hydrogeological environment, to establish the activities associated with the Proposed Development and to undertake an initial assessment and impact determination. This element of the assessment also included developing the Conceptual Site Model (CSM) for the site and receiving environment.

This stage of the assessment included a desk top study that comprised a review of published environmental information for the site. The study area, for the purposes of assessing the baseline conditions for the Hydrology and Hydrogeology Chapter of the EIAR, extends beyond the site boundaries and includes a 2.0km radius of the Proposed Development and potential receptors outside of this radius that are potentially hydraulically connected with the site were also considered. The extent of the wider study area was based on the Institute of Geologists of Ireland (IGI) Guidelines (IGI, 2013) that recommends a minimum distance of 2.0km radius from the site. The purpose of this increased search radius was to ensure that any potential hydrogeological / hydrological connections to sensitive receptors including habitats were identified.

The desk study involved collecting all the relevant data for the site and surrounding area including published information and details pertaining to the Proposed Development provided by the Applicant and design team.

A site walkover survey to establish the environmental site setting and baseline conditions at the site relevant to the hydrological and hydrogeological environment was undertaken by Enviroguide on the 3rd of July 2024.

The Element 1 stage of the assessment was completed by Enviroguide and included the review of the following sources of information:

- Environmental Protection Agency (EPA) web mapping (EPA, 2024).
- Geological Survey Ireland (GSI) Datasets Public Viewer and Groundwater web mapping (EPA, 2024).
- National Parks and Wildlife Services (NPWS) web mapping (NPWS, 2024).
- Ordnance Survey Ireland (OSI) web mapping (OSI, 2024).
- Water Framework Directive Ireland (WFD) web mapping (WFD, 2024).
- Teagasc web mapping (Teagasc, 2024).
- Office of Public Works (OPW) database on historic flooding and the Catchment Flood Risk Assessment and Management (CFRAM) maps (OPW, 2024).
- Information provided by the Applicant pertaining to the design proposals for the Proposed Development.

Element 2: Involves direct and indirect site investigation and studies stage where necessary to refine the CSM developed as part of Element 1 and evaluate the potential impacts associated with the Proposed Development. Site investigations (Site Investigations Ltd. (SIL), 2006, Ground Investigations Ireland (GII), 2010, GII, 2017 and GII, 2024 included in the Roger Mullarkey & Associates, 2024a Drainage Infrastructure Report submitted with the planning application) included trial pitting, borehole drilling and infiltration tests. The results of the site investigations were used to identify and assess the hydrogeological subsurface features at the site.

Element 3: Evaluation of mitigation measures, residual impacts and final impact assessment were based on the outcome of the information gathered in Element 1 and Element 2 of the assessment. Mitigation measures to address all identified adverse impacts that were identified in Element 1 and Element 2 of the assessment were considered in relation to the construction phase and operational phase of the Proposed Development. These mitigation measures were then considered in the impact assessment to identify any residual impacts.

Element 4: Completion of the Hydrology and Hydrogeology sections of the EIAR in this Chapter which includes all the associated figures and documents.

7.2.3 Description of Importance of the Receiving Environment

The National Roads Authority (NRA) criteria for estimation of the importance of hydrogeological features at the site of the Proposed Development during the Environmental Impact Assessment (EIA) stage, as documented by IGI (IGI, 2013) are summarised in Table 7-1.

Table 7-1. Criteria for Rating Site Importance of Hydrogeological Features

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

Importance	Criteria	Typical Example
Low	Attribute has a low quality or value on a local scale.	Poor Bedrock Aquifer. Potable water source supplying <50 homes.

7.2.4 Description and Assessment of Potential Impacts

Impacts will vary in quality from negative, to neutral or positive. The effects of impacts will vary in significance on the receiving environment. Effects will also vary in duration. The terminology and methodology used for assessing the 'impact' significance and the corresponding 'effect' throughout this Chapter are described in Table 7-2.

Table 7-2. Criteria for Assessment of Potential Impacts Terminology and Methodology

Quality of Effects/Impacts	Definition
Negative	A change which reduces the quality of the environment
Neutral	No effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error.
Positive	A change that improves the quality of the environment
Significance of Effects / Impacts	**Definition**
Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant Effects	An effect which, by its character, magnitude, duration, or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration, or intensity significantly alters a sensitive aspect of the environment.
Profound Effects	An effect which obliterates sensitive characteristics.
Extend and Context of Effects	**Definition**
Extend	Describe the size of the area, the number of sites and the proportion of a population affected by an effect.
Context	Describe weather the extent, duration or frequency will conform or contrast with established (baseline) conditions
Probability of Effects	**Definition**
Likely Effects	The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
Unlikely	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Duration of Effects / Impacts	**Definition**
Momentary	Effects lasting from seconds to minutes
Brief	Effects lasting less than a day
Temporary	Effects lasting one year or less

Short-term	Effects lasting one to seven years
Medium-term	Effects lasting seven to fifteen years
Long-term	Effects lasting fifteen to sixty years
Permanent	Effects lasting over sixty years
Reversible	Effects that can be undone, for example through remediation or restoration
Types of Effects	**Definition**
Indirect Effects	Effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway
Cumulative Effects	he addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects.
“Do-nothing” Effects	The environment as it would be in the future should the subject project not be carried out
“Worst-case” Effects	he effects arising from a project in the case where mitigation measures substantially fail.
Indeterminable Effects	When the full consequences of a change in the environment cannot be described.
Irreversible Effects	When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost
Residual Effects	The degree of environmental change that will occur after the proposed mitigation measures have taken effect.

7.3 The Existing and Receiving Environment (Baseline Situation)

7.3.1 Site Location and Surrounding Land Use

The site is located at Wayside, Enniskerry Road and Glenamuck Road, Kilternan, Dublin 18. A full description of the site location and surrounding land use is presented in Chapter 2 of this EIAR.

7.3.2 Current Land Use

The site, which comprises two parcels of largely undeveloped grasslands which will be separated by the future Glenamuck Distributer Link Road (GLDR), includes a derelict dwelling known as ‘Rockville’ and associated derelict outbuildings in the south and the former Kilternan Country Market in the north.

The current site layout is presented in Figure 7-1.

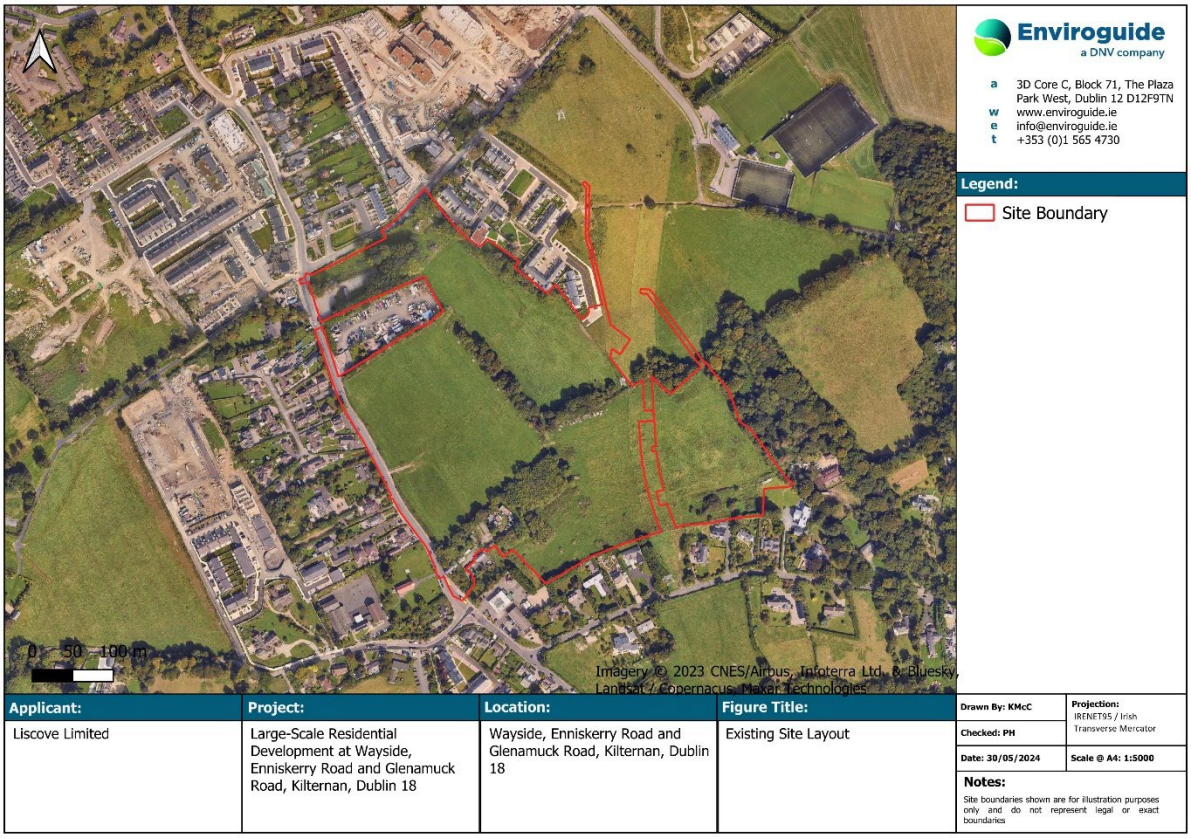

Figure 7-1. Current Site Layout

7.3.3 Topography

The topography surrounding the site of the Proposed Development is generally sloping toward the east and northeast towards the coast.

As documented in the Engineering Infrastructure Report (Roger Mullarkey & Associates, 2024. Engineering Infrastructure Report and Storm Water Impact Assessment for a Residential/Commercial project at Kilternan Village LRD, Kilternan, Dublin 18), the topography at the site generally slopes downwards from the Enniskerry Road along the western boundary in an easterly and north-easterly direction and falling off sharply towards the eastern boundary at a gradient of approximately 10%. Ground elevations at the site range from approximately 141.5 meters above Ordnance Datum (mOD) in the southwest to 122.5mOD in the northeast. The topographic survey with the elevation changes denoted is presented in Figure 7-2.

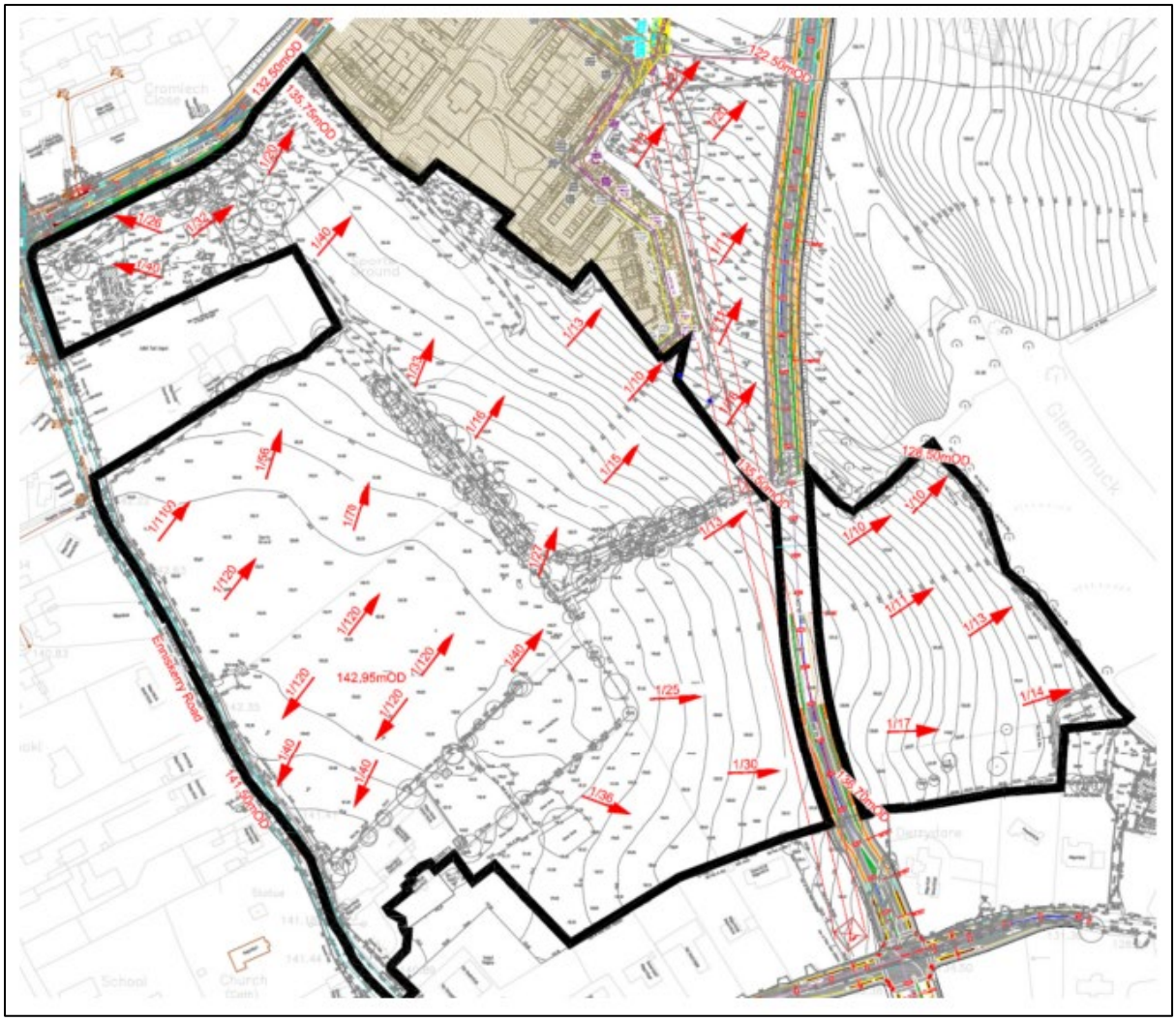

Figure 7-2. Topographic Survey (Roger Mularkey & Associates, 2024a)

