7.0 WATER

7.1 Introduction

This chapter addresses the magnitude of potential impacts to, and the significance of effects on, surface water and/or the groundwater receptors from the Carmanhall Road Strategic Housing Development (the 'Proposed Development') on lands located at the former Avid Technology International site on Carmanhall Road, Sandyford Industrial Estate, Dublin 18, (the 'Site' / 'Application Site'). It considers groundwater levels, flow regime, and quality; and surface water flows, quality and flood risk. The potential for changes in the water environment to impact any water dependent habitat receptors is considered in the ecology chapter (Chapter 5).

The chapter has been prepared by Anna Goodwin who has 16 years of experience and holds an MSc in Geology and an MSc in Hydrogeology and Steve Mustow who has 30 years of experience and holds an MSc in Aquatic Resource Management and a PhD in Biology.

7.1.1 Technical Scope

The technical scope of this assessment is to consider the potential impacts and effects of the Proposed Development on the water environment (including water resources and flood risk). The assessment considers the potential sources of change resulting from the Proposed Development activities as detailed in the project description on hydrological (surface water) receptors and hydrogeological (groundwater) receptors.

The assessment also considers the potential effects on land, people (including health) and infrastructure as a result of any predicted changes in flood risk. It is supported by the Flood Risk Assessment (AECOM Ireland Ltd, 2021b), and drainage design. Key baseline information about flood risk is presented in this chapter and the FRA has been used to determine the predicted magnitude of effects for this EIA. The assessment does not address the design requirements associated with managing effective water supply to, and wastewater discharge from, the Proposed Development.

This chapter also addresses the potential secondary effects of changes in land quality on water quality. As such, it draws on the assessment presented in Chapter 6 (Land, Soils and Geology). Secondary effects on ecology or biodiversity as a result of changes in water quality are considered in Chapter 5 (Ecology and Biodiversity).

7.1.2 Geographical and Temporal Scope

The geographical study area for the assessment covers the Proposed Development area (as identified in Figure 7.1 and a buffer zone that extends to 1 km from the development boundary. This study area allows for the identification of nearby off-site water features that may be affected by changes associated with the Proposed Development.

The temporal scope of the assessment covers the construction and after-use project phases. A decommissioning phase for the Proposed Development has not been considered due to the 'permanent' nature of the development. When it is demolished, it is assumed that the legislation, guidance and good practice at that time would be followed and the effects are likely to be similar to the construction effects.

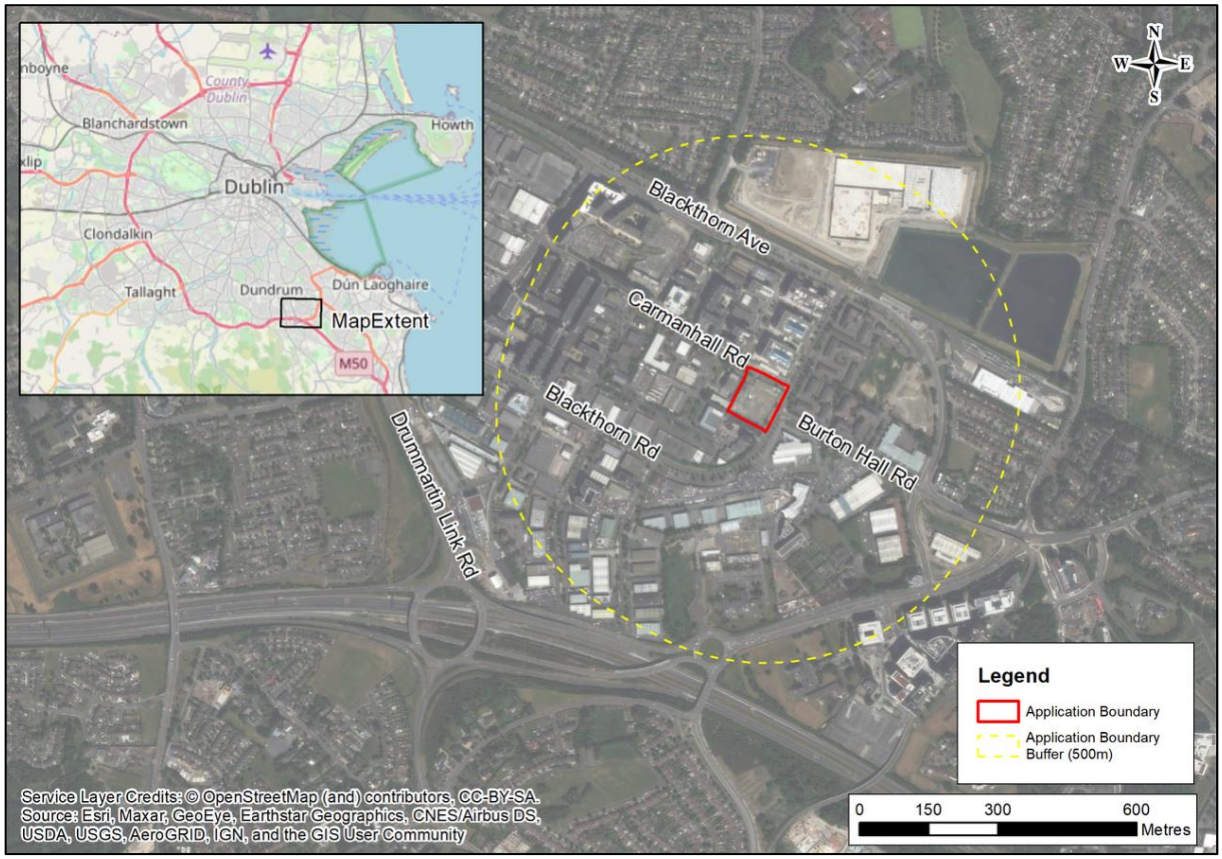

Figure 7.1: Location of the Proposed Development.

7.2 Legislative and Policy Context

This section describes the legislation and guidance that has been considered when preparing this chapter, and key policy context relevant to water that has guided the focus of the assessment. The overarching EIA legislation under which this assessment is required is addressed separately in Chapter 2.

7.2.1 Legislation and Guidance

In addition to the Regulations that underpin the EIA process (see Chapter 2), this assessment has been made with cognisance to relevant guidance, advice and legislation relating to the water environment, which have been used to steer the focus of the baseline information collection, the categorisation of receptor sensitivities, and the mitigation measures that have been included.

- Local Government (Water Pollution) Act 1977 (as amended) and associated Statutory Instrument Regulations made under that Act outlines the general prohibition of entry of polluting matter to water, the requirement to licence both trade and sewage effluent discharges, licencing of water abstractions, controlling discharges to aquifers, and notification of accidental damages.
- The European Union (EU) Water Framework Directive (WFD) (2000/60/EC) is the European legislation that establishes a framework for the protection of groundwater and surface water, including the establishment of river basin district, the requirement to prevent further deterioration by preventing or limiting inputs of pollutants, reducing the pollution and promoting sustainable water use. The Groundwater Daughter Directive (GWDD) (2006/118/EC) sits beneath the WFD and relates to water protection and management. It establishes measures to prevent and control groundwater pollution, including criteria for assessing good chemical status and identifying trends.

- The WFD and GWDD have been transposed into Irish law through many Regulations. These Regulations cover governance, the shape of the WFD characterisation, monitoring and status assessment programmes in terms of assigning responsibilities for the monitoring of different water categories, determining the quality elements and undertaking the characterisation and classification assessments. They include, but are not limited to, the following:
  - European Communities (Water Policy) Regulations 2003 and its subsequent amendments;
  - European Communities Environmental Objectives (Surface Waters) Regulations, 2009 and its subsequent amendments;
  - European Communities Environmental Objectives (Groundwater) Regulations, 2010 and its subsequent amendments; and
  - European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations 2011.
- The EU Directive on the Assessment and Management of Flood Risks (2007/60/EC) is transposed into Irish law by the European Communities (Assessment and Management of Flood Risks) Regulations 2010 and its subsequent amendment. The aim of the legislation is to reduce the adverse consequences of flooding on human health and the environment and to outline the requirements for flood risk assessments to be completed as part of the planning process.

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

- Institute of Geologists of Ireland. Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (April 2013).
- The EPA Advice Notes for Preparing Environmental Impact Statements (Draft, September 2015).
- The EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (Draft, August 2017) – which presents key topics of interest, high-level information on the interactions that should be considered in relation to EIA legislation, and overviews on the recommended approach to describing the baseline environment, completing impact assessments, describing effects, and addressing mitigation and monitoring.
- Department of Housing, Planning and Local Government. Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018).
- Gov.uk online guidance, Guidance on Land Contamination Risk Management (LCRM). Available at https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks. Uses a tiered approach to risk assessment, including preliminary risk assessment, generic quantitative risk assessment and detailed quantitative risk assessment.
- The National Roads Authority Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (undated) in relation to aspects to be considered and assessment approach (including relative receptor importance and cross discipline interactions).
- The National Roads Authority Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan (undated) in relation to impact mitigation.
- CIRIA C532: Control of water pollution from construction sites. Guidance for consultants and contractors (2001).

- CIRIA C741: Environmental Good Practice on Site (2015, Fourth Edition) in relation to source of impact and mitigation.
- CIRIA C750: Groundwater control – design and practice (2016, Second Edition).
- Scottish and Northern Irish Pollution Prevention Guidelines (PPGs) and Guidance for Pollution Prevention (GPPs) – these, although not Irish guidance, provide environmental good practice guidance for activities such as oil and chemical storage, works in or near water, works on construction sites, and dealing with spills and pollution incidents.

