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Hydrological and Hydrogeological Risk Assessment Report

PRESENTED TO

ZOLBURY Ltd.

Blackglen Road LRD, Sandyford, Dublin 18

DATE

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Environmental Consultancy Services

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1 INTRODUCTION

Enviroguide Consulting (hereafter referred to as 'EGC') was appointed by Zolbury Ltd. (hereafter referred to as 'the Applicant') to complete a hydrological and hydrogeological risk assessment for a proposed Large-scale Residential Development (LRD) at Blackglen Rd., Sandyford, Dublin 18 (hereafter referred to as 'the Proposed Development' or 'the Site').

1.1 Project Objective

The project objective was to establish the baseline hydrological and hydrogeological conditions at the site and to identify the potential for any impacts on receptors associated with the Site and the Proposed Development:

- Establish the hydrological and hydrogeological regime and Conceptual Site Model at the proposed development site.
- Determine if there are any potential impacts on the receiving water environmental receptors including those at the Site, if any, and adjoining waterbodies downgradient of the Site.
- Determine if the Proposed Development could impact on any Groundwater Dependant Terrestrial Ecosystems (GWDTE).
- Determine if the Proposed Development could impact on any designated and protected areas hydraulically connected with the Site including the Fitzsimons Woods proposed Natural Heritage Area (pNHA).
- Determine if the Proposed Development could impact on the water quality status assigned by the EPA of the receiving water bodies hydraulically connected with the Site for the purposes of the Water Framework Directive.

1.2 Project Scope of Work

The scope of the hydrological and hydrogeological assessment included the following tasks:

- A desk-based review of published information and information pertaining to the Site and Proposed Development provided by the Applicant.
- Develop a hydrogeological Conceptual-Site-Model (CSM) and identify any potential source-pathway-receptor (SPR) linkages.
- Identify and assess any potential impacts associated with the Proposed Development on sensitive receptors associated with the receiving water environment.

This assessment is reliant on the design information for the Proposed Development provided by the Applicant.

1.3 Professional Competency

The report was prepared by Nuria Manzanas a Principal Consultant with over 10 years' experience of preparing environmental and hydrogeological assessments and reviewed by Warren Vokes Ba MSc CIWEM, C.WEM, a Senior Consultant of Enviroguide Consulting with over 9 years' experience of preparing environmental and hydrogeological assessments. The report was approved by Patrick Higgins BSc, MSc, MIEnvSc CEnv who is Technical Director with Enviroguide Consulting, with 19 years' experience and who is professionally competent and accredited to undertake environmental risk assessments.

2 METHODOLOGY

2.1 Standards and Regulations

The methodology adopted for this assessment takes cognisance of the relevant standards and regulations pertinent to undertaking a hydrological and hydrogeological assessment in particular the following:

- Council Directive 2006/118/EEC, 2006. On the protection of groundwater against pollution and deterioration. European Parliament and the Council of European Communities.
- Commission Directive 2014/80/EU of 20 June 2014 amending Annex II to Directive 2006/118/EC of the European Parliament and of the Council on the protection of groundwater against pollution and deterioration.
- EU Water Framework 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.
- European Communities (Water Policy) Regulations 2003 (S.I. No. 722/2003);
- Environmental Protection Agency, December 2011. Guidance on the Authorisation of Discharges to Groundwater.
- Department of the Environment, Heritage and Local Government, Environmental Protection Agency and Geological Survey of Ireland, 1999. Groundwater Protection Schemes (Groundwater Protection Schemes, 1999);
- Local Government, July 1990. No. 21 of 1990. Local Government (Water Pollution) (Amendment) Act, 1990.
- S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010 and as amended; and,
- S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009 and as amended.

2.2 Desk-based Study

A desk-based study was undertaken including a review of relevant information from the following publicly available sources and information provided by the Applicant:

- Ordnance Survey Ireland Online mapping (OSI, 2024).
- Geological Survey of Ireland Online mapping (GSI, 2024).
- Environmental Protection Agency Online mapping (EPA, 2024);
- National Parks & Wildlife Services, Protected Sites Webmapping (NPWS, 2024).
- Information provided by the Applicant including:
    - Information pertaining to the design proposals for the Proposed Development.
    - Ground Investigations Ireland (GII, 2021). Ground Investigation Report undertaken for the Proposed LRD at Blackglen Road on behalf of O'Connor Sutton Cronin Consulting Engineers (OCSC) including trial pits, trenches, soakaways, installation of groundwater monitoring wells, infiltration tests, laboratory analysis and reporting.
    - O'Connor Sutton Cronin Consulting Engineers, 2024. Resource and Waste Management Plan, Blackglen Road LRD (OCSC, 2024a).

- O'Connor Sutton Cronin Consulting Engineers, 2024. Construction and Environmental Management Plan, Blackglen Road LRD (OCSC, 2024b).
- O'Connor Sutton Cronin Consulting Engineers, 2024. Site-Specific Flood Risk Assessment, Blackglen Road LRD (OCSC, 2024c).
- O'Connor Sutton Cronin Consulting Engineers, 2024. Engineering Services Report, Blackglen Road LRD (OCSC, 2024d).

2.3 Risk Based Impact Assessment

A risk-based and receptor-focussed approach was adopted to include an assessment of any adverse effects to the receiving hydrological and hydrogeological (water) environment associated with the Proposed Development.

The basis for a risk assessment is the Conceptual Site Model (CSM) or Source-Pathway-Receptor (SPR) model which underpins the Directive 2000/60/EC (Water Framework Directive) amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU that has been transposed to Irish legislation as European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003) as amended, as well as EPA guidelines on the protection of groundwater and surface water resources including associated aquatic ecosystems and human health receptors (e.g., groundwater supply users), the EPA Guidance on the Authorisation of Discharges to Groundwater (EPA, 2011) and the EPA Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (EPA, 2013) on the protection of groundwater and surface water resources including associated aquatic ecosystems and human health receptors (e.g., groundwater supply users).

A risk assessment is undertaken to provide an understanding of the risk associated with the presence of any potentially contaminating materials and/or activities on a Site. This is informed by the assessment of potential for viable pollutant linkage(s) to be present. A pollutant linkage is established when there is a viable or potentially viable **S**ource, a **P**athway and a **R**eceptor (refer to Section 2.4 below).If one or more of the three elements are missing, the exposure pathway is considered incomplete and there is no risk associated with the activity or contaminant source (i.e., a viable means of exposure is not considered to be present or is unlikely to be present).

The objective of the Water Framework Directive (WFD) is no deterioration of the water quality status, and the "prevent or limit" objective is a key element of achieving that WFD status for all water bodies regardless of the water quality status of the water body. The 'prevent or limit' objective is a key element to achieving the WFD status and water quality objectives and in principle, prevent or limit measures (i.e., avoidance and mitigation) are the first line of defence in restricting inputs of pollutants from a development (i.e., 'source' removal) and any potential adverse effect or deterioration of water quality status or WFD status of the receiving water body.

In this assessment all three elements of the Source-Pathway-Receptor model will be identified to develop a Conceptual Site Model (CSM), and any potential linkages evaluated and assessed to determine if the development could potentially adversely affect any identified receptors including Natura 2000 sites as well as the WFD Status of the water bodies associated with the Site.

2.4 Conceptual Site Model

A CSM represents the characteristics of the Site and identifies the possible relationship and potential risk between contaminant sources (i.e., characteristics of the Proposed Development), pathways and receptors (receiving environment). These three essential elements of the CSM are described as:

- A **source –** a substance that is in, on or under the land and has the potential to cause harm or pollution.
- A **pathway** – a transport route or means by which a receptor can be exposed to, or affected by, a contaminant source; and
- A **receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body.

The term pollutant linkage is used to describe a particular combination of source-pathway-receptor. Each of these elements can exist independently, but they create a risk only where they are linked together so that a particular contaminant affects a particular receptor through a particular pathway (i.e., a pollutant linkage).

The preliminary CSM for the Site of the Proposed Development is initially defined and this is then revised throughout the risk-based assessment process.

3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

Zolbury Ltd., intend to apply to Dun Laoghaire Rathdown County Council for permission for development for a Large-Scale Residential Development (LRD) on a site of approx. 3.86ha on lands at Blackglen Road, Sandyford, Dublin 18.

The development will consist of 192 No. residential units ranging from 2-5 storeys in height, associated resident amenity facilities, a childcare facility, all boundary treatment and landscaping works, site services connections and all site development works to include:

a) Construction of 192 No. residential units, in the form of 6 no. new apartment buildings (A1 – B4), 40 duplexes (C1, C2, C2A) and 14 houses (D1 & D2), to include 33 No. 1-beds, 84 No. 2 -beds, 61 No. 3-beds and 14 No. 4-beds as follows:
   - Block A1 (4 storeys) comprising 15 No. apartments (3 No. 1 bed units, 6 no. 2 bed units & 6 No. 3 bed units); a crèche facility of approx. 378.2 sq. m with associated outdoor play space of approx. 170 sq. m; and resident amenity facilities of approx. 31.6 sq. m.
   - Block A2 (3-4 storeys) comprising 26 No. apartments (2 No. 1 bed units, 20 No. 2 bed units and 4 No. 3 bed units) and resident amenity facilities of approx. 353.6 sq. m.
   - Blocks B1 and B2 (2-5 storeys) comprising 51 No. apartments (15 No. 1 bed units, 29 No. 2 bed units, 7 No. 3 bed units).
   - Blocks B3 and B4 (2-5 storeys) comprising 46 No. apartments (13 No. 1 bed units, 23 No. 2 bed units and 10 No. 3 bed units).
   - Duplex Units C1 (4 storeys), C2 and C2A (3 storeys) comprising 40 duplexes (6 No. 2 bed units, 20 No. 3 bed units and 14 No 4 bed units).
   - House Units D1 and D2 (2 storeys) comprising 14 houses (14 No. 3 bed units).

b) Total Open space (approx. 10,854 sq. m) is proposed in the form of public open space (approx. 8, 686 sq. m), and residential communal open space (approx. 2,168 sq. m). Each residential unit is afforded with associated private open space in the form of a garden/terrace/balcony.

c) The development will be served via a new vehicular access via Blackglen Road. This will be designed as a priority junction with pedestrian and cycle crossings where required to tie in with the Blackglen Road Improvement Scheme.

d) A new toucan crossing is proposed across Blackglen Road just to the east of the new vehicular access. This toucan crossing has been designed as per TL607 of the Cycle Design Manual to allow crossing of pedestrians and cyclists to the northern side of Blackglen Road for improved public transport access.

e) Emergency access only is proposed via Woodside Road.

f) A dedicated wildlife corridor is proposed to the east/south-east side of the site and a public open space (approx. 307 m in length) tree trail to the west/north-west side of the site.

g) Basement/Podium car park areas are proposed below Blocks B1, B2, B3 and B4. A total of 226 No. car parking spaces are proposed, which includes 2 No. car club spaces, 12 no. accessible spaces and 47 No. EV charging spaces (198 No. long-stay spaces, 18 No. visitor space & 10 No. car parking spaces for creche use), in addition to 9 no. motorcycle spaces.

h) A total of 484 No. bicycle spaces are proposed in the form of 442 No. long stay bicycle spaces 42 short-term stay visitor parking.

i) 2 No. ESB substations at surface level.
j) Bin Storage areas for the Duplex blocks are proposed at ground level adjacent to the Duplex blocks.
k) All associated site and infrastructural works to include provision for water services; foul and surface water drainage and connections; internal roads, attenuation proposal; permeable paving; all landscaping works including green infrastructure zones; green roofs; and general plant areas; photovoltaic panels; landscaped boundary treatment; footpaths; public lighting; and electrical services.

The needs of local wildlife have also been incorporated into the proposed design, with various areas of different habitat types proposed, including wildlife ponds along the eastern wildlife corridor for local amphibian populations to adopt, wildflower meadow areas throughout for local pollinator species, and potential mammal habitat in the wooded margins of the Site.

The layout of the proposed development is presented in Figure 3-1.



Figure 3-1. Proposed Development Site Layout (O'Mahoney Pike, 2024)

3.1 Construction Phase

As documented in the Engineering Services Report (OCSC, 2024d) and the Resource and Waste Management Plan (OCSC, 2024a), It is expected that the construction phase of the development will have a duration of approximately 18 months and will include the following:

- As per the CEMP (OCSC, 2024b), initial site clearance will provide a temporary access road and a compound set up on the site to manage the construction and provide welfare facilities for the workers on site.

- It is assumed that 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, surface water and foul water drainage infrastructure.
- Based on the findings of the previous site investigations (GII 2021), shallow groundwater is anticipated and it is therefore considered likely that there will be a requirement for dewatering during the construction of building foundations and utility infrastructure on the basis of the information provided.
- The description of the Proposed Development includes the construction of basements below Blocks B1, B2, B3 and B4. As per drawings 20006A-OMP-A1-ZZ-DR-A-2100, approximately 3.00 to 3.5mBGL will have to be excavated to accommodate the construction of the basements.

The excavation and construction of each basement and superstructure will take approximately 4-5 months per building with the superstructure being completed in an additional 5-7 months per building. As per site investigations, the bedrock appears to be of good quality for the foundations. Therefore, the basement and superstructure will be constructed from the bedrock up, eliminating the need for piling.

As stated on the CEMP (OCSC, 2024b), the excavation of the basements will consist of the following:

- Site Preparation: Survey and Planning: Each excavation will be carefully set out to ensure that the extents of the works are well understood and the adequate planning on access routes and safety measures are made in advance of any works. This will allow the proper space planning of the excavation works and ensure that perimeter drainage can be installed in advance of the main excavation.
- Excavation Method: Open Excavation and Hydraulic splitting, the overburden and the top metre of bedrock will be excavated with a tracked excavator. The remainder of the excavation will be excavated by traditional method of rock excavation with low-noise vibratory hammers. Based on site investigations, the total volume of excavation and rock excavation has been calculated within each basement. The majority of the excavation is in areas where the base of the excavation is within 1 metre of the expected bedrock level, with the exception of basements B1-B2, which base of excavation is over 2 metres below the bedrock level. Where the excavation of rock requires vibratory hammers to be used, this will be subject to the measures for the minimisation of noise and vibration.
- The dewatering strategy as part of the construction of the basements will consist of the following:
    - Well Points: Install well points around the excavation site to lower the groundwater level. These points will pump out water to keep the excavation dry.
    - Sump Pumps: Place sump pumps at strategic locations within the excavation to collect and remove water that accumulates.
    - Water Management:
        - Sedimentation Tanks: Direct the pumped water to sedimentation tanks to remove silt and debris.