7.3.4 Soil and Geology

The soils and geology at the site are described and assessed in Chapter 6 of this EIAR and summarised as follows:

- The soils beneath the majority of the site are mapped by Teagasc (Teagasc, 2024) as deep well drained mineral (mainly acidic), Acid Brown Earths, Brown Podzolics (IFS Soil Code: AminDW) derived from mainly non-calcareous parent materials described as till derived chiefly from granite (TGr). While the soils beneath the northwest and southern portions of the site are mapped by Teagasc (Teagasc, 2024) as made ground (IFS Soil Code: Made).
- The subsoil or quaternary sediments beneath the majority of the site are mapped by the GSI (GSI, 2024) as till derived from granites (TGr). While the subsoil or quaternary sediments beneath the northern portion of the Site and along a small section of the southern site boundary are mapped by the GSI (GSI, 2024) as bedrock outcrop or subcrop.
- The bedrock beneath the site is mapped by the GSI (GSI, 2024) as Type 3 Muscovite Porphyritic (New Code: IDNLGR3) described as granites with muscovite phenocrysts. Yellowish brown weathered granite was encountered during site investigations (SIL,

2006, GII, 2010, GII, 2017 and GII, 2024 included in the Roger Mullarkey & Associates, 2024a Drainage Infrastructure Report submitted with the planning application) at depths between 0.9 mbGL to 2.4mbGL.

- While no bedrock outcrops are mapped within the site boundary, a cluster of bedrock outcrops is located approximately 0.04 km off the southeast corner of the site (GSI, 2024).

7.3.5 Rainfall

Monthly rainfall data available for 1km x 1km grids (for the period 1991 to 2020) was sourced from Met Éireann (Met Éireann, 2024) and is presented in Table 7-3.

Table 7-3. Long Term Mean Monthly Rainfall Data

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
98	82	77	71	72	77	65	74	78	105	125	110	1033
Note: 1km x 1km Irish Grid Coordinated selected for the Site =X (Easting): 321000, Y (Northing): 222000												

The closest the synoptic meteorological station to the site, Casement Aerodrome, is located approximately 17.55km northwest of the site. A summary of the long-term average PE for the period 2021 to 2024 at Casement Aerodrome station (Met Éireann, 2024) is presented in Table 7-4.

Table 7-4. Average Potential Evapotranspiration

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
15.8	22.1	34.6	52.2	71.4	80.5	81.2	68.4	47.6	27.9	15.7	13.1	530.5

7.3.6 Hydrogeology

7.3.6.1 Site Investigation and Groundwater Levels

Groundwater strikes were recorded during drilling of boreholes at the site (SIL, 2006 included in the Roger Mullarkey & Associates, 2024 Drainage Infrastructure Report submitted with the planning application). The groundwater strikes were recorded at depths ranging from 2.5mBGL to 2.9mBGL and typically within the sandy gravelly clays/silts above the granite bedrock.

7.3.6.2 Groundwater Body and Flow Regimes

The bedrock aquifer beneath the site is within the Wicklow Groundwater Body (GWB) (EU Code: IE_EA_G_076) that covers some 1396km^2 and occupies an area across Co. Dublin, Co. Wicklow and Co. Wexford (GSI, 2024).

Recharge in the vicinity of the site is diffuse through overlying tills into the aquifer. The granite aquifer beneath the site is classified as a poor aquifer which is characterised by a lower capacity to accept recharge via infiltration of rainfall. A recharge coefficient of between 20% and 60% effective rainfall with a capped recharge value of 100mm/year has been assigned to the aquifer at the site (GSI, 2024).

The GSI (Wicklow GWB Report) identifies that the majority of groundwater flow direction in the aquifer will take place in the upper 3m of the rocks. Site investigation results indicate that

shallow groundwater, where encountered, was recorded at depths ranging from 2.5mbGL to 2.9mbGL and typically within the sandy gravelly clays / silts above the granite bedrock (SIL, 2006, GII, 2010, GII, 2017 and GII, 2024 included in the Roger Mullarkey & Associates, 2024a Drainage Infrastructure Report submitted with the planning application). Groundwater flow is considered to recharge and discharge on a local scale, with regional groundwater flow directed towards the Irish Sea and local flow towards nearby streams and rivers. Typical groundwater flow paths are on the order of a few hundred meters, with discharge occurring to the closest surface water feature (GSI, 2024).

Locally, groundwater flow within the vicinity of the site is likely to be towards the Carrickmines Stream and the Shanganagh River although baseflow contributions are noted to be low within the Wicklow GWB.

7.3.6.3 Aquifer Classification

The bedrock aquifer of the Type 3 Muscovite Porphyritic beneath the site and surrounding areas is mapped by the GSI (GSI, 2024) as a Poor Aquifer which is generally unproductive except for local zones (PI). Poor aquifers are capable of supplying 'moderate' to 'low' yields (<100m^3/day) and groundwater flows occurs predominantly through a limited and poorly connected network of fractures, fissures and joints (GSI, 2017). Mapping of bedrock aquifer characteristics is presented in Figure 7-3 below.

There are no gravel aquifers mapped by the GSI (GSI, 2024) at the site or within a 2.0km radius of the site (GSI, 2024).

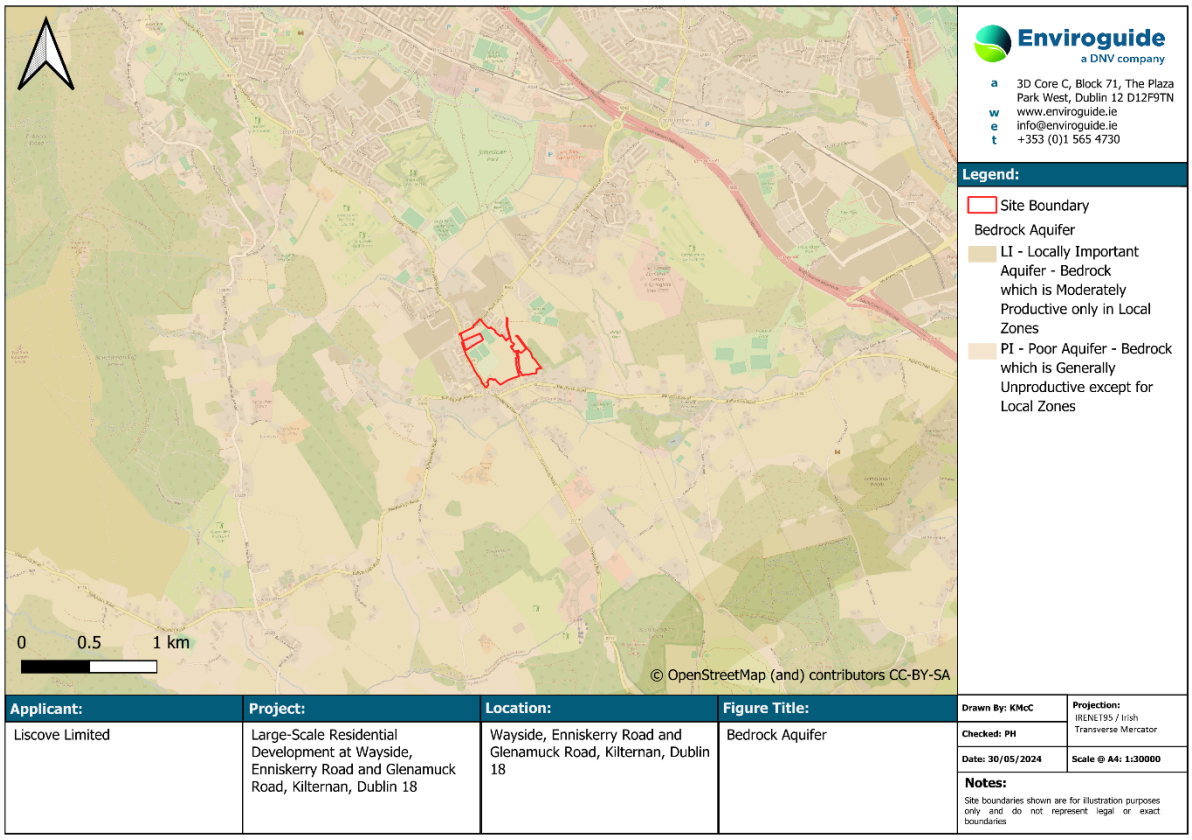

Figure 7-3. Aquifer Classification

7.3.6.4 Groundwater Vulnerability

The vulnerability categories, and methods for determination, are presented in the Groundwater Protection Schemes publication (DEHLG/EPA/GSI, 1999) and summarised in Table 7-5. The publications state that 'as all groundwater is hydrologically connected to the land surface, it is the effectiveness of this connection that determines the relative vulnerability to contamination. Groundwater that readily and quickly receives water (and contaminants) from the land surface is considered to be more vulnerable than groundwater that receives water (and contaminants) more slowly and in lower quantities. The travel time, attenuation capacity and quantity of contaminants are a function of the following natural geological and hydrogeological attributes of any area.

Table 7-5. Vulnerability Mapping Criteria (DEHLG/EPA/GSO, 1999)

Subsoil Thickness	Hydrogeological Requirements				
	Diffuse Recharge			Point Recharge	Unsaturated Zone
	Subsoil Permeability and Type			(Swallow Holes, Losing Streams)	(Sand and Gravel Aquifers Only)
	High Permeability (Sand and Gravel)	Moderate Permeability (Sandy Subsoil)	Low Permeability (Clayey Subsoil, Clay, Peat)		
0-3m	Extreme	Extreme	Extreme	Extreme (30m radius)	Extreme
3-5m	High	High	High	N/A	High
5-10m	High	High	Moderate	N/A	High
>10m	High	Moderate	Low	N/A	High
Notes: (i) N/A = not applicable (ii) Permeability classifications relate to the material characteristics as described by the subsoil description and classification method.					

The GSI has assigned a groundwater vulnerability rating of 'High' (H) for the groundwater beneath the majority of the site (GSI, 2024). While the groundwater beneath the eastern boundary of the site is mapped as 'Extreme' (E). The subsoil permeability classification beneath the site is 'moderate' (GSI, 2024). Based on the moderate permeability and high rating, the depth to bedrock beneath the site is anticipated to be between 0.0mbGL and 10.0mbGL. Bedrock depths observed during the site investigations were present between 0.9mbGL and 2.4mbGL across the site (SIL, 2006, GII, 2010, GII, 2017 and GII, 2024 included in the Roger Mullarkey & Associates, 2024 Drainage Infrastructure Report submitted with the planning application). Therefore, the groundwater vulnerability can be considered to be 'Extreme' locally beneath the site.

Groundwater vulnerability mapping is provided in Figure 7-4.