7.2.2 Policy

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

The current local plan is the **Dún Laoghaire-Rathdown Development Plan 2016 to 2022**. A review of this was initiated in January 2020 covering 2022 to 2028. The Draft Plan 2022 – 2028 is on public display online from January 12th, 2021 to April 16th 2021. Under the principles of development within the plan, ongoing development of the County is undertaken in such a way as to not compromise the quality of surface water (and associated habitats and species) and groundwater. Developments shall not give rise to the pollution of ground or surface waters both during construction and subsequent operation.

Specific policies relating to the protection of the water environment and management of surface water in the 2016 to 2022 plan include the following:

- Policy El3: Surface Water Drainage and Appropriate Assessment – The Council requires that a Sustainable Drainage System (SuDS) is applied to any development and that site specific solutions to surface water drainage systems are developed, which meet the requirements of the Water Framework Directive and the associated River Basin Management Plans and 'Water Quality in Ireland 2007-2009' or any updated version of the document.
- Policy El4: Groundwater Protection and Appropriate Assessment – The Council will ensure the protection of the groundwater resources in and around the County and associated habitats and species in accordance with the Groundwater Directive 2006/118/EC and the European Communities Environmental Objectives (Groundwater) Regulations, 2010. In this regard, the Council will support the implementation of Irish Water's Water Safety Plans to protect sources of public water supply and their contributing catchment.
- Policy EI8: SuDS – The Council will ensure that all development proposals incorporate SuDS. Development will only be permitted where the Council is satisfied that suitable measures have been considered that balance the impact of drainage through the achievement of control of run-off quantity and quality.
- Policy EI22: Water Pollution – The Council will implement the provisions of water pollution abatement measures in accordance with National and EU Directives and other legislative requirements in conjunction with other agencies as appropriate. This includes 1) endeavouring to improve the water quality in rivers and other watercourses in the County, including ground waters and 2) minimising the impact on groundwater of discharges from septic tanks and other potentially polluting sources.
- Policy CC15: Flood Risk Management – The Council will support the implementation of the EU Flood Risk Directive (2007/60/EC) on the assessment and management of flood risks, the Flood Risk Regulations (SI No 122 of 2010) and the Department of the Environment, Heritage and Local Government and the Office of Public Works Guidelines on 'The Planning System and Flood Risk Management, (2009)' and relevant

outputs of the Eastern District Catchment and Flood Risk Assessment and Management Study (ECFRAMS Study).

In addition, under the principles of development, the planning authority will require adequate and appropriate investigations to be carried out into the nature and extent of any groundwater contamination and the risks associated with site development work where brownfield development is proposed.

Within the Strategic Environmental Assessment report that is part of the 2016 to 2022 County Development Plan, Strategic Environmental Objectives (SEO) W1 and W2 relate to maintaining and improving where possible, the quality and status of surface waters, and preventing groundwater pollution.

The **Sandyford Urban Framework Plan** was adopted as Appendix No. 15 to the County Development Plan. Under that, the key objectives relating to water are as follows:

- SWD1 - It is an objective of the Council to ensure that stormwater management and SuDS, including a requirement to undertake Stormwater Audits, shall form part of the pre-planning stage of any application.
- SWD2 - It is an objective of the Council to ensure that SuDS measures shall be fully implemented on all sites to Greenfield runoff rates. In this regard solutions other than tanking systems shall be required for all developments. For larger applications green roofs shall be used in accordance with the Dún Laoghaire-Rathdown County Council's Green Roofs Guidance Document.
- FD10 - It is an objective of the Council to support Irish Water to ensure that detailed hydraulic analyses of the foul sewer network, between housing and commercial developments within the Sandyford Business District and the nearest significant trunk sewers, be completed by future applicants. Where capacity issues are identified localised upgrade works will be required in order to facilitate the development.

7.3 Assessment Methodology and Significance Criteria

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

7.3.1 Qualitative Assessment Method

The assessment of potential effects has been undertaken using the qualitative assessment method outlined below. The assessment is supported by the baseline condition information, the Proposed Development design, the preliminary Construction Management Plan (pCMP), Construction Environmental Management Plan (CEMP), Flood Risk Assessment (FRA), and drainage design. It follows a staged approach. A summary of the stages involved is included below:

1) Confirm baseline conditions – determine baseline and develop conceptual site model by consideration of available records and data sets, site reports and published information.

2) Confirm the key receptors and their value/importance.

3) Qualitatively characterise the magnitude of impacts on the receptors – describe what potential changes could occur to each receptor as a result of the Proposed Development, identify source-pathway receptor linkages, and assign the magnitudes of impact. This stage takes into account embedded design mitigation, good practice in construction environment management and pollution prevention.

4) Determine the initial effect significance of each potential impact on each sensitive receptor.

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

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

Stages 1 and 2 have been completed using published literature and guidance and available information specific to the Proposed Development, which is presented in Chapter 3. For the identification of receptor value/importance that completes Stage 2, and for the description of impact magnitude (Stage 3), a common framework of assessment criteria and terminology has been used based on the EPA's draft Guidelines on the Information to be Contained in EIARs (EPA, 2017)[1], with some modifications made to increase clarity. The descriptions for value (sensitivity) of receptors are provided in Table 7.1 and the descriptions for magnitude of impact are provided in Table 7.2.

The potential for an impact to occur at a receptor has been determined using the understanding of the baseline environment and its properties and consideration of whether there is a feasible linkage between a source of impact and each receptor (i.e. a conceptual site model). This follows the method of preliminary risk assessment that is widely presented in some of the guidance documents listed in Section 7.2.

Table 7.1: Environmental value (sensitivity) and descriptions.

Value (sensitivity) of receptor / resource	Typical description
High	High importance and rarity, national scale, and limited potential for substitution. For example: Global/European/National designation - or supports an internationally important feature. Human health receptors. Regionally important aquifer with multiple wellfields. Inner source protection area for a regional resource. Regionally important potable water source supplying >2500 homes (surface water or aquifer). Flood plain protecting more than 50 residential or commercial properties from flooding.
Medium	Medium or high importance and rarity, regional scale, limited potential for substitution. For example: Regionally important sites. Regionally important aquifer. Outer source protection area for a regional resource. Locally important potable water source supplying >1000 homes (surface water or aquifer). Flood plain protecting between 5 and 50 residential or commercial properties from flooding.
Low	Low or medium importance and rarity, local scale. For example: Locally important aquifer. Outer source protection area for a local resource. Local potable water source supplying >50 homes (surface water or aquifer).

[1] Environmental Protection Agency (2017) Guidelines on the information to be contained in Environmental Impact Assessment Reports, Draft, August 2017

Value (sensitivity) of receptor / resource	Typical description
	Flood plain protecting between 1 and 5 residential or commercial properties from flooding.
Negligible	Very low importance and rarity, local scale. Environmental equilibrium is stable and is resilient to impacts that are greater than natural fluctuations, without detriment to its present character. Poorly productive aquifer. Local potable water source supplying <50 homes (surface water or aquifer). Flood plain protecting 1 residential or commercial properties from flooding.

Table 7.2: Magnitude of impact and typical descriptions.

Magnitude of impact (change)		Typical description
High	Adverse	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. Significant harm to human health - death, disease, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. Significant harm to buildings/infrastructure/plant - Structural failure, substantial damage or substantial interference with any right of occupation. Significant pollution of the water environment, which is defined by: ■ A breach of, or failure to meet, any statutory quality standard for the water environment at an appropriate pollution assessment point. ■ A breach of, or a failure to meet, any operational standard adopted by EPA for the protection of the water environment. ■ Pollution results in an increase in treatment required for an existing drinking water supply. ■ Pollution results in an increase level of treatment required of water abstracted for industrial purposes. ■ Pollution results in deterioration in the status of a water body, failure to meet good status objectives defined by the Water Framework Directive, or failure of a protected drinking water area to meet its objectives as defined by the Water Framework Directive. ■ There is a significant and sustained upwards trend in concentration of pollutants in groundwater being affected by the land in question. There is a material and adverse impact on the economic, social and/or amenity use associated with a particular water environment.
	Beneficial	Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality.

Magnitude of impact (change)		Typical description
Medium	Adverse	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.
	Beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Low	Adverse	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
	Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse	Very minor loss or alteration to one or more characteristics, features or elements.
	Beneficial	Very minor benefit to or positive addition of one or more characteristics, features or elements.

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

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

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

- Temporary – effect likely to last less than 1 year without intervention (i.e. less than the construction phase);
- Short term – effect likely to last 1 to 7 years without intervention;
- Medium term – effect likely to last 7 to 15 years without intervention;
- Long term – effect likely to last 15 to 60 years without intervention; and
- Permanent – effect likely to last over 60 years without intervention.

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

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

7.3.2 Significance Criteria

The approach followed to derive effects significance from receptor value and magnitude of impacts (Stage 4) is shown in Table 7.3. Where Table 7.3 includes two significance categories, reasoning is provided in the text if the lower of the two significance categories is selected. A description of the significance categories used is provided in Table 7.4.