        - Filtration Systems: The use of filtration systems to further clean the water before discharge or reuse will be considered and if water quality warrants it this will occur.
        - Discharge: Ensure that the discharge of treated water complies with local environmental regulations.
    - Groundwater Recharge:
        - Recharge Wells: Construct recharge wells around the site to return a portion of the treated water back into the groundwater system.
        - Permeable Paving: Use permeable paving materials in surrounding areas to facilitate natural groundwater recharge.
- Construction of new foul and mains water connections in accordance with the Irish Code of Practice for Wastewater Infrastructure (IW-CDS-5030-03) and the Irish Code of Practice for Water Infrastructure (IW-CDS-5020-03):
    - The existing 150mm diameter wastewater sewer pipeline on Blackglen Rd is to be upgraded as part of the planned upgrade works on Blackglen Rd; and,
    - The 3" asbestos watermain present along the Blackglen Rd. (northern boundary of the Site) will be upgraded to a 200mm watermain as part of upgrades works to Blackglen Rd. and a new 200mm-diameter HDPE watermain connection is to be provided from the existing 200mm diameter watermain on the Blackglen Rd.
- The surface water drainage is to discharge attenuated flows to the public surface water network, which is located to the north of the site. A new connection to this existing sewer is to be provided on Blackglen Rd. The discharge rate at the outfall location is to be restricted to a maximum flow rate of 4.30 l/s/ha (7.8 l/s), which is less than the current greenfield equivalent runoff rate.
- Construction of new surface water drainage designed in accordance with the principles and objectives of Sustainable Drainage Systems (SuDS) and the Greater Dublin Strategic Drainage Study (GDSDS) and the requirements of Dún Laoghaire-Rathdown County Council (DLRCC).

The following details are extracted from the Construction and Environmental Management Plan Report submitted as part of the planning application (OSCS, 2024b).

- Only sediment-free run-off is to leave the site.
- A suitably sized detention basin or settlement area will be installed at the lowest point before discharge where excess run-off must leave the site.
- Silt curtains or earth berms will be used to channel run-off to locations where it can be controlled. These may take the form of an open detention area or, where the need arises, a portable skip/s, or similar, where inflow passes through straw bales, gravel etc.
- The site compound will include a dedicated bund for the storage of dangerous substances including fuels, oils etc.
- Refuelling of vehicles/machinery will only be carried out within the bunded area.
- Appropriate welfare facilities will be provided onsite for construction staff and will include.
    - Canteen facilities;
    - Toilet Facilities.
    - Office accommodation; and,

    - Tool storage areas.
- Measures will be put in place to keep public roads free of muck and debris. This will include providing a wheel wash on-site and undertaking regular road sweeping by a mechanical sweeper.

3.1.1 Construction and Demolition Material

The following details are extracted from the Resource and Waste Management Plan Report (OSCS, 2024a).

During the Construction Phase, excavations will be required for the Proposed Development. Excess inert soil and stone, subsoils, and fill material excavated during the works, that will not be used as fill material onsite, will be recovered off site.

- Soil and stones will only be removed by authorised waste collectors and sent to an authorised site.
- The concrete generated as part of the works is expected to be clean, inert material and should be recycled, where possible.
- All recyclable plastic will be segregated and stored in skips prior to collection for recycling.
- Uncontaminated timber waste generated from the works and from wooden pallets, etc., will be collected in a designated area within the Site and collected by a timber recycling company.
- Waste from Electrical and Electronic Equipment (WEEE) that does not contain hazardous components will be stored in dedicated covered cages/receptacles/pallets pending collection for recycling.

Where contaminated fill material is encountered during enabling works these will be stored separately from inert material and appropriately classified as non-hazardous or hazardous in accordance with the www.hazwasteonline.com application and EC Council Decision 2003/33/EC10, and transported to an appropriately authorised facility by permitted contractors following appropriate WAC (waste acceptance criteria) testing.

It is anticipated that non-hazardous waste materials will be produced which will include soil and stones, general municipal waste, dry recyclable waste, and waste construction materials.

Some hazardous material may be produced during the Construction Phase as follows:

1. Contaminated soil
2. Fuels and oils
3. Asbestos
4. Other Hazardous Substances (Paints, glues, adhesives, etc.),

3.2 Operational Phase

3.2.1 Surface Water Drainage

As documented in the Engineering Services Report (OCSC, 2024d), the proposed surface water drainage system has been designed to ensure that a comprehensive Sustainable Drainage System (SuDS), is incorporated into the development, which requires that post development runoff rates be maintained at equivalent, or lower, levels than pre-development

levels. In accordance with the Dun Laoghaire Rathdown County Council Development (2022 - 2028), the Proposed Development must be able to retain, within its boundaries, surface water volumes from extreme rainfall events up to a 1 in 100-year rainfall event, more commonly expressed as a 1.0% AEP (Annual Exceedance Probability), while also allowing for an additional climate change factor of 20% increase in rainfall intensity. Any new development must also have the physical capacity to retain surface water volumes as directed under the Greater Dublin Strategic Drainage Strategy (GDSDS).

As documented in the Engineering Services Report (OCSC, 2024d), the proposed surface water design splits the Proposed Development into two (2 No.) main surface water drainage catchments to best replicate the natural site catchments. Those catchments are Catchment 1 and Catchment 2, there are also five (5 No.) sub-catchments (1A, 1B, 1C, 1D and 1E) within Catchment 1 to better integrate Sustainable Drainage Systems (SuDS) measures and reduce the rainfall runoff rate.

- Catchment 1, part of the main development, will discharge controlled and restricted flow rates of the treated rainfall runoff to the existing stormwater network at Blackglen Rd. The gradient of Blackglen Rd. indicates that the surface water drainage network flows to the east where it discharges to the Carrickmines stream in the vicinity of Lamb's Cross.
- Catchment 2 comprises part of the access road for a number of blocks (B3 and B4). The topography of this portion of the site falls towards the south /southeast. As such, treated surface water runoff, at a restricted rate (Max. of QBAR for the catchment; 1.3 l/s) will flow towards the Carrickmines stream on the southeast boundary line, matching the existing outfall for the catchment.

The proposed surface water networks will mainly incorporate SuDS measures (bioretention areas, infiltration trench, green roofs, blue roofs / podium drainage, pervious paving, filter drains, trapped road gullies, flow control devices, attenuation storages implemented and integrated), wherever practicable. Source control measures are to be provided by green roofs and blue roofs (>70% total roof area for extensive green roofs), and throughout the drainage network within the landscape features, the podium build-up and pervious paving base course. In order to reduce development flow rates to the Greenfield Equivalent Runoff Rate (QBAR), further attenuation is to be provided before discharging from the site.

As detailed in the Engineering Services Report (OCSC, 2024d), SuDS are designed in accordance with best practice and the CIRIA C753 (The SuDS Manual) guidance material. Refer to detailed drawing B986-OCSC-XX-XX-DR-C-0500 and 0501 for the proposed drainage network layout, which is to serve the proposed development.

The following SuDS measures will be incorporated into the Proposed Development to provide a sustainable manner in which to attenuate surface water runoff, reduce surface water runoff, increase the overall water quality of surface water runoff and replicate the natural characteristics of rainfall runoff for the Site:

- Permeable paving - will allow rainwater to infiltrate through the surface permeable layer and into the underlying pervious structural layers where rainwater is stored beneath the overlying finished surface before either infiltration to the ground or discharge to the main surface water drainage network.

A Type B pervious paving, with a 300mm (typical) depth of open graded crushed rock as base course, is to be provided in the driveways / car parking for the individual units within the proposed development and a number of additional areas. An overflow pipe, from the basecourse, will be provided to the drainage network, which will allow for interception of initial rainfall, groundwater discharge, with an attenuated outflow to the main network in extreme rainfall events. For the remaining car parking spaces, a grasscrete surface is proposed. This provides initial abstraction by vegetation and, similar to green roof technology, retains a small amount of runoff allowing for transpiration and evaporation, thus reducing runoff volume.

- Bioretention areas - A number of small bioretention areas next to the individual housing units will provide treatment and interception for minor storm events. Runoff will pond temporarily on the surface and then filters through the vegetation and underlying soils. The filtered runoff is then collected using underdrain pipes and partially infiltrated into the surrounding soil.
- Green roofs - it is proposed to provide both green roofs on many of the buildings within the Proposed Development. Green roofs increase the time of rainfall falling into the roof due to the slow filtration as well as provide source treatment prior to entering the surface water network and increase biodiversity.
- Trapped road gullies - all road gullies serving the Proposed Development are to be trapped, to help prevent sediment and gross pollutants from entering the surface water network, and thus improving the water quality discharging from the site.The grated covers are to have a minimum load classification of D400, for frequent vehicular traffic.
- Silt traps - a manhole upstream of the attenuation system is to contain a 600mm sump, below invert level of outlet pipe, in order to trap sediment and other gross pollutants, and prevent from entering downstream watercourses improving the water quality discharging from site.
- Geo-cellular storage systems - Unlined proprietary geo-cellular storage units are to be provided for the attenuation of rainfall runoff for the catchment area. These systems are to provide sufficient temporary storage volume for rainfall events up to, and including, the design 1% AEP rainfall event (including climate change of 1.2 and an additional factor of 1.1 for urban creep). These generally comprise plastic cellular units of high porosity (typically >95%), structurally arranged in rows and layers, with a perforated distribution pipe through the centre. These systems also allow for interception of initial rainfall to be provided at the base of the system, by elevating the outlet relative to the system's base. Two of these attenuation structures are less than 5m from Block A1. However, as the building foundation will itself be founded over the shallow underlying rock, it is judged that they pose no risk to the building's stability. Access chambers for inspection and maintenance are also to be provided.
- Filter drains (perforated pipe with cl505 surround) - to be provided along roads where possible to intercept and treat polluted water. These drains intercept and store (filtration) excess rainfall runoff while conveying the excess to the network outfall and also provides infiltration to groundwater.
- Flow control device - to be provided immediately downstream of the of the final underground attenuation system, in order to restrict the surface water discharge from site to a flow rate equivalent, or below, the natural greenfield runoff rate which would be no greater than 16.0 l/s. The area of the Proposed Development contributing to the stormwater system is smaller (1.69 ha), and therefore, a more restrictive flow control

must be applied, reducing the system discharging flow rate to 7.1 l/s. Hydro-brakes (optimum vortex flow control unit of greater than 50mm diameter to mitigate the risk of blockage) will be approved by DLRCC and will be provided in the manhole downstream of the final attenuation system to achieve this rate of flow (i.e. 7.1l/s).,

- Oil separator - a Class 1 bypass fuel separator is to be provided immediately upstream of the final attenuation system, as an additional and final mitigation measure, prior to surface water discharge from each unit sub-catchment to the public surface water network on Blackglen Rd. (north of the site). A similar separator will be provided immediately upstream of the infiltration soakaway for the smaller surface water network which discharges from the area around Block B3/B4 (Catchment 2) to the existing stream on the southeastern boundary.

Attenuation systems are to be provided at strategic locations within the development in order to temporarily store excessive rainfall runoff, during significant rainfall events, due to the restricted discharge rates (to less than greenfield equivalent runoff rates) from the development outfalls. Attenuated runoff from Catchment 1 is to be discharged to the new surface water sewer which bounds the site to the north. A new connection to this existing sewer is to be provided on Blackglen Road. Catchment 2 is to discharge to a combination of infiltration soakaway and attenuated outfall to the Carrickmines stream along the southeastern boundary. Each sub-catchment area will aim to provide interception and treatment of the rainfall runoff, either at source or throughout the site.

3.2.2 Foul Drainage

As documented in the Engineering Services Report (OCSC, 2024d) and CEPM (OCSC, 2024b), it is proposed to separate the wastewater and surface water drainage networks for the Proposed Development and provide independent connections to the public wastewater infrastructure. The overall development is to be drained by a gravity wastewater network, based on the natural topography of the development site. The building's wastewater network is to connect to the new development's gravity wastewater network at the ground level which will connect the upgraded foul sewer network on Blackglen Rd. by Irish Water to serve the Proposed Development. Wastewater (volumetric) calculations have been compiled in accordance with Irish Water's Code of Practice Wastewater Infrastructure, IW-CDS-5030-03 and the design flow has been calculated using the Discharge Unit method described in I.S. EN 752. Refer to detailed drawings Z040-OCSC-XX-XX-DR-C-0503 and 0504 for the proposed wastewater drainage network layout, which is to serve the Proposed Development.

A Pre-Connection Enquiry Form (IW Ref. - CDS22002623) was submitted on 6th April 2022 to Irish Water for a total of 360 No. residential unit. Confirmation on feasibility was received subject to upgrades to the existing network. A new Pre-Connection Enquiry Form (IW Ref. - CDS24000835) was submitted on 26th January 2024 to Irish Water for a total of 192 No. residential units. Feedback on this enquiry has been received and states that the development is feasible, subject to upgrades to the existing network.

Foul water from the Proposed Development will be treated in the Ringsend Wastewater Treatment Plant (WWTP) (Discharge Licence No. D0034-01) before ultimately discharging to the Liffey Estuary Lower transitional waterbody (EU Code: IE_EA_090_0300).

3.2.3 Water Supply

As documented in the Engineering Services Report (OCSC, 2024d) and CEMP (OCSC, 2024b), there is an existing public 3" asbestos watermain along the Blackglen Rd along the northern boundary of the site. This watermain will be upgraded to a 200mm high-density polyethylene (HDPE) watermain to serve the proposed development and a connection will be provided to the new 200mm diameter watermain to be laid on Blackglen Rd. to the north of the site as part of upgrade works.

The proposed connection is to be carried out in accordance with Uisce Éireann'sCode of Practice for Water Infrastructure (IW-CDS-5020-03), following a New Connection agreement with Uisce Éireann, with a bulk water meter to be provided at the development's entrance.

Refer to drawings Z040-OCSC-XX-XX-DR-C-0550 and 0551 for the proposed watermain layout.

A Pre-Connection Enquiry Form (IW Ref - CDS22002623) was submitted 6th April 2022 to Uisce Éireann for a total of 360 No. residential units. Feedback on this enquiry has been received and states that the development is feasible subject to upgrades of the existing network. A new Pre-Connection Enquiry Form (IW Ref - CDS24000835) was submitted 26th January 2024 to Uisce Éireann for a total of 192 No. residential units. Feedback on this enquiry has been received and states that the development is feasible, subject to upgrades to the existing network.

3.2.4 Basements

The description of the Proposed Development includes the construction of basements below Blocks B1, B2, B3 and B4. According to drawing 20006A-OMP-A1-ZZ-DR-A-2100, approximately 3.00 to 3.5mBGL will have to be excavated to accommodate the construction of the basements.

Refer to Table 3-1 for the basement details for the Proposed Development.

Table 3-1. Basement Excavation Details

Basement	Average Depth of Excavation (m)	Average Depth of Bedrock (m)	Average Depth of Hard Excavation (m)	Volume of Excavation (m^3)	Likely Volume of Rock Excavation (m^3)
B3-B4	1.4	1.2	0.2	3,400	486
B1-B2	3.9	1.5	2.4	7,800	4,800
A1	1.9	1.6	0.3	1,184	187
A2	-0.6	1.8	-2.4	15	60

4 SITE SETTING

4.1 Site Location and Description

The Site of the Proposed Development, which comprises an area of approximately 3.86 hectares (Ha) situated on lands at Blackglen Rd., Sandyford, Dublin 18. The proposed site access is via the Blackglen Rd. (R113). The land use at the Site comprises undeveloped open grasslands. The surrounding lands are mainly comprised of residential and retail developments. The site is located approximately 2km southwest of Sandyford. It is bounded to the north by the Blackglen Rd., immediately to the north of Blackglen Rd. is the Explorium development and Fitzsimons Wood pNHA (proposed Natural Heritage Area). The Carrickmines streams forms the boundary of the southeast portion of the site. East of the site are further existing residential developments, one off housing and undeveloped greenfield lands. To the south of the site are further one-off housing and fields, and approximately 685m southeast of the site is Fernhill House and Gardens. To the west of the site is predominantly fields with several one-off housing.