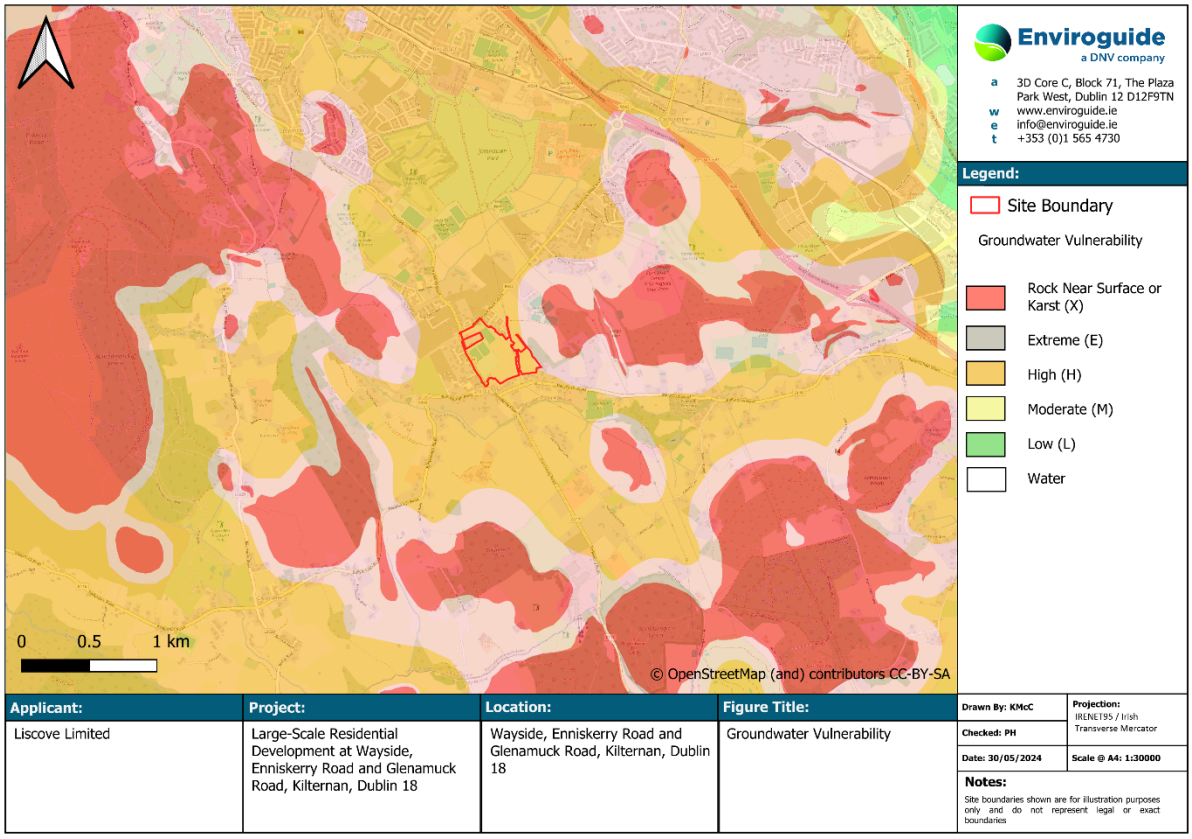

Figure 7-4. Groundwater Vulnerability

7.3.7 Hydrology

The site has been mapped by the EPA (EPA, 2024) to be within the Ovoca-Vartry WFD Catchment (ID: 10), the Ovoca-Vartry Hydrometric Area (HA10) and the Dargle_SC_010 Sub-Catchment, (Sub-Catchment ID: 10_5). The majority of the site has been mapped by the EPA (EPA, 2024) to be within the Carrickmines Stream_010 WFD River Sub Basin (IE_EA_10C040350), while the southern portion of the site is mapped within the Shanganagh_010 WFD River Sub Basin (IE_EA_10S010600).

The closest surface water feature is recorded on the EPA database (EPA, 2024) as the Shanganagh River (IE_EA_10S010600), named locally as the Loughlinstown River, which is located approximately 0.3km south / southeast of the site and flows eastwards, discharging to the Irish Sea (South Western Irish Sea - Killiney Bay - IE_EA_G_076), approximately 5.3km east of the site.

The Glenamuck North Stream (IE_EA_10C040350) is located approximately 0.4km north of the site and flows eastwards before converging with the Carrickmines Stream (IE_EA_10C040350) approximately 2.0km northeast of the site. The Carrickmines Stream flows approximately 3.2km downstream in a south-easterly direction before converging with the Shanganagh River approximately 3.9km east of the site (EPA, 2024). The Shanganagh River flows approximately 1.8km downstream in a south-easterly direction before discharging to the Irish Sea approximately 5.3km east of the site.

The surface water features mapped by the EPA within a 2km radius of the site are presented in Figure 7-5.

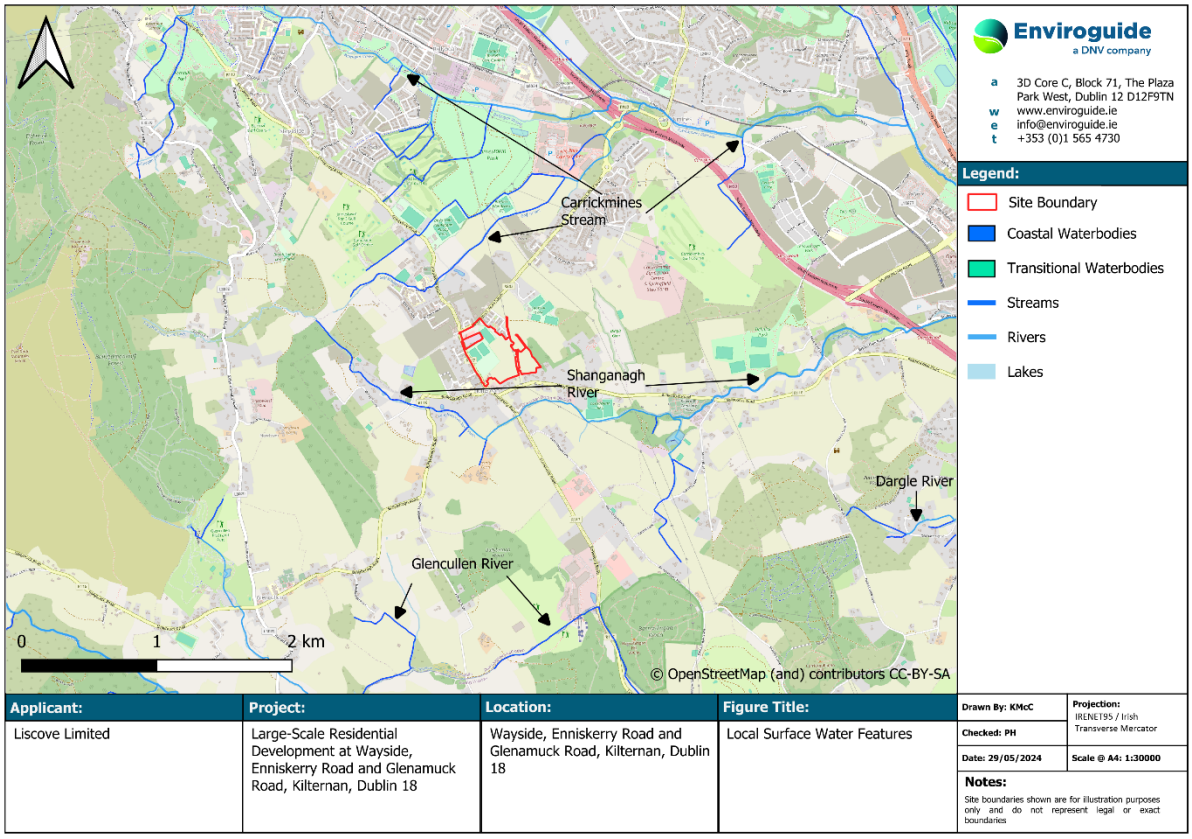

Figure 7-5. Surface Water Features within a 2km Radius of the Site

7.3.7.1 Existing Surface / Storm Water Drainage

There is no surface water drainage at the site and no direct hydraulic connection with any water courses.

There is an existing roadside drainage channel located approximately 0.02km north of the site along Glenamuck Road. It is understood that this drainage channel flows approximately 1.4km downstream in a north-easterly direction along Glenamuck Road before discharging to the Glenamuck North Stream. The Glenamuck North Stream flows approximately 0.6km downstream in a north-easterly direction before converging with the Carrickmines Stream.

7.3.8 Flooding

A site-specific flood risk assessment (SSFRA) was developed for the subject site and Proposed Development (Roger Mullarkey & Associates, 2024 submitted with the planning application). It assessed the potential flood risk associated with fluvial, groundwater, coastal and pluvial flooding.

The SSFRA, which takes into account the impacts of climate change by allowing a 10% increase in rainfall to drainage, 20% increase in flood flow to rivers and a 0.5m sea level rise, identifies that the site of the Proposed Development is located within Flood Zone C (Roger Mullarkey & Associates, 2024).

The SSFRA concludes that the Proposed Development is appropriate at the site and with an overall low risk of fluvial, groundwater, coastal and pluvial flooding (Roger Mullarkey & Associates, 2024).

7.3.9 Water Use and Drinking Water Source Protection

The site of the Proposed Development is located within an area serviced by mains water supply. The GSI groundwater wells and springs database (GSI, 2024) lists one (1No.) source within a 2km radius of the site as follows:

- Borehole TW 4 (GSI name: 3221NWW002) is located approximately 0.9km south of the site. The well was drilled to 55mbGL in August 1990 and bedrock was encountered at 11.0mbGL. The source use for the well is domestic, the yield classified is poor with a daily yield of 5.4m^3/day.

The site of the Proposed Development is located in an area serviced by mains water supply. There is an existing 300mm water supply main located along the Enniskerry Road and an existing 250mm water supply main located along Glenamuck Road (refer to Figure 7-8).

There are no Groundwater Source Protection Areas (SPAs) mapped by the GSI (GSI, 2024) within a 2km radius of the site. The closest Groundwater SPAs is the Ballyfolan Spring source located 15.1km southwest of the site.

The Shanganagh River which is located approximately 0.3km south of the site, at its closest point, is mapped by the EPA (EPA, 2024) as a surface water drinking water source under Article 7 of the Water Framework Directive. There are no other surface water drinking sources identified by the EPA (EPA, 2024) within a 2km radius of the site.

7.3.10 Water Quality Data

7.3.10.1 Published Regional Surface Water Quality

The EPA surface water quality monitoring database (EPA, 2024) was consulted. A summary of the most recent published EPA water quality monitoring data (EPA, 2024) for waterbodies which have a potential hydraulic connection to the site is presented in Table 7-6. It is noted that there is no listed surface water quality data for the Carrickmines Stream river waterbody.

Table 7-6. Surface Water Quality

River Waterbody	Location	EPA WFD Parameter Quality Trend Analysis			
		Parameter	Indicative Quality	Trend	Baseline Concentration (2017) (mg/l)
Shanganagh_010	Br at Friarsland (0.5km upgradient)	Ammonia- Total (as N)	High	Upwards	0.032
		Total Oxidised Nitrogen (as N)	Good	Downwards	1.427
		Orthophosphate (as P) – unspecified	Poor	Upwards	0.069
	Br SSW at Carns (Heron Ford Lane) (2.4km downs gradient)	Ammonia- Total (as N)	High	Upwards	0.022
		Total Oxidised Nitrogen (as N)	Good	Downwards	1.310
		Orthophosphate (as P) – unspecified	Moderate	Upwards	0.056
	At Commons Road	Ammonia- Total (as N)	High	None	0.015

River Waterbody	Location	EPA WFD Parameter Quality Trend Analysis			
		Parameter	Indicative Quality	Trend	Baseline Concentration (2017) (mg/l)
	(4.6km downgradient)	Total Oxidised Nitrogen (as N)	Good	Downwards	1.380
		Orthophosphate (as P) – unspecified	Poor	Upwards	0.061

The EPA Q-Value assessment is a system of water quality rating based on the biological quality of the water body and abundance for specific invertebrate species. A summary of the Q values for the operational and historical EPA monitoring locations along the Carrickmines Stream and the Shanganagh River (EPA, 2024) is presented in Table 7-7.

Table 7-7. Relevant EPA Monitoring Stations and Q-Values

River I.D. & Locations	Sample Locations	Monitoring Station	Q-Value & Year
Shanganagh River (0.63km upstream)	Shanganagh Middle Bridge Cabinteely Park	RS10S010100	3 (Poor) in 1990
Shanganagh River (0.27km downstream)	Shanganagh Kilternan Bridge Enniskerry Road	RS10S010440	3-4 (Moderate) in 2000
Shanganagh River (1.45km downstream)	Shanganagh Bridge North of Ballycorus Lead Works	RS10S010450	4 (Good) in 1994
Shanganagh River (4.6km downstream)	At Commons Road	RS10S010600	4 (Good) in 2020
Shanganagh River (5.3km downstream)	SHANGANAGH - Br E of Glebe Ho	RS10S010500	3-4 (Moderate) in 1990
Carrickmines Stream (2.0km downstream)	Carrickmines Stream Glenamuck Road Bridge (Friarsland / Priorsland)	RS10C040200	3 (Poor) in 2003
Carrickmines Stream (2.9km downstream)	Carrickmines Stream Bridge near Glendruid House	RS10C040300	3-4 (Moderate) in 1990
Carrickmines Stream (3.7km downstream)	Carrickmines Stream Upstream Overpass	RS10C040350	4 (Good) in 2020
Carrickmines Stream (3.9km downstream)	Carrickmines Stream Bridge at Loughlinstown	RS10C040400	3 (Poor) in 2003

It is noted that the Ballyogan Landfill facility (Licence Number W0015-01) is located approximately 1.3km north of the site and upstream from where the Glenamuck Stream converges with the Carrickmines Stream approximately 2.0km east and downstream of the site. The most recent available Annual Environmental Report (AER) for 2020 indicates no non-compliance issues for that reporting period.