Table 7.3: Significance Matrix

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

Table 7.4: Significance categories and typical descriptions

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

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

Following the assessment of the level of effect significance, mitigation measures are presented that will be used to avoid, prevent or reduce the magnitude of the potential impact (Stage 5). The significance of the effect taking into account the mitigation is then assessed (Stage 6) to give the residual effect significance. Any monitoring that will be required to measure the success of the mitigation is also presented in residual impacts and effects tables in Section 7.7 (Stage 7).

The effects of the Proposed Development are also considered cumulatively with those that could foreseeably result from other known developments in the assessment study area that are going through the planning process (see Chapter 15).

7.4 Baseline Conditions

This section presents baseline information on the water environment (hydrology, hydrogeology and flooding). Information about land use, soils and geology and ground conditions at the Site is included in Chapter 6.

7.4.1 Existing Contamination

Details of previous site investigation work are presented in Chapter 6. The land quality assessment work to date (AECOM, 2020) does not indicate any widespread contamination at the Site. The historical industrial/commercial use of the land might mean that previously unidentified contamination is present. The results of the ground gas monitoring (carbon dioxide, oxygen and methane) showed there was negligible gas and it was concluded in the AECOM report that no safety issues relating to ground gas were identified. No asbestos traces were identified in the soil samples taken.

7.4.2 Groundwater

Regional Hydrogeological Setting Overview

The majority of bedrock aquifers across the Republic of Ireland that are 'regionally important' are Karstified Limestones. Groundwater flow in these rocks is predominantly through fissures and fractures (EPA, 2019). The majority of these aquifers are unconfined.

Two percent of the country is underlain by sand and gravel aquifers. These represent the only aquifers with intergranular permeability, and are generally unconfined. They are typically relatively thin, with a typical saturated thickness of 5 m to 15 m (EPA, 2019).

Water is usually abstracted from these aquifers from pumping wells or boreholes, although water can naturally seep to the surface via springs. Well depths within the bedrock aquifers range between 30 m and 100 m below ground level (bgl). The water abstracted tends to be a composite of water from fractures and conduits throughout the total length of bedrock in the borehole (EPA, 2019).

Local Aquifers and their Properties

The Water Framework Directive Groundwater Body (GWB) over which the Proposed Development is located is the Kilcullen GWB (GSI, 2020). The bedrock is classified as a 'Poor Aquifer' (EPA, 2020). The bedrock aquifer is classified as having 'good' Water Framework Directive groundwater body status (EPA, 2020). There are no mapped gravel aquifers (sensitive groundwater bodies).

Groundwater Vulnerability defines how easily groundwater may be contaminated by human activities. The vulnerability of groundwater is moderate on the west side of the Site and high on the east (EPA, 2020) (Figure 7.2). The change in vulnerability is likely due to a reduction in thickness of soil cover from west to east.

The Site is currently covered in hardstanding, which limits groundwater recharge. The underlying Glacial Till will also limit recharge to the bedrock at depth. Groundwater recharge to the Made Ground is estimated at 83 mm/yr and sub-soil permeability is mapped as low (GSI, 2020).

Two infiltration tests were undertaken at the Site as part of the March 2020 site investigation (AECOM Consulting Engineers, 2020). During these tests there was no fall in the water level, which indicated a very low permeability clay. It was concluded in the AECOM report that the ground was unsuitable for dispersion of storm and surface water and that use of the local authority drainage systems for storm water and surface water disposal was recommended.

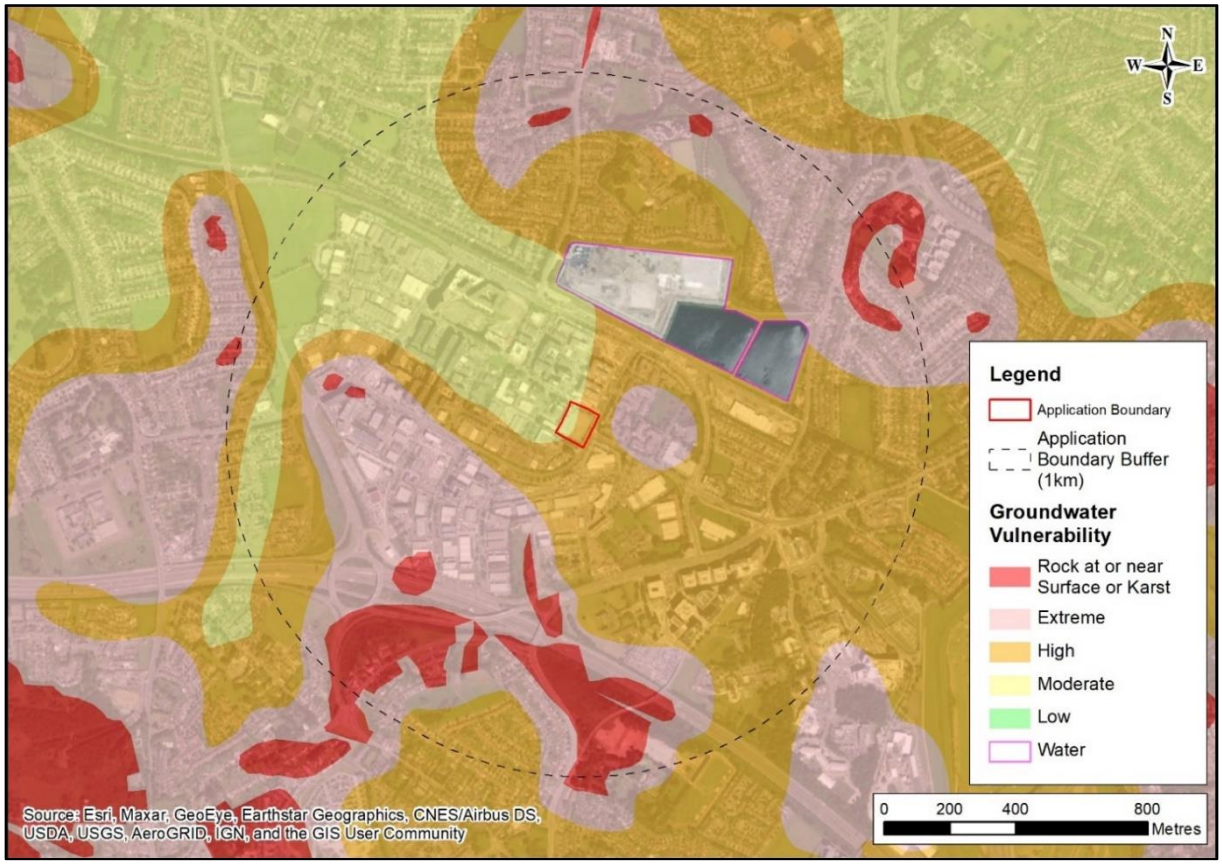

Figure 7.2: Groundwater Vulnerability

Local Groundwater Levels and Flows

Regional groundwater contour mapping suggests elevations around 90 m above Ordnance Datum (m AOD) to 100 m AOD, which is likely to be near ground level (GSI, 2020).

A site investigation was undertaken in March 2020 (AECOM Consulting Engineers, 2020). Intrusive works comprised four cable percussion boreholes of 200 mm diameter (BH01 to BH04) that were located in the corners of the Site, two 78 mm diameter rotary core boreholes (RC02 and RC04), and 12 trial pits (TP01 to TP12). Two infiltration tests, and water level monitoring were also undertaken.

Cable percussion boreholes BH02 and BH04 were dry. Slow to moderate water seepage was noted in borehole BH01 at 3.8 m bgl. Slow to moderate water seepage was noted in borehole BH03 at 3.1 m bgl. Boreholes BH01 and BH03 were installed with slotted pipe for water monitoring within the Glacial Till. Rotary core boreholes RC02 and RC04 were also installed with slotted pipework in the granitic bedrock.

Dips of the depth to groundwater were collected once a month for three months (March, May and June 2020) and the results indicate the depth to groundwater in both the Glacial Till and the granitic bedrock is typically between 2 m bgl and 3 m bgl.

Although there is some groundwater present at shallow depths, the likely low hydraulic conductivity and highly anisotropic nature of the Glacial Till suggests there will be limited potential for lateral groundwater flow in the superficial deposits. Given the geology (see Chapter 6, Section 6.4) and aquifer classification, groundwater may only be in the more weathered bedrock geology nearer the surface. Flow in the weathered zone would be in the top couple of meters and towards rivers or springs (GSI, undated), but regional flow paths do not develop due to low transmissivity values. There may also be deeper bedrock groundwater flow in a fracture network, but flow in isolated fractures only is expected below 30 m.

Local Groundwater Quality

The Site is on the Kilcullen Water Framework Directive (WFD) groundwater body (EPA, 2020). This is designated as 'not at risk' under the WFD. It had good chemical and quantitative status (2013 to 2018). This groundwater body intersects EU designated Special Areas of Conservation (SAC) and Special Protection Area (SPA) habitats.

7.4.3 Surface Water

Surface Water Features and Catchments

The Proposed Development is in the Liffey and Dublin Bay WFD catchment, the Dodder WFD sub-catchment and the Brewery Stream River sub-basin (EPA, 2020).

