

OCSC

O'CONNOR · SUTTON · CRONIN

MULTIDISCIPLINARY CONSULTING ENGINEERS

Z040: BLACKGLEN ROAD LRD

ENGINEERING SERVICES REPORT

For
Zolbury Ltd

18 December 2024

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1 INTRODUCTION

1.1 APPOINTMENT

O'Connor Sutton Cronin & Associates (OCSC) have been appointed by Zolbury Ltd. to prepare this Engineering services report with respect to the proposed residential development comprising the design of 192 no. residential units, associated resident amenity facilities and a childcare facility at Blackglen Road, Sandyford, Dublin 18.

1.2 ADMINISTRATIVE JURISDICTION

The proposed development is located in the jurisdiction of Dun Laoghaire-Rathdown County Council (DLRCC), and therefore this assessment has given due consideration to the relevant guidelines including:

- Dun Laoghaire-Rathdown County Council Development Plan (2022 – 2028);
- Greater Dublin Strategic Drainage Study (GDSDS);
- The Planning System and Flood Risk Management Guidelines for Planning Authorities (Department of Environment, Heritage and Local Government and the Office of Public Works).

1.3 SITE LOCATION

The subject site is located on lands at Blackglen Road, Sandyford, Dublin 18 in as shown in the figure overleaf. The proposed development site is immediately bound by:

- Residential properties to the east & west;
- Blackglen Road to the north;
- Woodside Road to the south



Figure 1: Site Location

1.4 EXISTING SITE OVERVIEW

The overall development site area is **c. 3.86 hectares,** and is currently greenfield in nature. It is generally graded towards north of the site with the highest point of the site being located at the south-west boundary and is approximately +160.12m AOD with lowest the point being located at the north-east boundary of the site and is approximately +138.72m AOD. This gives a typical gradient of approximately 8.2% across the site.

1.5 PROPOSED DEVELOPMENT CONTEXT

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. 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.



Figure 1.2 – Proposed site layout

2 SCOPE OF SERVICES REPORT

This Engineering Services Report was prepared by reviewing the available data from the Local Authority sources and national bodies *i.e.* Dublin City Council, Uisce Éireann, The OPW, and the wider Design Team. The following services are addressed within this report, with respect to the proposed development:

- Surface Water Drainage;
- Wastewater Drainage;
- Potable Water Supply;
- Flood Risk Assessment;

The proposed design, for the aforementioned services, have been carried out in accordance with the following technical guidelines and information:

- Dun Laoghaire Rathdown County Council Development Plan (2022 – 2028);
- Greater Dublin Strategic Drainage Study (GDSDS);
- Greater Dublin Regional Code of Practice for Drainage Works (GDRCOP);
- Uisce Éireann Code of Practice for Wastewater, IW-CDS-5030-03 (Revision 2);
- Uisce Éireann Code of Practice for Water Supply, IW-CDS-5020-03 (Revision 2);
- The Building Regulations – Technical Guidance Document Part H;
- BE EN 752 – Drainage Outside Buildings;
- BS 7533-13 – Guide for Design of Permeable Pavements;
- The Office of Public Works, the Planning System and Flood Risk Management;
- OPW website **www.floodinfo.ie** & **www.floodmaps.ie**;
- DECLG website **www.myplan.ie**;
- EPA website **http://gis.epa.ie/EPAMaps**;
- Geological Survey of Ireland Maps;
- Architectural drawings;
- Topographical survey of the proposed site;
- Dún Laoghaire-Rathdown County Council's and Uisce Éireann's Drainage and Watermain Records.

Members of the wider design team cover all other elements of the application pertaining to traffic, sustainability, landscaping, planning, ecological, and architectural detail.
This report should be read in conjunction with the set of OCSC Civil Engineering design drawings that accompany this submission.

3 SURFACE WATER DRAINAGE

3.1 DESIGN GUIDELINES OVERVIEW

Any planning permission sought on the subject lands are required to adhere to the Local Authority requirements *i.e.* the Dun Laoghaire-Rathdown County Development Plan (2022 – 2028), and as such, the Greater Dublin Strategic Drainage Study (Dublin City Council, 2005).

New development must ensure that a comprehensive Sustainable Drainage System (SuDS), is incorporated into the development. SuDS requires that post development run-off rates be maintained at equivalent, or lower, levels than pre-development levels. Thus, the 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). Furthermore, the design must allow for *an additional **20%** increase in rainfall intensity due to climate change, and a further **10%** increase to the drainage design and attenuation volumes to accommodate urban creep*. These are in accordance with Appendix 7 of the Dun Laoghaire-Rathdown County Development Plan (2022 - 2028).

Any new development must also have the physical capacity to retain surface water volumes as directed under the Greater Dublin Strategic Drainage Strategy (GDSDS) and, if necessary, release these attenuated surface water volumes to an outfall at a controlled flow rate, not greater than the greenfield runoff equivalent.

A further component of the SuDS protocol is to increase the overall water quality of surface water runoff before it enters a natural watercourse or a public sewer, which ultimately discharges to a water body. This is to ensure the highest possible standard of surface water quality.

SuDS are designed in accordance with best practice and the CIRIA C753 (The SuDS Manual) guidance material.

3.2 SURFACE WATER DESIGN STRATEGY OVERVIEW

The proposed development is to be served by a gravity surface water network comprising a single catchment as a result of the natural topography, with attenuated surface water runoff generated within the new development site boundary to be discharged to the new surface water sewer on Blackglen Rd., which bounds the site to the north of the site.

Sustainable Drainage Systems are to be provided, wherever practicable, and these are discussed in more detail in *Section 3.5*, with discharge rates from site being restricted to the greenfield equivalent runoff rate, for design rainfall events up to, and including, the 1% AEP, in accordance with the Dun Laoghaire-Rathdown County Development Plan and the GDSDS.

3.3 EXISTING SITE DRAINAGE

3.3.1 EXISTING SITE CATCHMENT AREA

As detailed in *Section 1.4*, the existing c. 3.86-hectare site is greenfield in nature and is graded from south-west towards north-east. The site in its current condition drains naturally as there is no surface water infrastructure within the site.

3.3.2 EXISTING SURFACE WATER DRAINAGE INFRASTRUCTURE

Existing services records indicate that no surface water sewer is present in the vicinity of the proposed development. A new surface water sewer is proposed as part of the upgrades works on Blackglen Rd.
Refer to *Figure 3.1* for an excerpt from the public drainage records, which are also provided in **Appendix A**, for indicative locations of existing infrastructure.

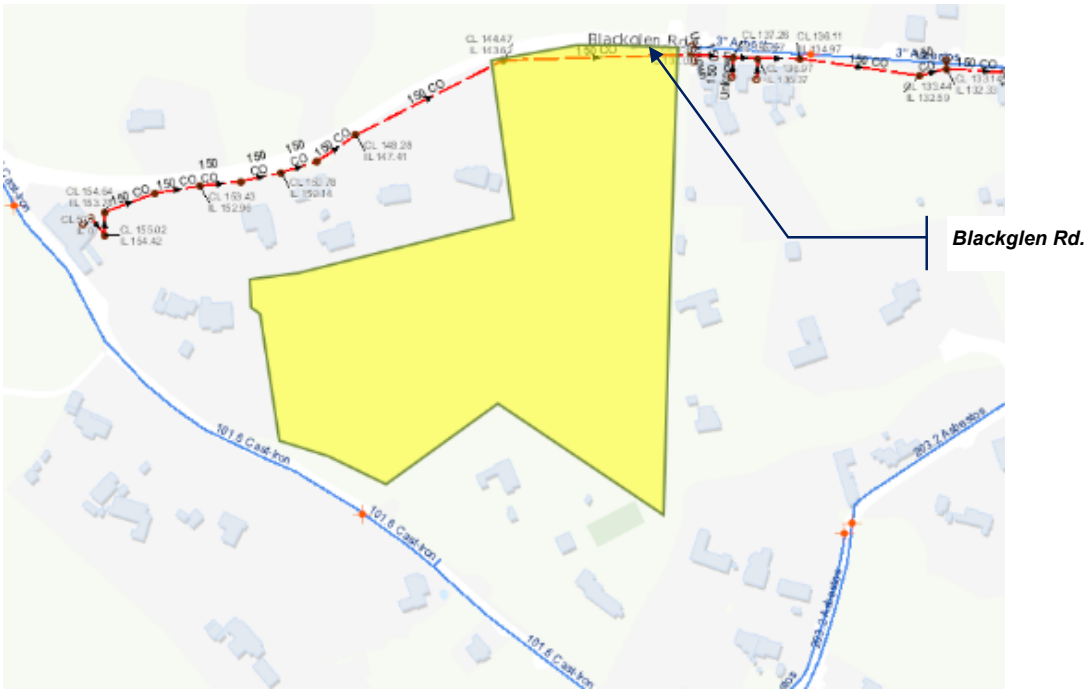


Figure 3.1 – Existing Drainage Infrastructure Records

3.3.3 EXISTING SITE RAINFALL RUNOFF

Runoff from the site is allowed to infiltrate naturally.
The soil value can be calculated from *Figure 1.4.18 (institute of Hydrology, 1978)* which shows the various soil types. The soil classifications are also available from the *Wallingford Procedure, Volume 3, Maps, "Winter rain acceptance potential"*. The equation was first published in FSSR 16, 1985. Refer to *Figure 3.2* for the "Soil" value in MicroDrainage that considers the SPR value and it can be obtained at *Greater Dublin Strategic Drainage Study – Regional Drainage Policies Volume 2 – New Development at section 6.7.2*.

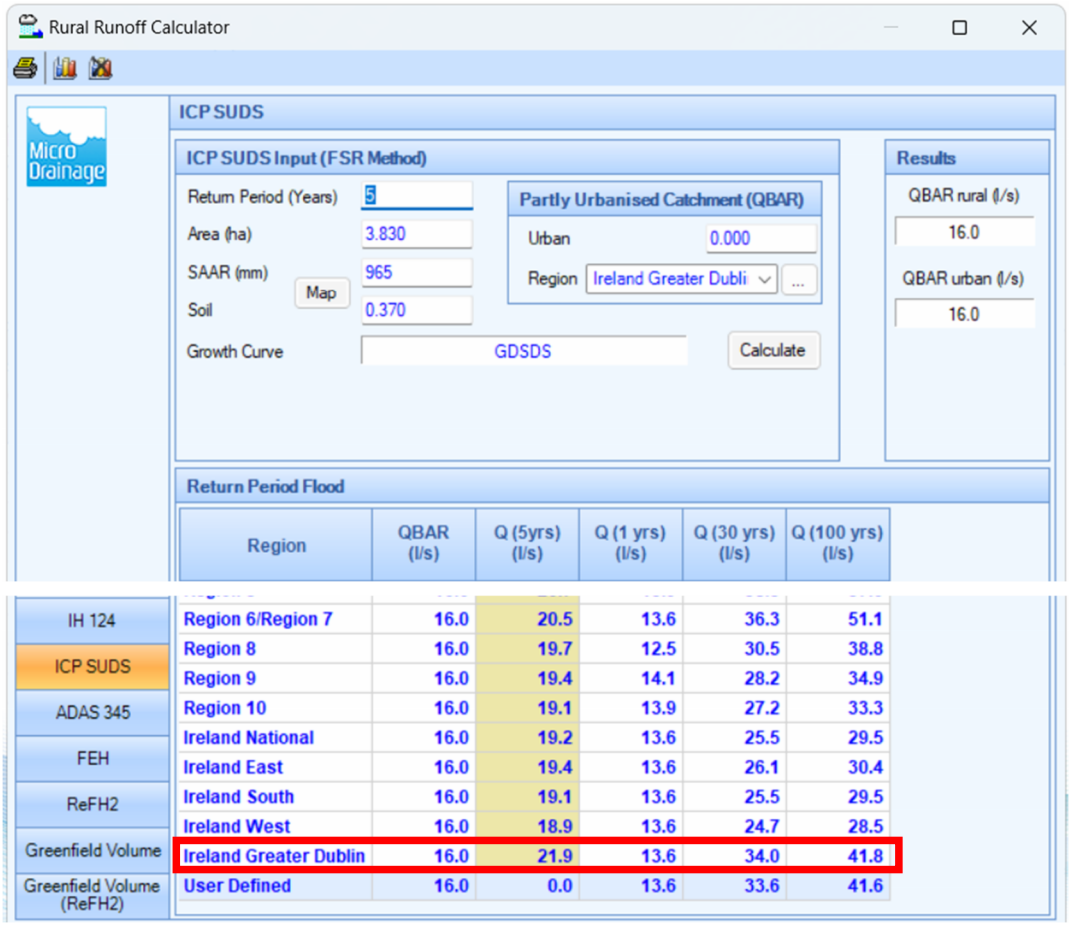
SOIL	SPR value (% runoff)
1	0.1
2	0.3
3	0.37
4	0.47
5	0.53

Figure 3.2 – SPR Values for Soil (Excerpt from GDSDS: Table 6.7)

From the aforementioned mapping and Ground investigation report (refer to **Appendix M**), a **Soil Type 3** was used in design calculations along with the local Standard Annual Average Rainfall (SAAR) value of **965mm**, as obtained from Met Éireann. These were used to determine the rainfall runoff rate. Refer to **Appendix B** for the Return Period Rainfall Depths for Sliding Durations from Met Éireann.