7.3.10.2 Published Regional Groundwater Quality

The EPA (EPA, 2024) groundwater monitoring data was reviewed and there are no groundwater quality monitoring stations within a 2km radius of the site or that are hydraulically connected to the site.

7.3.10.3 Receiving Water Quality – Shanganagh Wastewater Treatment Plant

Foul water from the Proposed Development will discharge via the Shanganagh Wastewater Treatment Plant (WWTP) to the Southwestern Irish Sea - Killiney Bay (HA10). The WWTP is operated under relevant statuary approvals. The most recent available Annual Environmental

Report (AER) for the Shanganagh WWTP is 2023 (Irish Water, 2024). The AER identified that the final effluent was compliant with the Emission Limit Values (ELV) specified in the discharge license (D0039-02).

The AER confirms the capacity of the plant will not be exceeded in the next three years. Importantly, the AER notes the following in relation to significance of results:

- *'The coastal/transitional ambient monitoring results meet the required EQS. The EQS relates to the Oxygenation and Nutrient Conditions set out in the Surface Water Regulations 2009.*
- *The discharge from the wastewater treatment plant does not have an observable impact on the water quality.*
- *The discharge from the wastewater treatment plant does have an observable impact on the coastal/transitional water quality.*
- *The discharge from the wastewater treatment plant does not have an observable impact on the bathing water quality.*
- *The discharge from the wastewater treatment plant does not have an observable negative impact on the Water Framework Directive status.'*

7.3.11 Water Framework Directive Status

The WFD status for river, lake, groundwater, transitional and/or coastal water bodies that have a potential hydraulic connection to the site as recorded by the EPA (EPA, 2024) in accordance with European Communities (Water Policy) Regulations 2003 (SI no. 722/2003) are provided in Table 7-8 and the locations shown in Figure 7-6.

It is noted that the Glenamuck North and Carrickmines rivers are both part of the Carrickmines Stream_010 WFD sub-catchment.

Table 7-8. Water Framework Directive Status

Waterbody Name	Waterbody EU Code	Location from Site	Distance from Site (km)	WFD Status (2016-2021)	WFD Risk	Hydraulic Connection to the Site
Surface Water Bodies						
Carrickmines Stream_010	IE_EA_10C040350	North	0.50	Good	Not at risk	Yes, via groundwater and surface water drainage from the Proposed Development
Shanganagh_010	IE_EA_10S010600	South	0.31	Good	Not at Risk	Yes, via groundwater and downstream of the Carrickmines Stream_010 river waterbody
Coastal Water Bodies						
Southwestern Irish Sea - Killiney Bay	IE_EA_100_0000	East	5.4	High	Not at risk	Yes, downstream of the Shanganagh_010 and

Waterbody Name	Waterbody EU Code	Location from Site	Distance from Site (km)	WFD Status (2016-2021)	WFD Risk	Hydraulic Connection to the Site
						Carrickmines Stream_010 river waterbodies. Also receives treated effluent from the Shanganagh WWTP.
Groundwater Bodies						
Wicklow	IE_EA_G_076	Underlying Aquifer	n/a	Good	At risk	Yes, underlying the Site

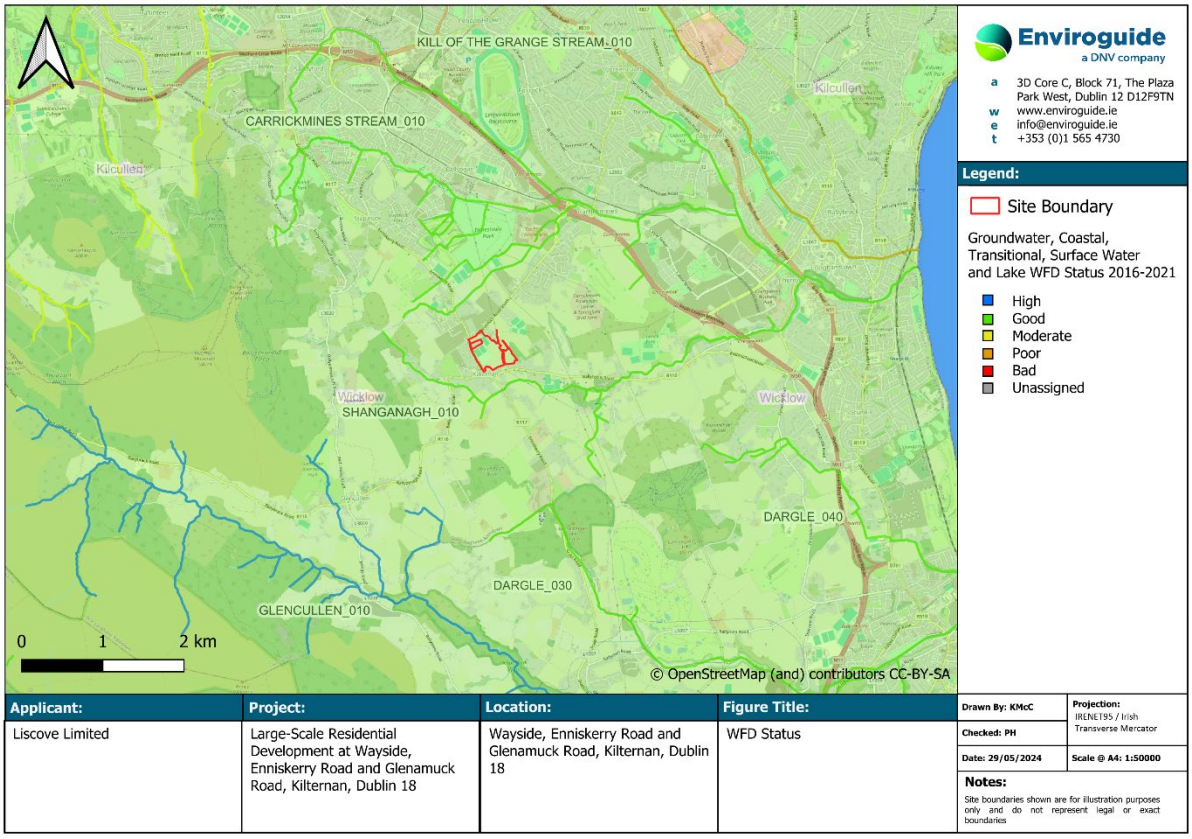

Figure 7-6. Water Framework Directive Status (2016-2021)

7.3.12 Designated and Protected Sites

The Habitats Directive (92/43/EEC) seeks to conserve natural habitats and wild fauna and flora by the designation of Special Areas of Conservation (SACs) and the Birds Directive (2009/147/EC) seeks to protect birds of special importance by the designation of Special Protection Areas (SPAs). SACs and SPAs are collectively known as Natura 2000 or European sites (referred to hereafter as Natura 2000 site).

National Heritage Areas (NHAs) are designations under the Wildlife Acts to protect habitats, species, or geology of national importance. The boundaries of many of the NHAs in Ireland overlap with SAC and/or SPA Sites. Although many NHA designations are not yet fully in force

under this legislation (referred to as 'proposed NHAs' or pNHAs), they are offered protection in the meantime under planning policy which normally requires that planning authorities give recognition to their ecological value.

The Natura 2000 sites and other protected and designated site identified with a potential hydraulic connection to the site and Proposed Development are summarised in Table 7-9 and presented in Figure 7-7.

Table 7-9. Natura 2000 sites with a Potential Hydraulic Connection to the Site

Site Code	Site Name	Distance and Direction from the Site	Potential for Hydraulic Connection
Special Areas of Conservation (SACs)			
000714	Bray Head SAC	8.01km Southeast	Potential hydraulic connection via the Irish Sea. However, located 5.92km south along the coast from the point of discharge from the Shanganagh River.
003000	Rockabill to Dalkey Island SAC	6.60km East	Potential hydraulic connection via the Irish Sea. However, located 1.50km east from the point of discharge from the Shanganagh River.
Special Protection Areas (SPAs)			
004172	Dalkey Island SPA	7.67km Northeast	Potential hydraulic connection via the Irish Sea. However, located 3.11km north along the coast from the point of discharge from the Shanganagh River.
Proposed Natural Heritage Areas (pNHAs)			
001207	Dingle Glen pNHA	0.52km East	Typical groundwater flow paths are on the order of a few hundred meters, with discharge occurring to the closest surface water feature (i.e., Carrickmines Stream and the Shanganagh River). Therefore, there is no identified hydraulic connection via groundwater.
001211	Loughlinstown Woods pNHA	3.64km East	Indirect hydraulic connection via the Shanganagh_010 and Carrickmines Stream_010 river waterbodies.
001206	Dalkey Coastal Zone and Killiney Hill pNHA	5.04km East	Indirect hydraulic connection via the Shanganagh_010 and Carrickmines Stream_010 river waterbodies and discharges of treated effluent from the Shanganagh WWTP.
000714	Bray Head pNHA	8.01km Southeast	Potential hydraulic connection via the Irish Sea. However, located 5.92km south along the coast from the point of discharge from the Shanganagh River.

The Natura 2000 sites are assessed and described in further detail in Chapter 5 of this EIAR.

The findings of the Hydrogeological Risk Assessment (Enviroguide, 2024 submitted with the planning application) concluded that the closest designated and protected sites with a

hydrological connection to the site were those associated with Shanganagh River (Loughlinstown Wood pNHA) and closest to where it discharges to the Irish Sea. The closest Natura 2000 sites to the outfall of the Shanganagh River at Killiney Bay include Rockabill to Dalkey Island SAC, Dalkey Island SPA and Dalkey Coastal Zone and Killiney Hill pNHA located 6.60km east, 7.67km northeast and 5.04km east of the site respectively.

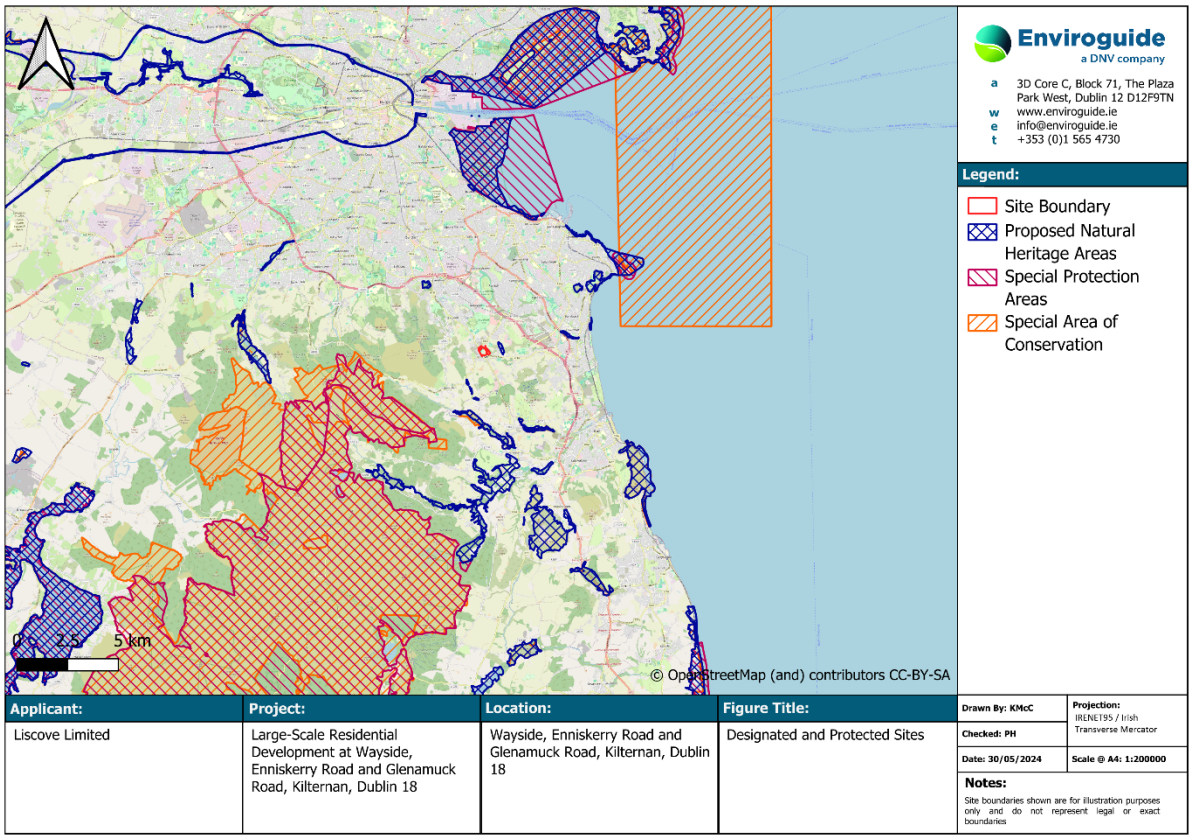

Figure 7-7. Designated and Protected Sites

7.3.13 Importance and Sensitivity of the Receiving Environment

Surface runoff at the site currently infiltrates to ground and there are no water courses with a direct connection to the site of the Proposed Development, however there is a potential indirect connection via groundwater to downgradient catchments of the Carrickmines Stream and Shanganagh River.