There are no surface watercourses on site. The Stillorgan Reservoirs are located just over 200 m to the north (Figure 7.3). Carrickmines Stream/Racecourse Stream (Figure 7.3) is located approximately 600 m to the south and appears to be partially culverted under the industrial estate, but is mapped at the surface in an open, vegetated area to the south of the M50 motorway (EPA, 2020). It flows towards the south-east to become Carrickmines River; eventually converging with the Loughlinstown River (North) to the east of the Site (near the N11 road and Loughlinstown) and discharging, as the Shanganah River, into the Irish Sea between Loughlinstown and Shankhill. Racecourse Stream is defined as having moderate waterbody status and is an 'at risk waterbody' under the WFD.

Brewery Stream/Carysfort Maretimo Stream (Figure 7.3) is mapped at the surface approximately 800 m north east of the Site (EPA, 2020). This stream, which is extensively culverted in the area of the Site, originates in the Tree Rock Mountains and flows under the M50 and across the heavily urbanised areas of Sandyford, Leopardstown and Stillorgan before discharging into Dublin Bay/the Irish Sea at Blackrock. There is no WFD status currently assigned to this watercourse.

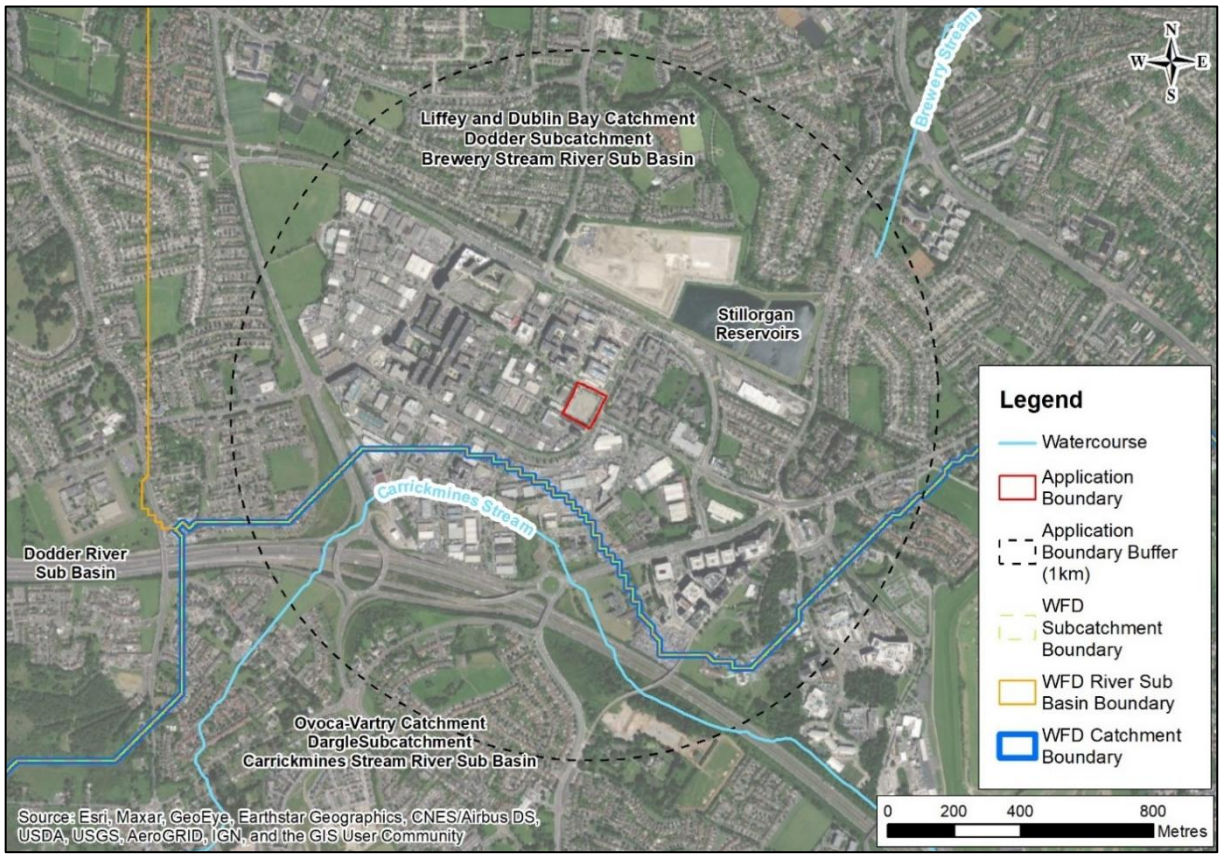

Figure 7.3: Surface Water Features

Existing Flows and Drainage

Details about the existing surface water drainage (AECOM, 2021a) indicate that there is a 450 mm diameter public surface water sewer in Carmanhall Road and a separate 375 mm diameter public surface water sewer in Blackthorn Avenue. The previous development was connected to the junction manhole on Blackthorn Avenue. Both these sewers are expected to discharge to Brewery Stream/Carysfort Maretimo Stream.

There is an existing connection to the 225 mm diameter clay wastewater sewer in Carmanhall Road (AECOM, 2021a). There is also another 225 mm foul sewer in Blackthorn Avenue (AECOM, 2021a).

Foul discharge from the Proposed Development is ultimately expected to drain to Ringsend wastewater treatment plant (WWTP) prior to discharge to Dublin Bay at Poolbeg. In April 2019 Irish Water was granted planning permission for an upgrade to the Ringsend facility[2]. This will see improved treatment standards and will increase network capacity by 50%, with a target completion date of 2023, which will be in time to address additional loading from the Proposed Development.

Flooding

The Site is not mapped as at risk of flooding from rivers or the coast (Office of Public Works, 2020) and is classed as being at low flood risk (Flood Zone C) (AECOM, 2021b).There are localised areas of low to medium risk from river (fluvial) flooding to the east of the Site, including an area of low flood probability mapped along Blackthorn Road along the eastern boundary of the Site (Flood Zone B) (Figure 7.4).

Figure 7.4: Present Day Scenario and Modelled Future Scenarios of the 1:1000 Year Fluvial Flood Event – all predict the same flood extent (available on floodinfo.ie, reproduced from Figure 4.1 of AECOM, 2021b)

Low flood probability covers areas that modelling has shown might be flooded by rivers in a very extreme flood event. Such events have a probability of 1 in 1,000 of occurring in a given year (an annual exceedance probability of 0.1%). This area of fluvial flood mapping is associated with the route of the Carysfort Maretimo Stream, which is culverted in the area of the Site.

[2] https://www.water-technology.net/projects/ringsend-wastewater-treatment-plant-upgrade-project/

The Flood Risk Assessment (FRA) prepared by AECOM (AECOM, 2021b) notes that available future scenario models including climate change allowances, do not predict an increase in flood extent onto the Site, i.e., the Site remains in Flood Zone C which is most preferable for residential developments. The FRA also reports that from a review of the topography of Blackthorn Road, the gradient slopes away from the Site, reducing the potential impact to the Site from the 1:1000 year fluvial flood event.

There are no historic records of flooding in the immediate vicinity of the Site (AECOM 2021b).

7.4.4 Regulated Discharges and Emissions

There are no wastewater treatment plants or emission points on Site or in the study area. The Site is in the Ringsend WWTP catchment area. There are no Section 4 discharges to water located within the study area (EPA, 2020).

7.4.5 Water Users

The Site is not in a Group Scheme and Public Supply Source protection area. There is only one well or spring mapped within 2 km (GSI, 2020), but the available mapping does not provide an exhaustive dataset (Figure 7.5). That borehole is located over 1.7 km northeast of the Site. It was drilled in 1997 to 85.3 m depth. The purpose of the borehole is not specified, but there is no abstraction rate recorded, so it could be a monitoring well. It is understood that properties in the area, and the previous development at the Site, have mains water supplies. Private water supplies could be present, but the poor aquifer potential limits the likelihood.

Previous development at the Site was connected to mains water and there are no known supply wells on Site. There is a 355.6 mm asbestos cement watermain in Carmanhall Road and 152.4 mm asbestos cement watermains in both Carmanhall Road and Blackthorn Avenue. The Site was connected to the 152.4 mm diameter watermain in Blackthorn Avenue by a 101.6 mm connection (AECOM, 2021a).

Figure 7.5: GSI Well / Spring Location

7.4.6 Designated Sites

There are no international designated sites at, or within 2 km of, the Proposed Development. There is a proposed national designated Natural Heritage Area (Fitzsimon's Wood) located approximately 1.6 km to the south west (Figure 7.6). Parts of Dublin Bay (between approximately 3.5 km and 9 km north) are designated SACs for their habitats (North Dublin Bay SAC and South Dublin Bay SAC), SPAs for various bird species (South Dublin Bay and River Tolka Estuary SPA, and North Bull Island SPA), and as a Nature Reserve (North Bull Island Nature Reserve) (Figure 7.7).

Part of the near-shore water (about 1.5 km off the coast of where the Shanganah River discharges into the sea, and 8 km east of the Site) is designated as the Rockabill to Dalkey Island SAC (Figure 7.7). These coastal designated sites have the potential to be hydraulically linked to the Proposed Development by the surface watercourses, or by discharges of waste water via the Ringsend WWTP.

The Wicklow Mountains SAC and SPA are located approximately 6.5 km to the south west (Figure 7.7). These are upstream of the Proposed Development and at a distance where the potential for impacts can be excluded from this assessment.