The Site Location is presented in Figure 4-1 and the current layout of the Site is presented in Figure 4-2.

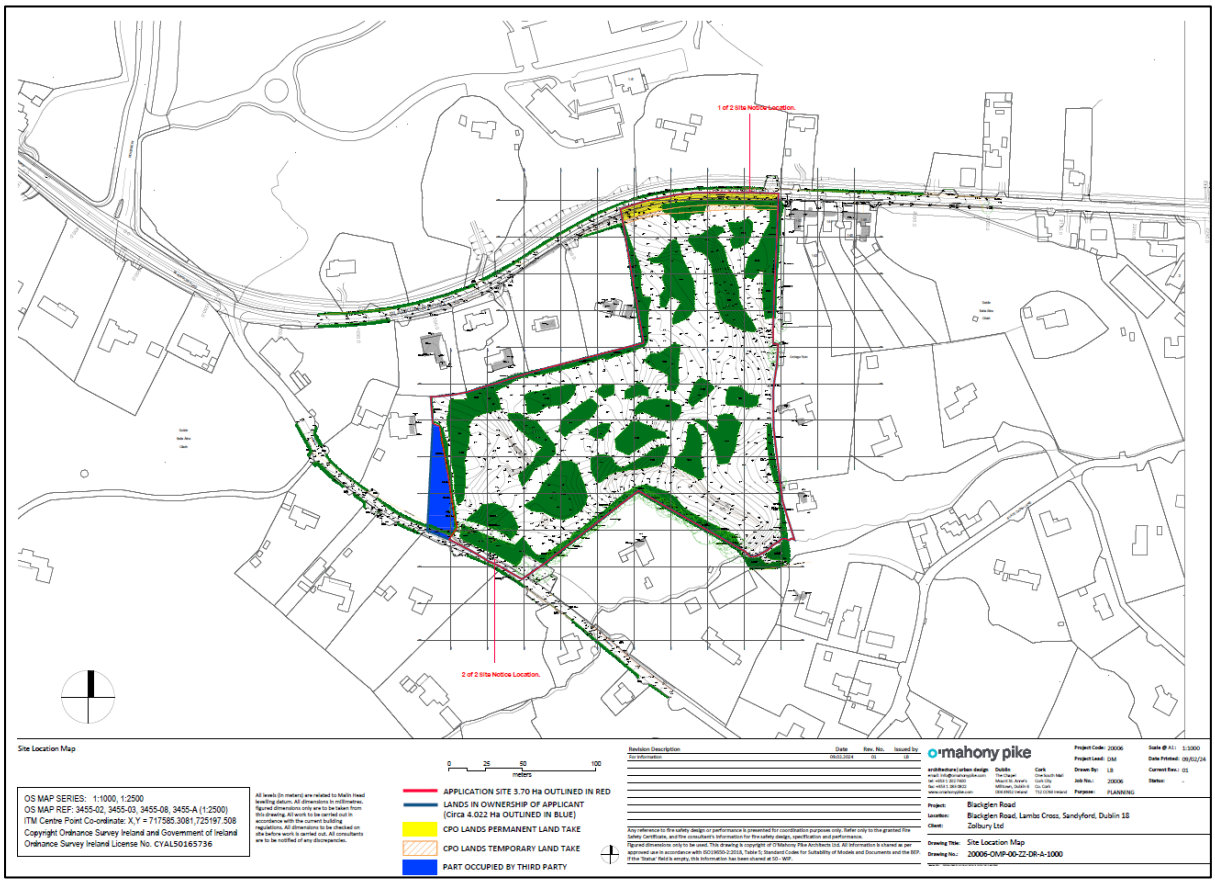


Figure 4-1. Site Location

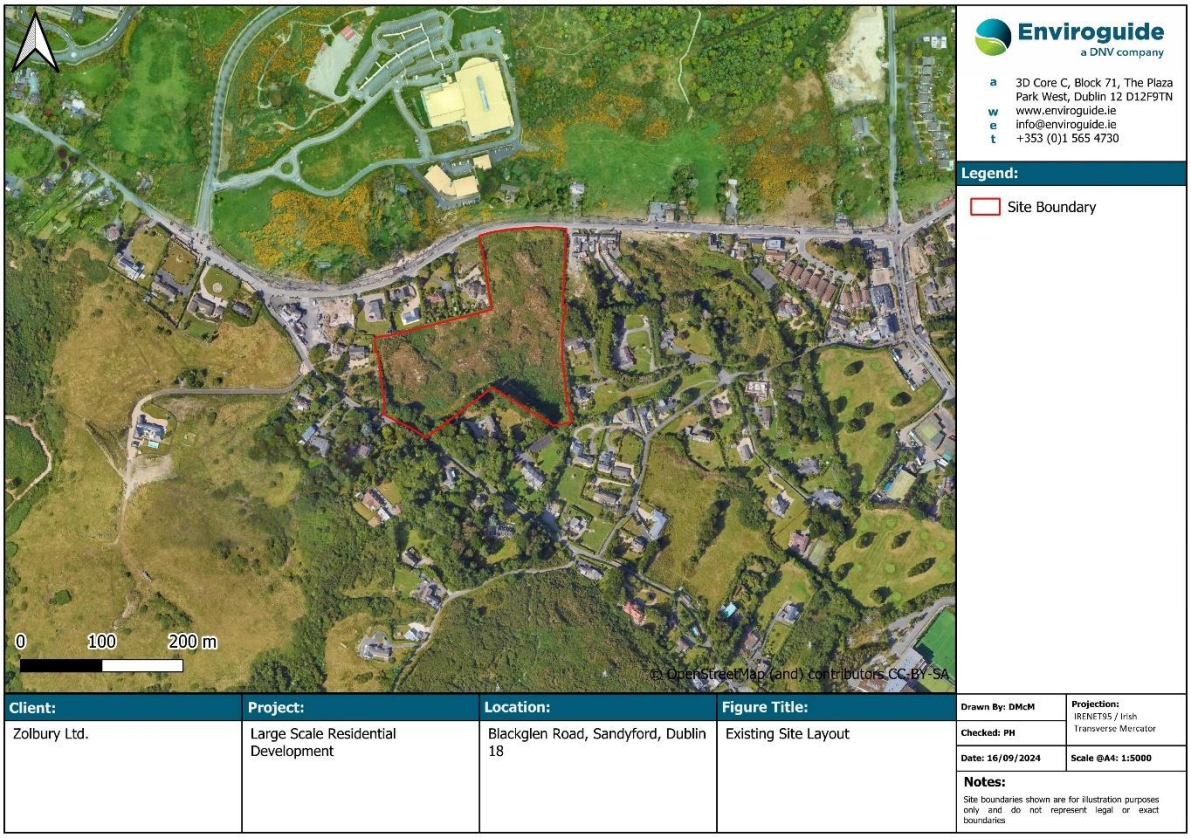


Figure 4-2. Current Site Layout

4.2 Previous Land Uses

The site is currently undeveloped, however, there are indications of historic quarrying activity along the north portion of the site as shown in the historic mapping available on the OSI website. As part of ground investigations for the site (GII, 2021), made ground deposits were encountered beneath the topsoil at TP01 and TP03 and were present to a depth of between 1.30m and 2.30mBGL (meters below ground level).

4.3 Site Topography

The topography of the site varies significantly and ranges from approximately 159 mAOD in the southwest boundary of the site to 138.7 mAOD (meters above ordnance datum) in the northeast boundary of the site. The site generally falls from west to east with a slight camber resulting in the northern half of the site falling towards the northeast while the southern half of the site falls to the southeast corner which borders the Carrickmines stream.



Figure 4-3. Site Topography as Derived from OPW Lidar (OPW, 2011)

4.4 Soil and Geology

The soils beneath the majority of the Site are mapped by Teagasc (Teagasc, 2024) as shallow well drained mineral (mainly acidic), Lithosols, Regosols derived from mainly non-calcareous parent materials (IFS Soil Code: AminSW). A small area to the south of the Site is mapped as shallow, rocky, peaty/non-peaty mineral complexes (mainly acidic), Podzols (Peaty), Lithosols, Peats derived from non-calcareous rock or gravels with/without peaty surface horizon (IFS Soil Code: AminSRPT). A small area to the north of the site is mapped as deep well drained mineral (mainly acidic), Acid Brown Earths, Brown Podzolics derived from mainly non-calcareous parent materials (IFSC Code: AminDW).

The subsoil or quaternary sediments beneath the majority of the site are mapped by the GSI (GSI, 2024) as bedrock outcrop or subcrop (Rck). While the subsoil or quaternary sediments beneath the northern portion of the site are mapped by the GSI (GSI, 2024) as till derived from granites (TGr).

The bedrock beneath the site is mapped by the GSI (GSI, 2024) as Type 3 muscovite porphyritic described as granite with muscovite phenocrysts.

There is bedrock outcropping (GSI, 2024) mapped within the northern part of the site. The closest outcropping recorded by the GSI (GSI, 2024) in the vicinity of the site is located approximately 0.652km north of the site, within Fitzsimons Wood.

There are no karst features mapped by the GSI (GSI, 2024) at the Site or within a 2km radius of the site.

4.4.1 Previous Site Investigation Results

4.4.1.1 Soils and Geology

The soils and geology encountered during the previous site investigations (GII, 2021) are summarised as follows:

- Topsoil was encountered in all the exploratory holes and was present to a maximum depth of 0.30mBGL.
- Made ground deposits were encountered beneath the topsoil at TP01 and TP03 and were present to a depth of between 1.30m and 2.30mBGL. These deposits were described generally as brown sandy gravelly clay with occasional angular to subangular cobbles, some boulders and contained occasional fragments of concrete, wire and glass. The presence of a historic quarry in the northern portion of the site may explain the presence of infill material at TP01.
- Cohesive deposits were encountered beneath the topsoil and made ground where present and were described typically as soft or soft to firm reddish brown/brown sandy gravelly clay with occasional angular to subangular cobbles and some boulders. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the cohesive matrix. These deposits had some, occasional or frequent cobble and boulder content were noted on the exploratory hole logs.
- Weathered bedrock (Granite) - In some of the exploratory holes weathered rock was encountered to a depth of up to 1.0m below the top of the stratum. The trial pits were terminated upon encountering the more competent bedrock.
- Bedrock - Medium strong to strong massive grey coarsely crystalline granite, partially to distinctly weathered. The depth to rock varies from 1.10mBGL in RC03 in the western portion of the Site, to a maximum of 4.20mBGL in RC04, located in the southern portion of the Site. RC01 & RC02 (northern portion of the Site) encountered rock between 2.30m and 2.60mBGL.

As per the GII logs, slow to moderate seepage was encountered at a number of trial pits (TP02, ENV TP01, ENV TP02, ENV TP03, ENV TP04 and ENV TP05) which depth ranged from 1.5mBGL at ENV TP01 and ENV TP04 to 3.2mBGL at ENVTP03. Groundwater was also encountered during the installation of the monitoring well RC01 at a depth of 8mBGL. RC02, RC03 and RC04 did not encounter any groundwater during the installation of the wells. Data loggers were installed in the groundwater monitoring wells on the 10th of May 2021 to record changes in water level until the 19th of June 2021 according to the graphs supplied in Appendix 8 (OCSC, 2024d). A manual measurement of the standing water level was taken before the installation of the loggers as follows:

- RC01 – 1.97mBGL;
- RC02 – 1.54mBGL;
- RC03 – 2.43mBGL; and
- RC04 – 2.94mBGL.

The graphs show water level (mOD) vs. time and the temperature was also graphed. There was a noticeable increase in water levels between the 20th and 29th of October 2024 at all wells, which potentially corresponds with a high rainfall event. The water levels increased from approximately 0.3mBGL at RC04 to 0.7mBGL at RC03 and decreased again to near baseline conditions (i.e. first measured water level according to the data loggers).

4.4.2 Soil Quality

Soil analytical data for soil samples collected across the site are provided in the ground investigation report (GII, 2021). As documented in the ground investigation report (GII, 2021), several soil samples collected were and analysed for a suite of parameters suitable to assist in the classification of soils. Soil analytical data for soil samples collected across the site are provided in the ground investigation report (GII, 2021). It is noted that a waste classification assessment was not included within the ground investigation report (GII, 2021).

Analytical results for soil samples collected from the site during the site investigations in 2021 were compared to the Generic Assessment Criteria (GAC) for human health risk assessment. These generic assessment criteria for soil apply to the United Kingdom and are used for guideline purposes. They have no statutory basis in Ireland but are recommended in the EPA Guidance. The GAC used included the following:

- Suitable for Use Levels (S4ULs) LQM/CIEH, 2015.
- Development of Category 4 Screening Levels (C4SL) for Assessment of Land Affected by Contamination, 2014.
- Soil Generic Assessment Criteria (GAC) Contaminated Land: Applications in Real Environments (CL:AIRE), 2010.

Based on the proposed use of the site for residential type use the GAC for ‘Residential (referred to hereafter as ‘Residential GAC’) was used to screen all soil analytical results. The results are summarised as follows:

- EPH (extractable petroleum hydrocarbon) interpretation was reported as ‘PAH's, Possible tarmac/bitumen & Possible lubricating oil’ at TP01. ‘No interpretation possible’ was reported for the remaining of the soil samples collected at the site.
- No exceedances of MTBE (Methyl Tertiary Butyl Ether) and PCB’s (Polychlorinated Biphenyls) were reported at any soil investigation location.
- Detectable concentrations of arsenic up to 418.8mg/kg were reported in one of the soil samples (ENV TP01) analysed for the site. The arsenic concentrations exceeded the residential GAC at ENV TP01 (176.4mg/kg at 0.0-1.0m depth and 418mg/kg at 1.0-7.0m depth), at ENV TP02 (47mg/kg at 1.0-2.0m depth) and ENV TP05 (76.9mg/kg at 0.0-1.0m depth). The reported concentrations of arsenic at the remaining soil sample locations were below the residential GAC.
- Detectable concentrations of Polycyclic Aromatic Hydrocarbons (PAHs), up to 3.67mg/kg, were reported in TP01. The reported concentrations of PAHs at the remaining sample locations were below the residential GAC.
- Mineral oil concentrations were all below the limit of detection (LOD).
- Toluene, benzene, ethylbenzene, o-xylene and m/p xylene concentrations were all below the LOD.
- Asbestos was reported as ‘no asbestos detected’ for all samples.

A number of exceedances in arsenic were noted on the soil samples (see above). However, leachability analysis on those samples showed that the concentration of arsenic was below the groundwater and surface water regulation limit values.