Results from three soakaway tests indicated infiltration at all three of the test locations varying from 4.151E-06 m/s to 16.62E-06 m/s across the site. Refer to **Appendix M** for the locations of the soakaway tests.

Using the ICPSuDS Input, FSR *(Flood Studies Report)* Method, the rainfall runoff discharging from the total greenfield site area to be developed (i.e. 3.86 ha), in its existing condition, has been estimated at **$Q_{BAR\ (RURAL)}$ = 4.2 l/s/ha**. Refer to *Figure 3.3* for an excerpt of the results from the MicroDrainage Runoff Calculator, which also provides the calculated Q_{BAR} runoff rate along with the discharge rate for varying Annual Recurrence Intervals (ARI). Refer to the **Appendix C** for the Q_{BAR} runoff calculations.



Region	QBAR (l/s)	Q (5yrs) (l/s)	Q (1 yrs) (l/s)	Q (30 yrs) (l/s)	Q (100 yrs) (l/s)
Region 6/Region 7	16.0	20.5	13.6	36.3	51.1
Region 8	16.0	19.7	12.5	30.5	38.8
Region 9	16.0	19.4	14.1	28.2	34.9
Region 10	16.0	19.1	13.9	27.2	33.3
Ireland National	16.0	19.2	13.6	25.5	29.5
Ireland East	16.0	19.4	13.6	26.1	30.4
Ireland South	16.0	19.1	13.6	25.5	29.5
Ireland West	16.0	18.9	13.6	24.7	28.5
Ireland Greater Dublin	16.0	21.9	13.6	34.0	41.8
User Defined	16.0	0.0	13.6	33.6	41.6

Figure 3.3 - Existing Site Runoff Calculator Results (MicroDrainage Excerpt)

3.4 PROPOSED SURFACE WATER DRAINAGE DESIGN STRATEGY

3.4.1 PROPOSED SURFACE WATER STRATEGY

It is proposed to separate the surface water and wastewater drainage networks, which will serve the proposed development, and provide independent connections to the surface water sewer and local wastewater sewer networks, respectively.

Refer to *Section 4* for details of the proposed wastewater drainage design.

Refer to detailed drawing **Z040-OCSC-XX-XX-DR-C-0500 to …C-0504** for the proposed drainage network layout, which is to serve the proposed development.

3.4.2 PROPOSED SURFACE WATER NETWORK STRATEGY

The proposed surface water network is to be split into two main surface water drainage catchments, replicating the natural site catchments i.e.:

1. Main Development catchment (**Catchment 1**) discharging controlled and restricted flow rates of the treated rainfall runoff to the existing stormwater network at Blackglen Road. This is split into seven sub-catchments (**1A, 1B, 1C, 1D, 1E, 1F and 1G**).
2. Blocks B3 and B4, including access road (**Catchment 2**), draining to the proposed infiltration soakaway, and then discharging treated rainfall runoff at a restricted rate (Max. of Q_{BAR} for the catchment; 1.3 l/s) to the existing stream on the southeast boundary line, matching existing outfall for the catchment. This is split into two sub-catchments (**2A and 2B**)

Due to its size and layout, Catchment 1 will be divided into several sub-catchments, in order to best integrate Sustainable Drainage Systems. Each sub-catchment area will aim to provide interception and treatment to the rainfall runoff, either at source or through site design. Refer to Section 3.5.3 for overview of proposed catchment areas.

Infiltration systems will be provided in off podium areas where applicable as the soakaway testing carried out on site resulted in good infiltration rates across the site.

The proposed surface water networks are to typically comprise a gravity pipe network, with significant Sustainable Drainage Systems e.g., bioretention areas, infiltration trenches, green roofs, blue roofs / podium drainage, pervious paving, filter drains, trapped road gullies, tree pits, rain gardens, flow control devices, attenuation storage implemented and integrated, wherever practicable.

Interim attenuation benefits are to be provided at roof level, through the provision of green roofs and blue roofs (>70% total roof area for extensive green roofs), and throughout the external drainage network: within the landscape features, the podium build-up and pervious paving base course. However, in order to reduce development flow rates to the Greenfield Equivalent Runoff Rate (Q_{BAR}), further attenuation is to be provided; before discharging from the site.

The typical traditional and Sustainable Drainage Systems (SuDS) to be provided, all of which will be designed in accordance with CIRIA C753, the SuDS Manual, and the design guidance material listed in Section 2 of this report, are listed and detailed in order of general sequence within the drainage network, as follows:

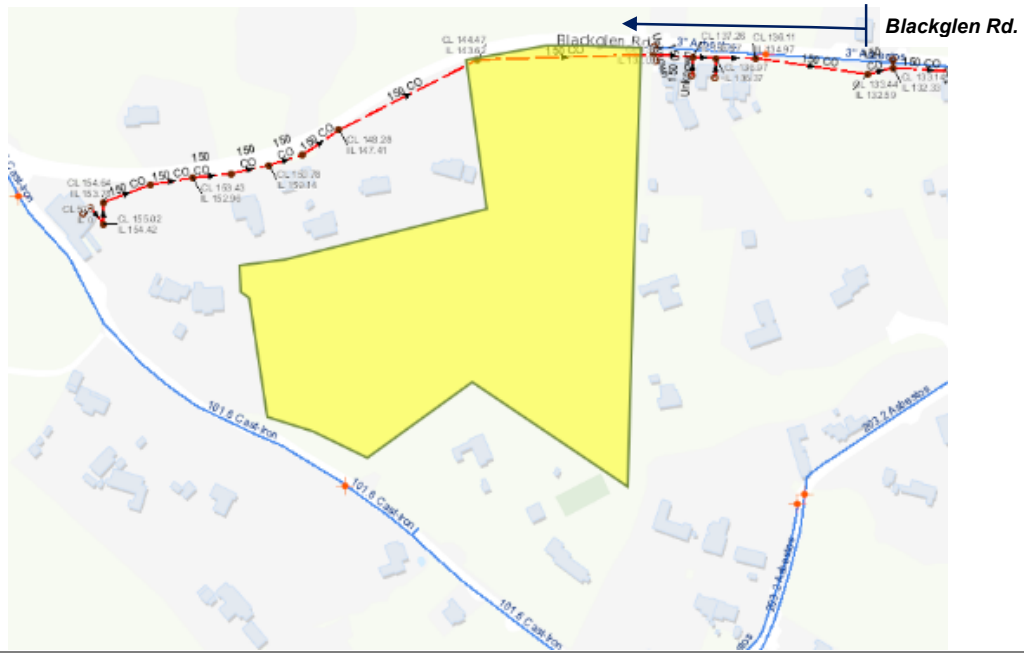




Figure 3.4 - Proposed Surface Water Drainage Strategy

3.4.2.1 GREEN/BLUE ROOFS

It is proposed to provide green roofs on many of the buildings within the development. Green roofs pose many advantages to sustainability, providing at source treatment prior to entering the surface water network. Aside from the obvious boon to biodiversity, the slow filtration of rainwater increases the time it takes for that falling on the roof to enter the drainage system, thus decreasing the local discharge rate of runoff. It additionally allows time for transpiration and evaporation of a portion of the attenuated rainwater back into the atmosphere, reducing the overall quantity of runoff to the public system.

While PV panels are also being proposed at roof level as a further sustainability measure, these are generally considered incompatible with green roof productivity. Thus, a complementarian approach will be taken by maximising their use on the sloped roofs where green roofs are impractical.

As this development includes roof areas greater than 300m^2 on apartment buildings, the planning application must include green roof coverage in accordance with Standard GR2 of Appendix 7.2 (DLR County Development Plan). This calls for at least 70% coverage for applicable buildings when using an extensive buildup (min. 80mm substrate), or at least 50% coverage when using an intensive buildup (min 200mm substrate).

It is proposed that block B1/B2 and block B3/B4 will each provide a minimum of 50% green roof coverage using an intensive buildup. The green roofs on these blocks will also be blue roofs. The difference between a green and blue roof is that a blue roof also provides attenuation of rainwater, releasing it at a controlled discharge rate and enabling a reduction of downstream attenuation.

Blocks A1 and A2 both have sloped roofs which are not practical for green roof construction. However, as both buildings exceed the 300m^2 threshold, green roof coverage has been provided as an extensive buildup on 20 of the individual housing units. Even with a 700mm setback on each of these roofs almost 80% coverage for Blocks A1 and A2 is provided, thus exceeding the 70% requirement.

3.4.2.2 PERVIOUS PAVING

Pervious pavements provide a pavement finish suitable for both pedestrian and vehicular traffic, while also allowing rainwater to infiltrate the surface layer and into the underlying pervious structural layers. Here, the rainwater is temporarily stored beneath the overlying finished surface before either infiltrating to the ground or discharging to the main surface water drainage network.

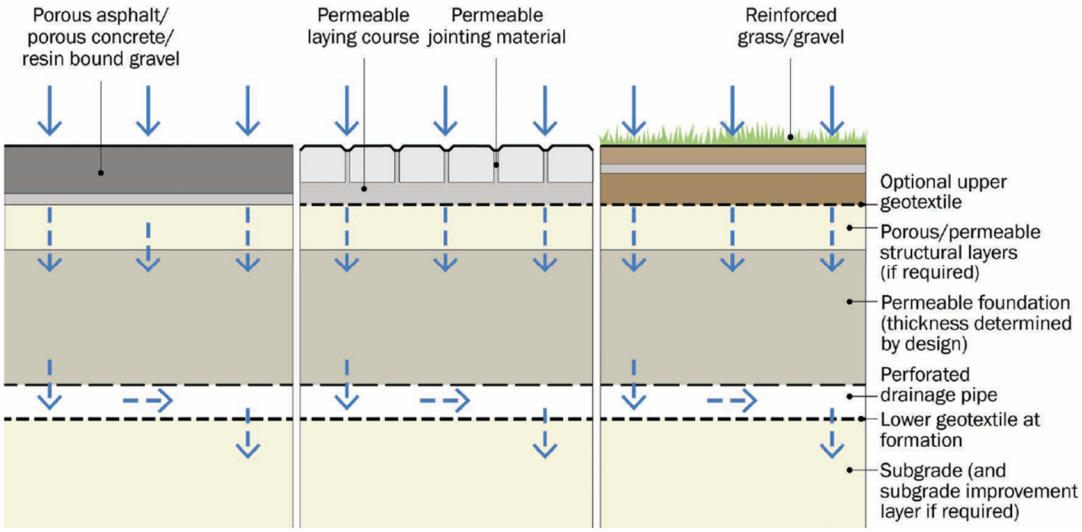


Figure 3.5 - Detail of Type B Pervious Paving (CIRIA C753)

Pervious paving systems are an efficient means of treating the rainwater at source by providing initial interception of the rainwater, reducing the volume and frequency of the runoff and improving the surface water quality by providing at source treatment of the rainfall runoff leaving the site. This is achieved by helping remove and retain pollutants prior to discharge to the drainage system and / or groundwater system.