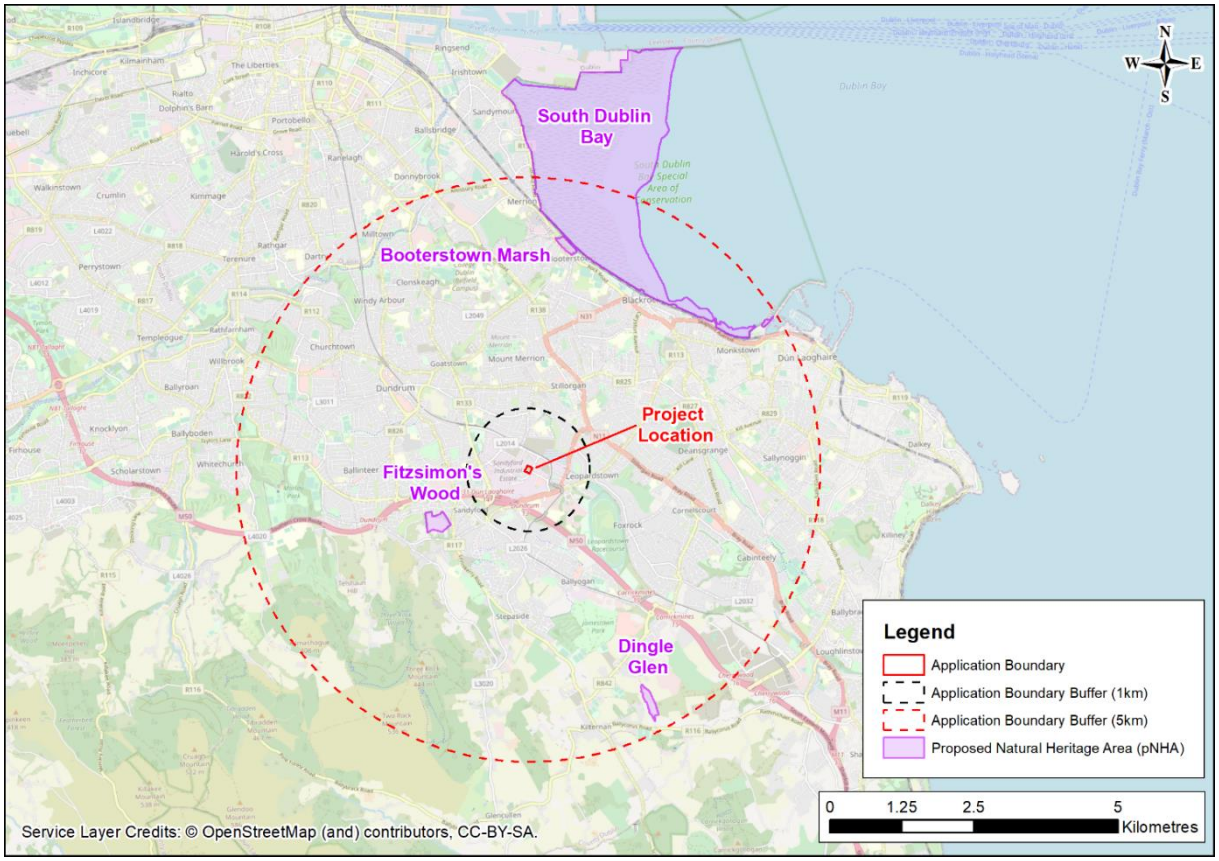

Figure 7.6: Location of Natural Heritage Areas and proposed National Heritage Areas

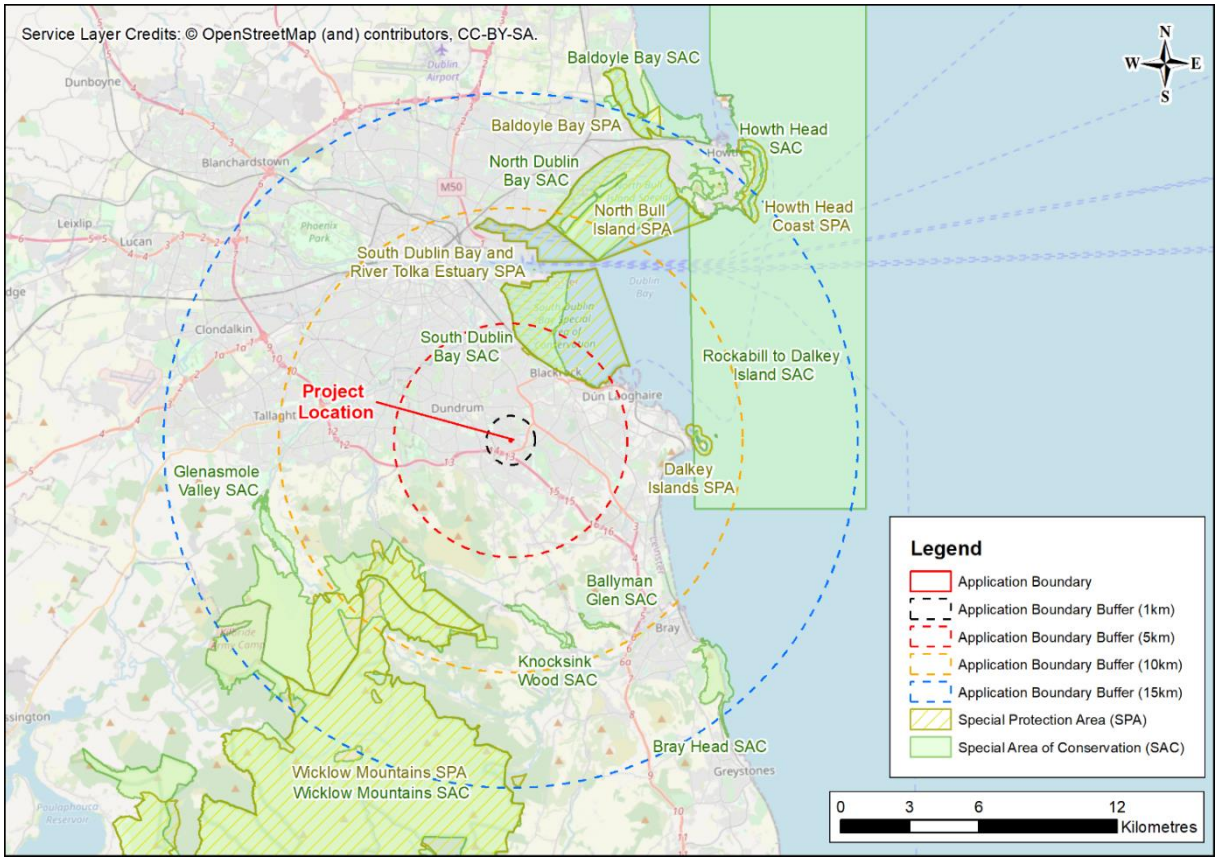

Figure 7.7: Location of Special Areas of Conservation and Special Protection Areas

7.4.7 Commentary on the Future Baseline and Climate Trends

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

Current climate trends indicate a potential increase in annual rainfall in northern and western areas of Ireland and decreases or small increases in the south and east (EPA, 2005).

Predictions associated with future climate change indicate that the future baseline might involve warmer average summer and winter temperatures, higher sea levels, and changes in rainfall patterns, volume and intensity. The Proposed Development is unlikely to be directly affected by sea level change. However, changes in rainfall patterns could alter run-off and discharge patterns, groundwater recharge, the mobilisation of suspended solids and flooding.

However, as noted in Section 7.3 above, the Flood Risk Assessment notes that available future scenario models including climate change allowances, do not predict an increase in flood extent onto the Site.

Longer drier periods combined with higher temperatures could lead to increased potential for drought that could also affect future water resource availability, and changes in population (specifically increases) could result in more demand on water resources and water shortages in summer months. Changes in future water resource availability and demand could increase the relative importance of groundwater and surface water that either currently, or could in the future, provide water supplies.

7.4.8 Information Gaps

At the time of assessment, the following information gaps have been identified with respect to this assessment:

- There is no site-specific information on current groundwater quality.

- There has been no water features survey to confirm the status of wells mapped in the study area, or to identify if there are any surface water users in the study area. For the purposes of this assessment, the information presented in the section on water users (Section 7.4.5) has been used in the receptor selection process.

7.4.9 Selection of Sensitive Receptors

Taking account of the above and the receptor classification method described in Section 7.3, the receptors carried forward in this assessment and their assigned importance are presented in Table 7.5.

Table 7.5: Water Receptors

Receptor	Importance and Reasoning
Groundwater – unlikely currently used for supply and limited future resource potential. Quality and availability due to regulatory requirement to maintain good quality status.	Negligible (local importance poorly productive aquifer)
Surface water – quality and availability due to regulatory requirement to maintain quality status. Surface water features that could feasibly be connected to the Proposed Development by sewers/waste water drainage and discharge (specifically the Dublin Bay SACs and SPAs).	High (no known supplies, connection to internationally designated sites)
Flooding – Changes in surface water flows on on-site plant and infrastructure (during construction and during after-use).	Negligible (local importance, not in flood risk area)
Flooding - Changes in surface water flows on infrastructure immediately adjacent and downstream of the Proposed Development.	Negligible (local importance, not in flood risk area)
Humans/Human Health (existing water users – water availability and quality).	High (human receptor)

With regard to existing water users, the likelihood of groundwater use for supply is very low due to the nature of the aquifers in the area, the predominance of mains water supply, and because only one borehole located over 1.5 km from the Site has been identified as part of the baseline work. However, there are data gaps around the use of the borehole, if there are other unidentified boreholes in the area, and if surface water is used as a source of supply. Therefore, it has been assumed that groundwater and/or surface water could be used as a local resource in the project area.