4.5 Hydrogeology

4.5.1 Groundwater Body

The EPA (EPA, 2024) maps the groundwater body (GWB) beneath the Site as the Wicklow GWB (EU Code: IE_EA_G_076). The Wicklow GWB covers some 1,396 km^2 and occupies an area across Co. Dublin, Co. Wicklow and Co. Wexford (GSI, 2024). It is noted that the northwestern boundary of the Site is approximately 70m from the mapped boundary with the Kilcullen GWB (EU Code: IE_EA_G_003).

The Wicklow GWB Report (GSI, 2024) identifies that the dominant recharge process in this area will be diffuse recharge from water percolating through the overlying tills and into the aquifer. High rates of potential recharge are expected in the hilly areas where there are very thin subsoils and high rainfall. However, a large portion of this potential recharge will be rejected because the rocks in this area are considered to be poor aquifers with low storativity. In addition, the steep slopes in the area will increase surface runoff. Therefore, the rapid runoff component to streams will be higher (GSI, 2024).

The majority of groundwater flow in this aquifer will take place in the top few metres (approximately in the upper 3m) within the weather zone moving laterally towards discharge points such rivers and streams. Deeper groundwater flow is possible in some instances within areas of a greater degree of structural deformation which provides a fracture network often encountered (between 10 and 40mbgl). However, only flow in isolated fractures is expected below 30m (GSI, 2024). Typical groundwater flow paths will be in the order of a couple of hundred metres, with discharge occurring to the closest surface water feature. Groundwater flow is considered to recharge and discharge on a local scale. Regional groundwater flow paths are not considered to develop, as the rocks do not have sufficient transmissivity to transport water over long distances. Typical groundwater flow paths will be in the order of a couple of hundred metres, with discharge occurring to the closest surface water feature.

4.5.2 Aquifer Classification

The bedrock aquifer mapped by the GSI (GSI, 2024) beneath the Site is classified as Poor Aquifer which is generally unproductive except for local zones (Pl). A Pl aquifer is characterised of poorly-connected fractures, fissures and joints, and with less permeable and/or more limited zones of higher permeability. Overall, these aquifers have low permeability, poor storage capacity and low recharge acceptance. The length of flow path may extend less than a few hundred metres.

The bedrock aquifer beneath the Site is presented in Figure 4-4 below.

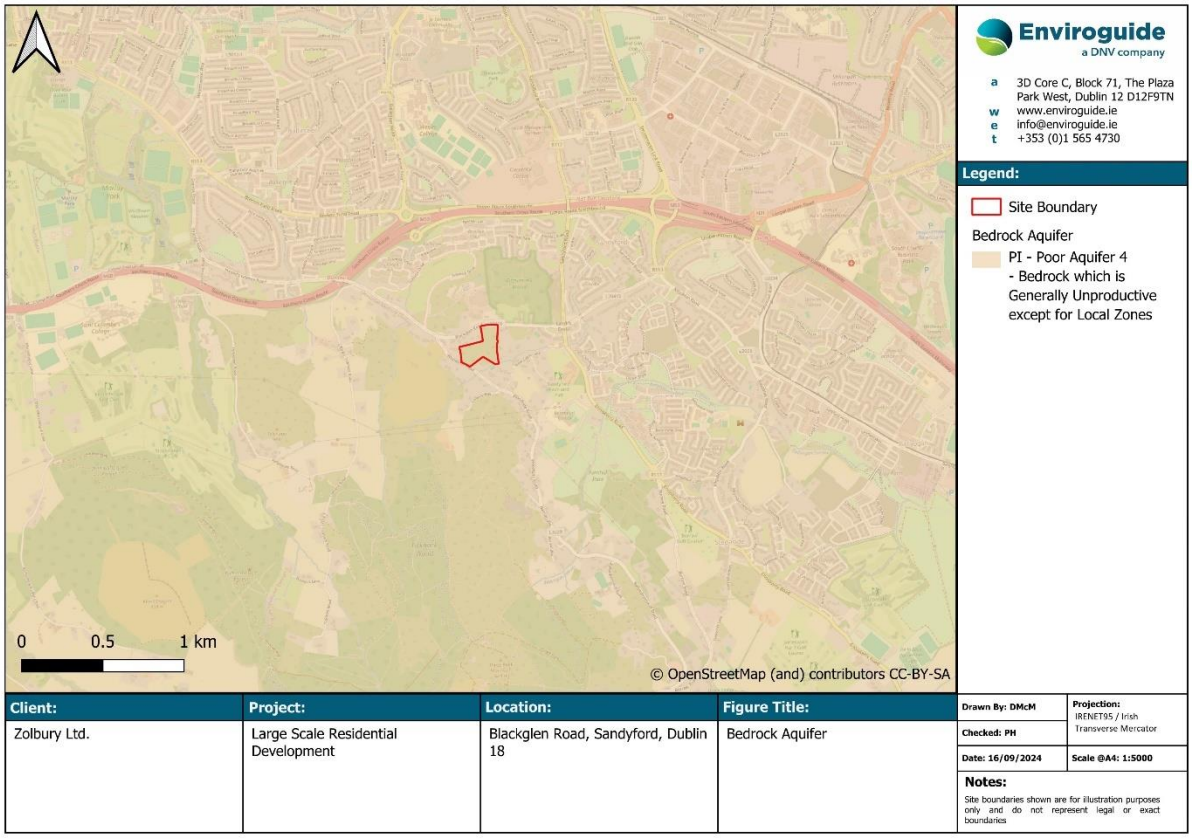


Figure 4-4. Bedrock Aquifer

4.5.3 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 4-1. 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 4-1. Vulnerability Mapping Criteria

Subsoil Thickness	Hydrogeological Requirements				
	Diffuse Recharge			Point recharge	Unsaturated Zone
	Subsoil Permeability & Type			(Swallow holes, losing streams)	(sand & gravel aquifers only)
	High permeability (sand & 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 (GSI, 2024) has assigned a groundwater vulnerability rating of Rock at or near Surface or Karst (X) for the groundwater beneath the majority of the Site and Extreme (E) for the groundwater beneath a small area to the north of the Site.

Based on ground investigations for the Site (GII,2021), topsoil was encountered to a maximum depth of 0.3mBGL and made ground was also encountered between 1.30m and 2.30mBGL in some trial pits. The depth to rock varies from 1.10mBGL (western portion of the Site), to a maximum of 4.20mBGL (southern portion of the Site). Rock between 2.30m and 2.60mBGL in the northern portion of the Site. Therefore, the maximum subsoil's thickness is approximately 1.9mBGL and they were described as sandy gravelly Clay, which according to Table 4-1 corresponds with an Extreme vulnerability.

The groundwater vulnerability rating map is provided in Figure 4-5.

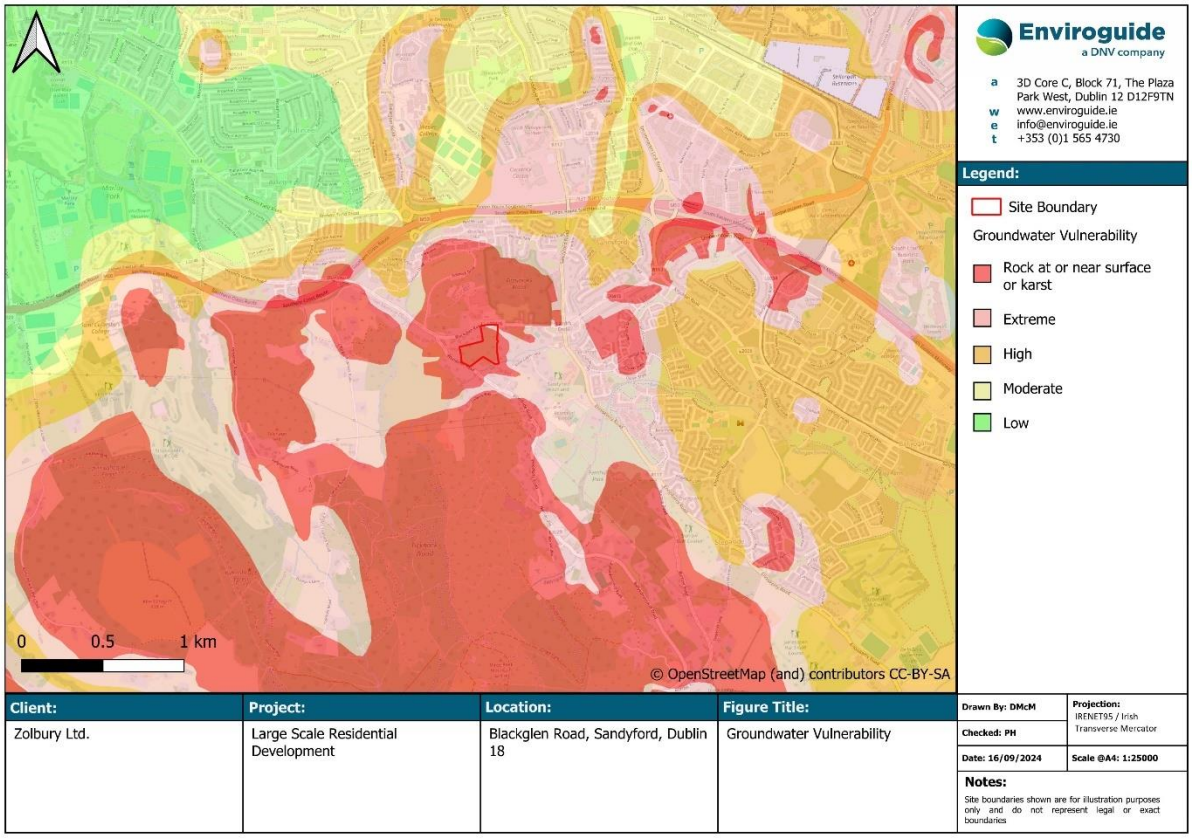


Figure 4-5. Groundwater Vulnerability

4.5.4 Site Hydrogeology

As documented in the previous site investigations (GII,2021), shallow water seepages were encountered at a number of trial pitting and a deeper water strike was encountered during the installation of RC01 at 8mBGL. Data loggers were installed in the wells in May 2021, a manual measurement was taken before the installation of the loggers. Groundwater levels for the Site ranged from 1.54mBGL at RC02 to 2.94mBGL at RC04.

Bedrock was also encountered shallow around the Site, which varied from 1.10mBGL in the western portion of the Site to a maximum of 4.20mBGL in the southern portion of the Site.

Three soakaway tests were performed in accordance with BRE Digest 365 during previous site investigations (GII,2021). Infiltration Rates of $4.151E^{-06}$ m/s, $1.662E^{-05}$ m/s and $1.599\ E^{-05}$ m/s were reported for the site.

4.6 Hydrology

The Site is mapped by the EPA (EPA, 2024) as within the Ovoca-Vartry WFD Catchment (Catchment I.D.: 10), the Dargle_SC_010 WFD Sub-catchment (Sub-catchment I.D.: 10_05) and the Dodder_050 WFD River Sub-Basin (River Waterbody Code: IE_EA_09D010900). It is noted that the northern and western boundary of the Site is immediately adjacent to the boundary between the Liffey and Dublin Bay WFD Catchment (Catchment I.D.: 09) and the Ovoca-Vartry WFD Catchment.

The closest surface water feature is recorded on the EPA database (EPA, 2024) as the Carrickmines Stream (River Waterbody Code: IE_EA_10C040350, WFD Name: Carrickmines Stream_010), which is located adjacent to the southern boundary of the Site. The Carrickmines Stream flows southeast for approximately 8.8km before converging with the Shanganagh River (River Waterbody Code: IE_EA_10S010600, WFD Name: Shanganagh_010). The Shanganagh River flows east before discharging to the Southwestern Irish Sea - Killiney Bay (HA10) (Coastal Waterbody Code: IE_EA_100_0000) approximately 1.6km downstream.

The River Slang (River Waterbody Code: IE_EA_09D010900, WFD Name: Dodder_050) is located approximately 0.4km west of the site at its closest point. The River Slang flows north for approximately 5.7km before converging with the River Dodder (River Waterbody Code: IE_EA_09D010900, WFD Name: Dodder_050). The River Dodder then flows north for approximately 4.9km before discharging to the Liffey Estuary Lower transitional waterbody (EU Code: IE_EA_090_0300) and ultimately into the Dublin Bay (EU Code: IE_EA_090_0000) located approximately 5.6km to the north-northeast of the site. It is noted that the there is no identified hydraulic connection identified between the site and the Slang River which is located within a different catchment, the Liffey and Dublin Bay WFD Catchment.

4.6.1 Site Drainage

There is an existing ditch along Woodside Road on the southwestern corner of the site with flow due east into a neighbouring private garden observed during the site walkover on the 29th of November 2023. Dun Laoghaire Rathdown drainage records indicate that this ditch receives water from the Woodside Rd surface water drainage network. Overall, the site slopes south to north towards Blackglen Rd.

The local surface waterbodies within a 2km radius of the Site are presented in Figure 4-6.

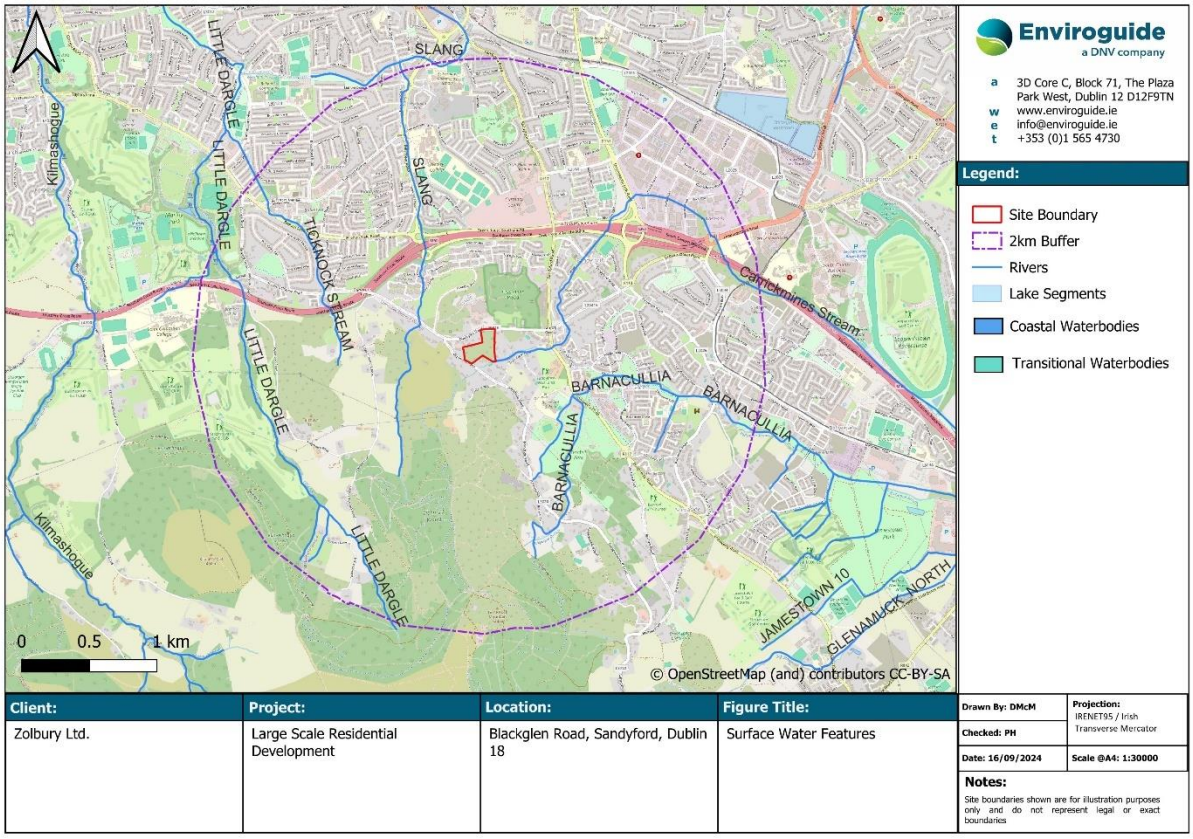


Figure 4-6. Local Surface Water Features

4.7 Flooding

The site-specific flood risk assessment (SSFRA) report produced by O'Connor Sutton Cronin Consulting Engineers (OCSC, 2024d) assessed the potential flood risk associated with fluvial, groundwater, coastal and pluvial flooding for the Site and Proposed Development.