A **Type B** pervious paving, with a 450mm (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 base-course, 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.

3.4.2.3 GRASSCRETE



For the remaining car parking spaces, a grasscrete surface is proposed. While providing the general benefits of permeable paving (above), it 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.

Figure 3.6 – Example of Grasscrete usage (top) and typical section (bottom)

3.4.2.4 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 filter through the vegetation and underlying soils. The filtered runoff is then collected using underdrain pipes and partially infiltrated into the surrounding soil.

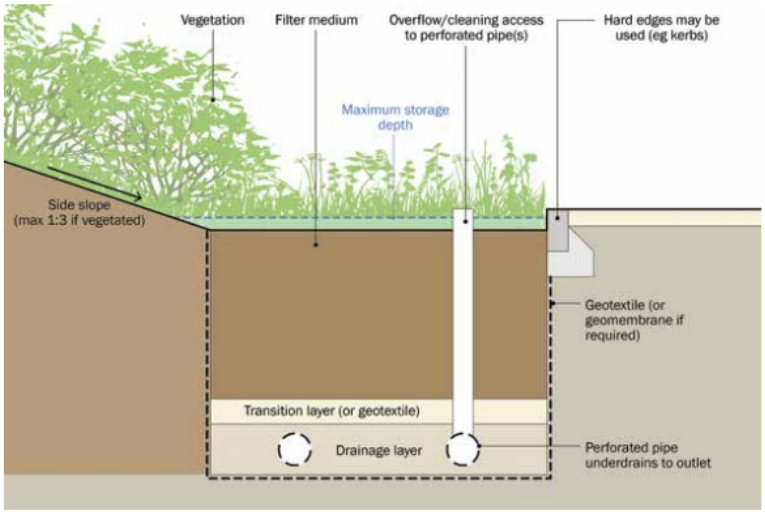
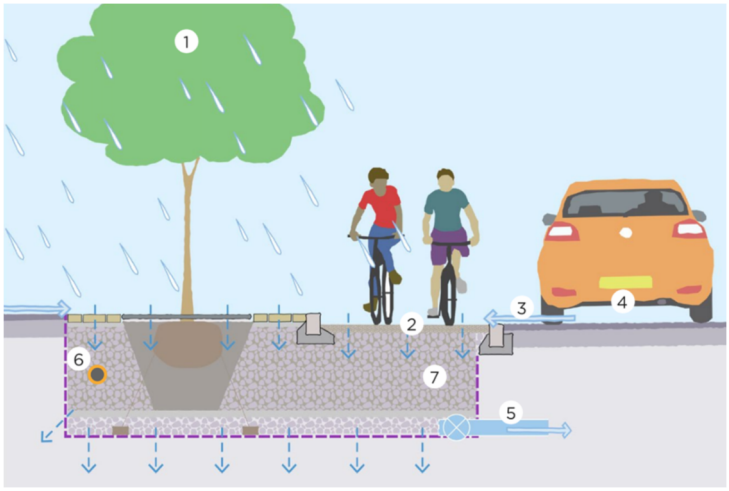


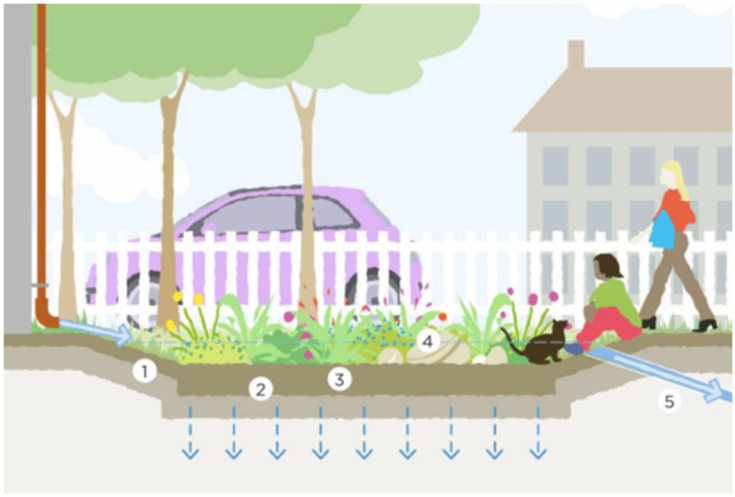
Figure 3.7 - Detail of Bioretention area (CIRIA C753)

3.4.2.5 TREE PITS



Forty four Tree Pits have been proposed for the site. These collect water from the surrounding landscape, including impermeable surfaces, enabling even large trees to thrive by being watered every time it rains. The growing medium can also be used to store water before being released slowly to the next part of the drainage system. Recent research has shown that when air space is provided deeper in the ground, that tree roots will grow naturally in that direction. A typical cross section has been provided on drawing C-0523.

3.4.2.6 RAIN GARDENS



Rain Gardens have been provided in various locations alongside the access road and buildings. They are designed to collect and manage reasonably clean water from roofs and low pollution risk drives and pathways, allowing treatment and infiltration back to subgrade. They have gently sloping sides and a free-draining soil beneath. Garden plants that can tolerate occasional submersion and wet conditions are used. Some maintenance is necessary for the upkeep of these attractive features (See maintenance manual – Appendix J). A typical cross section has been provided on drawing C-0523.

3.4.2.7 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 site. The grated covers are to have a minimum load classification of D400, for frequent vehicular traffic.

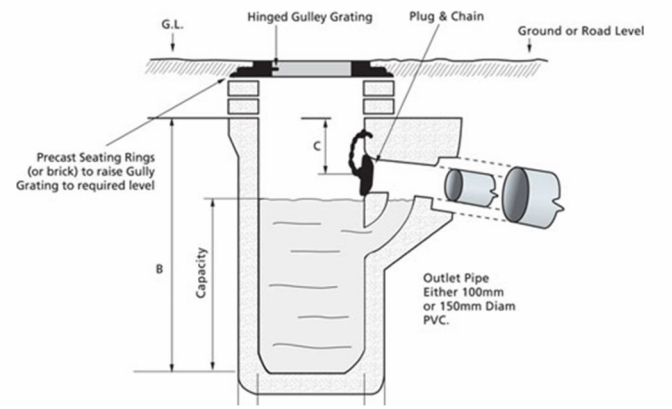


Figure 3.8 - Trapped Road Gully (Typical Detail)

3.4.2.8 UNDERGROUND PIPE NETWORK

A traditional gravity pipe and manhole network will be provided, to convey the collected rainfall runoff as far as the development's outfall. Manholes, compliant with the GDSDS and GDRCOP, are provided for maintenance access at branched connections, changes in pipe size and gradient, and at intervals no greater than 90m distance.

3.4.2.9 SILT TRAPS

All manholes upstream of attenuation systems and fuel separators are to contain a 600mm sump, below invert level of outlet pipe, in order to trap sediment and other gross pollutants, and prevent them from entering the downstream watercourse; thus improving the water quality discharging from site.

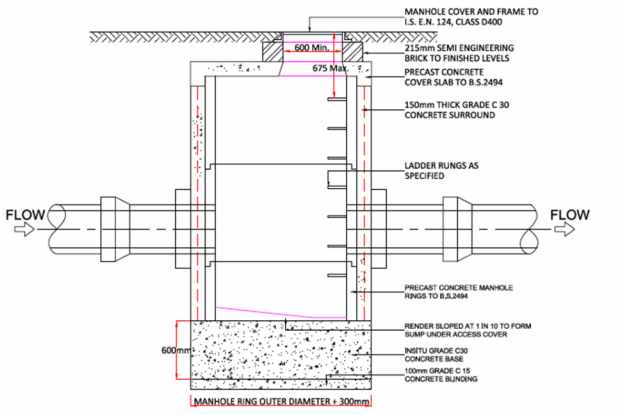


Figure 3.9 - Typical Detail of Silt Trap Manhole

3.4.2.10 GEOCELLULAR STORAGE SYSTEMS

Unlined proprietary geocellular storage units are to be provided for the attenuation of rainfall runoff for the developed 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 factor of 1.2 and an additional factor of 1.1 for urban

creep). Typical geocellular storage systems 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 allowing a 150mm stone bed under the system's base and outflowing invert level.

Three of these attenuation structures are less than 5m from a building. 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. In no case is a geocellular storage structure, or any SuDS feature proposed, located within 3m of the site boundary.

Access chambers for inspection and maintenance are also to be provided.

Refer to **Appendix I** for the copy of the Cellular Attenuation System details.

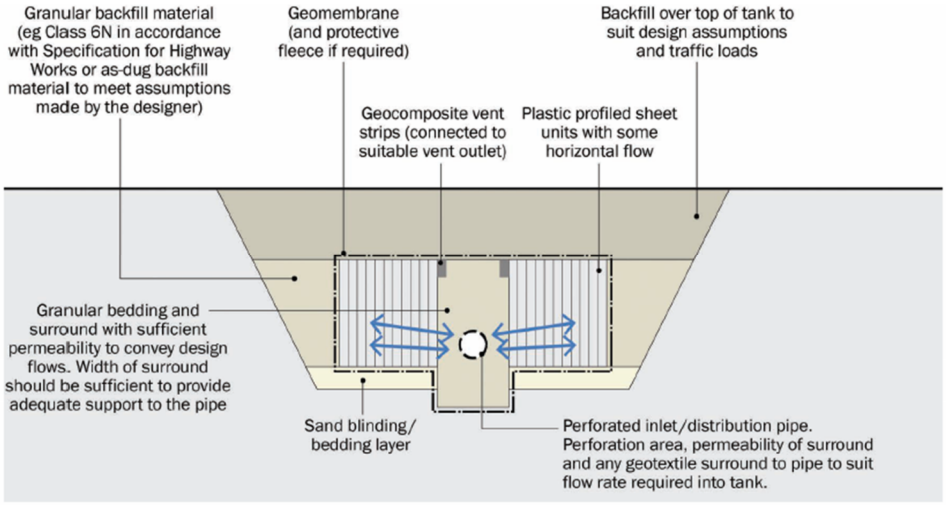
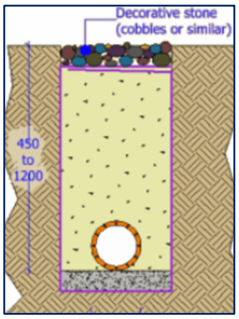


Figure 3.10 - Typical Section of Geocellular System (CIRIA C753)

3.4.2.11 FILTER DRAINS



Filter drains (perforated pipe with Cl. 505 surround) are to be provided along roads where possible to intercept and treat polluted water.

Filter drains allow for interception of rainfall, while also acting as storage and conveying the excess rainfall runoff to the network outfall. Further benefits allow for filtration of surface water and infiltration to groundwater.

Figure 3.11 - Filter Drain under pavement (left)

3.4.2.12 FLOW CONTROL DEVICE

A flow control device is to be provided immediately downstream 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. The overall flow rate for the proposed development would be no greater than **16.0 l/s**, which is the greenfield runoff equivalent, as described in *Section 3.3.3*. However, as the area of the development contributing to the stormwater system is somewhat smaller (1.691ha for the main system / 0.318ha for the southeastern system), a more restrictive flow control must be applied, reducing the system outfalling flow rates to **7.1 l/s** (main system) and **1.3 l/s** (southeastern system). It is proposed to provide the Hydro-brake optimum vortex flow control unit (or similar approved by DLRCC) in the manhole downstream of each of the final attenuation systems to achieve this rate of flow. The final flow control used at the outfall of each system should not have a bypass door (per DLR CDP Appendix 7.1.3).

Further, it is noted that the required aperture of the proposed Hydro-Brake outlets have been designed to be **at least 50mm diameter**, to mitigate the risk of blockage. Any outlets less then 50mm to have a protective orifice plate.

The flow control chamber is to be 1200x1200mm cast in-situ concrete and should be fitted with a penstock valve at the inlet and a silt trap, to allow for easy access and maintenance.

We suggest the following flow controls in order to achieve the required runoff.