Where it is possible the impacts to the water environment study area could also impact ecological receptors (e.g. downstream designated sites that could have some water dependence – either on water quality or flows - for their qualifying species/habitats) this has been discussed in Section 5.16 of Chapter 5, (Ecology and Biodiversity).

7.5 Characteristics of the Proposed Development

7.5.1 Proposed Development Plans

Construction of the Proposed Development is expected to last for approximately 24 months. The operational phase of the Proposed Development will follow and will be a ‘permanent’ duration (lasting greater than sixty years). A decommissioning phase for the Proposed Development has not been considered due to the ‘permanent’ nature of the development.

The Proposed Development will comprise of:

(i) construction of a Build-To-Rent residential development within a new part six, part eight, part nine, part eleven storey rising to a landmark seventeen storey over basement level apartment building (40,814sq.m) comprising 428 no. apartments (41 no. studio, 285 no. one-bedroom, 94 no. two-bedroom & 8 no. three-bedroom units) of which 413 no. apartments have access to private amenity space, in the form of a balcony or lawn/terrace, and 15 no. apartments have access to a shared private roof terrace (142sq.m) at ninth floor level;

(ii) all apartments have access to 2,600sq.m of communal amenity space, spread over a courtyard at first floor level and roof terraces at sixth, eighth and ninth floor levels, a 142sq.m resident's childcare facility at ground floor level, 392sq.m of resident's amenities, including concierge/meeting rooms, office/co-working space at ground floor level and a meeting/games room at first floor level, and 696sq.m of resident's amenities/community infrastructure inclusive of cinema, gym, yoga studio, laundry and café/lounge at ground floor level. The café/lounge will primarily serve the residents of the development and will be open for community use on a weekly/sessional basis;

(iii) provision of 145 no. vehicular parking spaces (including 8 no. mobility parking spaces, 2 no. club-car spaces and 44 no. electric charging spaces), 5 no. motorcycle parking spaces, bin stores, plant rooms, switch room and 2 no. ESB sub-stations all at ground floor level; provision of bicycle parking (752 no. spaces), plant and storage at basement level; permission is also sought for the removal of the existing vehicular entrance and construction of a replacement vehicular entrance in the north-western corner of the site off Carmanhall Road;

(iv) provision of improvements to street frontages to adjoining public realm of Carmanhall Road & Blackthorn Road comprising an upgraded pedestrian footpath, new cycling infrastructure, an increased quantum of landscaping and street-planting, new street furniture inclusive of bins, benches and cycle parking facilities and the upgrading of the existing Carmanhall Road & Blackthorn Road junction through provision of a new uncontrolled pedestrian crossing; and,

(v) All ancillary works including provision of play equipment, boundary treatments, drainage works - including SuDS drainage, landscaping, lighting, rooftop telecommunications structure and all other associated site services, site infrastructure and site development works. The former Avid Technology International buildings were demolished on foot of Reg. Ref. D16A/0158 which also permitted a part-five rising to eight storey apartment building. The development approved under Reg. Ref. D16A/0158, and a subsequent part-seven rising to nine storey student accommodation development permitted under Reg. Ref. PL06D.303467, will be superseded by the Proposed Development.

The elevation of the floor of the basement will be at 80.3 metres above Ordnance Datum (m AOD). The ground floor will be at 84.5 m AOD and the surrounding land at about 86.3 m AOD. As current ground elevations are typically around 85 m AOD to 86 m AOD, the development of a basement level will involve the excavation of material.

The plant located in the basement will include heating, water tanks, elements of the ventilation system, switch rooms, parts of the fire-fighting systems (i.e. the sprinkler tanks). The water tank(s) will be for attenuation and will hold roof drainage. Some rainfall will be managed by green roofs and watering bioretention/herbaceous planting areas of the Proposed Development, whilst the rest will be managed through the attenuation and surface water drainage system. There are no planned discharges to ground.

It is proposed to discharge surface water from the Proposed Development to the existing 450 mm diameter concrete surface water sewer in Carmanhall Road, via a new connection. It is proposed to decommission the

existing connection in Blackthorn Drive (AECOM, 2021a). All surface water from the Site will discharge to the public network after flowing through the proposed petrol interceptor, where hydrocarbons are removed.

Wastewater drainage is proposed to connect via a new connection to the existing 225 mm diameter clay wastewater sewer in Arkle Road, as instructed by the Confirmation of Feasibility from Irish Water (AECOM 2021a).

It is envisaged that the public footpath outside the northern boundary of the Site will drain to the proposed public landscaping. It is proposed to drain the additional runoff from the widened public footpath and new cycle path that are proposed on the western side of Blackthorn Road to the existing 450 mm diameter surface water sewer via the existing gully network on Carmanhall Road/Blackthorn Road junction. The proposed footpaths within the Development Site will drain to the surface water network via swales.

The operational development will be on mains water supply. The existing site connection will be used to supply the café. It is proposed to supply the residential units using a 150 mm connection to the 355.6 mm watermain in Carmanhall Road.

The Property Management Strategy Report (Aramark, 2021) states that a property management agent will consult and advise on the operational management strategy. A property management agent will manage the estate and common areas on behalf of the landlord, including maintenance, landscaping and waste storage/management. It is intended that the agent will engage the rental community with respect to awareness of environmental and sustainability matters.

7.5.2 Embedded Mitigation

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

- No soil or backfill material is anticipated to be needed to be imported for construction purposes. Materials already on site will be reused where possible. Should any material need to be imported, it will be of a suitable quality that will not lead to ground contamination. Any imported material will come from a suitable source where the quality of the material will have been confirmed prior to acceptance.
- There will be no septic tanks during construction or after-use that could result in leaks to ground and the water environment. Welfare facilities for construction workers will include portable toilets. Waste from these will be disposed of off-site.
- All water required during construction will be taken from the mains and the completed development will be connected to mains water (i.e. there will be no new groundwater or surface water abstractions) and foul sewer. A Pre-Connection Enquiry was submitted to Irish Water (Reference No: CDS20000844) for the Proposed Development and the Confirmation of Feasibility was issued by Irish Water on the 14th August 2020 (AECOM, 2021b).
- There will be no on-site concrete batching.
- There will be a wheel washing system to reduce the deposition of material on the surrounding road network that could get into the water environment.
- There are no planned discharges to ground during construction, which will reduce the potential for impacts to water quality.

- Excavations will be left open and exposed for as little time as possible, which will be used to control sediments in run-off, and reduce the potential for leaving pathways open for contamination between the surface and groundwater.
- Stockpiles will be evaluated and monitored by the main contractor to minimise erosion and input of suspended solids to the water environment.
- Refuelling and the addition of hydraulic oils or lubricants to vehicles or generators will take place on-site using a mobile bowser fuelling plant (i.e. no bulk fuel storage tanks will be used). This will only take place in designated areas. The designated areas will have impermeable surfaces, any fuel/oils that enter the drains will be intercepted, and the refuelling areas will be equipped with easily accessible spills kits that staff have been trained to use. Any flexible pipe, pump, tap or valve will be fitted with a lock and will be secured when not in use. Portable generators or similar fuel containing equipment will be placed on suitable drip trays.
- The Contractor will prepare a Construction Management Plan (CMP) and a Construction Environmental Management Plan (CEMP). Initial versions of these documents, which will be further developed by the Contractor, accompany this EIAR. The CMP and CEMP will set out how the construction of the Proposed Development will be managed. The CMP/CEMP are living documents and will go through iterations before works commence and during the works. The CMP/CEMP will include widely used good practice measures to avoid or reduce the potential impact of construction works on workers, members of the public and the environment. For the protection of the water environment, these will include, but not be limited to, the following:
  - All construction works will be conducted in accordance with the appropriate site rules.
  - Hazardous materials will be labelled clearly, transported with care by competent and trained persons, and stored in dedicated areas in appropriately bunded containers. Any liquid accumulating within the bunds, or secondary containment systems, will be disposed of at a suitably authorised facility.
  - Maintenance checks and procedures will be completed to reduce the potential for leaks and spills from plant and substance storage. These will include plans for inspections, maintenance and actions should a spill occur.
  - Method statements will be prepared and followed for the management, storage, testing and disposal of waste (including excavated materials).
  - Water will be managed during construction to reduce suspended solid generation.
  - Pollution management measures will be implemented to prevent contamination of the water environment (either directly or via the ground) by silt or from machinery pollutants, such as fuels, oils and lubricants during construction and operation activities. These measures will be informed by guidance provided in relevant documents, such as the CIRIA guides to environmental good practice on site.
  - Other information on good practice to reduce the potential for environmental pollution that will be consulted includes the following documents developed by the Environment Agency (England and Wales), the Scottish Environment Protection Agency and the Northern Ireland Environment Agency
    - PPG 1 General guide to the prevention of pollution;
    - GPP 2 Above ground oil storage;
    - PPG 3 Use and design of oil separators in surface water drainage systems;