Table 3.1 of The Planning System and Flood Risk Management Guidelines (PSFRM), classifies the proposed residential development as being 'Highly Vulnerable Development' based on its proposed land use and type of development.

The proposed surface water drainage network has been designed to ensure that no flooding is experienced during design rainfall events up to and including the 5% AEP including an additional 20% intensity for climate change projections.

The SSFRA concludes that the proposed buildings for this development are located within Flood Zone C except of the southern site boundary which aligns with flood zone A but this appears to be confined to the Carrickmines stream channel and no alterations of existing levels in that area will occur.

Pluvial and groundwater flooding will be managed through the implementation of the mitigation measures. Therefore, in accordance with the Planning System and Flood Risk Management Guidelines for Planning Authorities, there is no significant risk for flooding in the proposed development and it is appropriate for use.

4.8 Water Use and Source Protection

A search of the GSI groundwater well database (GSI, 2024) was conducted to identify registered wells and groundwater sources in the surrounding area. There are no groundwater sources recorded at the Site or within a 2km radius of the Site.

There are no groundwater source protection areas located within a 2km radius of the Site.

There are no surface water drinking water sources, under Article 7 of the Water Framework Directive, identified by the EPA (EPA, 2024) within a 2km radius or hydraulically connected to the Site.

4.9 Water Quality

4.9.1 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 4-2 below.

Table 4-2. Surface Water Quality

River I.D. (Location)	EPA WFD Parameter Quality & Trend Analysis				
	Parameter	Period	Indicative Quality	Trend	Baseline Conc. (2017)
Carrickmines Stream_010	No Data Available				
Shanganagh River_010	Ammonia-Total (as N) - Br at Friarsland Station	Annual	High	Upward	0.032mg/l
	Ammonia-Total (as N) - Br SSW of Carns (Heron Ford Lane)	Annual	High	Upward	0.040mg/l
	Ammonia-Total (as N) - At Commons Road	Annual	High	None	0.015mg/l
	Total Oxidised Nitrogen (as N) - Br at Friarsland Station	Annual	Good	Upward	1.427 mg/l
	Total Oxidised Nitrogen (as N) - Br SSW of Carns (Heron Ford Lane)	Annual	Good	Upward	1.382mg/l

River I.D. (Location)	EPA WFD Parameter Quality & Trend Analysis				
	Parameter	Period	Indicative Quality	Trend	Baseline Conc. (2017)
	Total Oxidised Nitrogen (as N) - At Commons Road	Annual	Good	Upward	0.909mg/l
	ortho-Phosphate (as P) – unspecified - Br at Friarsland Station	Annual	Poor	Upward	0.069mg/l
	ortho-Phosphate (as P) – unspecified - Br SSW of Carns (Heron Ford Lane)	Annual	Moderate	Upward	0.056mg/l
	ortho-Phosphate (as P) – unspecified - At Commons Road	Annual	Poor	Upward	0.061mg/l
Dodder_050	Ammonia-Total (as N)	Annual	Moderate	Upward	0.110mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Downward	1.272mg/l
	ortho-Phosphate (as P) - unspecified	Annual	Good	Upward	0.033mg/l
Southwestern Irish Sea - Killiney Bay (HA10) – Coastal Waterbody	No Data Available				
Liffey Estuary Lower	Chlorophyll	Summer	High	Downward	2.5mg/m^3
		Winter	High	Downward	0.5mg/m^3
	Dissolved Inorganic Nitrogen (as N)	Summer	Good	Upward	0.255mg/l
		Winter	Good	Upward	0.535mg/l
	ortho-Phosphate (as P)- unspecified	Summer	Good	Upward	40.5ug/l
		Winter	Good	Upward	44.0ug/l

River I.D. (Location)	EPA WFD Parameter Quality & Trend Analysis				
	Parameter	Period	Indicative Quality	Trend	Baseline Conc. (2017)
Dublin Bay	Chlorophyll	Summer	High	Downward	1.8mg/m^3
		Winter	High	Downward	0.5mg/m^3
	Dissolved Inorganic Nitrogen (as N)	Summer	High	Upward	0.035mg/l
		Winter	High	Downward	0.203mg/l
	ortho-Phosphate (as P)- unspecified	Summer	High	Upward	9.950ug/l
		Winter	Good	Upward	27.0ug/l

4.9.2 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.

4.9.3 Receiving Water Quality – Ringsend Wastewater Treatment Plant (WWTP)

Foul water from the site will discharge via the Ringsend WWTP to the Liffey Estuary Lower transitional waterbody. The WWTP is operated under relevant statuary approvals. The most recent available Annual Environmental Report (AER) for the Ringsend WWTP is 2022 (UE, 2022). The AER identified that the final effluent was non-compliant with the Emission Limit Values (ELV) specified in the discharge license (D0034-01). The parameters falling to meet there ELV's included biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), total nitrogen and total phosphorus. It was reported that the non-compliances for all parameters were as a result of overloading with the exception of total phosphorus which was due to no phosphorus removal treatment onsite.

While exceedances in the ELV's is noted, the following is also noted under the significance of results section of the AER:

- *'The primary discharge from the wastewater treatment plant does have an observable negative impact on the water quality in the near field of the discharge and in the Liffey and Tolka Estuaries.*
- *The primary discharge from the WWTP does not have an observable negative impact on the Water Framework Directive status in the Liffey Estuary.'*

4.10 Water Framework Directive

The WFD status for river, lake, groundwater, transitional and/or coastal water bodies that have a potential hydraulic connection to the subject 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 4-3 and shown in Figure 4-7 overleaf.

Table 4-3. Water Framework Directive Status

Waterbody Name	Waterbody EU Code	Location from Site	Distance Downstream of the Site (km)	WFD Status (2016-2021)	WFD Risk	Hydraulic Connection to the Site
River Waterbodies						
Carrickmines Stream_010	IE_EA_10C040350	Adjacent – southern boundary	0.0	Good	Not At Risk	Potential, shallow groundwater connection to the Site
Shanganagh River_010	IE_EA_10S010600	East	6.7	Good	Not At Risk	Potentially Hydraulically connected to Site through the Carrickmines Stream
Dodder_050	IE_EA_09D010900	West	0.4	Moderate	At Risk	Not Hydraulically connected to Site – Upstream of the Site (different catchment)
Transitional Waterbodies						
Liffey Estuary Lower	IE_EA_090_0300	North	8.8	Moderate	At Risk	Not Hydraulically connected to Site – Upstream of the Site (different catchment)
Coastal Waterbodies						
Southwestern Irish Sea - Killiney Bay (HA10)	IE_EA_100_0000	East	8.3	High	Not At Risk	Yes, potential hydraulic connection through the Carrickmines Stream, the Shanganah River and the Ringsend WWTP discharge

Waterbody Name	Waterbody EU Code	Location from Site	Distance Downstream of the Site (km)	WFD Status (2016-2021)	WFD Risk	Hydraulic Connection to the Site
Dublin Bay	IE_EA_090_0000	Northeast	14	Good (Ecological Status) Failing to achieve good (Chemical Status)	Not At Risk	Not Hydraulically connected to Site – Upstream of the Site (different catchment)
Groundwater Bodies						
Wicklow GWB	IE_EA_G_076	Underlying	0.0	Good	At Risk	Yes, underlying the Site
Kilcullen GWB	IE_EA_G_003	Northwest	0.7	Good	At Risk	Potential connection due to proximity to the Site

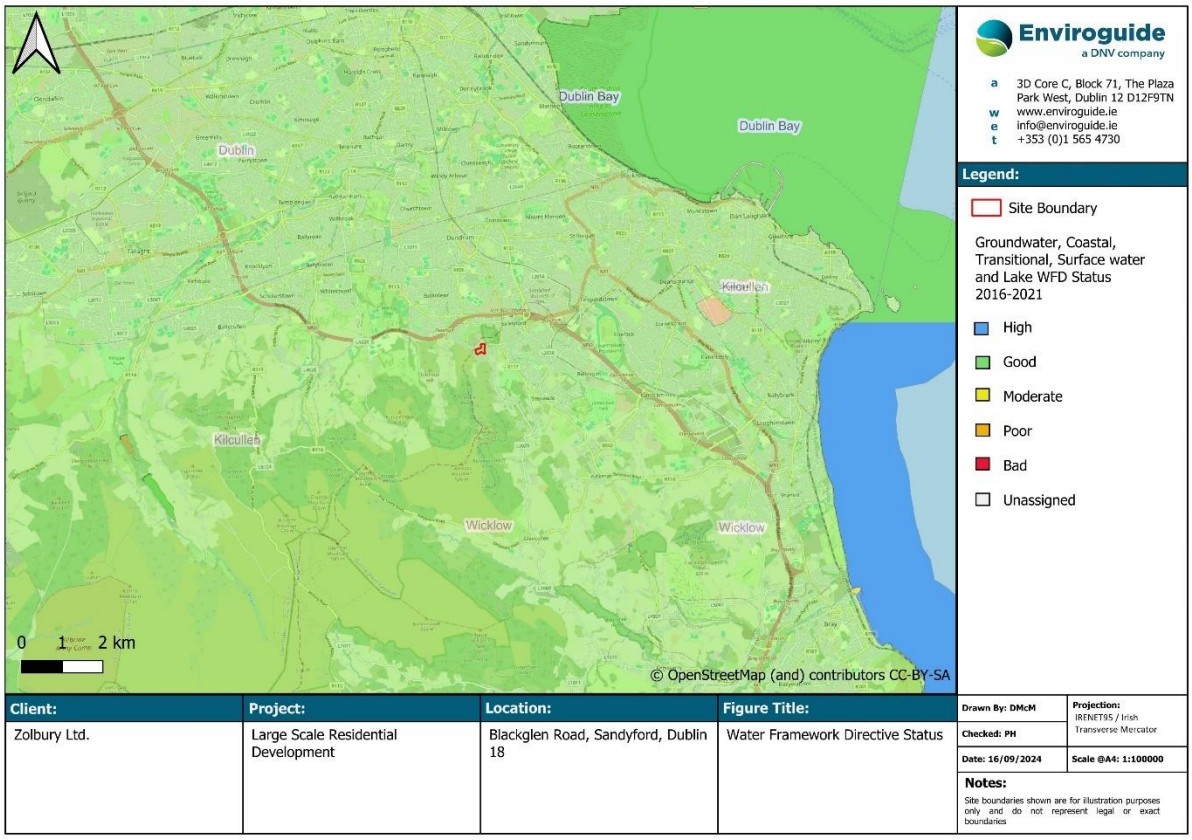


Figure 4-7. Water Framework Directive Status

4.10.1 Existing Services

As per the O'Conner Sutton Cronin Engineering Services Report (OSCS, 2024d). Currently, the Site is a greenfield site.

4.10.1.1 Surface Water

Existing services records indicate that no surface water sewer is present in the vicinity of the Proposed Development, however, a new surface water network is proposed as part of the upgrades works on Blackglen Rd. Given the slope of Blackglen Rd it is assumed that this will discharge to the existing surface water drainage network at Lambs Cross and subsequently to the Carrickmines stream immediately to the east.

The rainfall runoff from the site is currently allowed to infiltrate naturally to ground. In extreme events the site may generate overland flow that discharges to the Blackglen Rd or adjacent properties to the east following natural topography. The southern portion of the site may discharge overland flow directly to the Carrickmines stream to the south.

4.10.1.2 Foul Water

Existing services records do not indicate the presence of any wastewater infrastructure within the site of the Proposed Development. Records indicate that there is an existing 150mm Ø wastewater sewer on Blackglen Rd. This sewer is to be upgraded as part of the planned upgrade works on Blackglen Rd.

4.10.1.3 Water Supply

The Irish Water public drainage records indicate that there is an existing public 3” asbestos watermain along on the Blackglen Rd along the northern boundary of the site. That watermain is to be upgraded to a 200mm watermain as part of upgrades works to Blackglen Rd.

4.11 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).

There are seven (7 No.) Natura 2000 sites that are identified with a potential hydraulic connection to the Site and Proposed Development. There are also four (4 No.) proposed Natural Heritage Areas (pNHA) identified with a potential hydraulic connection to the site and Proposed Development. The Natura 2000 sites and other protected and designated sites or areas with a potential hydraulic connection to the site are summarised in Table 4-4 and Figure 4-8. It is noted that the Kilcullen GWB beneath the site is considered to have short groundwater flow paths (anticipated to be in the order of a couple of hundred metres), with groundwater discharging to the closest surface water feature (i.e., the Carrickmines Stream). Therefore, there is no perceived pathway from groundwater beneath the Site to the identified downgradient Natura 2000 sites and other protected and designated sites.

Table 4-4. Designated and Protected Sites

Designated Site	Site Code	Distance from Site (km)*	Direction	Potential Risk
Special Area of Conservation (SAC)				

Designated Site	Site Code	Distance from Site (km)*	Direction	Potential Risk
North Dublin Bay SAC	000206	11.1	Northeast	Yes, hydrological connection via River Slang and downstream waterbodies. There is also a connection via discharge from Ringsend WWTP.
South Dublin Bay SAC	000210	5.94	Northeast	
Rockabill to Dalkey Island SAC	003000	9.85	East-Northeast	Yes, hydrological connection via the Carrickmines stream and river Shanganagh.
Special Protection Area (SPA)				
North-West Irish Sea SPA	004236	11.06	Northeast	Yes, hydrological connection via the Carrickmines stream and river Shanganagh.and downstream waterbodies. There is also a connection via discharge from Ringsend WWTP.
North Bull Island SPA	004006	11.45	Northeast	
South Dublin Bay and River Tolka Estuary SPA	004024	6.16	Northeast	
Dalkey Islands SPA	004172	9.85	East-Northeast	
Proposed Natural Heritage Area (pNHA)				
Fitzsimon's Wood pNHA	001753	0.55km	North	Potential groundwater hydraulic pathway due to downgradient nature relative to the Site.