Outfalling Flow Control Devices

Surface Water Sytem	Outfalling to	Recommended Device	Model Number	Design Head (m)	Design Flow (l/s)	Designated Manhole	Orifice Size (mm)
Storm-Main	Public surface water sewer on Blackglen Road	Hydro-brake Optimum or similar approved	SHE-0114-7100-1700-7100	1.700	7.1	SW-MN-47	114
Storm-Southeast	Carrickmines Stream; southeastern boundary of site	Hydro-brake Optimum or similar approved	SHE-0050-1300-1385-1300	1.385	1.3	SW-MH-7	50

The technical specifications for the above models, including the design drawings and hydraulic characteristics, are included in Appendix K.



Figure 3.12 – Typical Vortex Hydro-Brake Flow Control Unit (Hydro International)

3.4.2.13 OIL SEPARATOR

Oil separators are designed to separate gross amounts of oil and large (>250µm) suspended solids from the surface water, mainly through sedimentation process.

A Class 1 bypass fuel separator is to be provided immediately upstream of the final attenuation structure in each system, as an additional and final mitigation measure, prior to surface water discharge from each unit sub-catchment to the public surface water network.

So also for the smaller surface water network which discharges from the area around Block B3/B4 to the existing stream on the southeastern boundary, a similar separator will be provided immediately upstream of the infiltration soakaway.

Recommended fuel separators are as follows:

Fuel Separators

Surface Water Sytem	Location	Recommended Appliance	Flow (l/s)	Peak Flow Rate (l/s)	Inlet Invert (m AOD)	Outlet Invert (m AOD)	Upstream MH	Downstream MH
Storm-Main	Between Block A1 and A2	Klargester NSBE-015 or similar approved	15	150	138.018	137.918	SW-MN-47	SW-MN-48
Storm-Southeast	North east of Block B3/B4	Klargester NSBP-003 or similar approved	3	30	141.027	140.927	SW-SE-5	SW-SE-6

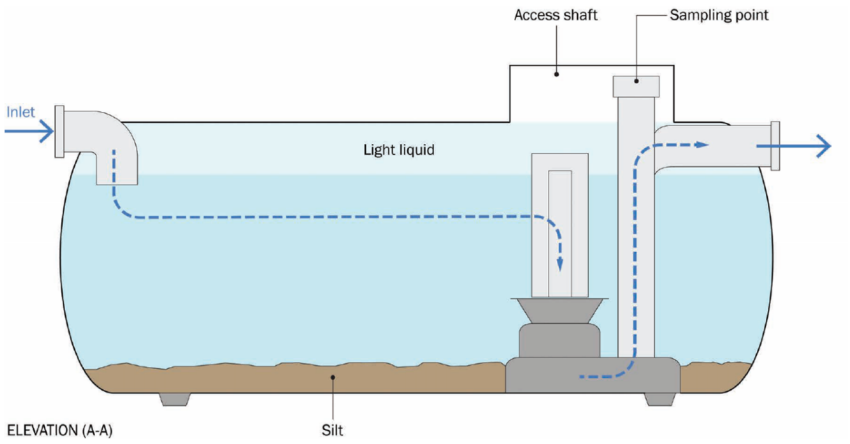


Figure 3.13 - Typical Section Detail of Fuel Separator (CIRIA C753)

Please see Appendix J for the **SuDS Operation and Maintenance Manual**.

3.5 PROPOSED SURFACE WATER NETWORK DETAILED DESIGN

3.5.1 SOFTWARE DESIGN CRITERIA

The proposed surface water network has been designed in accordance with the regulations and guidelines outlined in *Section 2*, using Causeway Flow v10.8 by Causeway Technologies Ltd., which simulates the performance of the integrated drainage network for varying rainfall return periods and storm durations.

This software applies the Flood Studies Report (FSR) methodology for analysis of the rainfall profiles. However, the input design parameters that were used, as part of this design, were based on the available Flood Studies Update (FSU) data, *i.e.* the return period rainfall depths for sliding durations, which determine the $\mathbf{M_{5\text{-}60}}$ and **R** values, and the standard annual average rainfall (SAAR); as sourced from Met Éireann.

The **Design Settings** used for analysis are tabulated below:

Rainfall Methodology	FSR
Return Period (years)	1
Additional Flow (%)	0
FSR Region	Scotland & Ireland
M5-60 (mm)	17.300
Ratio-R	0.270
CV	1.000
Time of Entry (mins)	5.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.600
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	☑
Enforce best practice design rules	☑

Also, see below for the **Simulation Settings** used:

Rainfall Methodology	FSR
FSR Region	Scotland & Ireland
M5-60 (mm)	17.300
Ratio-R	0.270
Summer CV	☑ 1.000
Winter CV	☑ 1.000
Analysis Speed	Detailed
Skip Steady State	☐
Drain Down Time (mins)	240
Additional Storage (m³/ha)	0.0
☑ Check Discharge Rate(s)	Calc

Return Period (years)	Q (l/s)
1	5.9
30	11.7
100	13.9

☑ Check Discharge Volume	Calc
100 year +20% 360 minute (m³)	516

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	20	10	0

Storm Durations (mins)

- ☑ 15
- ☑ 30
- ☑ 60
- ☑ 120
- ☑ 180
- ☑ 240
- ☑ 360
- ☑ 480
- ☑ 600
- ☑ 720
- ☑ 960
- ☑ 1440
- ☑ 2160
- ☑ 2880
- ☑ 4320
- ☑ 5760
- ☑ 7200
- ☑ 8640
- ☑ 10080

Figure 3.14 - Surface Water Network Design Criteria (From Causeway Flow)

3.5.2 CLIMATE CHANGE ALLOWANCE

As noted earlier in 3.1, and indicated in Figure 3.14 above, the proposed network is to be designed to allow for an additional 20% increase in rainfall intensity, to allow for Climate Change projections, in accordance with the Dún Laoghaire-Rathdown County Council Development Plan and the GDSDS.
All discussion within this report, with regard to surface water network design calculations and results, include for the allowance of an increase of 20% in rainfall intensity, as required.

3.5.3 URBAN CREEP

In addition to the above, and as noted earlier in 3.1, the proposed network has also been designed to allow for urban creep. The factor used was 1.1 in accordance with Appendix 7.2 (DLR County Development Plan 2022-2028). This applies an increase to the general drainage design and attenuation volumes.
As above, ***all discussion within this report, with regard to surface water network design calculations and results, include for the allowance of a 10% increase due to urban creep, as required.***

3.5.4 PROPOSED SURFACE WATER CATCHMENT AREA

Due to the topography of the site and the proposed layout, the proposed surface water network is to be split into 2nr. main catchment areas, with catchment 1 divided into a number of sub-catchments; in order to best integrate Sustainable Drainage Systems. These catchments are best summarised as follows:
Catchment 1 – Generally all but southeastern portion of site
Sub-Catchment 1A – first row of housing units on southwestern corner of property, along with first two access roads;
Sub-Catchment 1B – second row of housing units on southwestern corner of property, along with third access roads to same;
Sub-Catchment 1C – third and fourth rows of housing units on southwestern corner of property, along with fourth access roads to same;
Sub-Catchment 1D – permeable paving to rear of fourth row of housing units / most of 'S' bend of main access road / amenity area in centre of site;
Sub-Catchment 1E – Block B1/B2 Podium and roof catchment;
Sub-Catchment 1F – Block A1 and surrounding catchment;
Sub-Catchment 1G – Block A2 and surrounding catchment, along with main access road from the entrance south to the 'S' bend;
Catchment 2 – Block B3/B4 and access road to same.
Sub-Catchment 2A – Block B3/B4 Podium and roof catchment;
Sub-Catchment 2B – access road from Block B3/B4 up to main access road;

Attenuated runoff from Catchment 1 is to be discharge to the new surface water sewer which bounds the site to the north. Catchment 2 is to discharge to an infiltration soakaway and outfall at less than greenfield runoff rate to the existing stream on the southeastern boundary.

Each sub-catchment area will aim to provide interception and treatment of the rainfall runoff, either at source or through site (See Appendix L for tabulated calculations).
Refer to catchment drawing **Z040-OCSC-XX-XX-DR-C-0505** for information.

3.5.5 PROPOSED DEVELOPMENT RAINFALL RUNOFF

It is proposed to reduce and restrict the rainfall runoff, discharging from the proposed development to the greenfield equivalent, $QBAR_{RURAL}$, runoff rate, as per the FSR ICP SuDS method, which is based on the IH124 method for catchments smaller than 25km^2 in area.
This is to be achieved with the provision of a flow restrictor (Hydro-Brake Optimum by Hydro-International, or similar approved) prior to discharging to the existing surface water network to the north of the site, with the appropriate measures of attenuation provided. Sub-catchment flow-control devices and associated attenuation are also to be strategically provided, in order to maximise SuDS benefits and avail of the open space for preliminary attenuation.
Refer to *Figure 3.3*, in *Section 3.3.3*, for an excerpt from the results MicroDrainage Runoff Calculator for the development catchment area (c.3.86-hectares), which indicates the greenfield equivalent, $Q_{BAR\ (RURAL)}$, value of **4.2 l/s/ha** along with the calculated runoff for varying Average Recurrence Intervals (ARI). Catchment 1 has a positively drained area of 1.691ha which equals to a runoff rate of **7.1 l/s**. Catchment 2 has a positively drained area of 0.318ha which yields a runoff rate of **1.3 l/s**., though there will be some infiltration into the ground at the soakaway prior to outfalling to the stream.
For the purpose of the surface water network design simulation, we have considered all external paved roads as being 100% impermeable. For areas of permeable pavement, we have used a factor of 0.7 for the portion of contribution to the surface water system. For areas of grasscrete and grass (in reasonable proximity to the SW system), we have used a factor of 0.3. For the volumetric runoff coefficient C_V, we have use both a winter and summer C_V of 1.00 in accordance with Appendix 7.1.3 (DLR County Development Plan 2022-2028).

3.5.6 PROPOSED SURFACE WATER PIPE NETWORK DESIGN

The overall surface water drainage system, serving the proposed development, is to consist of a gravity sewer network that will convey runoff from the roofs and paved areas to the outfall manhole. The new gravity networks will discharge a controlled attenuated flow rate to the existing public network to the new surface water sewer to the north of the site, as outlined in *Section 3.3.2*.
The proposed piped-network has been designed in accordance with BS EN 752 and all new infrastructure is to be compliant with the requirements of the GDSDS and the GDRCOP for Drainage Works, with minimum full bore velocities of **1.0 m/s** achieved throughout.
All main surface water carrier pipes have been sized to ensure no surcharging of the proposed drainage network for rainfall events up to, and including, the 1 in 5-year ARI event.
Refer to drawings **Z040-OCSC-XX-XX-DR-C-0500 / 501 / 502** for the proposed drainage infrastructure layout.

3.6 PROPOSED SURFACE WATER ATTENUATION STORAGE

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.

This will be provided initially through integration with the landscape proposals around the development, with further provision of pervious paving and grasscrete for car parking areas.

The development is to combine a number of sustainable drainage features along with elements of a traditional drainage system. The development's main attenuation features are as follows (summarised in table beneath):

- Subcatchments 1A, 1B, 1C & 1D, including access road will flow via a filter drain along the road to a two stage underground attenuation setting (1&2) in the centre of the overall property, first to the west of the access road, and continuing to the east of the same. This will be in the form of two proprietary, modular systems *(such as the geocellular ESS ECOCELL, or similar approved)*.
- Flow will continue onwards following the general path of the access road, to a third underground attenuation structure (3) to the east of Block B1/B2 *(proprietary, modular system, such as the geocellular ESS ECOCELL, or similar approved)*.
- Subcatchment 1E will be primarily attenuated via blue roof (6) at roof level on Block B1/B2. The blue roof will be subject to specialist design.
- Subcatchment 1F will be attenuated in an underground structure (5) *(proprietary, modular system, such as the geocellular ESS ECOCELL, or similar approved)*.
- Subcatchment 1G will be primarily attenuated in an underground structure (4) *(proprietary, modular system, such as the geocellular ESS ECOCELL, or similar approved)* to the south of Block A2 just upstream of the final flow control device.
- Catchment 2B will be attenuated at roof level of Block B3/B4 (via blue roof (7) – subject to specialist design)
- Catchment 2A will be attenuated in a stone infiltration soakaway (8) Upstream of the final flow control.