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

- Information about the proposed design of the Development includes specific design mitigation relating to the water environment (AECOM, 2021a). It addresses water management at the Proposed Development and the risk presented by flooding and ensures the proposed drainage system has sufficient capacity to accept flows from within the Proposed Development boundary and from the surrounding land that will be intercepted by the Proposed Development. These mitigation measures include:
  - Green roofs that will provide a first level of water treatment (removal/attenuation of pollutants or sediments) and storage (reduction and delay of surface water runoff volumes).
  - Permeable landscaping and planting that will provide bioretention of water to provide further attenuation of surface water run-off/discharges. Evapotranspiration will increase, run-off will be delayed, and some suspended solids will be filtered out, but infiltration to ground will be limited due to the clayey nature of natural ground at the Site.
  - The proposed storage network to serve the Development has been designed and modelled, using Innovyze Microdrainage, for the 1 in 100-year storm event, with an allowance of 10% for climate change (as reported in AECOM, 2021a). Two no. attenuation tanks with total net storage capacity of 286 m^3 will be provided within the Site to prevent flooding on site for the critical duration storm of the 1 in 100 year event plus 10% climate change allowance (AECOM 2021a).
  - A simulation for the surface water network was undertaken to ensure runoff from the Site will be limited to 4.9 l/s for a 1 in100 year event plus a 20% allowance for climate change.
  - Drainage design calculations considered flows if there was a 50% blockage of the attenuation system. The work showed that, in these instances, some water would flow out onto Carmanhall Road. To reduce the risk of a blockage, a screen is proposed at the Hydrobrake manhole to prevent large debris from entering the Hydrobrake.
- The proposed surface water storage network has been assessed and designed as per the Greater Dublin Strategic Drainage Study and the SuDS Manual, CIRIA C753 (AECOM, 2021a). Specific design requirements for SuDS systems will be in accordance with those established by the Construction Industry Research and Information Association's publication CIRIA C753-SuDS Manual (2015).
- Permeable paving is proposed on the access road and 2 no. parking spaces, outside of the under-croft car park. This will reduce the volume and frequency of runoff and will provide a treatment medium. However, infiltration is not proposed, and the system will be lined to prevent ingress from groundwater.
- All surface water from the Site will discharge to the public network after flowing through the proposed petrol interceptor, where hydrocarbons are removed.
- There will be no underground storage tanks that could result in leaks to groundwater.

- With specific reference to EPA guidance[3] on private well protection, and if relevant, there will be a minimum of 30 m between wells and any septic tank or fuel storage, and a minimum of 5 m between a well and chemical storage.

The Property Management Strategy Report (Aramark, 2020) states the following mitigation will be adopted during the operational phase:

- A policy document for open spaces will be issued to all tenants to ensure compliance and H&S protocol particularly around the water table.
- Plant, such as water tanks and pumps, will be maintained in accordance with manufacturer guidelines.
- Parking places will only be used for parking (no other purpose).
- There will be a fire-fighting system in place that comprises dry and wet risers. The systems will be supplied by mains water and there will be no need for chemical storage. Existing hydrants are to be confirmed on site and two no. new hydrants are proposed to serve the Proposed Development.

7.6 Potential Effects

The main potential impacts and associated effects that will be considered in the assessment relate to the following:

- Mobilisation of existing contamination by construction works (e.g. earth movements, excavation, foundation construction and piling) that could impact water quality and use;
- Importation of material that could leach and impact water quality and use;
- Activities that might impact water quality and use (e.g. increased suspended solids, leaks and spills from machinery or stored substances, or discharges – including drainage and waste water discharges and their potential impacts, and effects on water quality at the SACs/SPAs);
- Dewatering during construction that could lead to changes in groundwater levels and flow regimes (and, therefore, water availability), and the discharge of dewatering water that could result in changes to watercourse quality and/or morphology;
- Changes to surface water flow regimes and discharges that could alter flood risk; and
- Construction of the basement and foundations that could lead to changes in groundwater levels and flow regimes (and, therefore, water availability).

These are discussed and assessed in the following sections.

Construction Phase Impacts

Changes in the quality and/or availability of surface water or groundwater as a result of the Proposed Development could affect existing users and future resource potential and would not support the WFD objectives. The Proposed Development could introduce a range of sources that on their own or in combination have the potential to impact water quality or availability. These are grouped together in the following section to describe the potential impact linkages to the selected receptors.

Impacts to surface water could occur directly or indirectly via surface flows or via groundwater. Impacts to groundwater are more likely to be indirect through the ground, but excavations into the sub-surface would reduce

[3] http://kildare.ie/CountyCouncil/Environment/SepticTanksorDomesticWasteWaterTreatmentSystems/SS%20Wells%20Web.pdf

soil and sub-soil thickness and could result in an increased risk to aquifer water quality from contamination/pollution incidents on the surface.

There is also the potential for activities undertaken during construction to create a new pathway for an impact to affect a receptor, or increase the likelihood or magnitude of an impact. Piling activities, if used for ground improvements or foundations, and excavations into the subsurface could create pathways that increase the vulnerability of groundwater by either providing a source of pollution in the activity itself or creating more rapid/direct pathways for pollution transport to groundwater.

Changes in Water Quality (Groundwater and Surface Water)

Potential sources of impact that could result in a change in water quality depend on the activities that will be undertaken during construction. The following potential sources have been identified through the project description and experience of typical construction activities:

- Refuelling leaks or spills could introduce hydrocarbons to the water environment.
- Leaching of substances from imported infill materials if the materials are not of suitable quality.
- Discharges or leaks from welfare facilities could introduce washing and toilet facility waste to the environment.
- Wheel washing discharges that could be contaminated with hydrocarbons, brake dust, metals, road salt, cleaning agents and other traffic residue.
- Leaks and spills of substances during storage, transport, use and/or disposal.
- The introduction of drilling fluids through piling (foundation type to be confirmed).
- Dewatering and the discharge of dewatering water. Based on the project description, dewatering would be within the top metre or two from the ground surface rather than within deeper aquifer systems, but the discharge of groundwater to a different location, such as surface water, could impact surface water quality.
- Works that discharge water to the surface water sewer, which in turn discharges into Brewery Stream/Carysfort Maretimo Stream. Poor sediment erosion control could result in high suspended solids. Construction activities such as excavations, earth movement, stockpiling, reprofiling and building represent potential sources of suspended solids.

Embedded mitigation includes activities or processes to manage and limit the potential impact from refuelling, leaching from imported materials, leaks and spills from stored and used substances, and water discharges. With management in place, the predicted magnitude of impact is considered to be **negligible (adverse)**.

However, the impacts associated with potential for previously unidentified contamination and piling activities mean that pollution events could occur, baseline water quality could deteriorate, and water quality standards could be breached. The predicted magnitude of impact to water quality is **high (adverse).**

It is assumed that the wheel wash would be supplied from the mains and would be reused as much as possible. The water and sludge that collects in the wheel wash has the potential to become contaminated with material washed off the vehicles. There are no planned discharges to ground, but if this was to be discharged or leak to the water environment, this could affect water quality. The predicted impact to water quality is **high (adverse).**

Changes in Surface Water Flow Characteristics (Catchments and Run-off Rates)

Increased hardstanding (e.g. roads and paving) can change surface water flow regimes, which can in turn affect flood risk. Capturing excess water during construction to manage water levels (e.g. passive or active

dewatering) or water quality (e.g. settlement ponds) could result in changes to discharge rates and locations from the catchment.

Taking into account the intended water management design (AECOM, 2021a) and the construction good practice measures, the predicted magnitude of impact is considered to be **negligible (adverse)**.

Changes in Groundwater Flow Regime (Levels and Flows)

Changes in recharge to groundwater could occur as a result of increased coverage of the ground with hardstanding and due to the compaction of soils during construction. This could, in turn, result in a change in groundwater resource availability. Given that the Site was previously developed, the underlying subsoil/superficial deposits are clayey and the bedrock is classified as a poor aquifer, the predicted impact on groundwater recharge is considered to be **negligible (adverse).**

If any groundwater abstraction is required for dewatering, this will result in a localised change in groundwater flow directions and levels. This could, in turn, result in a temporary change in local groundwater resource availability. The near surface ground conditions at the Site are known to be clayey and, although water has been encountered, only minor seeps have been observed. Therefore, if dewatering of any kind (including passive drainage of excavations) is required, the predicted impact on groundwater flows and levels is considered to be **negligible (adverse).**

Piled foundations result in the installation of a barrier to groundwater flow in the sub-surface. This can locally change groundwater flow paths and change groundwater levels (back up of groundwater upgradient and groundwater shadowing downgradient), particularly if the piling is laterally extensive, or extends to the full thickness of an aquifer. It is uncertain at this stage if any of the Development foundations will be piled. If such activities are undertaken, there is the potential to impact groundwater resource availability. Given the size of the Proposed Development compared to the lateral extent of the mapped geological units, that underlying subsoil/superficial deposits are clayey with low hydraulic conductivity meaning that any changes in water levels will likely be over short distances, and the bedrock is classified as a poor aquifer, the predicted impact on groundwater flows and levels is considered to be **negligible (adverse).**

Secondary Receptors

Effects on the water can have secondary effects on human water users. The nearest known water borehole is located over 1.5 km from the Proposed Development and the area is known to have mains water supplies. However, there could be unknown private water supplies or abstractions from surface water in the study area, so the end user could also be affected by any changes in groundwater quality and/or availability. The magnitude of the predicted impact to water is discussed in the text above. The associated level of effect depends on the importance of the receptor. The predicted effects on human receptors are presented in Table 7.6.