Designated Site	Site Code	Distance from Site (km)*	Direction	Potential Risk
Royal Canal pNHA	002103	9.73	North	No, located upstream of surface waterbodies hydraulically connected to the Site (i.e., the Shanganagh River).
Grand Canal pNHA	002104	7.88	North	
South Dublin Bay pNHA	000210	6.16	Northeast	Yes, remote hydrological connection via River Carrickmines stream, river Shanganagh and downstream waterbodies. There is also a connection via discharge from Ringsend WWTP.
Dalkey Coastal Zone And Killiney Hill pNHA	001206	9.65	East	
North Dublin Bay pNHA	000206	11.1	Northeast	
Note: '*' = Distance is measured as closest point to the Site				

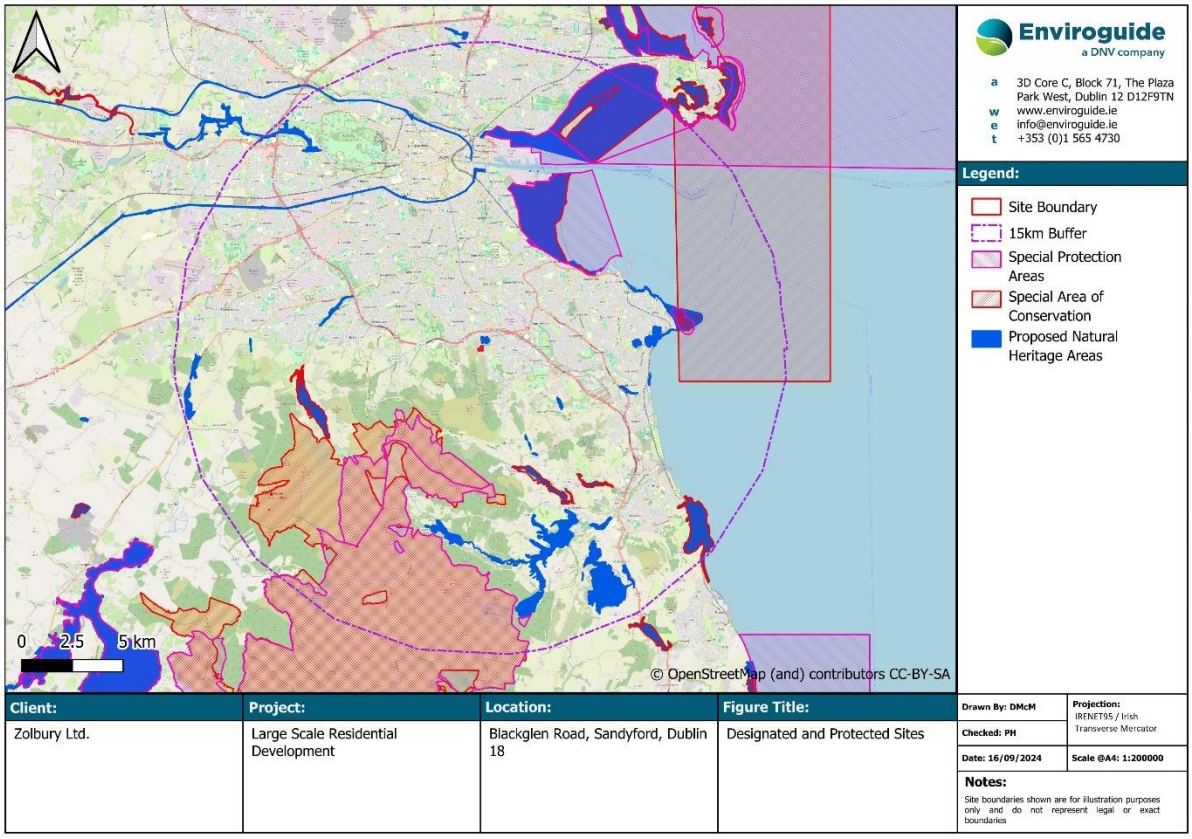


Figure 4-8. Protected and Designated Areas

4.11.1 Fitzsimon's Wood pNHA

Special consideration is given to Fitsimon's Wood pNHA due to its close proximity. The NPWS pNHA site synopsis for Fitzsimon's Wood (NPWS, 2009) provides a description of the ecology and threats affecting this site. *"Fitzsimon's Wood occupies an area of approximately 8ha near Lamb's Cross in Sandyford, Co. Dublin. The woodland consists of mature birch (Betula spp.) with some oak (Quercus spp.), together with a well developed understorey of Holly (Ilex aquifolium). Natural regeneration is occurring and there is a profuse growth of young birch, Ash (Fraxinus excelsior), oak and other species. Some marshy areas also occur within the woodland. An area of heath, dominated by Gorse (Ulex europaeus) scrub is also included in the site. The underlying rock of the area is granite and where this outcrops it is often covered with ferns and mosses.*

Fitzsimon's Wood is directly adjacent to a housing estate and is subject to significant recreational pressure. Dumping of cars and rubbish is a problem. The sporadic removal of wood, coupled with camp fires, also poses a threat to the site. These activities will need to be controlled if the gradual attrition of the wood is to be prevented.

Nonetheless, the basic woodland structure remains intact and as birch woodland is very rare in Co. Dublin, Fitzsimon's Wood continues to be of ecological importance."

As per the NPWS description the Fitzsimons Woods pNHA, no habitats within the pNHA have been identified as water dependant. However, as discussed in Enviroguide's Ecological Impact Assessment report (2024), Enviroguide is aware of "An area adjacent and south of the pNHA, known as Gorse Hill, contains four ponds (D'Arcy, 2021), of which Smooth newt are

known to breed in at least one of them (Tubridy, 2006). These ponds are located outside of the pNHA and largely off the walking trails and would not be susceptible to significant disturbance relating to increase usage of the woods by residents of the Proposed Development." It is our understanding that these ponds are relatively shallow and are sustained by pluvial contributions that has created a local perched groundwater table. There are no contributions from surface water drainage or watercourses to these ponds.

5 ASSESSMENT OF POTENTIAL IMPACTS

5.1 Conceptual Site Model

As outlined in Section 2.4, the CSM represents the characteristics of the Site and identified the possible relationship and potential risk between the contaminant sources, pathways and receptors.

The preliminary CSM and identified sources, pathways and receptors associated with the Site and Proposed Development are outlined in Section 5.1.1, Section 5.1.2 and Section 5.1.3.

5.1.1 Potential Sources

The potential sources associated with the Construction Phase and Operational Phase of the Proposed Development are discussed below:

5.1.1.1 Construction phase

Surface Water Flow

During the Construction Phase of the Proposed Development there will be no direct discharges to surface water or groundwater with the exception of rainfall which will infiltrate to ground via exposed surfaces during excavation works for the construction of building foundations and utility infrastructure.

Groundwater Flow

As per the recommendation on the GII report (GII, 2021), any excavations which penetrate the granular weathered rock deposits will require to be appropriately battered or the sides supported and are likely to require dewatering due to the groundwater seepages noted in the exploratory hole logs. The description of the Proposed Development includes the construction of Basement/Podium car park areas proposed below Blocks B1, B2, B3 and B4. The excavations required for the construction of these basements are likely to the intersect groundwater table and will require dewatering during the Construction Phase.

As part of the initial site preparation, the proper planning for the excavation works and ensure that perimeter drainage can be installed in advance of the main excavation, which could temporarily change the flow patterns beneath the site and could also have potential effects on receiving surface water bodies. However, the dewatering strategy (i.e. installation of wells to lower the water table, placement of sump pumps within the excavations to remove ponding water as well as water management of the pumped water) and groundwater recharge strategy (i.e. installation of recharge wells and use of permeable paving) developed for the site, for the construction of the basements, will provide protection to the quality and quantity of water that will be introduced back into the groundwater body reducing the effects on changes of the groundwater flow patterns and waterbodies downstream of the site.

Water Quality

Foul water discharge from the temporary welfare units (canteen facilities, toilet facilities, office accommodation and tool storage areas) at the site during the Construction Phase of the Proposed Development will either be tankered offsite in accordance with waste management legislation or discharged under temporary consent to the UE mains foul network for treatment at Ringsend WWTP subject to agreement with UE.

Soil Quality

An exceedance of the residential GAC was noted for arsenic on a number of soil samples collected at the site which were localised to the north/northeastern boundary of the site. It is noted that the potential human health risks to construction workers are outside the scope of this assessment. It is recommended that appropriate health and safety measures that are protective of site workers are implemented by the appointed contractor during the construction phase.

Other potential sources of contamination that could impact on water quality during the Construction Phase based on the design of the Site include:

- Storage and use of fuel, oils and chemicals used during construction which in the event of an accidental release through the failure of secondary containment or a materials handling accident could infiltrate to the underlying groundwater.
- Use of concrete and cementitious materials during construction in particular for installation of below ground infrastructure and foundations where shallow groundwater may be encountered.
- Suspended sediment and other contaminants entrained in runoff arising from groundworks, stockpiling of materials and other constructions works at the site.
- Sediment or other material on construction vehicles could potentially be tracked offsite to external public roads.
- Accidental release of wash-water or foul water from facilities at the subject site (e.g., wheel wash and temporary welfare facilities); and,
- Release of foul water from existing foul water drainage during connection to live sewers.

5.1.1.2 Operational phase

Surface Water Flow

Surface water runoff from the Proposed Development will be managed in accordance with the principles and objectives of SuDS and GDSDS and will be treated and attenuated prior to discharge from the site. The proposed surface water design splits the Proposed Development into 2 No. catchments to better integrate SuDS measures and reduce the rainfall runoff rate. Attenuated runoff from Catchment 1 is to be discharged to the new surface water sewer which bounds the site to the north. Catchment 2 is to discharge to a combination of infiltration soakaway and attenuated outfall to the Carrickmines stream along the southeastern boundary. Each sub-catchment area will provide interception and treatment of the rainfall runoff, either at source or throughout the site.

The proposed surface water drainage from Catchment 1 is to discharge attenuated flows to the public surface water network, which is located to the north of the site. A new connection to this existing sewer is to be provided on Blackglen Rd. The discharge rate at the outfall location is to be restricted to less than the current greenfield equivalent runoff rate. The attenuated runoff from Catchment 2 will discharge to an infiltration soakaway which all or a portion of is likely to discharge to the Carrickmines stream along the southern boundary of the site thus maintaining existing flow conditions in the Carrickmines stream. Therefore, there will

not be an increase in flow rates and volumes from the development site to be discharged to the receiving infrastructure and therefore, there will not be an adverse impact on adjoining and other downstream properties.

Groundwater Flow

The building foundations / basements have the potential to impede local groundwater flow and movement through the site with the potential for groundwater mounding upgradient of such structures. Standard design and construction measures that include incorporating groundwater drainage around impermeable subsurface structures (i.e., building foundations, basements and temporary barriers during construction) will minimise adverse effects of groundwater mounding at the upgradient side of the structures. Changes to groundwater flow could also have potential effects on receiving surface waterbodies such as the Carrickmines stream.

Water Utilities

The existing public 3" asbestos watermain along the Blackglen Rd. along the northern boundary of the Site will be upgraded to a 200mm high-density polyethylene (HDPE) watermain to serve the proposed development and a connection will be provided to the new 200mm diameter watermain to be laid on Blackglen Rd. to the north of the site as part of upgrade works. A Pre-Connection Enquiry Form was submitted on the 06th April 2022 for 360 No. residential units and the feedback stated that the development was feasible subject upgrades to the existing network. A new Pre-Connection Enquiry Form was submitted on the 26th January 2024 for 192 No. residential units. Feedback on this enquiry received on the 31st May 2024 states that the development is feasible, subject to upgrades to the existing network.

The proposed foul water drainage network for the Proposed Development will be connected to the existing 150mm diameter wastewater sewer on Blackglen Rd. This sewer is to be upgraded as part of the planned upgrade works on Blackglen Rd. The overall development is to be drained by a gravity wastewater network, based on the natural topography of the development site. A Pre-Connection Enquiry Form was submitted on the 06th April 2022 for 360 No. residential units and the feedback stated that the development was feasible subject upgrades to the existing network. A new Pre-Connection Enquiry Form was submitted on the 26th January 2024 for 192 No. residential units Feedback on this enquiry received on the 31st May 2024 states that the development is feasible, subject to upgrades to the existing network.

Water Quality

Surface water runoff from the Proposed Development, which will be managed in accordance with the principles and objectives of SuDS and will be treated prior to discharge from the site. There will be no requirement for bulk storage of petroleum hydrocarbon-based fuels during the operational phase.

Soil Quality

An exceedance of the residential GAC was noted for arsenic on a number of soil samples collected at the site which were localised to the north/northeastern boundary of the site. The potential for human health risk is considered to be low, given that this area will be occupied by buildings and hardstanding. Therefore, there are no identified open pathways to human health receptors. It is noted that where required, soil and subsoil materials to be reused within the Proposed Development (i.e., for engineering fill and landscaping) will be subject to

assessment of the suitability for use in accordance with engineering and environmental specification for the Proposed Development.

The most plausible, albeit worst case, source scenario is outlined:

- Fuels or other potentially hazardous materials released in the event of an accidental spill or leak from a vehicle (assumed 500 litres) is considered a worst-case source at the site. This potential source is considered to be a short-term event in a worst-case scenario and while unlikely to occur, this scenario is considered in this assessment.
- Suspended sediment entrained in surface water runoff is considered a low-risk source of contamination at the Site for the Operational Phase of the Proposed Development.

5.1.2 Pathways

The following potential pathways are identified and evaluated below:

Vertical migration to the underlying bedrock and lateral migration within the aquifer to downgradient receiving surface water bodies

The site is underlain by a poor bedrock aquifer (Pl) within the Wicklow GWB. The dominant recharge process in this area will be diffuse recharge from water percolating through the overlying tills and into the aquifer. However, due to the rock's low storativity (poor aquifer), the majority of that recharge will be rejected and therefore, a rapid runoff component to streams will be higher.

During the site investigations (GII, 2021), low to moderate seepage was encountered at a number of trial pits at shallow depths (maximum depth of 3.2mBGL). However, deeper water strikes were recorded at one groundwater monitoring well (approximately 8.0mBGL) during the site intrusive investigations. Groundwater manual measurements taken in May 2021 before the installation of the loggers recorded standing groundwater levels ranging from 1.54mBGL at RC02 to 2.94mBGL at RC04. Groundwater levels recorded continuously over one month (10th May 2021 to 19th June 2021) showed some variations in the water levels (i.e., water level rising), potentially due to a high rainfall event towards the end of May and the beginning of June 2021. Nevertheless, the water levels remained within the range measured before the installation of the data loggers.

Groundwater flow is considered to recharge and discharge on a local scale (GSI, 2024). Regional groundwater flow paths are not considered to develop with typical groundwater flow paths being in the order of a couple of hundred metres, with discharge occurring to the closest surface water feature.

The vulnerability of the aquifer beneath the site is mapped on the GSI website (GSI, 2024) as having rock at surface (X) within the majority of the site, which means that the bedrock is exposed at the surface as outcrops, and extreme (E) vulnerability has been mapped by the GSI (GSI, 2024) within a small section north of the site. During the site investigations shallow bedrock was reported at the site. During groundworks and excavations (Construction Phase), the shallow groundwater will be more vulnerable and as a result there will be a more direct pathway for surface contaminants to enter underlying bedrock aquifer and migrate towards the closest downgradient receiving surface water bodies.