Taking account of the receiving hydrogeological environment, in accordance with the criteria set out in Table 7-1, the site is considered to be of 'low' hydrogeological importance given that the bedrock is classified as a poor aquifer (Pl) albeit with an extreme (E) vulnerability rating, and there is only one groundwater source within 2km of the site. Furthermore, the site of the Proposed Development is not located within a mapped source protection area.

The receiving water bodies have been assigned a WFD Status of 'high' for groundwater, and 'good' for the closest river and coastal waterbodies. The findings of the Hydrogeological Risk Assessment (Enviroguide, 2024 submitted with the planning application) concluded that there is no identified negative impact on the closest hydraulically connected Natura 2000 sites and other protected and designated sites in particular the Rockabill to Dalkey Island SAC, and

Dalkey Island SPA, Loughlinstown Woods pNHA and Dalkey Coastal Zone and Killiney Hill pNHA associated with Proposed Development individually or in-combination.

Overall, the receiving water environment in which the Proposed Development site is located is considered to be of low hydrogeological importance with a low to moderate sensitivity to impact taking account of the characteristics of the environment including the WFD Status of receiving river, coastal and groundwater waterbodies.

7.4 Characteristics of the Proposed Development

The Applicant intends to apply for permission for a Large-Scale Residential Development on 2No. sites, measuring approximately 14.2 hectares (Ha), which will be separated by the future Glenamuck Distributer Link Road (GLDR).

The full description of the Proposed Development is outlined in Chapter 2 of this EIAR.

7.4.1 Construction Phase

The construction phase of the Proposed Development will include:

- The demolition of approximately 740m^2 of existing structures onsite.
- Foundation design will consist of pad and strip foundations with no requirement for piling.
- The stripping of existing topsoil at the Site.
- Excavation of soil and subsoil for the construction of building foundations, drainage and other infrastructure to depths of between 0.6m and 3.0m for foundations and 1.5m to 3.0mbGL for drainage and infrastructure with excavation of 95,250m^3 of soils. It is anticipated that there will be no requirement for the excavation of bedrock during the construction phase of the Proposed Development.
- Where possible, it is intended to reuse suitable excavated soil and subsoil for landscaping and engineering use. However, it is anticipated that up to 66,400m^3 of surplus materials will require removal offsite in accordance with all statutory legislation.
- It is anticipated that excavations for foundations will be above groundwater however, locally groundwater may be encountered during deeper excavations for drainage.
- The importation of 77,750m^3 of aggregate fill materials will be required for the construction of the Proposed Development (e.g., granular material beneath road pavement, under floor slabs and for drainage and utility bedding / surrounds etc.).
- Construction of new surface water drainage (refer to Section 7.4.2.1) designed in accordance with the principles and objectives of Sustainable Drainage Systems (SuDS) and the Greater Dublin Sustainable Drainage System (GDSDS) and the requirements of Dún Laoghaire-Rathdown County Council (DLRCC).
- Construction of new foul and mains water connections (refer to Section 7.4.2.2 and Section 7.4.2.3) in accordance with UE Code of Practice for Wastewater Infrastructure (IW-CDS-5030-03) and UE's Code of Practice for Water Infrastructure (IW-CDS-5020-03).

7.4.2 Operational Phase

7.4.2.1 Surface Water Drainage

As documented in the Engineering Infrastructure Report (Roger Mullarkey & Associates, 2024 submitted with the planning application), the surface water drainage for 12.6Ha of the 14.2Ha site (i.e., the drained site area) has been divided into four (4No.) catchment areas as follows:

- Catchment 1 (9.99Ha) outfalls into the existing piped infrastructure constructed as part of the existing Rockville development (D17A/0793) to the northeast of the site. This connection point of the attenuated flow will be downstream of the existing Rockville attenuation system into the existing 300mm surface water drain. It is understood that this surface water drain currently discharges to the existing roadside drainage channel located in Glenamuck Road which in turn flows approximately 1.4km downstream in a north-easterly direction along Glenamuck Road before discharging to the Glenamuck North Stream. It is noted that the existing 300mm surface water drain will eventually be diverted to the regional attenuation pond located beside the Glenamuck Road/GDRS junction permitted as part of the DLRCC GLDR/GDRS roads project. (Roger Mullarkey & Associates, 2024a).
- Catchment 2 (0.21Ha) outfalls into the 225mm surface water drain to be constructed as part of the GDRS upgrade. It is understood that this drainage channel flow north along Enniskerry Road before discharging to the Glenamuck North Stream approximately 0.42km north of the Site.
- Catchment 3 (0.56Ha) outfalls into the existing 300mm surface water drain in Enniskerry Road at the Glenamuck Road junction.
- Catchment 4 (1.80Ha) outfalls into the 300mm surface water drain to be constructed as part of the GLDR project.
- Surface water from all remaining areas of the Proposed Development (i.e., undeveloped / landscaped areas) will continue to discharge to ground.

It was confirmed by DLRCC consultants that the GDRS infrastructure has been designed to cater for the attenuated run-off from the Proposed Development (subject to grant of planning) and that the regional pond in that project has capacity to intercept and store the surface water outfall from the site (Roger Mullarkey & Associates, 2024).

Attenuated and treated surface water from the GLDR/GDRS roads project will ultimately outfall to the watercourses within the catchments of the Carrickmines Stream (River Waterbody Code: IE_EA_10C040350) and the Shanganagh River (River Waterbody Code: IE_EA_10S010600). The Environmental Impact Assessment Report (EIAR) for the GDRS project (DBFL, 2019) that assess the overall scheme including surface water drainage concluded that *'the significance of the identified impacts will be reduced to a "not significant" residual impact on the identified hydrological/ hydrogeological receptors'.*

Surface water runoff from the Proposed Development will be managed in accordance with the principles and objectives of Sustainable Drainage Systems (SuDS) and the Greater Dublin Sustainable Drainage System (GDSDS) to treat and attenuated water prior to discharge to the outfall point. A full SuDS treatment train approach has been implemented in accordance with the CIRIA SuDS Manual, as detailed in Engineering Infrastructure Report (Roger Mullarkey & Associates, 2024) and includes:

- Filter drains to the rear of the housing.
- Permeable paving to all parking spaces.
- Rainwater butts (200l) to the rear downpipes.
- Swales adjacent to roads where practically feasible.
- Tree pits where practically feasible.
- Extensive Green Roofs and Blue Roof.
- Bio-Retention areas and Rain Garden areas.
- Silt-trap/catchpit manholes.
- Hydrobrake limiting flow to the drained area Qbar greenfield rate.
- Petrol interceptors.
- Stone lined voided arch retention storage devices.

The proposed surface water drainage for the Proposed Development is provided in Figure 7-8.

Figure 7-8. Drainage Masterplan (Roger Mullarkey & Associates, 2024. 2104C/313 Drainage Masterplan)

7.4.2.2 Foul Water Drainage

As documented in the Engineering Infrastructure Report (Roger Mullarkey & Associates, 2024), the foul drainage from the Proposed Development has been divided into four (4No.) catchment areas as follows:

- Catchment 1 (308No. residential units, 5,434m^2 commercial / retail and 619m^2 creche) outfalls into the existing 225mm foul sewer constructed as part of the existing Rockville development (D17A/0793 and D18A/0566) to the northeast of the site.

- Rockville foul sewer has been submitted by the Rockville developer for taking-in-charge by Uisce Éireann (hereafter referred to as UE) and the Applicant has a wayleave agreement for the connection into this foul pipe. This existing infrastructure in turn outfalls downstream into the existing UE owned 300mm foul drainage piped infrastructure on Glenamuck Road.
- Catchment 2 (18No. residential units) outfalls into the 225mm foul sewer to be extended as part of the Glenamuck Road upgrade.
- Catchment 3 (36No. residential units) outfalls into the existing 300mm UE owned foul sewer in Enniskerry Road at the Glenamuck Road junction.
- Catchment 4 (125No. residential units) outfalls into the 225mm foul sewer to be constructed as part of the GLDR project.

It was confirmed by DLRCC consultants that the GDRS infrastructure has been designed to cater for the foul water from the Proposed Development (subject to grant of planning) (Roger Mullarkey & Associates, 2024). The foul outfalls from Catchment 2 and Catchment 4 are dependent on the construction of the foul drainage infrastructure as part of the GLDR/Glenamuck Road project. This roads project has already commenced as of May 2024, and it has been stated by DLRCC that it will be completed by Q1 2026. Therefore, the above noted Catchment 2 and Catchment 4 will be phased to coincide with the GLDR completion (Roger Mullarkey & Associates, 2024).

The estimated peak wastewater loading generated by the Proposed Development's Dry Weather Flow is estimated at 2.51l/s residential and 1.5l/s commercial with a Design Flow of 7.57l/s residential and 6.9l/s commercial.

The proposed foul drainage for the Proposed Development is provided in Figure 7-8.

Construction of new foul drainage connection will in accordance with UE's Code of Practice for Wastewater Infrastructure (IW-CDS-5030-03).

The UE Confirmation of Feasibility (CoF) letter dated the 14th of June 2024 (UE Reference: CDS24004528) states that the proposed foul water connection is feasible without infrastructure upgrade by UE. A Statement of Design Acceptance (SODA) was subsequently received from UE on the 17th of June 2024 (UE Reference: CDS24004528) confirming that UE has no objections to the foul water design proposals.

Foul water from the Proposed Development will be treated in the Shanganagh Wastewater Treatment Plant (WWTP) (Discharge Licence No. D0039-02) before ultimately discharging to the Southwestern Irish Sea - Killiney Bay coastal waterbody.

7.4.2.3 Water Supply

Water supply to the western portion of the Proposed Development (i.e., to the west of the GLDR) will be from the existing 300mm UE mains water supply located on Enniskerry Road. While water supply to the eastern portion of the Proposed Development (i.e., to the east of the GLDR) will be via the 280mm watermain currently under construction as part of the GLDR roads project. As part of the land acquisition agreements for the GLDR between the Applicant and DLRCC, it has already been agreed that a spur watermain connection from this new water main into the eastern portion of the site will be constructed as part of the GLDR project.

The estimated peak hour water demand for the Proposed Development is 14.45l/s residential and 8.6l/s commercial / retail and creche. In accordance with best practice, the use of water conservation appliances in the buildings will be employed as part of the Proposed Development to reduce the water demand (i.e., water saving tap valves, eco-flush, toilet system and water saving appliances). As a further measure of demand reduction, it is proposed to provide approximately one hundred and eighty-five (185No.) 200 litre rainwater butts to the rear of each gabling property. This will collect rainwater from the house roofs for use in garden irrigation, therefore reducing drinking water demand and decreasing run-off from the site (Roger Mullarkey & Associates, 2024).

The proposed water supply network for the Proposed Development is provided in Figure 7-8.

Construction of new water supply connection will in accordance with UE's Code of Practice for Water Infrastructure (IW-CDS-5030-02).

The UE CoF letter dated the 14th of June 2024 (UE Reference: CDS24004528) states that the proposed water supply connection is feasible without infrastructure upgrade by UE. A SODA was subsequently received from UE on the 17th of June 2024 (UE Reference: CDS24004528) confirming that UE has no objections to the water supply design proposals.

7.5 Potential Impact of the Proposed Development

The procedure for determination of potential impacts on the receiving hydrology and hydrogeology is to identify potential receptors within the site boundary and surrounding environment and use the information gathered during the desk study, site walkover and site investigations to assess the degree to which these receptors will be impacted upon in the absence of mitigation.

The potential impacts associated with the construction phase and operational phase of the Proposed Development are summarised below.

7.5.1 Construction Phase

7.5.1.1 Hydrogeological Flow Regime

There will be no direct discharge to groundwater or surface water during the construction phase of the Proposed Development.

Temporary diversions of water courses are not required for the construction phase, however there may be a requirement for management of surface water (rainwater) and shallow groundwater where encountered during groundworks. This will be within localised areas of the site only and taking account of the urban setting of the site, the presence of clayey strata in the overburden and limited capacity of the bedrock aquifer to accept recharge there will be no overall impact groundwater recharge within the bedrock aquifer at the site.

There will be no impact on the hydrology or surface water flow regime within receiving surface water bodies during the construction phase of the Proposed Development.

There will be no abstraction of water for use during construction works (i.e. dust suppression, welfare facilities). Water supply will be from mains supply in accordance with a connection agreement from UE and therefore there will be no impact on water resources.

Overall, it is considered that any impact on the hydrogeological regime of the underlying poor important aquifer is unavoidable however will be 'negative', 'imperceptible', 'temporary' within a very localised zone of the aquifer only and there will be no impact on the flow regime of receiving water bodies.