Secondary receptors to changes in surface water flows and flood risk include Development plant and infrastructure, and infrastructure immediately adjacent and downstream of the Proposed Development itself. Taking into account the intended water management design (AECOM, 2021a) and the construction good practice measures, the predicted magnitude of impact is considered to be **negligible (adverse)**.

Secondary impacts to ecology as a result of changes to the water environment are addressed in Chapter 5.

After-use Phase Impacts

The proposed after-use of the Development is a mixture of residential housing and associated amenities (e.g. shared utilities, recreational spaces, parking and childcare facilities). For the purposes of this assessment it is assumed that residential users will not grow vegetables in the ground in the shared areas at ground level. The Proposed Development will be connected to mains water and sewerage. It is, therefore, unlikely that additional water supplies will be required.

Depending on the activities that may take place during the occupied after-use phase, there is the potential that discharges to ground, or leaks, could lead to water quality being affected. Such discharge or leaks could originate from sewerage; drainage from areas of hard standing (e.g. car parks and roads); or transport, storage and handling of hazardous substances required for plant maintenance. The potential impact from sanitary waste will be mitigated by connection to mains sewer, parking places (with associated oil/water interceptor) will be for parking only, and the landscaping/surfacing will be designed to provide attenuation and filtering. With this mitigation the predicted potential impact on water quality is **negligible (adverse)**.

Changes to flood risk, water quality or water availability that continue through the after-use phase, but that originated from permanent sources of impact initiated in the construction phase (e.g. changes to drainage, hardstanding, foundations) are not reconsidered in this assessment phase.

The Proposed Development will be equipped with a fire safety system using mains water, as referenced in Section 7.5.2. In the unlikely event of a major fire the predicted potential impact on water quality would be **negligible (adverse)**, as no significant quantities of hazardous materials will be stored on-site and the Site's SuDS system would be expected to treat some, if not all, of the run-off fire water that arose.

Evaluation of Initial Effect Significance

The evaluation of effects takes into account the predicted impact magnitude combined with receptor sensitivity. The evaluation of effect significance from each of the initial construction and after-use impacts (taking account of embedded mitigation) discussed above is presented in Table 7.6. As can be seen from Table 7.3, any negligible initial impact magnitude will result in a slight or imperceptible level of effect, both of which levels are 'not significant'. Therefore, Table 7.6 only includes those sources of impact that may result in a low to high initial impact magnitude.

Table 7.6: Evaluation of Initial Impacts and their Effect Significance

Project Phase	Receptor	Sensitivity	Source of Impact/Description of Change*	Impact Magnitude*	Level of Effect *
Construction	Groundwater	Negligible	Drilling and piling activities and/or disturbance of unidentified previously contaminated material introducing substances to groundwater resulting in poorer groundwater quality	High (adverse), indirect, short term, reversible	Slight
			Wheel wash water or sludge discharges resulting in poorer groundwater quality	High (adverse), indirect, short term, reversible	Slight
	Surface Water	High	Wheel wash water or sludge discharges resulting in poorer water quality	High (adverse), direct/indirect, temporary, reversible	Profound
	Human water users	High	Drilling and piling activities and/or disturbance of unidentified previously contaminated material introducing substances to groundwater resulting in poorer groundwater quality for groundwater users	High (adverse), indirect, short term, reversible	Profound
			Wheel wash water or sludge discharges resulting in poorer water quality for water users	High (adverse), indirect, short term, reversible	Profound

* Taking account of embedded mitigation

7.6.1 'Do-Nothing' Scenario

In the event that the Proposed Development does not progress (i.e. the Site remains undeveloped with the previous building demolished), there are unlikely to be impacts on the water environment in the area of the Site.

Derelict and vacant land can encourage fly tipping, so there is some potential for pollution incidents to occur and water quality to be adversely impacted if the Proposed Development did not proceed

7.7 Mitigation and Management

To further mitigate the initial effects associated with the potential impacts on the water environment and associated human users, the following additional mitigation will take place:

- A pre-construction water feature survey to obtain current information on any potential non recorded local water users and the source of their water (note that given the urban location it is considered highly unlikely that there are any non-recorded water users). If such users are identified, an assessment to be made of how/if the Proposed Development (including construction activities) could affect these water users. This CEMP will be updated to include any further mitigation that may be required if impacts are predicted (although it is considered highly likely that existing mitigation measures will be sufficient).
- If evidence of previously unidentified potential contamination (either visual or olfactory) is identified during construction works, construction good practice and management procedures will be followed that may include investigation and assessment works.
- Any sludge collected from wheel wash used during construction will be tested and disposed of to an appropriate waste disposal facility. No used water or settled solids will be disposed of to land or water without prior consent. Should any discharges to ground or surface water be proposed during construction, the relevant responsible authority will be consulted to determine if the discharges require authorisation. Local authorities are responsible for the issuing of effluent discharge licences for effluents discharged to waters, and Irish Water are responsible for effluent discharges to sewers. If authorisation is required, the discharger will make the relevant application(s). Discharges will be monitored as per the licence/consent, and appropriate treatment will be undertaken so that discharges meet the relevant environmental standards.
- Any piling activities will be undertaken using good practice methods that reduce the potential for creating new pathways between the surface and sub-surface; particularly to groundwater within the bedrock aquifer.

7.7.1 Monitoring

No monitoring requirement is foreseen to maintain and protect the conditions of the water environment. Any monitoring associated with licences or permits will be detailed within the licences or permit documentation.

7.8 Residual Effects

Any impact linkages included in Table 7.6 have been carried forward to this section. A summary of the sources of impact, predicted magnitudes of residual impact (accounting for embedded mitigation and additional mitigation) and subsequent residual effect significance is presented in Table 7.7. In all cases the residual effect is **not greater than Slight and is therefore Not Significant.**

Table 7.7: Evaluation of Predicted Residual Impacts and their Effect Significance

Project Phase	Receptor (importance)	Potential Source of Impact	Direct or Indirect	Duration*	Reversible or Irreversible	Summary of Combined Mitigation (embedded and additional)	Residual Magnitude of Impact (direction)	Residual Effect Significance
Construction	Groundwater (Negligible)	Drilling and piling activities and/or disturbance of unidentified previously contaminated material introducing substances to groundwater resulting in poorer groundwater quality	Indirect	Short term	Reversible	Good practice piling techniques if piling is required. Construction good practice and management procedures, including investigation and assessment works if required.	Negligible	Not significant/ Imperceptible
		Wheel wash waste discharges to groundwater resulting in poorer groundwater quality	Indirect	Short term	Reversible	No planned discharges to ground. Appropriate management, collection and disposal of wheel wash water/sludge. Follow good practice detailed in CMP/CEMP. Consented discharges to the water environment or sewer where proposed.	Negligible	Not significant/ Imperceptible
	Surface Water (High)	Wheel wash waste discharges to surface water resulting in poorer water quality	Direct or indirect	Temporary	Reversible	No planned discharges to ground. Appropriate management, collection and disposal of wheel wash water/sludge. Follow good practice detailed in CMP/CEMP.	Negligible	Not significant/ Slight

Project Phase	Receptor (importance)	Potential Source of Impact	Direct or Indirect	Duration*	Reversible or Irreversible	Summary of Combined Mitigation (embedded and additional)	Residual Magnitude of Impact (direction)	Residual Effect Significance
						Consented discharges to the water environment or sewer where proposed.		
	Human water users (High)	Drilling and piling activities and/or disturbance of unidentified previously contaminated material introducing substances to groundwater resulting in poorer groundwater quality for groundwater users	Indirect	Short term	Reversible	Pre-construction water feature survey. Good practice piling techniques if piling is required. Construction good practice and management procedures, including investigation and assessment works if required.	Negligible	Not significant/ Slight
		Wheel wash waste discharges resulting in poorer water quality for water users	Indirect	Short term	Reversible	Pre-construction water feature survey. No planned discharges to ground. Appropriate management, collection and disposal of wheel wash water/sludge. Follow good practice detailed in CMP/CEMP. Consented discharges to the water environment or sewer where proposed.	Negligible	Not significant/ Slight

* Maximum duration without intervention

7.9 Difficulties Encountered

No particular difficulties were encountered in undertaking the assessment of the water environment.

7.10 Summary and Conclusions

This assessment considers the potential impacts and effects on the water environment that can be reasonably foreseen as consequences of the normal construction and operation of the Proposed Development during the construction and after-use phases.

The main receptors that required to be assessed were groundwater, surface water, on-site plant and infrastructure, infrastructure immediately adjacent and downstream of the Proposed Development and human health (specifically existing water users) that could be secondarily affected by changes to the water environment. The secondary effects on ecology and biodiversity are considered in Chapter 5.

There are no surface water features on the Site, the closest being Stillorgan Reservoirs just over 200m to the north. The Site is classified as being at low flood risk (Flood Zone C). There is only one well or spring mapped within 2km of the Site, a borehole located over 1.7km to the north-east. There are no internationally designated sites at, or within 2km, of the Site.

Known design and construction management mitigation measures were accounted for in an assessment of initial impacts and effects. Where additional mitigation measures could be incorporated to reduce the initial impacts and effects further, these were identified and included in an assessment of residual impacts and effects.

In summary, the significance of residual effects on water (and on human health from water) resulting from the different potential sources of impact are predicted to be no greater than **slight adverse** and, therefore, **not significant** in terms of this assessment.

7.11 References

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