Basement and Buildings Foundations

Based on the available groundwater level data and the proposed levels for subsurface structures it would appear that levels for the proposed basements and building foundations would be below the groundwater during and post construction.

The proposed basement and building foundations have the potential to impede local groundwater flow and movement through the Site with potential for groundwater mounding upgradient of structures. There may be an increase in hydrostatic pressure and result in buoyancy and structural integrity risks for subsurface structures. However, as stated in the CEMP (OSCS, 2024b), a number of wells will be installed around the excavation with the purpose of lowering the groundwater level at the site to keep excavations dry. In addition, a number of recharge wells will also be constructed around the site to return a portion of the treated water back into the groundwater system.

Local dewatering will be required during construction based on recorded groundwater levels for the Site in 2021, with a potential temporary localised change in groundwater levels. As there will be works below the groundwater table there is a potential for adverse effects to affect groundwater quality (i.e., water chemistry) that may be exposed during works.

Surface Water Runoff and Migration Offsite via Watercourses to Downstream Surface Waterbodies

Based on a walkover survey on the 29th of November 2023, there is an existing ditch along Woodside Road on the southwestern corner of the site with flow due east into a neighbouring private garden. Overall, the site slopes south to north towards Blackglen Rd. During the Construction Phase, surface water run off (i.e., rainfall runoff) may potentially discharge into the ditch along the southwestern site boundary as well as the Carrickmines stream if precautionary measures are not effectively implemented.

Groundwater Discharge to Mains Sewer and Downstream Receiving Surface Waterbodies

Based on the findings of the previous site investigations (GII, 2021), excavations in the made ground, peat or soft cohesive deposits will require to be appropriately battered or the sides supported due to the low strength of these deposits. Any excavations which penetrate the granular weathered rock deposits will require to be appropriately battered or the sides supported and are likely to require dewatering due to the groundwater seepages noted in the exploratory hole logs. Furthermore, groundwater levels at the site range from 1.54mBGL at RC02 to 2.94mBGL at RC04.The groundwater and stability noted on the trial pit logs should be consulted when determining the most appropriate construction methods for excavations.

Furthermore, there will be a need to temporarily dewater the Site during the Construction Phase due to the design of the Proposed Development (i.e., construction of basements).

Surface Water Run off Discharge to Mains Sewer and Downstream Receiving Surface Waterbodies

There will be a requirement for management of surface water (rainwater) during the Construction Phase and Operational Phase of the Proposed Development. Therefore, there will be a pathway for surface water runoff (rainwater) discharged via onsite drainage network during the Construction Phase and Operational Phase of the Proposed Development:

- Where required, surface water runoff (rainwater) during the Construction Phase will be discharged offsite in accordance with the necessary discharge licences issued by Irish Water under Section 16 of the Local Government (Water Pollution) Acts and Regulations for any water discharges to sewer (and ultimately the Liffey Estuary Lower via the Ringsend WWTP) or from DLRCC under Section 4 of the Local Government (Water Pollution) Act 1977, as amended in 1990 for discharges to surface water (and ultimately downstream receiving waterbodies).
- Surface water runoff during the Operational Phase from the Proposed Development, will be managed in accordance with the principles and objectives of SuDS and GDSDS, and will be treated and attenuated prior to discharge from the site.
- During the Operational Phase, the surface water drainage will discharge attenuated flows to the public surface water network, which is located to the north of the site before ultimately discharging to the downstream receiving waterbodies (Catchment 1). A new connection to this existing sewer is to be provided on Blackglen Rd. The attenuated runoff from Catchment 2 is to discharge to a combination of infiltration soakaway and attenuated outfall to the Carrickmines stream along the southeastern boundary.

Leaching of Existing Contaminants in Soil to Groundwater

Elevated concentrations of arsenic were reported for a number of soil samples collected at the site which were localised to the north/northeastern boundary of the site. The leachability analysis on those samples showed that the concentration of arsenic was below the groundwater and surface water regulation limit values and therefore there is no identified risk to the receiving environment (i.e. groundwater and surface water bodies).

Foul Water Discharge to Main Sewer and Receiving Surface Waterbodies

Foul water during the Construction Phase of the Proposed Development will be either removed by tanker in accordance with waste management legislation and managed accordingly. Foul water during the Operational Phase of the Proposed Development will be discharged to the existing 150mm diameter wastewater sewer on Blackglen Rd which will be upgraded as part of the planned upgrade works on Blackglen Rd and ultimately discharged to the Liffey Estuary Lower via the Ringsend WWTP. Therefore, this indirect pathway to the Liffey Estuary Lower is considered in this assessment.

5.1.3 Receptors

The receptors considered in this assessment include the following:

- Groundwater
  - Underlying poor bedrock aquifer (Pl) which is part of the Wicklow GWB.
- Surface Water:
  - Carrickmines Stream (Carrickmines Stream_010);
  - Shanganagh River (Shanganagh_010);
  - Southwestern Irish Sea - Killiney Bay (HA10);
  - Liffey Estuary Lower; and
  - Dublin Bay.
- Natura 2000 Sites:
  - North Dublin Bay SAC;
  - South Dublin Bay SAC;

- Rockabill to Dalkey Island SAC;
- North Bull Island SPA;
- Dalkey Islands SPA
- South Dublin Bay and River Tolka Estuary SPA; and
- North-West Irish Sea SPA.

- Proposed Natural Heritage Areas:
  - Fitzsimons Woods pNHA.

5.2 Risk Evaluation of Source-Pathway-Receptor Linkages

A risk-based assessment of the Source-Pathway-Receptor Model and the potential risk linkages associated with the Construction Phase and Operational Phase of the Proposed Development was undertaken. The results were evaluated to determine if the Proposed Development could potentially impact any potential receptors associated with the Site.

Table 5-1. Conceptual Site Model (Source- Pathway Receptor) and Risk Evaluation

Source	Pathway	Receptor	Risk Evaluation and Avoidance
Construction Phase			
Discharge of Contaminants to Ground / Groundwater	Vertical and Lateral Groundwater Migration in Bedrock Aquifer	Underlying Bedrock Aquifer Receiving surface waterbodies (i.e., the Carrickmines stream and downstream waterbodies) Natura 2000 Sites and Proposed Natural Heritage Areas	Low to Moderate Risk (worst-case unmitigated scenario) During groundworks and the excavations, shallow groundwater will be more exposed to surface borne contaminants. However, based on the relatively low recharge potential due to the poor aquifer nature of the rock and low storativity, it is considered that there is some protection of groundwater from migration of dissolved contaminants to the aquifer beneath the Site, which will likely be confined to the immediate vicinity of the Site. The Wicklow GWB beneath the site is considered to have short groundwater flow paths (being in the order of a couple of hundred meters), with groundwater discharging to the closest surface water feature. Therefore, there is no perceived direct pathway from groundwater beneath the Site to the identified downgradient Natura 2000 sites. However, there is a potential pathway for groundwater to the Fitzsimons Woods pNHA.

Source	Pathway	Receptor	Risk Evaluation and Avoidance
			In a worst-case scenario during either the Construction Phase (e.g., accidental release of fuels, chemicals or oils through the failure of secondary containment or a materials handling accident) in the absence of any mitigation measures there is potential for discharge of contaminants to groundwater and downgradient receiving surface water receptors. During the construction phase, all works will be undertaken in strict accordance with the CEMP which will detail appropriate design avoidance and mitigation measures to prevent any potential impact to the receiving water quality.
Discharge of Entrained Contaminants in Surface Runoff	Discharge to Downstream Receiving Waterbodies	Receiving surface waterbodies (i.e. the Carrickmines stream and downstream waterbodies) Natura 2000 Sites and Proposed Natural Heritage Areas	Low Risk (worst-case unmitigated scenario) Discharge of surface water runoff either to the surface water network on the Blackglen Rd. or the Carrickmines stream in the southeast corner of the site has potential to adversely effect water quality and flow in downstream waterbodies and protected sites. However, the intervening distance of over 10 river km and the lack of direct connectivity to any European site (outfall to Irish Sea at Shanganagh and not directly into European sites) negates potential for likely significant effects to protected areas. During the construction phase, all works will be undertaken in strict accordance with the CEMP which will detail appropriate design avoidance and mitigation measures to prevent any potential impact to the receiving water quality.
Surface Water Runoff	Discharge to Downstream	Receiving surface waterbodies (i.e. the	Low Risk

Source	Pathway	Receptor	Risk Evaluation and Avoidance
	Receiving Waterbodies and public sewers	Carrickmines stream and downstream waterbodies) Natura 2000 Sites and Proposed Natural Heritage Areas	Any local diversion for treatment of surface water required to enable construction will have a negligible effect on flow regime of receiving waterbodies. During the construction phase, all works will be undertaken in strict accordance with the CEMP which will detail appropriate design avoidance and mitigation measures to prevent any potential impact to the receiving water quality.
Foul Water Discharge	Discharge to Mains Sewer	Receiving surface waterbodies (i.e. the Carrickmines stream and downstream waterbodies) Natura 2000 Sites and Proposed Natural Heritage Areas	Low Risk Foul water during the Construction Phase of the Proposed Development will be either removed by tanker in accordance with waste management legislation and managed accordingly or discharged under consent to the mains UE drainage network and ultimately discharged to the receiving surface waterbodies (i.e., the River Liffey or the Liffey Estuary Lower via Ringsend WWTP). Foul water from the Site will only be discharged to the UE network under the appropriate consents from UE and therefore, the Proposed Development will not cause a potential impact at any receiving waterbody or Natura 2000 sites associated with discharges from the Site.
Building Foundations and Basements Construction and Required Dewatering	Groundwater (Subsurface) Flow Regime	Local Groundwater Levels Groundwater/ Surface Water Flow Offsite Surface Water Flow Offsite Onsite and Offsite Groundwater Dependent Receptors (Including Sensitive Habitats)	Low to Moderate Risk Any required groundwater dewatering due to the construction of the basements will be localised and temporary and associated adverse effects will be within a localised area of the underlying aquifer. The dewatering strategy will ensure the expected localised temporary adverse effects on groundwater levels will be maintained within the work

Source	Pathway	Receptor	Risk Evaluation and Avoidance
			area onsite and not extend offsite. Therefore, a number of wells will be constructed around the excavation site to lower the groundwater level. These points will pump out water to keep the excavation dry. In addition, a number of recharge wells will be installed around the site to return a portion of the treated water back into the groundwater system. If necessary, during construction, temporary dewatering of wetland areas will be incorporated in the dewatering management plan. Existing water dependent habitats in the vicinity of the scheme such as adjacent to Fitzsimon Woods are relatively shallow and are sustained by pluvial contributions that have created local perched groundwater table and therefore, with the appropriate design avoidance and mitigation measures any potential impact to the receiving water quality and sensitive water dependant habitats will be prevented.
Operational Phase			
Discharge of Surface Water Runoff (i.e., Rainwater)	Discharge to Surface Water Drainage Network	Receiving surface waterbodies (i.e. the Carrickmines stream and downstream waterbodies) Natura 2000 Sites	Low Risk (worst-case unmitigated scenario) During the Operational Phase of the Proposed Development, there is limited potential for discharge of any contaminated runoff to the receiving water courses associated with surface water runoff from the Site. Surface runoff from roofs and paved areas will be managed and treated in accordance with SUDS and pass through petrol interceptor and attenuation tanks prior to discharging to the public surface water network, which is located to the north of the Site before

Source	Pathway	Receptor	Risk Evaluation and Avoidance
			ultimately discharging to the downstream receiving waterbodies (Catchment 1). Catchment 2 is to discharge to a combination of infiltration soakaway and attenuated outfall to the Carrickmines stream along the southeastern boundary. However, in a worst-case scenario during the Operational Phase (e.g., failure of SuDS) in the absence of any mitigation measures there is potential for discharge of contaminants to receiving surface water receptors (i.e., the Carrickmines Stream and downstream receptors).
Discharge of Contaminants to Ground / Groundwater	Vertical and Lateral Groundwater Migration in Bedrock Aquifer	Underlying Bedrock Aquifer Receiving surface waterbodies (i.e. the Carrickmines stream and downstream waterbodies) Natura 2000 Sites	Low Risk Based on the design of the Proposed Development there is limited potential sources of contamination during the Operational Phase and there will be limited potential for discharge of contaminants associated with surface water runoff to ground via unpaved, permeable areas due to the low infiltration potential at the Site. Surface water will be managed in accordance with the principles and objectives of SuDS and the GDSDS to treat and attenuate water prior to discharging offsite. 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 during the Operational Phase of the Proposed Development.

Source	Pathway	Receptor	Risk Evaluation and Avoidance
Leaching of existing contaminants in the soil to groundwater	Vertical and Lateral Groundwater Migration in Bedrock Aquifer	Underlying Bedrock Aquifer Receiving surface waterbodies (i.e. the Carrickmines stream and downstream waterbodies) Natura 2000 Sites	Low Elevated concentrations of arsenic were noted on a number of soil samples collected for the site which were localised to the north/northeastern boundary of the site. However, leachability analysis on those samples showed that the concentration of arsenic was below the groundwater and surface water regulation limit values and therefore will not pose a risk to the environment (i.e. groundwater and surface water bodies).
Foul Water Discharge	Discharge to Mains Sewer	Receiving surface waterbodies (i.e. the Carrickmines stream and downstream waterbodies) Natura 2000 Sites	No identified Risk Foul water during the Operational Phase of the Proposed Development will be discharged by a gravity wastewater network, based on the natural topography of the development site, and will connect to the new development's gravity wastewater network at the ground level which will connect the upgraded foul sewer network on Blackglen Rd. by Irish Water to serve the Proposed Development. Foul water during the Operational Phase of the Proposed Development will be discharged to the UE drainage network and ultimately discharged to the Liffey Estuary Lower via the Ringsend WWTP. Foul water from the Site will only be discharged to the UE network under the appropriate consents from UE, and therefore, the proposed development will not cause a potential impact at any receiving waterbody or Natura 2000 sites associated with discharges from the Site .