STORAGE SUMMARY*

Attenuation Structure	Description	Location	Storage Volume Provided (m^3)	Invert Level (m AOD)	Plan Area (m^2)	Depth (m)	Porosity	Min. Cover (m)
1	Underground Attenuation structure (ESS ECO Cell or similar)	South West of Block B2	**359.8**	145.000	249.8	1.5	0.96	0.58
2	Underground Attenuation structure (ESS ECO Cell or similar)	North of Block B3	**441.2**	143.120	306.3	1.5	0.96	0.58
3	Underground Attenuation structure (ESS ECO Cell or similar)	East of Block B1/B2	**170.6**	141.000	118.4	1.5	0.96	1
4	Underground Attenuation structure (ESS ECO Cell or similar)	South of Block A2	**238.7**	138.300	165.7	1.5	0.96	0.7
5	Underground Attenuation structure (ESS ECO Cell or similar approved)	South of Block A1	**126.8**	138.500	88.0	1.5	0.96	1
6	Blue Roof Attenuation on Roof	Block B1/B2	**162.0**	Roof level	**	**	0.40	N/A
7	Blue Roof Attenuation on Roof	Block B3/B4	**164.0**	Roof level	**	**	0.40	N/A
8	Stone Infiltration Soakaway	East of Block B3/B4	**46.5**	139.900	88.6	1.5	0.35	0.5
9	Bio-Retention Area A	Roadside (next to individual units) See Drainage Layout (C-0501/2)	**43.0**	-	122.3	0.5	1.00	-
10	Bio-Retention Area B	Roadside (next to individual units) See Drainage Layout (C-0501/2)	**35.0**	-	104.2	0.5	1.00	-
11	Bio-Retention Area C	Roadside (next to individual units) See Drainage Layout (C-0501/2)	**28.0**	-	90.2	0.5	1.00	-
12	Bio-Retention Area D	Roadside (north of Block B1/2) See Drainage Layout (C-0501/2)	**11.3**	-	39.7	0.5	1.00	-
13	Bio-Retention Area E	East of Block B1/B2 at site perimeter See Drainage Layout (C-0501/2)	**58.0**	-	145.7	0.5	1.00	-
14	Bio-Retention Area F	East of Block B1/B2 at site perimeter See Drainage Layout (C-0501/2)	**24.7**	-	67.8	0.5	1.00	-

Notes:
** Table does not include storage along filter drains or under permeable pavement*
*** Final plan area and depth to be determined by Architects and Green/Blue Roof designer*

In addition to the above, storage in the form of a 900mm wide filter drain has been provided along the side of much of the access road layout. This storage is achieved by the use of appropriately sized orifice plates at regular intervals (none less than 50mm diameter).

Pervious paving to be provided within all car parking spaces within the development (utilising both permeable paving blocks or grasscrete). This will provide at source treatment of runoff from the roads while also providing interim storage within the base course. A minimum of 300mm stone with a minimum porosity of 30% is to be provided below the pervious paving. Runoff temporarily stored within the base course will be allowed to infiltrate naturally to ground water via a 500mm filter drain, which is connected to the main drainage network for cases of overflow from extreme events.

3.7 SURFACE WATER OUTFALL LOCATION

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 **4.2 l/s/ha** (7.1 l/s), which is less than the current greenfield equivalent runoff rate, as discussed in *Section 3.3.3*.
The above is to ensure that there is no increase in flow rates and volumes, from development of the site, being discharged to the receiving infrastructure; thus, causing no adverse impact on adjoining and other downstream properties.

3.8 WATER QUALITY

The quality of the surface water discharging from site is to be improved through the following provisions, each of which is discussed in greater detail in *Section 3.4.3*:

- Pervious Paving and Grasscrete in all car parking areas;
- Green roofs;
- Intensive landscaping, where practical;
- Interception storage;
- Trapped road gullies on the road carriageway, to trap silt and gross pollutants;
- Silt trap to be provided on manhole immediately upstream of attenuation system and fuel separators, as a further preventative measure to trap silt and other gross pollutants;
- Class 1 bypass fuel separators to be provided prior to discharging from site.

3.9 MAINTENANCE

The proposed surface water drainage network has been carefully designed to minimise risk of blockage throughout the network, mainly through the following provisions that limit and restrict the size of pollutants entering the network:

- Pervious paving;
- Trapped road gullies;
- Silt trap manhole;
- Flow control appropriately sized.
- Oriface plates – none less than 50mm dia.

All devices, including road gullies, silt trap, flow control device and the attenuation system, should be inspected regularly and maintained, as appropriate and in accordance with manufacturer's recommendations and guidelines.
Items such as the flow controls and fuel separators have been located so as to provide easy vehicular access for inspection and maintenance.
A SuDS Operation and Maintenance Manual has been provided in **Appendix J**.

3.10 TAKING IN CHARGE

It is proposed that all new surface water infrastructure associated within the redline boundary **is not** to be offered to be taken in charge by Dun Laoghaire Rathdown County Council.

3.11 SURFACE WATER IMPACT ASSESSMENT

The design criteria for the drainage system are established in *GDSDS-RDP Volume 2*, *Section 6.3.4* and explained further in *GDSDS-RDP Volume 2, Appendix E*. There are four design criteria, each of which has been considered for the subject site:

- River Water Quality Protection;
- River Regime Protection;
- Level of Service (flooding) for the site and;
- River Flood Protection.

3.12 CRITERION 1 – RIVER WATER QUALITY PROTECTION

It is proposed that the overall drainage system, serving this development, will contain a range of surface water treatment methods, as outlined previously in *Section 3.4,* which will improve the quality of surface water being discharged from the proposed development.
Gross pollutants, sediments, hydrocarbons, and other impurities, will be removed at source with the following provisions:

a) Pervious Paving / Grasscrete to all car parking areas;
b) Intensive landscaping, where practicable;
c) Interception storage at attenuation systems;
d) All road gullies and linear channel drains are to be trapped;
e) Silt-trap prior to attenuation storage area;
f) Class 1 fuel separators prior to discharge from the development.

3.13 CRITERION 2 – RIVER REGIME PROTECTION

Surface water discharge from the overall development will be restricted to an equivalent rural runoff rate of **7.1 l/s**, as per GDSDS and Dun Laoghaire Rathdown County Council requirements. Refer to *Section 3.3.3* for further details of the proposed development rainfall runoff calculations.
This will be achieved with the provision of a flow control devices (Hydro-Brake Optimum, by Hydro-International, or similar approved) upstream of the outfall manhole. Refer to *Section 3.4.2.10* for further details.

3.14 CRITERION 3 – LEVEL OF SERVICE (FLOODING) SITE

There are four sub-criteria for the required level of service, for a new development; as set out in the *GDSDS Volume 2, Section 6.3.4 (Table 6.3).*

- No flooding on site except where planned (30-year high intensity rainfall event);
- No internal property flooding (100-year high intensity rainfall event);

- No internal property flooding (100-year river event and critical duration for site) and;
- No flood routing off site except where specifically planned. (100-year high intensity rainfall event).

3.14.1 SUB-CRITERION 3.1

The surface water drainage systems, serving the proposed development, have been designed to accommodate the 100-year return period rainfall event (including an allowance of 20% increase in rainfall intensity for climate change) without flooding. Therefore, the system has capacity for the 30-year return period rainfall event without flooding.
The performance of the proposed drainage system has been analysed for design rainfall events up to, and including, the 1% AEP event (including 20% climate change allowance) using the *Causeway Flow network design software*, by Causeway Technologies Ltd. Refer to Section 3.5.1 and **Appendix D** for details of design criteria, calculations and results. The analyses indicate that no flooding will occur for design rainfall events up to, and including, the 1% AEP.

3.14.2 SUB-CRITERION 3.2

The surface water drainage systems, serving the proposed development, have been designed to accommodate the 100-year return period rainfall event (including an allowance of 20% increase in rainfall intensity for climate change) without flooding.
The performance of the proposed drainage system in 100-year return period storm events (including 20% climate change allowance) has been analysed – Refer **Appendix D** for calculations. The analyses show that no flooding will occur in 100-year return period storm events.

3.14.3 SUB-CRITERION 3.3

Details of the flood risk assessment associated with the proposed development is outlined in *Section 7* of this report. The assessment indicates that there is no apparent risk of internal property flooding for a design 100-year return period pluvial rainfall event (including 20% climate change allowance).

3.14.4 SUB-CRITERION 3.4

The surface water drainage systems, serving the proposed development, have been designed to accommodate the 100-year return period rainfall event (including an allowance of 20% increase in rainfall intensity for climate change) without flooding, so no flood routing off site will be experienced for such a rainfall event.
The performance of the proposed drainage system in 100-year return period storm events (including 20% climate change allowance) has been analysed – Refer **Appendix D** for calculations. The analyses show that no flooding will occur in 100-year return period storm events.
Details of the flood risk assessment associated with the proposed development is outlined in *Section 7* of this report. This assessment, along with the network design simulation results, from the Causeway Flow network

analysis, indicates that no internal property flooding will occur in a 100-year return period fluvial flood event (including 20% climate change allowance).

3.15 CRITERION 4 – RIVER FLOOD PROTECTION

As outlined in *Section 3.13* (Criterion 2), the surface water runoff from the development's catchment will be limited to a maximum of **7.1 l/s** (4.2 l/s/ha).

Refer to *Section 3.3.3* and *Section 3.5* of this report for further details on the limiting discharge rates. The *GDSDS Volume 2, Appendix E* states that this practice ensures *"that sufficient stormwater runoff retention is achieved to protect the river during extreme events".*

Attenuation storage is to be provided for the 100-year return period rainfall event (including an increased 20% rainfall intensity; to allow for climate change). Discharge from site is to be achieved through the use of a vortex flow control device (e.g. Hydro-Brake Optimum, by Hydro-International, or similar approved), which will reduce the risk of blockage present with other flow devices.

Refer to **Appendix D** for details of hydraulic modelling calculations of attenuation and flow control facilities, as carried out using *Causeway Flow network design software*, by Causeway Technologies Ltd.

4 WASTEWATER DRAINAGE

4.1 OVERVIEW

The proposed gravity wastewater sewer design has been carried out in accordance with Irish Water's Code of Practice for Wastewater Infrastructure.

4.2 EXISTING WASTEWATER DRAINAGE

Existing services records do not indicate the presence of any wastewater infrastructure within the proposed site. 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.

Figure 4.1 contains an excerpt from the Irish Water service records. The existing sewers are shown below.