7.5.1.2 Water Quality

Construction Phase activities at the Proposed Development site that could potentially impact on water quality include:

- Groundworks including bulk excavation of soil and if required bedrock required for subsurface infrastructure including drainage. The handling, stockpiling, reprofiling and removal offsite of soils could result in generation of excessive suspended solids in surface water runoff.
- Discharge of water that may potentially be contaminated from works areas to groundwater. There is no identified direct pathway to surface water drainage associated with the site for the construction phase of the Proposed Development however runoff could potentially enter onto roadways and indirectly to other offsite water receptors.
- Storage and use of fuels, oils and chemicals used during construction which in the event of an accidental release could infiltrate to the underlying groundwater or migrate offsite.
- Imported materials including fill materials that are not of the appropriate quality could result in leaching or runoff of contaminants to the water environment.
- Export of waste materials from the site to unauthorised facilities could result in an impact on water quality at the receiving / destination site.
- Discharges or leaks from temporary welfare facilities could introduce contaminants to the water environment. Release of foul water during connection to live sewers. Due to the temporary and phased nature of the Construction Phase the potential impact from an accidental spillage is limited.
- Release of wash water from the wheel-wash could result in localised introduction of contaminants including hydrocarbons, brake dust, metals, road salt, cleaning agents and other traffic residue to the receiving water environment.
- Piling is not required and the associated potential impacts water quality will not occur as a result of the Proposed Development.

The potential risk to the receiving water is considered in the absence of standard and appropriate construction management and mitigation measures.

During excavation, there is a risk to the underlying gravel and bedrock aquifers due to any accidental release of deleterious materials (e.g., fuels, cementitious material or other hazardous materials), through the failure of secondary containment or a materials handling accident at the Site, to exposed granular subsoils or bedrock creating a direct pathway to the underlying gravel and bedrock aquifers. The groundwater vulnerability will temporarily be increased during the construction phase. In a worst-case scenario, and in the absence of mitigation, it is considered that this could result in a negative moderate to significant and medium-term impact on the receiving hydrogeological and hydrological environment depending on the nature of the incident. It is deemed unlikely that such an incident at the site would impact on receiving surface water bodies (Enviroguide, 2024).

There is a potential risk associated with the cementitious materials used during the construction of deeper infrastructure where groundwater may be encountered that could result in a 'negative', 'significant' and 'medium-term' impact groundwater quality beneath the site.

Surface runoff entrained with sediment is unlikely to result in an impact on receiving water courses as there is no direct connection for the construction phase based on the existing site condition. The release of suspended solids entrained in surface runoff indirectly tracked on vehicles to haul routes to / from site within a short distance of the site (e.g. Glenamuck Road) could enter the receiving water could potentially result in a 'negative', 'slight to moderate' 'short-term' impact on receiving water quality.

Where dewatering of excavations is required or where water must be pumped from the excavations, water will be discharged by the contractor, following appropriate treatment (e.g., settlement or hydrocarbon interceptor), to sewer, watercourses or groundwater in accordance with the necessary discharge licences issued by UE under Section 16 of the Local Government (Water Pollution) Acts and Regulations for any water discharges to sewer or from Kildare County Council under Section 4 of the Local Government (Water Pollution) Act 1977, as amended in 1990 for discharges to surface water / groundwater. There will be no unauthorised discharge of water (groundwater / surface water runoff) to sewer, watercourses or groundwater during the construction phase of the Proposed Development. Therefore, the potential impacts will have been adequately assessed and mitigated as part of the statutory consent and there will be neutral, imperceptible and temporary impact on the receiving water environment.

The release of foul water during connection to the live sewers could result in a release of contaminants to ground or as overland runoff. Due to the temporary and phased nature of the construction phase of the Proposed Development, in the absence of mitigation the potential impact from an accidental spillage is considered to be 'negative', 'moderate' and 'short-term.

All surplus materials and waste that will require removal offsite will be removed in accordance with the requirements and recommendations outlined in the Resource and Waste Management Plan (RWMP) (Enviroguide, 2024 submitted with the planning application) and managed in accordance with all statutory obligations including where appropriate re-use as by-product in accordance with Article 27 of the European Communities (Waste Directive) Regulations 2011 (SI No. 126 of 2011) as amended (referred to hereafter as Article 27). In the unlikely event that surplus soil or other waste materials are directed to an unauthorised location there is potential to impact on the receiving hydrogeology at that location. In the event of such a scenario it is considered that this could result in a 'negative', 'slight to moderate' and 'medium-term' impact on the hydrogeology at any receiving unauthorised locations. Appropriate controls will be in place to prevent this unlikely scenario.

7.5.2 Operational Phase

During the operational phase of the Proposed Development there is limited to zero potential for any adverse impact on the receiving water (hydrological and hydrogeological) environment at the site taking account of the design for the Proposed Development.

7.5.2.1 Hydrogeological Flow Regime

There will be no groundwater or surface water abstractions during the Operational Phase. The only discharge to ground will be infiltrating rainfall on areas outside the surface water drainage

catchments. All surface water runoff will indirectly discharge to receiving surface water courses within the catchments of the Carrickmines Stream and Shanganagh River following onsite treatment and attenuation within the onsite surface water drainage designed in accordance with the principles and objectives of SuDS and the GDSDS (Roger Mullarkey & Associates, 2024).

The permeability and potential for infiltration to ground at the site will be modified with the change in cover from greenfield to paved areas within the Proposed Development. The existing capacity for infiltration and recharge to the aquifer is low due to the nature of the poor granite bedrock aquifer. Therefore, any change in the recharge potential within the site taking account of the nature of the aquifer including recharge potential and localised groundwater flow paths and limited baseflow contributions within the GWB will only impact a very localised area of the aquifer within the vicinity of the site. Overall, it is considered that there will be a 'negative', 'imperceptible', 'long-term' impact on the Wicklow GWB and associated surface water courses.

7.5.2.2 Flooding

As documented in the SSFRA (Roger Mullarkey & Associates, 2024) the site of the Proposed Development is located within Flood Zone C (less than 0.1%AEP or 1 in 1000). The SSFRA identified that the flood risk associated with each of tidal, fluvial, pluvial, groundwater and also human mechanical error (e.g. blockage of drainage) flood sources was low. It was concluded that the site is suitable for development in the context of flood risk.

Therefore, the potential flooding impacts associated with the Proposed Development are 'neutral', 'imperceptible' 'long-term'.

7.5.2.3 Water Quality

There will be no significant sources of contamination at the site during the operational phase of the Proposed Development taking account of the following embedded design considerations:

- There will be no bulk storage of petroleum hydrocarbon-based fuels used during the operational phase, thereby removing any potential contaminant sources associated with fuels.
- There will be no discharges to ground from drainage and only rainfall on public open spaces and landscape areas will infiltrate to ground.
- All surface water runoff including from trafficked areas (road and carparks) will be collected and managed within the surface water drainage incorporating SuDS measures as outlined in the Engineering and Infrastructure Report (Roger Mullarkey & Associates, 2024).
- All foul water will be directed to mains sewer in accordance with agreement from UE and Confirmation of Feasibility for the connection has been received from UE. All below ground foul sewers will be constructed in accordance with current UE requirements and Building Regulations. Therefore, any potential contaminant sources associated with drainage including foul sewers will be eliminated.

As identified in the Hydrological and Hydrogeological Risk Assessment (Enviroguide Consulting, 2024 submitted with the planning application) (Appendix 7-1), in the unmitigated worst-case source scenario, the discharge of surface water from Catchment 1 and Catchment

3 of the Proposed Development could result in a potential 'negative', 'significant' and short term' impact on the receiving water quality of the roadside drainage channel on Glenamuck Road, the Glenamuck North Stream and potentially within the Carrickmines Stream locally within the vicinity of the point of discharge to the Carrickmines Stream. It is considered that there would be no impact to water quality downstream where the Carrickmines Stream confluences with at the Shanganagh River taking account of the nature of the incident and the potential for assimilation within the receiving water bodies. There would also be no impact where the Shanganagh River discharges to the Irish Sea.

Surface water from Catchment 2 and Catchment 4, and eventually Catchment 1, of the Proposed Development will be discharged to the mains drainage network within the GDRS scheme which has been designed to incorporate discharges from the Proposed Development (Roger Mullarkey & Associates, 2024). The EIAR (DBFL, March 2019) prepared for the GDRS identified that discharges from the GDRS incorporating connections from the Proposed Development will have no impact on the receiving water environment. Therefore, in the unmitigated worst-case source scenario, the discharge of surface water from Catchment 2 and Catchment 4, and eventually Catchment 1, of the Proposed Development would be diluted, treated and attenuated within the GDRS surface water drainage network prior to discharge to receiving waters and there would be no impact on the receiving water quality.

It is important to note that the surface water management strategy includes a number of measures that will capture any potentially contaminating compounds (petroleum hydrocarbons, metals, and suspended sediments) in surface water runoff from roads and the impermeable areas that could potentially otherwise discharge to groundwater or the receiving water courses.

The measures incorporated in the SuDS design include filter drains, permeable paving, swales, silt-trap/catchpit manholes, tree pits, green roofing, bio-retention, attenuation storage and class1 petrol interceptors within the drainage and SuDS system. The filter drains, permeable paving, swales, silt-trap/catchpit manholes, tree pits, green roofing, bio-retention, attenuation storage will be effective in the treatment and removal of any contaminants (metals, polycyclic aromatic hydrocarbons (PAHs) and suspended solids) entrained in surface water runoff. The effectiveness of these SuDS measures is documented in TII guidance (TII,2014) and the SuDS Manual (C753). The Proposed Development also includes two (2No.) class 1 petrol interceptors prior to discharge from the site that will be effective in removal of hydrocarbons that may enter the drainage system in particular in the event of worst-case scenario spill incident (e.g. collision on the roadway resulting in the loss of fuel from a vehicle).

Accordingly, any potential impact on receiving surface water and groundwater beneath the site of the Proposed Development will be avoided taking account of the design proposals. Therefore, it is considered that the water quality protection criteria and objectives of the GDSDS and Water Framework Directive will be achieved.

There is no identified impact on the receiving water environment associated with the foul drainage at the site and discharge from the site (Enviroguide, 2024). Foul water from the Site will ultimately discharge via the Shanganagh WWTP to the Irish Sea via the long sea outfall and short sea outfall. Foul water from the site will only be discharged to the mains foul network under the appropriate consents from UE.

7.5.3 Potential Cumulative Impacts

Cumulative Impacts can be defined as “impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project”. Effects which are caused by the interaction of effects, or by associated or off-site projects, are classed as indirect effects. Cumulative effects are often indirect, arising from the accumulation of different effects that are individually minor. Such effects are not caused or controlled by the project developer.

As part of this assessment, other offsite developments and proposed offsite developments as detailed in Chapter 2 of this EIAR were reviewed and considered for possible cumulative effects with the Proposed Development.

7.5.3.1 Water Resources

Water supply to the western portion of the Proposed Development (i.e., to the west of the GLDR) will be from the existing 300mm UE mains water supply located on Enniskerry Road. While water supply to the eastern portion of the Proposed Development (i.e., to the east of the GLDR) will be via the 280mm watermain currently under construction as part of the GLDR roads project. UE have confirmed (UE Reference: CDS24004528 dated 14th June 2024) that a connection is feasible without infrastructure upgrade by UE. Furthermore, UE have issued the SODA letter (UE Reference: CDS24004528 dated 17th June 2024) (Roger Mullarkey & Associates, 2024) confirming that there are no objections to the design proposals. The mains water supply will be operated in accordance with relevant existing statutory consents therefore there will be no cumulative impacts associated with the Proposed Development on the supply network and water resources.

7.5.3.2 Water Quality

Foul water from the Proposed Development will be discharged to the mains foul network for treatment at Shanganagh WWTP. UE have confirmed (UE Reference: CDS24004528 dated 14th June 2024) that a connection is feasible without infrastructure upgrade by UE. Furthermore, UE have issued the SODA letter (UE Reference: CDS24004528 dated 17th June 2024) (Roger Mullarkey & Associates, 2024) confirming that there are no objections to the design proposals. Therefore, it is understood that there is capacity within the network to receive and treat foul effluent from the Proposed Development. The Shanganagh WWTP is operated in accordance with relevant statutory approvals and the available 2022 AER for the Shanganagh WWTP indicates that discharges from the WWTP to the Irish Sea were compliant with the licenced ELVs (UE, 2024). The Hydrological and Hydrgeological Risk Assessment (Enviroguide, 2024a) (Appendix 7-1) identifed that there is no identified impact on the receiving environment associated with foul discharges from the Proposed Development site via Shanganagh WWTP individually or in-combination.

Surface water runoff from Catchment 1 and Catchment 3 of the Proposed Development will ultimately outfall to the Glenamuck North Stream together with other runoff within the catchment. Therefore, in the absence of mitigation, there could be a potential ‘negative’, ‘significant’ and short term’ impact on the receiving water quality of the roadside drainage channel on Glenamuck Road, the Glenamuck North Stream and potentially within the Carrickmines Stream locally within the vicinity of the point of discharge to the Carrickmines Stream. However, as mentioned above, the unmitigated worst-case source scenario is

deemed to be an unlikely scenario taking account of the embedded design avoidance measures and mitigation measures.