Source	Pathway	Receptor	Risk Evaluation and Avoidance
Building Foundations and Basements	Groundwater (Subsurface) Flow Regime	Local Groundwater Levels Groundwater/ Surface Water Flow Offsite Surface Water Flow Offsite Onsite and Offsite Groundwater Dependent Receptors (Including Sensitive Habitats)	Low to Moderate Risk Identified The proposed basement and building foundations have the potential to impede local groundwater flow and movement through the Site with potential for groundwater mounding upgradient of structures. There may be an increase in hydrostatic pressure and result in buoyancy and structural integrity risks for subsurface structures. Standard design and construction measures that include incorporating groundwater drainage around impermeable subsurface structures (i.e., basements, building foundations, and temporary barriers during construction) will minimise adverse effects of groundwater mounding at the upgradient side of the structures and potential buoyancy issues. The proposed drainage to intercept and locally convey groundwater through the southern and central portions of the Site will also minimise the potential adverse effects of groundwater on subsurface structures. It is understood the detailed design will include measures to counter buoyancy of subsurface structures.
Amendment of Existing Water Dependent Habitats	Proposed Site Layout	Existing Water Dependent Habitat	Low to Moderate Risk Identified Four ponds have been identified adjacent Fitzsimons Woods pNHA which are relatively shallow and are sustained by pluvial contributions that have created a local perched groundwater table. Therefore, with the

Source	Pathway	Receptor	Risk Evaluation and Avoidance
			appropriate design avoidance and mitigation measures any potential residual impact to the receiving water quality or groundwater level variations to these ponds associated with the dewatering of the Site during the Construction Phase will be prevented. Existing areas of ponding within the site are to be supplemented and expanded as part of the proposed development. Several natural wildlife ponds are proposed to be located along part of the Site's southern boundary (See Landscape Plan prepared by Gannon & Associates), within the wildlife corridor/refuge. Thus, there will likely be an improvement in the quality of water dependent habitat as a result of the proposed development.

5.2.1 Design Avoidance and Mitigation

The assessment of the potential impacts on the receiving environment takes account of the embedded design avoidance measures and standard good practice construction methods to reduce the potential for impacts to the water environment. These are outlined below together with additional specific measures based on the findings of this assessment.

5.2.1.1 Construction Phase

The assessment of the potential adverse effects on the receiving environment takes account of the embedded design avoidance measures and standard best practice construction methods to reduce the potential for adverse effects to the water environment. These are outlined below together with additional specific measures based on the findings of the risk assessment.

Standard design and construction measures that include incorporating groundwater drainage around impermeable subsurface structures (i.e., building foundations and basement tanking during construction) will minimise adverse effects of groundwater mounding at the upgradient side of the structures and potential buoyancy issues. Where the building foundations and drainage infrastructure intercept groundwater, appropriate design and drainage around the structures will prevent ingress of groundwater.

The drainage design for the Proposed Development incorporates appropriate drainage measures to ensure conveyance of water at the site. Interception drainage will convey shallow groundwater to prevent flooding near properties. The intercepted shallow water may be diverted to support wetland features in biodiversity corridors where wet grassland is proposed in accordance with the landscape design proposals.

During the Construction Phase, all works will be undertaken in accordance with the preliminary CEMP (OCSC, 2024b). Following appointment, the contractor will be required to further develop the 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 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 adverse effects which include:

- Control and management of water and surface runoff.
- Control and management of groundwater during excavation and dewatering.
- Management and control of works in and adjoining water courses.
- Management and control of imported soil and aggregates from off-site sources.
- Fuel and Chemical handling, transport and storage; and
- Accidental release of contaminants.

The CEMP will outline measures for the control and treatment of water encountered during construction and methodology for the treatment of water to ensure that there are no prior to discharge from the Site.

The dewatering methodology to be implemented by the contractor (once appointed) will ensure that any dewatering is confined to the localised zone and does not extend towards the boundaries of the Site.

Surface water runoff management will be required to prevent runoff entering excavations during construction. Surface water will require diversion around the open excavations using standard temporary drainage methods to ensure that surface water is effectively conveyed around works areas and with no adverse effects to the overall existing surface water flow regime.

A watching brief by an Environmental / Ecological Clerk of Works is recommended during critical stages of the construction works associated with surface water in particular works for the diversion of the drainage ditch.

All near stream works will follow the measures outlined in the CEMP and the guidelines published by Inland Fisheries Ireland (IFI) Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters (IFI, 2016) and the National Roads Authority (now Transport Infrastructure Ireland) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes.

Pumping of concrete will be monitored to ensure that there is no accidental discharge. All work will be carried out in the dry and effectively isolated from any onsite drains. A suitable risk assessment for wet concreting will be completed prior to works being carried out. There will

be no mixer washings or excess concrete discharged onsite. All excess concrete is to be removed from Site and all washout of concrete chutes to be captured in a tank which shall be removed offsite for disposal at an authorised waste facility.

All below (below ground) drainage infrastructure will be constructed in accordance with current UE requirements to ensure that there are no potential adverse effects to groundwater quality.

Discharges from the Site will be in accordance with relevant statutory approvals from UE for discharges to sewer and DLRCC for discharges to surface water.

Where surplus material or material not suitable for re-use requires removal offsite, the appointed contractor must ensure that its removal is undertaken in accordance with the Waste Management Act 1996. Detailed waste management records should be maintained demonstrating compliance with relevant waste management legislation.

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 either be discharged to temporary holding tank(s), the contents of which will periodically be tankered off site to a licensed facility or discharged to public sewer in accordance with the necessary temporary discharge licences issued by UE.

The Ringsend WWTP is operated in accordance with relevant statutory approvals issued by UE. While it is noted there is an exceedance in effluent above the discharge license ELVs, as specified in the 2022 AER, it is noted there the WWTP has an observable impact on the water quality in the in the near field of the discharge, in the Liffey Estuary Lower and the Tolka Estuary, it does not have an observable impact on the Water Framework Directive status. The increase discharge to the Ringsend WWTP as a result of the Proposed Development is considered to be insignificant in terms of the overall scale of the facility. The increased load does not have the capacity to alter the effluent released from the WWTP to such an extent as to result in likely significant effects on its receiving waters. In addition, upgrade works are currently on-going at Ringsend WWTP to increase the capacity of the facility from 1.6 million PE to 2.4 million PE. This plant upgrade will result in an overall reduction in the final effluent discharge of several parameters from the facility including BOD, suspended solids, ammonia, DIN and MRP (Irish Water, 2018).

5.2.1.2 Operational Phase

Based on the design of the Proposed Development there is limited potential sources of contamination during the Operational Phase and there will be limited potential for discharge of contaminants associated with surface water runoff to ground via unpaved, permeable areas due to the low infiltration potential at the Site. The surface water drainage will discharge attenuated flows to the public surface water network, which is located to the north of the Site before ultimately discharging to the downstream receiving waterbodies (Catchment 1). A new connection to this existing sewer is to be provided on Blackglen Rd. The attenuated runoff from Catchment 2 is to discharge to a combination of infiltration soakaway and attenuated outfall to the Carrickmines stream along the southeastern boundary.

Furthermore, surface water will be managed in accordance with the principles and objectives of SuDS and the GDSDS to treat and attenuate water prior to discharging offsite. 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.

Existing areas of existing ponding within the site are to be supplemented and expanded as part of the proposed development. Several natural wildlife ponds are proposed to be located along part of the Site's southern boundary (See Landscape Plan prepared by Gannon & Associates), within the wildlife corridor/refuge. The ponds will be constructed as per Baker *et al*. (2011) the *Amphibian Habitat Management Handbook. Amphibian and Reptile Conservation with best practice ecological guidance.* Section 4: Pond Creation, on page 19 of this document provides detail on best-practice when creating amphibian pond habitat. The construction of these ponds will take cognisance of this guide and will be supervised by a suitably qualified Ecological Clerk of Works.

Where required, soil and subsoil materials to be reused within the Proposed Development (i.e., for engineering fill and landscaping) will be subject to assessment of the suitability for use in accordance with engineering and environmental specification for the Proposed Development. Furthermore, landscaping within public / communal open space areas in the north/north eastern corner of the site, where the reported concentrations of arsenic in soil exceed the residential land use GAC, will include a minimum cover of 0.8m of imported clean, suitable for use soil thereby removing any potential risks associated with direct contact and inhalation of soils in the public / communal open space areas.

Foul water during the Operational Phase of the Proposed Development will ultimately discharge via the Ringsend WWTP to the Liffey Estuary Lower under the appropriate consents from UE. As stated previously, the Ringsend WWTP, which is operated in accordance with relevant statutory approvals issued by UE, is currently undergoing upgrade works to improve the final effluent discharge of several parameters from the facility including BOD (Biological Oxygen Demand), suspended solids, ammonia, DIN and MRP.

5.2.2 Potential Impact on Protected Areas

Based on the findings of this assessment, it is considered that in applying the precautionary principle and assessing a worst-case scenario there is no identified potential negative impact associated with the Proposed Development on the closest hydraulically connected Natura 2000 sites in particular the North Dublin Bay SAC, South Dublin Bay SAC, Rockabill to Dalkey Island SAC, North Bull Island SPA, Dalkey Islands SPA, South Dublin Bay and River Tolka Estuary SPA and North-West Irish Sea SPA individually or in-combination.

The closest Protected Area to the site is the Fitzsimons Woods pNHA, no habitats within the pNHA have been identified as water dependant and there will be no perceptible impact to the hydrological or hydrogeological integrity of the pNHA.

Four ponds have been identified adjacent Fitzsimons Woods pNHA which are relatively shallow and are sustained by pluvial contributions that have created a local perched groundwater table. Therefore, with the appropriate design avoidance and mitigation measures any potential residual impact to the receiving water quality or groundwater level variations to these ponds associated with the dewatering of the site during the Construction Phase will be prevented.

Furthermore, based on the design of the Proposed Development there are limited potential sources of contamination anticipated during the Operational Phase. Foul water from the site

will only be discharged to the UE network under the appropriate consents from UE. Surface water will be managed by SuDS to treat and attenuate water prior to discharging offsite. Therefore, the proposed development will not cause any potential impact on the Fitzsimon's Wood pNHA associated with the discharges from the Site.

5.2.3 Water Framework Directive Status

The findings of the risk-based assessment identified that in the absence of any mitigation and avoidance measures there could be a potential impact on the water quality within receiving water bodies associated with the Proposed Development, specifically within a local zone of the Wicklow GWB and locally within the Carrickmines Stream_10, Shanganagh_10 or downstream waterbodies. There is no identified potential impact to the downstream receiving Southwestern Irish Sea - Killiney Bay attributed to the separation distances and anticipated assimilation capacity of the receiving water bodies taking account of the existing baseline conditions and WFD Status.

The mitigation measures as outline above, including the implementation of the CEMP during the Construction Phase and the incorporation of SUDS in accordance with the GDSDS in the design of the Operation Phase of the Proposed Development, will prevent any impact on the receiving groundwater and surface water environment. Hence, the Proposed Development will not have any impact on compliance with the EU Water Framework Directive, European Communities (Environmental Objectives) Surface Water Regulations, 2009 (SI 272 of 2009, as amended 2012 (SI No 327 of 2012), and the European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010), as amended 2012 (SI 149 of 2012) and 2016 (S.I. No. 366 of 2016).

The Proposed Development will not cause a deterioration in the status of waterbodies hydraulically connected with the Proposed Development, taking account of design avoidance and mitigation measures that will be implemented. The Proposed Development will not jeopardise objective to achieve 'good' surface water status or good ecological potential.

There will be no impact to the existing WFD status of water bodies associated with the Proposed Development including the Carrickmines Stream_10, Shanganagh_10 or downstream waterbodies and the Wicklow GWB as a result of the Proposed Development taking account of embedded design avoidance and mitigation measures.

6 CONCLUSIONS

Enviroguide has carried out a risk-based hydrological and hydrogeological impact assessment for a proposed development at Blackglen Rd, Sandyford, Dublin 18 to determine if there is any potential for significant impacts on the receiving water environment, Groundwater Dependant Terrestrial Ecosystems (GWDTE) including the Fitzsimons Woods pNHA and designated Natura 2000 sites in the absence of avoidance and mitigation measures.

The CSM was developed identifying plausible S-P-R linkages for the Proposed development and receiving water environment. The CSM formed the basis of the evaluation of any potential impacts to receptors including waterbodies, GWDTEs and Natura 2000 sites associated with the Proposed Development. The assessment assumed a worst-case scenario (individually and in-combination) and in the absence of any mitigation measures intended to avoid or reduce potential harmful effects.

Based on the findings of this assessment the following can be concluded:

- There is a potential risk of impact to local groundwater quality and the receiving Carrickmines_10 waterbody via groundwater flow and/or surface water runoff, assuming a worst-case scenario at the site and taking account of the local hydrological and hydrogeological flow regime. However, the implementation of appropriate mitigation measures (in line with the CEMP and described above in Section 5.2.1) during construction will ensure that overall impacts to surface/groundwater quality and flow is negligible.
- The appropriate standard design measures for the Construction Phase and Operational Phase of the Proposed Development including implementation of the CEMP and SuDS measures within the drainage design will prevent, limit and mitigate the potential for the worst-case scenario to occur. These embedded measures will ensure there is no risk to water quality of the receiving watercourses. The flow contributions to the Carrickmines stream is to remain unchanged from the existing during the operational phase of the scheme.
- The underlying aquifer has been identified as ‘Poor’ with limited recharge potential which restricts potential pollutants pathways within the Wicklow GWB and to migration to other waterbodies. In a worst-case scenario, impacts will likely be confined to the immediate vicinity of the site.
- An exceedance of the residential GAC was noted for arsenic on a number of soil samples collected at the site which were localised to the north/northeastern boundary of the site. However, the potential for human health risk is considered to be low, given that this area will be primarily occupied by buildings and hardstanding. Furthermore, landscaping within public / communal open space areas in this area of the site will include a minimum cover of 0.8m of imported clean, suitable for use soil thereby removing any potential risks associated with direct contact and inhalation of soils in the public / communal open space areas. Where required, soil and subsoil materials to be reused within the Proposed Development (i.e., for engineering fill and landscaping) will be subject to assessment of the suitability for use in accordance with engineering and environmental specification for the Proposed Development.

- The leachability analysis of the samples with elevated concentrations of arsenic were below the groundwater and surface water regulation limit values and therefore there is no identified risk to the receiving environment (i.e. groundwater and surface water bodies).
- All construction works at the site should be undertaken in accordance with relevant health and safety regulations for construction work at brownfield sites.
- The proposed basement and building foundations have the potential to impede local groundwater flow and movement through the site. Standard design and construction measures that include incorporating groundwater drainage around impermeable subsurface structures (i.e., basements, building foundations, and temporary barriers during construction) will minimise adverse effects of groundwater mounding at the upgradient side of the structures and potential buoyancy issues.
- There is no identified risk to water quality associated with the indirect (mains drainage) discharge of foul water from the Proposed Development to the existing mains UE foul drainage network that will ultimately be discharged to the Liffey Estuary Lower via the Ringsend WWTP under appropriate consent from UE.
- Though hydraulicly down-gradient of the site, effects on Fitzsimons Woods pNHA are likely imperceptible due to the limited connectivity in the underlying aquifer and lack of water dependant habitats within the pNHA. The existing ponds adjacent the pNHA are similarly unlikely to be unaffected by the proposed development. Existing ponds within the site are to be supplemented and enhanced as part of the proposed development.
- In the unmitigated worst-case scenario, there is no identified negative impact on the closest hydraulically connected Natura 2000 sites in particular North Dublin Bay SAC, South Dublin Bay SAC, North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA and North-West Irish Sea SPA associated with Proposed Development either individually or in-combination.
- There is no identified impact to the existing WFD status of water bodies associated with the Proposed Development including the Carrickmines Stream_10, Shanganagh_10, downstream waterbodies and the Wicklow GWB as a result of the Proposed Development taking account of design avoidance and mitigation measures that will be implemented as described.

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