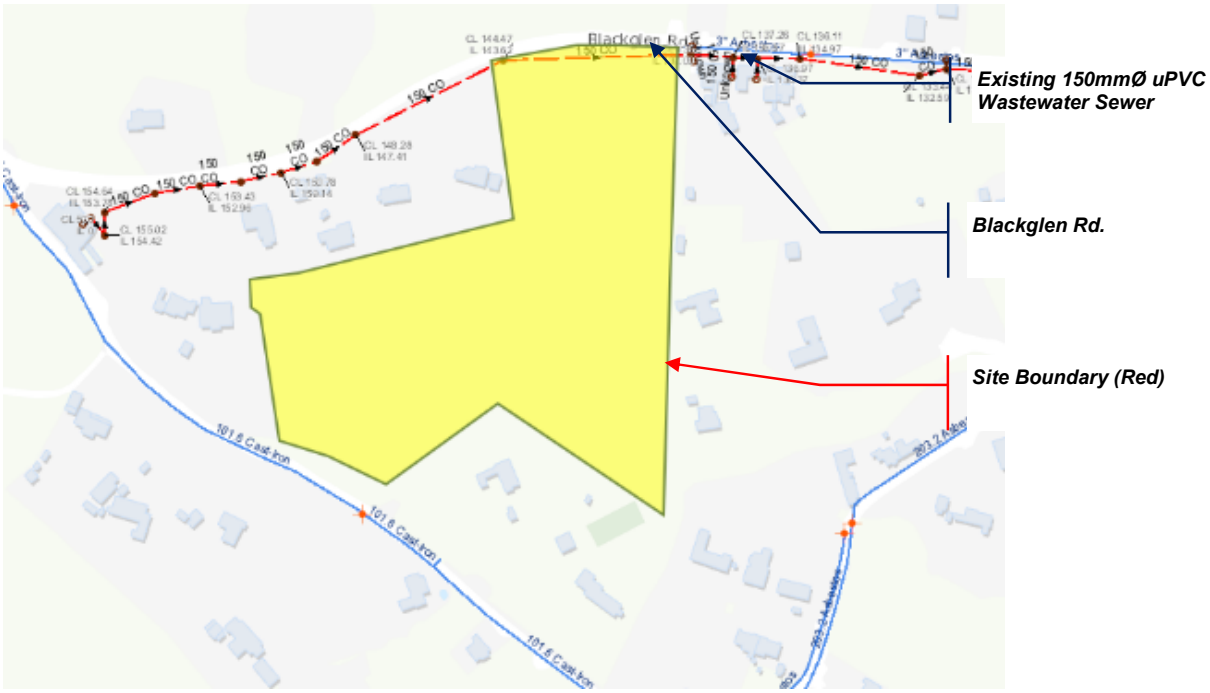


Figure 4.1 – Irish Water Public Records (Excerpt)

Refer to **Appendix A** for details of Irish Water existing wastewater infrastructure records.

4.3 CONSULTATION

A Pre-Connection Enquiry Form ***(IW Ref Nr. CDS22002623)*** was submitted 06th April 2022 to Irish Water for a total of 360nr. residential units. Feedback on this enquiry has been received and states that the development is feasible subject to upgrades to the existing network.

A new Pre-Connection Enquiry Form **(IW Ref Nr. CDS24000835)** was submitted 26th January 2024 to Uisce Éireann for a total of 192nr. residential units. Feedback on this enquiry has been received and states that the development is feasible, subject to upgrades to the existing network.

Refer to **Appendix G** for Confirmation of Feasibility for current application (IW Ref Nr. *CDS24000835*).

4.4 PROPOSED WASTEWATER DRAINAGE STRATEGY

It is proposed to separate the wastewater and surface water drainage networks, which will serve the proposed development, and provide independent connections to the public wastewater infrastructure.
Refer to *Section 3* for details of the proposed surface water drainage design strategy.
The overall development is to be drained by a gravity wastewater network, based on the natural topography of the development site (with the exception of 1 building – see section **4.4.1** below). The buildings 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.

4.4.1 RISING MAIN

Due to the natural topography of the site, it was deemed necessary to provide a pumped rising main for the wastewater discharge from Block B3/B4, for a short distance (16m) to connect it to the main gravity sewer. This has been designed in accordance with Uisce Éireann COP for Wastewater Infrastructure (July 2020 - Rev. 2).
Refer to detailed drawing **Z040-OCSC-XX-XX-DR-C-0503 & 0504** for the proposed wastewater drainage network layout, which is to serve the development. See also drawings **Z040-OCSC-XX-XX-DR-C-0515 & 0516** for wastewater long-sections.

4.5 WASTEWATER NETWORK DESIGN CALCULATIONS

It is proposed to separate the wastewater and surface water drainage networks, which will serve the proposed development, and provide independent connections to the adjacent watercourse and local wastewater sewer network, respectively.

Wastewater (volumetric) calculations have been compiled in accordance with *Irish Water's Code of Practice Wastewater Infrastructure, IW-CDS-5030-03* and are included in **Appendix E**. Pipe design calculations have been compiled using Causeway Flow software and are included in **Appendix E**. Design flow has been calculated using the Discharge Unit method described in *I.S. EN 752*. The calculations demonstrate that conveyance capacity is provided for all development of zoned lands within the catchment, that self-cleansing velocity will be achieved with the expected design flow rates and that the flow velocities will not exceed the upper limit of 3.0m/s.

4.6 TAKING IN CHARGE

It is proposed that all new wastewater drainage infrastructure installed to serve the proposed development within the redline boundary **is not** to be offered to Irish Water for to be taken-in-charge.

5 POTABLE WATER SUPPLY

5.1 OVERVIEW

All proposed potable water design has been carried out in accordance with *Irish Water's Code of Practice for Water Infrastructure, IW-CDS-5020-03.*

A new 200mm-diameter HDPE watermain connection is to be provided from the existing 200mm Ø watermain on the Blackglen Rd. along the northern site boundary.

5.2 EXISTING WATERMAIN INFRASTRUCTURE

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.

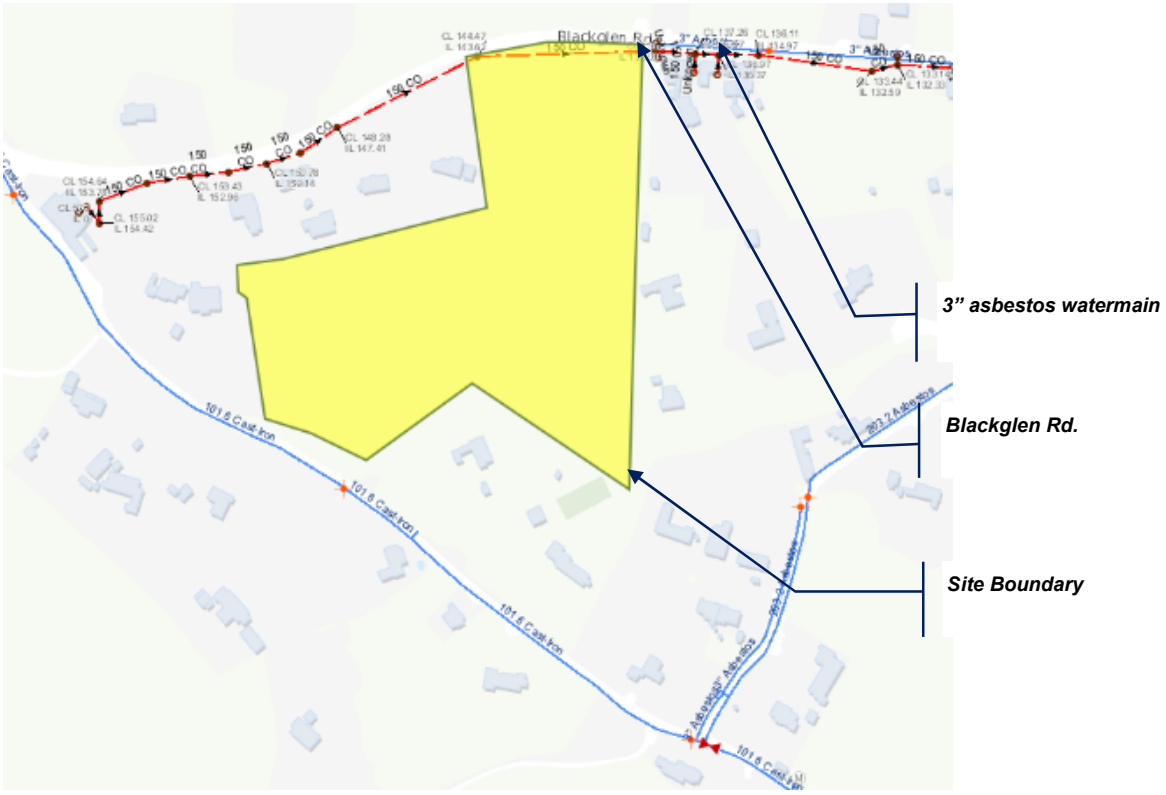


Figure 5.1 - Irish Water Public Records (Excerpt)

Refer to **Appendix A** for details of existing watermain infrastructure records.

5.3 CONSULTATION

A Pre-Connection Enquiry Form ***(IW Ref Nr. CDS22002623)*** was submitted 06th April 2022 to Uisce Éireann for a total of 360nr. residential units. Feedback on this enquiry has been received and states that the development is feasible subject upgrades to the existing network.
A new Pre-Connection Enquiry Form **(IW Ref Nr. CDS24000835)** was submitted 26th January 2024 to Uisce Éireann for a total of 192nr. residential units. Feedback on this enquiry has been received and states that the development is feasible, subject to upgrades to the existing network.
Refer to **Appendix G** for Confirmation of Feasibility for current application (IW Ref Nr. *CDS22002623*).

5.4 CONNECTION TO THE EXISTING NETWORK

It is proposed to serve the proposed development by providing a new 200mm high density polyethylene (HDPE) connection to the new 200mm Ø watermain to be laid on Blackglen Rd. to the north of the site.
The proposed connection is to be carried out in accordance with *Uisce Éireann's Code of Practice for Water Infrastructure*, following a New Connection agreement with Uisce Éireann, with a bulk water meter to be provided at the development's entrance.
Refer to drawing **Z040-OCSC-XX-XX-DR-C-0550 and 0551** for the proposed watermain layout.

5.5 WATER SAVING DEVICES

Water saving devices are to be considered for use within the proposed development, in order to conserve the use of water, as part of the internal fit-out.

5.6 WATER METERS

A bulk water meter is to be provided at the connection to the public watermain, at the development entrance, along with individual meters provided at the connection to each unit. All metering is to be provided in accordance with Irish Water's requirements.

5.7 TAKING IN CHARGE

All new watermain infrastructure, installed to serve the proposed development after the bulk meter **is not** to be offered to Irish Water for to be taken-in-charge.

6 FLOOD RISK ASSESSMENT

6.1 DESIGN GUIDELINES OVERVIEW

Any planning permission sought on the subject lands are required to adhere to the Local Authority requirements *i.e.* the Dún Laoghaire-Rathdown County Council Development Plan, and as such, The Planning System and Flood Risk Management (FRM), Guidelines for Planning Authorities, in which, its Technical Appendices outline the requirements for a Site Specific Flood Risk Assessment.

6.2 THE PLANNING SYSTEM AND FLOOD MANAGEMENT, GUIDELINES FOR PLANNING AUTHORITIES

The FRM Guidelines outline methodologies for the "transparent consideration of flood risk at all levels of the planning process, ensuring consistency of approach throughout the country".
"The core objectives of the FRM Guidelines are to:

- Avoid inappropriate development in areas at risk of flooding;
- Avoid new developments increasing flood risk elsewhere, including that which may arise from surface runoff;
- Ensure effective management of residual risks for development permitted in floodplains;
- Avoid unnecessary restrictions of national, regional, or local economic and social growth;
- Improve the understanding of flood risk among relevant stakeholders; and
- Ensure the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management flood risk management."

In order to achieve the aims and objectives that are set out in the FRM Guidelines, the key principles that should be applied to new development are as follow:

- Avoid the risk, where possible;
- Substitute less vulnerable uses, where avoidance is not possible; and
- Mitigate and manage the risk, where avoidance and substitution are not possible.

Justification for development is required in situations where 'avoid' and 'substitute' principles cannot be applied. This is further summarised in the FRM Guidelines Sequential Approach, as illustrated in *Figure 6.1*.

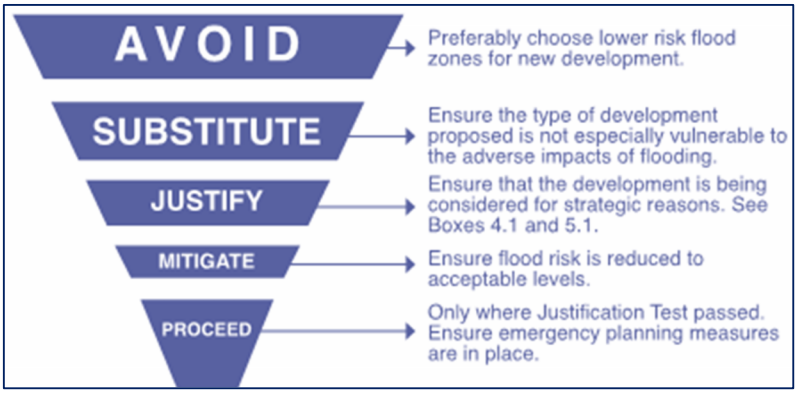


Figure 6.1 – Sequential Approach Principles in Flood Risk Management

6.3 FLOOD RISK ASSESSMENT

The assessment of flood risk requires an understanding of where the water comes from (*i.e.* the source), how and where it flows (*i.e.* the pathways) and the people and assets that if affects (*i.e.* the receptors). This is illustrated further in *Figure 6.2*, as sourced from the FRM Guidelines.