Surface water runoff from Catchment 2 and Catchment 4, and eventually Catchment 1, of the Proposed Development will be discharged to the mains drainage network within the permitted GDRS scheme together with other runoff within the GDRS catchment. It has been verified by DLRCC that there GDRS design incorporates capacity for connection from the Proposed Development (Roger Mullarkey & Associates, 2024a). The EIAR (DBFL, March 2019) prepared for the GDRS, identified that discharges from the GDRS will have no impact on the receiving water environment. Accordingly, there are no identified cumulative impacts associated with the discharge of surface water drainage from Catchment 2 and Catchment 4, and eventually Catchment 1, of the Proposed Development.

There are no other potential cumulative impacts associated with the Proposed Development.

7.5.4 "Do Nothing" Impact

The procedure for determination of potential impacts on the receiving hydrology and hydrogeology is to identify potential receptors within the site boundary and surrounding environment and use the information gathered during the desk study and site walkover to assess the degree to which these receptors will be impacted upon in the absence of mitigation.

If the Proposed Development did not proceed the site would remain as undeveloped lands. There would be no change to the drainage at the site or to the hydrological and hydrogeological regime at the site.

7.5.5 Water Framework Directive

The findings of the Hydrological and Hydrgeological Risk Assessment (Enviroguide, 2024) (Appendix 7-1) identifed that in the absence of any mitigation or avoidance measures there could be a potential impact on the water quality within receiving water bodies associated with the site, specifically within a local zone of the Wicklow GWB during the Construction Phase. A potential 'negative', 'significant' and 'medium-term' impact to GWB status within a local portion of the Wicklow GWB could occur.

In the unmitigated worst-case source scenario at the site, and in the absence of design and mitigation measures there could be a potential 'negative', 'significant' and 'short term' impact, on the receiving WFD Status of the Carrickmines Stream_010 river waterbody (i.e., within the Glenamuck North Stream and locally within the Carrickmines Stream), associated with surface water discharges from the site during the operational phase. Taking account of the nature of the incident and the potential for assimilation within the receiving water bodies, it is considered that there would be no impact to the receiving WFD Status within the Shanganagh_010 river waterbody, and the Southwestern Irish Sea - Killiney Bay coastal waterbody.

7.6 Avoidance, Remedial & Mitigation Measures

The measures outlined in this section of the report will ensure that there will be no significant impact on the receiving groundwater and surface water environment and associated receptors (e.g., Natura 2000 sites). Therefore, the Proposed Development will not have any impact on compliance with the EU Water Framework Directive, European Communities (Environmental

Objectives) Surface Water Regulations (S.I. 272 of 2009 and as amended) and the European Communities Environmental Objectives (Groundwater) Regulations (S.I. No. 9 of 2010 and as amended) individually or in combination.

7.6.1 Construction Phase

During the construction phase, all works will be undertaken in accordance with the Construction Management Plan (CMP) (Atkins Ireland Limited, 2024) and the Construction Environmental Management Plan (CEMP) (Enviroguide, 2024). Following appointment, the contractor will be required to further develop the CMP and CEMP to provide detailed construction phasing and methods to manage and prevent any potential emissions to ground with regard to the relevant industry standards (e.g., Guidance for Consultants and Contractors, CIRIA-C532', CIRIA, 2001). The CMP and CEMP will be implemented for the duration of the construction phase, covering construction and waste management activities that will take place during the construction phase of the Proposed Development. Mitigation works will be adopted as part of the construction works for the Proposed Development. These measures will address the main activities of potential impact which include:

- Control and Management of surface water runoff.
- Control and management of shallow groundwater during excavation and dewatering (if required).
- Management and control of soil and materials.
- Appropriate fuel and chemical handling, transport and storage.
- Management of accidental release of contaminants at the site

The construction works will be managed in accordance with all statutory obligations and regulations and with standard international best practice. Good construction management practices will minimise the risk of pollution from construction activities at the site including but not limited to:

- Construction Industry Research and Information Association (CIRIA), 2001. Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors.
- CIRIA, 2015. Environmental Good Practice on Site (C741).
- Enterprise Ireland Oil Storage Guidelines (BPGCS005).
- Environmental Protection Agency (EPA), 2013. IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities.
- CIRIA, 2007. The SuDS Manual (C697).
- UK Environment Agency, 2004. UK Pollution Prevention Guidelines (PPG).
- CIRIA, 2006. Control of Water Pollution from Linear Construction Projects: Technical Guidance (C648).
- National Roads Authority (now Transport Infrastructure Ireland), 2016. Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes.
- Inland Fisheries Ireland (2016). Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters.

7.6.1.1 Control and Management of Water and Surface Water Runoff

There will be no direct discharge to groundwater or surface water during the construction phase of the Proposed Development.

All run-off from the site or any areas of exposed soil will be managed as required with temporary pumping and following appropriate treatment as required. Surface water runoff from areas stripped of topsoil and surface water collected in excavations will be directed to onsite settlement ponds where measures will be implemented to capture and treat sediment laden runoff prior to discharge at a controlled rate. It is noted that, where required, surface water runoff will be prevented from entering open excavations with sandbags or other approved methods proposed by the Contractor.

Where dewatering of shallow groundwater is required or where surface water runoff must be pumped from the excavations, water will be managed in accordance with best practice standards (i.e., CIRIA C750), the CMP (Atkins Ireland Limited, 2024), the CEMP (Enviroguide, 2024b) and regulatory consents to minimise the potential impact on the local groundwater flow regime of the underlying aquifer.

All water leaving the site during the construction phase will be desilted in onsite settlement ponds to include geotextile liners and riprapped inlets and outlets to prevent scour and erosion. The location of the settlement ponds will be reviewed and moved regularly as required. Additional measures will be implemented as required to capture and treat sediment laden surface water runoff (e.g., sediment retention ponds / tanks, surface water inlet protection, fencing and signage around specific exclusion zones and earth bunding adjacent to open drainage ditches). Where required, the water will also be directed through a hydrocarbon interceptor prior to discharge from the Site.

Unauthorised discharge of water (groundwater / surface water runoff) to ground, drains or watercourses will not be permitted. Existing surface water drainage located along public roads (i.e., Wayside, Enniskerry Road and Glenamuck Road) will be protected for the duration of the works. The appointed Contractor will ensure that the discharge of water to ground, drains or watercourses will be in accordance with the necessary discharge licences issued by UE under Section 16 of the Local Government (Water Pollution) Acts and Regulations for any water discharges to sewer or from Kildare County Council under Section 4 of the Local Government (Water Pollution) Act 1977, as amended in 1990 for discharges to surface water.

Where required, stockpiles of loose materials pending re-use onsite will be protected for the duration of the works and not located in areas where sediment laden runoff may enter existing surface water drains. To help shed rainwater and prevent ponding and infiltration, the sides and top of the stockpiles will be regraded to form a smooth gradient with compacted sides reducing infiltration and silt runoff. Where required, silt fences will be erected at the toe of stockpiles to prevent run-off. The silt fences will be monitored daily by the appointed contractor and silt will be removed as required.

A regular review of weather forecast will take place, insofar as possible, ground excavation works will be scheduled during period of dry weather to minimise potential for silt laden runoff.

7.6.1.2 Importation of Materials

Contract and procurement procedures will ensure that all imported aggregates, soil and other construction materials required for the Proposed Development will be sourced from reputable suppliers operating in a sustainable manner and in accordance with industry conformity/compliance standards and statutory obligations. The importation of aggregates will be subject to management and control procedures to ensure the suitability for use in

accordance with engineering and environmental specifications for the Proposed Development. Therefore, any unsuitable material will be identified prior to unloading / placement on-site.

7.6.1.3 Concrete Works

Pre-cast concrete will be used where technically feasible to meet the design requirements for the Proposed Development. Where cast-in-place concrete is required, all work will be carried out to avoid any contamination of the receiving geological environment through the use of appropriate design and methods implemented by the appointed Contractor and in accordance with the CMP (Atkins Ireland Limited, 2024), the CEMP (Enviroguide, 2024) and relevant industry standards.

All ready-mixed concrete will be delivered to the site by truck. The following measures will be implemented where poured concrete is being used on site:

- The production, transport and placement of all cementitious materials will be strictly planned and supervised. Site batching/production of concrete will not be carried out on site.
- Shutters will be designed to prevent failure. Grout loss will be prevented from shuttered pours by ensuring that all joints between panels achieve a close fit or that they are sealed.
- Where concrete is to be placed by means of a skip, the opening gate of the delivery chute will be securely fastened to prevent accidental opening.
- Where possible, concrete skips, pumps and machine buckets will be prevented from slewing over water when placing concrete.
- Concrete mixer trucks will not be permitted to wash out on-site with the exception of cleaning the chute into a container which will then be emptied into a skip for appropriate compliant removal offsite.
- Surplus concrete will be returned to batch plant after completion of a pour.

7.6.1.4 Handling of Fuels and hazardous Materials

Fuelling and lubrication of equipment will be carried out in accordance with the procedures outlined in the CEMP (Enviroguide, 2024), in a designated area of the site away from any watercourses and drains (where not possible to carry out such activities onsite.

Any diesel, fuel or hydraulic oils stored on-site will be sealed, secured and stored in a dedicated internally bunded chemical storage cabinet unit or inside concrete bunded areas to prevent any seepage to ground. There will be clear labelling of containers so that appropriate remedial measures can be taken in the event of a spillage.

- Bunds will have regard to Environmental Protection Agency (EPA) guidelines ‘Storage and Transfer of Materials for Scheduled Activities’ (EPA, 2013) and Enterprise Ireland’s Best Practice Guide (BPGCS005 Oil Storage Guidelines). All tank and drum storage areas will, as a minimum, be bunded to a volume not less than the greater of the following:
    - 110% of the capacity of the largest tank or drum within the bunded area; or
    - 25% of the total volume of substance that could be stored within the bunded area.
- Vehicle or equipment maintenance work will take place in a designated impermeable area within the Site.

- Emergency response procedures will be put in place, in the unlikely event of spillages of fuels or lubricants.
- Spill kits including oil absorbent material will be provided so that any spillage of fuels, lubricants or hydraulic oils will be immediately contained.
- In the event of a leak or spill from equipment in the instance of a mechanical breakdown during operation, any contaminated soil will be removed from the Site and compliantly disposed off-site. Residual soil will be tested to validate that all potentially contaminated material has been removed. This procedure will be undertaken in accordance with industry best practice procedures and EPA guidelines.
- Site staff will be familiar with emergency procedures for in the event of accidental fuel spillages.
- All staff on-site will be fully trained on the use of equipment to be used on-site.
- Portable generators or similar fuel containing equipment will also be placed on suitable drip trays or bunds.

Refuelling of plant and vehicles during the construction phase will only be permitted at designated refuelling station locations onsite and will be from a road tanker brought to site as required. Each station will be fully contained and equipped for spill response and a specially trained and dedicated Environmental and Emergency Spill Response team will be appointed by the Contractor before the commencement of works onsite.

A procedure will be drawn up by the contractor which will be adhered to during refuelling of on-site vehicles. This will include the following:

- Fuel will be delivered to plant on-site by dedicated tanker.
- All deliveries to on-site vehicles will be supervised and records will be kept of delivery dates and volumes.
- The driver will be issued with, and will carry at all times, absorbent sheets and granules to collect any spillages that may accidentally occur.
- Where the nozzle of a fuel pump cannot be placed into the tank of a machine then a funnel will be used.
- All re-fuelling will take place in a designated impermeable area. In addition, oil absorbent materials will be kept on-site in close proximity to the re-fuelling area.

7.6.1.5 Emergency Procedures

Emergency procedures will be developed by the appointed Contractor in advance of works commencing and spillage kits will be available on-site including in vehicles operating on-site. Construction staff will be familiar with emergency procedures for in the event of accidental fuel spillages. Remedial action will be immediately implemented to address any potential impacts in accordance with industry standards and legislative requirements.

- Any required emergency vehicle or equipment maintenance work will take place in a designated impermeable area within the Proposed Development Site.
- Emergency response procedures will be put in place, in the unlikely event of spillages of fuels or lubricants.
- Spill kits including oil absorbent material will be provided so that any spillage of fuels, lubricants or hydraulic oils will be immediately contained.
- In the event of a leak or spill from equipment in the instance of a mechanical breakdown during operation, any contaminated soil will be removed from the Proposed

Development Site and compliantly disposed off-site. Residual soil will be tested to validate that all potentially contaminated material has been removed. This procedure will be undertaken in accordance with industry best practice procedures and standards.

- All construction works staff will be familiar with emergency procedures for in the event of accidental fuel spillages.
- All construction works staff on-site will be fully trained on the use of equipment.

This procedure will be undertaken in accordance with industry best practice procedures and standards. These measures will ensure that there is minimal risk to the receiving hydrological and hydrogeological environment associated with the construction phase of the Proposed Development.