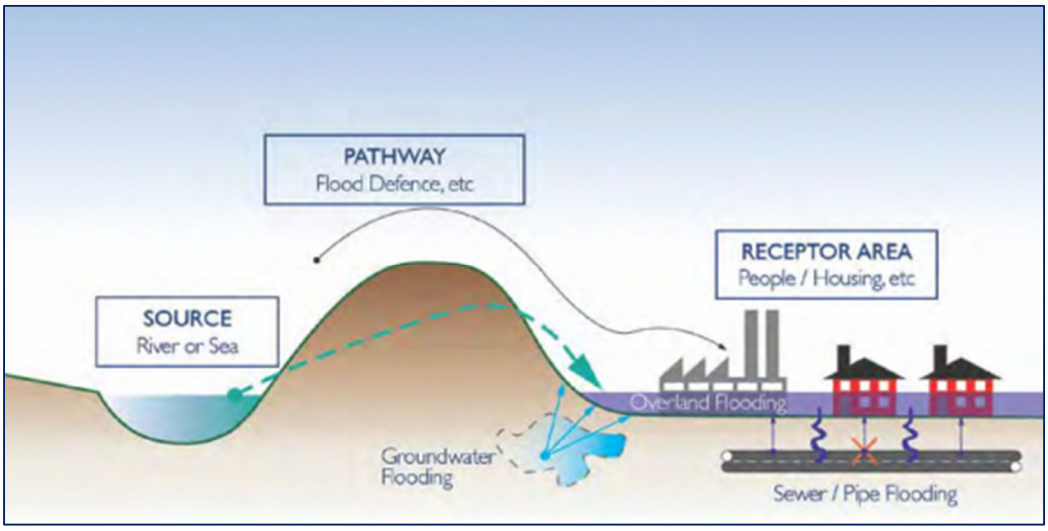


Figure 6.2 – Source – Pathway – Receptor Model

The main sources of flooding are rainfall or higher than normal sea or river levels.

The main pathways include rivers, streams, sewers, drains, overland flow, and river and costal floodplains and their assets.

Receptors typically include people, their property, and their environment.

All three elements of this model must be examined as part of the flood risk assessment, including the vulnerability and exposure of receptors in order to determine its potential consequence.

Risks to people, property and the environment should be assessed over the full range of probabilities, including extreme events. Flood risk assessment should cover all sources of flooding, including effects of run-off from a development locally and beyond the development site.

6.4 FLOOD RISK ASSESSMENT STAGES

The FRM Guidelines outline that a staged approach should be adopted when carrying out a flood risk appraisal or assessment of flood risk for individual planning applications. These stages are:

- **Stage 1** – Flood risk identification
- **Stage 2** – Initial flood risk assessment
- **Stage 3** – Detailed flood risk assessment

6.5 FLOOD ZONES

The FRM Guidelines identifies three types, or levels, of flooding zones, which are defined as follows:

1. **Flood Zone A** – where the probability of flooding from rivers and sea is highest (greater than 1% AEP for fluvial, or 0.5% AEP for coastal flooding);
2. **Flood Zone B** – where the probability of flooding from river and sea is moderate (between 0.1% AEP and 1% AEP for fluvial and between 0.1% AEP and 0.5% AEP for coastal flooding);
3. **Flood Zone C** – where the probability of flooding from rivers and sea is low (less than 0.1% AEP for both fluvial and coastal flooding).

6.6 CLIMATE CHANGE

The *FRM Guidelines* require that account be taken of the effects of climate change over the design of a development, typically 100 years. Design parameters to take account of climate change were established in the *GDSDS* and revised following later studies, as directed within the Local Authority's Development Plan. These parameters are set out in the *Figure 6.3 – Climate Change – Impact on Design Parameters*, below.

Design Category	Impact of Climate Change
Drainage	10% increase in rainfall
Fluvial (River)	20% increase in flood flow
Tidal / Coastal	Sea level rise of 500mm

Figure 6.3 – Climate Change – Impact on Design Parameters

6.7 DEVELOPMENT VULNERABILITY

Table 3.1 of The Planning System and Flood Risk Management Guidelines, reproduced in *Figure 6.4* below, classifies the proposed residential development as being **'Highly Vulnerable Development'** based on its proposed land use and type of development.

Vulnerability Class	Land uses and types of development which include:
Highly Vulnerable Development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; ***Dwelling houses***, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less Vulnerable Development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible Development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).

Figure 6.4 – Development Vulnerability Class

Table 3.2 of the PSFRM Guidelines, reproduced in *Figures 6.5* below, illustrates the types of development that are considered appropriate to each flood zone, and those that would be required to meet the criteria of a Justification Test, which establishes the criteria under which desirable development of a site within a floodplain may be warranted.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable Development	Justification Test	Justification Test	Appropriate
Less Vulnerable Development	Justification Test	Appropriate	Appropriate
Water-compatible Development	Appropriate	Appropriate	Appropriate

Figure 6.5 - Matrix of Vulnerability Vs. Flood Zone

Therefore, based on the table above, *Highly Vulnerable Development*, such as dwellings is classified as **'appropriate'** if it is located within Flood Zone C.

6.8 SEQUENTIAL APPROACH

A sequential approach, based on the development vulnerability and location with respect to flood zones, is a key tool in ensuring new development is first and foremost directed towards land that is at low risk of flooding. This approach is illustrated further in *Figure 6.6* below.

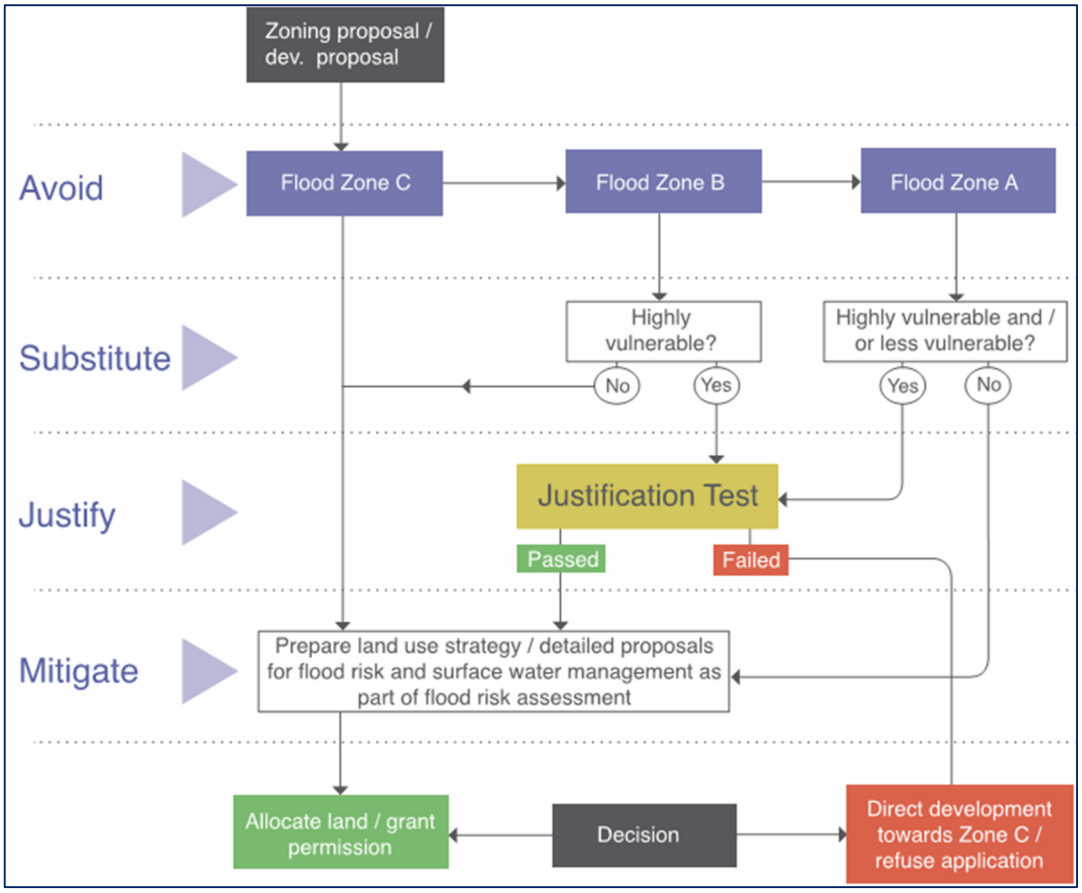


Figure 6.6 – Sequential Approach Mechanism (FRM Guidelines)

7 FLOOD RISK IDENTIFICATION & ASSESSMENT

Details of the information sources that were used as part of the flood risk identification as assessment associated with the subject development site are provided in *Section 2* of this report.

7.1 HISTORICAL FLOODING

The Office of Public Works (OPW) collates all information available from reports of flooding from all sources on a nationwide basis. This information is available from the OPW's website **www.floodinfo.ie**, which was consulted in order to obtain any information on previous flooding in the vicinity of the site. There are no reported incidents of flooding in the vicinity of the proposed development

Refer to *Figure 7.1 – OPW Historical Flooding*, below.

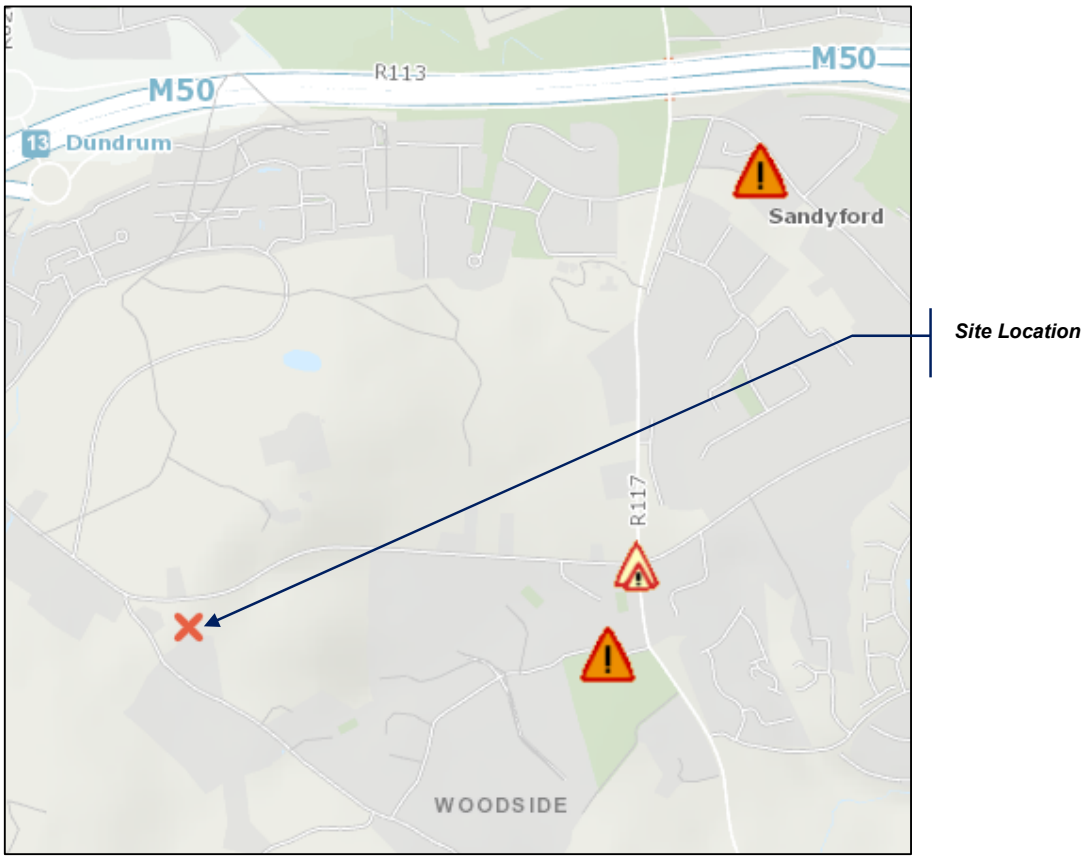


Figure 7.1 – OPW Historical Flooding (www.floodinfo.ie)

7.2 FLUVIAL FLOODING

Fluvial flooding occurs when a river overtops its banks due to a blockage in the channel or the channel capacity is exceeded due to excess rainfall in its catchment area.