7.6.1.6 Welfare Facilities

Welfare facilities have the potential, if not managed appropriately, to release organic and other contaminants to ground or surface water courses. Foul drainage from temporary welfare facilities during the construction phase of the Proposed Development will be discharged to temporary holding tank(s) the contents of which will periodically be tankered off site to a licensed facility. All waste from welfare facilities will be managed in accordance with the relevant statutory obligations by tankering of waste offsite by an appropriately authorised contractor.

Any connection to the public foul drainage network during the Construction Phase of the Proposed Development will be undertaken in accordance with the necessary temporary discharge licences issued by UE.

7.6.2 Operational Phase

There will be no risk to water quality including groundwater and surface water associated with the operational phase of the Proposed Development. It is considered that the design of the Proposed Development is in line with the objectives of the Water Framework Directive (2000/60/EC), as amended (WFD) to prevent or limit any potential impact on water quality.

There will be no petroleum hydrocarbon-based fuels used during the operational phase and the main operating system for heating will be gas based / air to water heat pump, thereby removing any potential contaminant sources associated with fuels.

There will be no discharges to ground from drainage and only rainfall on public open spaces will infiltrate to ground.

All drainage from paved areas along roads and impermeable roads will be collected and managed within the surface water drainage and SuDS solutions as outlined in the Infrastructure Report (Roger Mullarkey & Associates, 2024).

The surface water management strategy includes a number of measures that will capture any potentially contaminating compounds (petroleum hydrocarbons, metals, and suspended sediments) in surface water runoff from the higher risk areas including roads and the impermeable areas that could potentially otherwise discharge to groundwater or receiving water courses in the vicinity the site. The measures incorporated in the SuDS design include, filter drains, permeable paving, swales, silt-trap/catchpit manholes, tree pits, green roofing, bio-retention, attenuation storage and class1 petrol interceptors within the drainage and SuDS

system. The filter drains, permeable paving, swales, silt-trap/catchpit manholes, tree pits, green roofing, bio-retention, attenuation storage will be effective in the treatment and removal of any contaminants (metals, polycyclic aromatic hydrocarbons (PAHs) and suspended solids) entrained in surface water runoff. The effectiveness of these SuDS measures is documented in TII guidance (TII, 2014). Furthermore, prior to discharging from the site will pass through a class 1 petrol interceptor that will be effective in removal of hydrocarbons that may enter the drainage system in particular in the event of worst-case scenario spill incident (e.g., collision on the roadway resulting in the loss of fuel form a vehicle).

Ongoing regular operational monitoring and maintenance of drainage and the SuDS measures will be incorporated into the overall management strategy for the Proposed Development. This will ensure that there are no impacts on water quality and quantity (flow regime) during the Operational Phase of the Proposed Development.

Accordingly, any potential impact on receiving surface water and groundwater beneath the Proposed Development site will be avoided taking account of the design proposals. Therefore, it is considered that the water quality protection criteria and objectives of the GDSDS and Water Framework Directive will be achieved.

There is no other requirement for mitigation measures for the Operational Phase of the Proposed Development.

7.6.3 "Worst Case" Scenario

As identified in the Hydrological and Hydrogeological Risk Assessment (Enviroguide, 2024) (Appendix 7-1) submitted with the planning application during the Construction Phase, in a worst-case scenario, such as a fuel spill or accidental unmitigated release of other hazardous compounds occurring, and in the absence of any mitigation measures it is considered that there would be a potential 'negative', 'significant', ' medium term' impact on the quality of a localised zone of the aquifer.

During the Operational Phase, in the event of the worst-case source scenario (i.e., accidental release of fuel) with unmitigated discharge of potentially contaminated surface water runoff it is considered that there would be a localised 'negative', 'significant', 'short term' impact on the quality of the receiving roadside drainage channel on Glenamuck Road, the Glenamuck North Stream and potentially within the Carrickmines Stream locally within the vicinity of the point of discharge to the Carrickmines Stream (Enviroguide, 2024).

However, these worst-case scenarios are deemed to be unlikely scenarios taking account of the embedded design avoidance measures and mitigation measures.

7.7 Residual Impacts

Residual Impacts are defined as 'effects that are predicted to remain after all assessments and mitigation measures'. They are the remaining 'environmental costs' of a project and are the final or intended effects of a development after mitigation measures have been applied to avoid or reduce adverse impacts.

The predicted impacts of the construction phase and operational phase of the Proposed Development are described in Table 7-10 in terms of quality, significance, extent, likelihood,

and duration. The relevant mitigation measures are detailed, and the residual impacts are determined which take account of the avoidance, remedial and mitigation measures.

There are no significant residual impacts on hydrology and hydrogeology anticipated regarding this Proposed Development.

There will be no impact to the existing WFD Status of water bodies associated with the Proposed Development including the Glenamuck North Stream, the Carrickmines Stream, the Shanganagh River, Southwestern Irish Sea – Killiney Bay and the Wicklow GWB as a result of the Proposed Development taking account of design avoidance and mitigation measures where required.

Table 7-10. Summary of Residual Impacts

Activity	Attribute	Predicted Impact	Quality	Significance	Duration	Type	Mitigation	Residual Impact
Construction Phase								
Groundworks And Management of Water.	Hydrogeological Regime	Localised temporary impacts within the site only on hydrogeological regime.	Negative	Imperceptible	Temporary	Direct	None Required.	Imperceptible
Use of Cementitious Materials.	Water Quality	Potential release of cementitious material during the construction of foundations, pavements, and other structures.	Negative	Significant	Medium Term	Direct	The design will incorporate the use of pre-cast concrete structures where appropriate. The Contractor will carry out works in accordance with industry standards.	Imperceptible
Surface Runoff Containing Contaminants or Suspended Solids.	Surface Water	Potential for contaminants entrained in surface runoff to enter the receiving drainage channels on lands adjoining the Proposed Development Site.	Negative	Slight to Moderate	Short term	Direct/Indirect	Site works will be managed to prevent runoff migrating offsite. Wheel wash facilities will be used to prevent tracking of debris to haul routes that may runoff to water courses.	Imperceptible
Accidental Release of Deleterious Materials Including Fuel and Other Materials	Groundwater / Surface Water	Potential to impact on a localised zone of the aquifer. It is deemed unlikely to impact on receiving surface water bodies.	Negative	Moderate Significant	Long Term	Direct	Refuelling of plant during the Construction Phase will only be carried in a designated impermeable area onsite equipped with spillage kits.	Imperceptible

Activity	Attribute	Predicted Impact	Quality	Significance	Duration	Type	Mitigation	Residual Impact
Being Used Onsite.							Any other diesel, fuel or hydraulic oils stored onsite or within fuel containing equipment will be stored in bunded storage tanks / drip trays.	
Construction of Foul Drainage and Connection to Live Sewers	Groundwater	The release of foul water during connection to the live sewers could result in a release of contaminants to ground or as overland runoff.	Negative	Moderate	Short Term	Direct	Foul water drainage infrastructure will be designed and constructed in accordance with current guidelines. Procedures will be in place for the connection to prevent any accidental release during works.	Imperceptible
Earthworks – Removal of Surplus Material and Waste	Water Quality	Potential for impact on water environment at destination site/facility.	Negative	Slight to Moderate	Medium-Term	In-direct	All surplus material and waste material will be removed offsite in accordance with detailed procedures in strict accordance with all waste management legislation and the procedures outlined in the CEMP/RWMP.	Imperceptible
Construction Activities	Water Quality / WFD Status	Potential for impact on Wicklow GWB within a localised zone in the event of a worst-case scenario occurring.	Negative	Significant	Medium Term	Direct / Worst Case	Appropriate mitigation measures to prevent the worst-case scenario occurring	Imperceptible

Activity	Attribute	Predicted Impact	Quality	Significance	Duration	Type	Mitigation	Residual Impact
							will be implemented by the Contractor.	
Operational Phase								
Modification of the Surface Cover	Hydrogeological Regime	Potential for localised variations in recharge potential however, taking account of the nature of the aquifer and limited capacity to accept recharge a localised impact only may occur.	Negative	Imperceptible	Long Term	Direct	None Required.	Imperceptible
Surface Water Drainage / Proposed Development	Flood Risk	The Site-Specific FRA identified that there is no risk of flood associated with the Proposed Development.	Neutral	Imperceptible	Long Term	Direct	None Required. Ongoing maintenance of the SUDS and drainage network will be undertaken.	Imperceptible
Surface Drainage	Water Quality	Potential for impact on the receiving water quality associated with the discharge of surface water runoff from Catchment 1 and Catchment 3 to the Glenamuck North Stream.	Negative	Significant	Short Term	Direct (also Cumulative)	The surface water management strategy includes a number of measures that will capture any potentially contaminating compounds (petroleum hydrocarbons, metals, and suspended sediments) in surface water runoff from the Proposed Development. Ongoing maintenance of the SUDS and drainage network will be undertaken.	Imperceptible

Activity	Attribute	Predicted Impact	Quality	Significance	Duration	Type	Mitigation	Residual Impact
Surface Drainage	Water Quality	The discharge of surface water from Catchment 2 and Catchment 4, and eventually Catchment 1, to the mains drainage network for the GDRS will not result in any impact on the receiving water quality.	Neutral	Imperceptible	Long Term	Direct (also Cumulative)	None Required.	Neutral
Foul Drainage	Water Quality	The discharge of foul water from the Proposed Development to the mains foul network under the appropriate consents from UE will not result in any impact on the receiving water quality.	Neutral	Imperceptible	Long Term	Direct (also Cumulative)	None Required.	Neutral
Surface Drainage / Foul Drainage	WFD Status	In the absence of design and mitigation measures there could be a potential impact, on the receiving water quality and potentially WFD Status of the Carrickmines Stream.	Negative	Significant	Short Term	Direct	The surface water management strategy includes a number of measures that will capture any potentially contaminating compounds (petroleum hydrocarbons, metals, and suspended sediments) in surface water runoff from the Proposed Development. Ongoing maintenance of the SUDS and drainage network will be undertaken.	Imperceptible

7.8 Monitoring

7.8.1 Construction Phase

During the construction phase of the Proposed Development the following monitoring measures will be considered:

- Inspections will be undertaken during excavations and other groundworks to ensure that measures that are protective of water quality outlined in this EIAR, the CMP (Atkins Ireland Limited, 2024) and the CEMP (Enviroguide, 2024) are fully implemented and effective.
- Discharges to surface water / foul sewers will be monitored where required in accordance with statutory consents (i.e., discharge licence).
- Routine monitoring and inspections during refuelling, concrete works to ensure no impacts and compliance with avoidance, remedial and mitigation measures.

7.8.2 Operational Phase

Ongoing regular operational monitoring and maintenance of drainage and the SuDS measures will be undertaken throughout the lifetime of the operational phase of the Proposed Development.

7.9 Interactions

7.9.1 Population and Human Health

An assessment of the potential impacts of the Proposed Development on human health is included in Chapter 4 of this EIAR.

No public health issues associated with the water (hydrology and hydrogeology) conditions at the site have been identified for the construction phase or operational phase of the Proposed Development.

Appropriate industry standard and health and safety legislative requirements will be implemented during the construction phase that will be protective of site workers.

7.9.2 Biodiversity

An assessment of the potential impacts of the Proposed Development on the biodiversity of the Site, with emphasis on habitats, flora and fauna which may be impacted as is included in Chapter 5 of this EIAR such as potential pollution of waterbodies impacting on flora and fauna in the absence of mitigation measures.

Chapter 5 addresses the impact of the Proposed Development on habitats and species, particularly those protected by national and international legislation or considered to be of particular conservation importance and proposes measures for the mitigation of these impacts.

7.9.3 Land, Soils and Geology

An assessment of the potential impact of the Proposed Development on the existing land, soils and geological environment during the construction phase and operational phase of the Proposed Development is set out in Chapter 6 of this EIAR. In the absence of avoidance and mitigation measures, there is a potential for sediments from excavated soils entering the drainage network and tracking downstream during the construction phase.

7.9.4 Material Assets

An assessment of the potential impact on the Proposed Development on the material assets including built services and infrastructure has been set out in Chapter 12 of this EIAR.

During the construction phase of the Proposed Development discharge of water will be accordance with the necessary discharge licences issued by UE under Section 16 of the Local Government (Water Pollution) Acts and Regulations for any water discharges to sewer or from Kildare County Council under Section 4 of the Local Government (Water Pollution) Act 1977, as amended in 1990 for discharges to surface water.

During the construction phase of the Proposed Development, any connection of welfare facilities to the public foul drainage network will be undertaken in accordance with the necessary temporary discharge licences issued by UE.

During the operational phase of the Proposed Development, any discharge to the public foul sewer and water supply will be under consent from UE.

7.10 Difficulties Encountered When Compiling

No difficulties were encountered in the preparation of this chapter of the EIAR.

7.11 References

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