The *Environment Protection Agency (EPA)* collates all information available about the waterbodies from all sources on a nationwide basis. This information is available from the EPA's website **http://gis.epa.ie/EPAMaps**. The Carrickmines/Shanganagh Stream is located along the south-eastern boundary of the site, see Figure 7.2. The development is set back approximately 25m from the Carrickmines Stream.

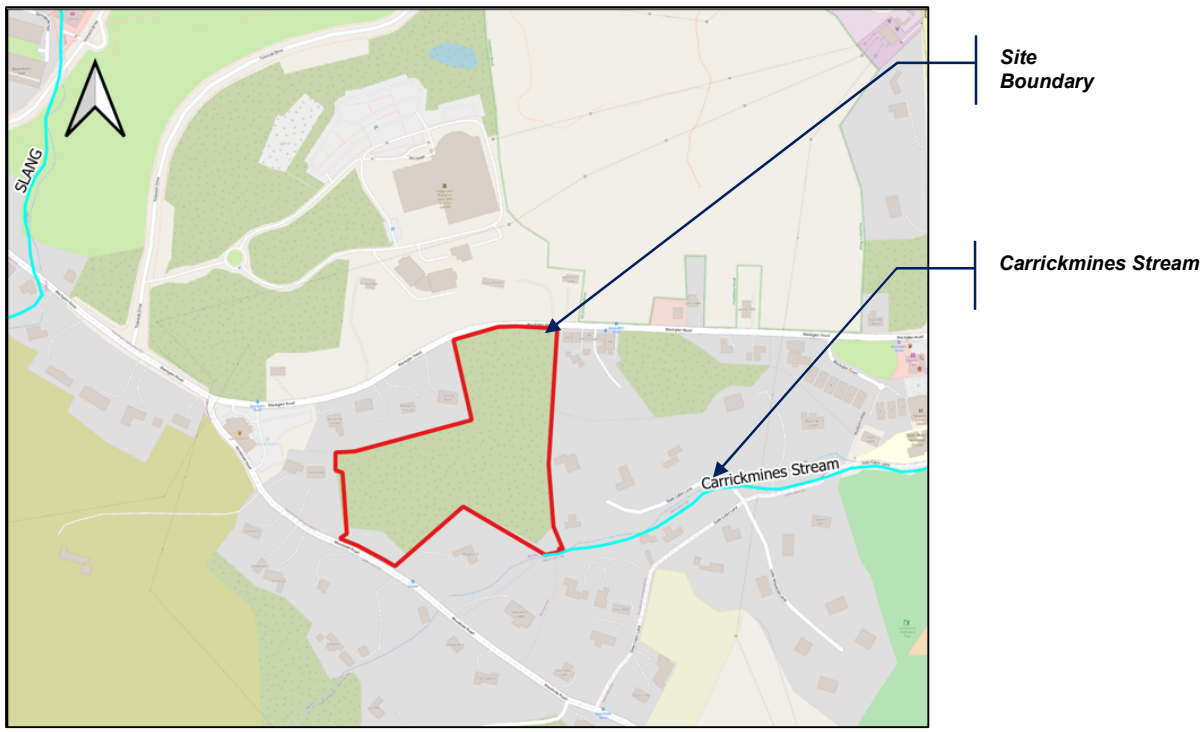


Figure 7.2 – Location of the Carrickmines Stream

The OPW in conjunction with Dun Laoghaire-Rathdown County Council have developed the Flood Risk and Hazard maps as part of the CFRAMS programme. The site of the proposed development has been included in the CFRAMS model. Figure 7.3 below is an extract from the CFRAMS fluvial flood map for the area surrounding the proposed development site. The flood map indicate that the site lies outside the modelled flood extents. The estimated 1 in 1000-year flood level at the node nearest the site (1061M00754D) is 128.36 mAOD. This is 10.49 m below the site levels, and 12.14 m below the minimum finished floor level (140.50 mAOD).

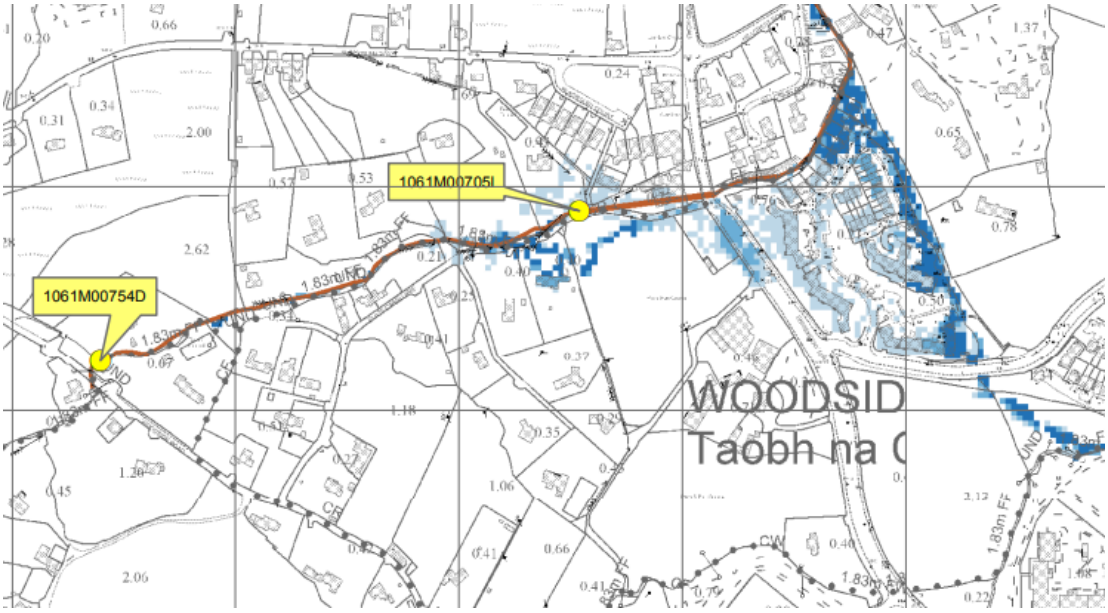


Figure 7.3 – Extract from the CFRAMS fluvial flood map

The Dun Laoghaire Rathdown Council Development Plan 2016-202 Strategic Flood Risk Assessment outlines the flood risk in the area associated with the "Carrickmines/Shanganagh" catchment. As part of this assessment flood risk maps have been produced.

Figure 7.4 below is taken from on the online flood maps that have been produced by the OPW. It can be seen that the site is not located within the modelled flood extent for the river.

The above-mentioned document clearly demonstrates that the proposed site is located outside the predicted 10%, 1% and 0.1% AEP flood extent of the "Carrickmines/Shanganagh" river catchment.

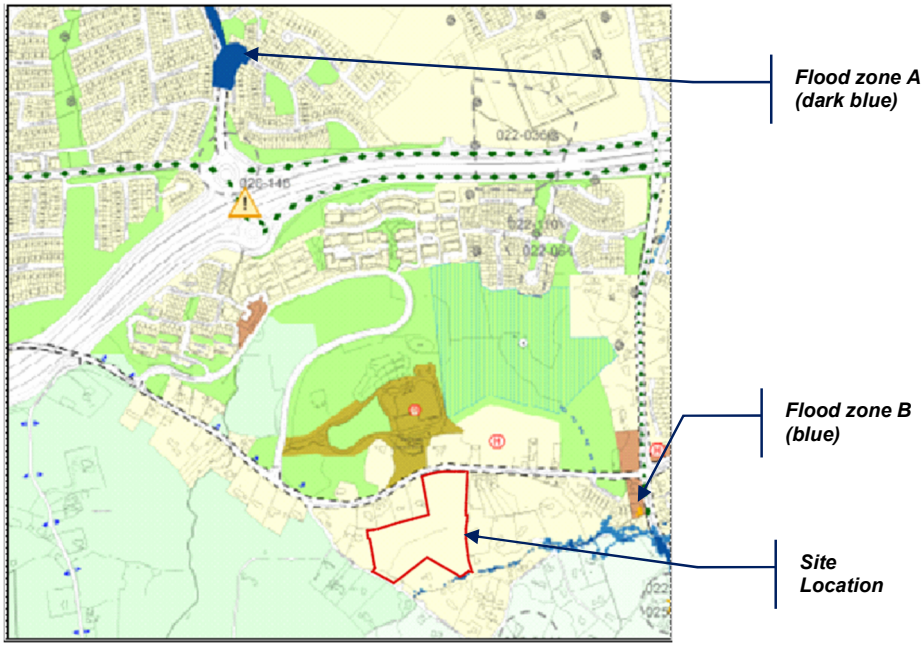


Figure 7.4 – Fluvial Flood Extent

Figure 7.4 confirms that the development site is located within Flood **Zone C**, *i.e.* is **not** considered at risk from Fluvial Flooding.

7.3 COASTAL FLOODING

Coastal flooding is caused by high sea levels resulting in the sea overflowing onto the land. The proposed site is located approximately 8.5km west of the east coast. Refer to *Figure 7.5 – Coastal Flooding*, below.

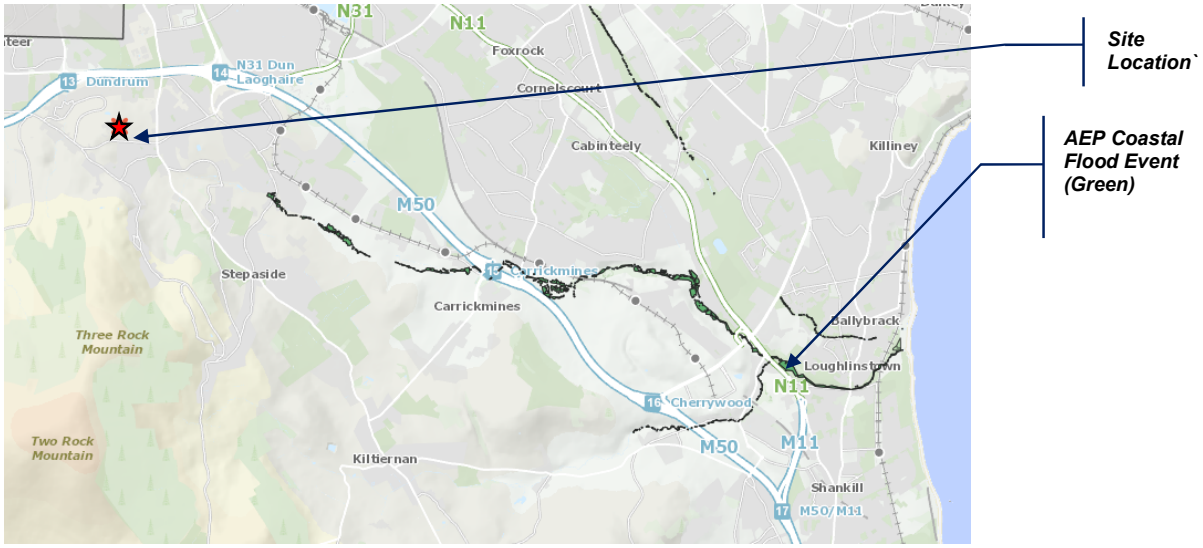


Figure 7.5 – Coastal Flood Extent (www.floodinfo.ie)

Therefore, the site is **not** considered at risk from Coastal Flooding.

7.4 PLUVIAL FLOODING

7.4.1 PRELIMINARY FLOOD RISK ASSESSMENT

Pluvial flooding occurs when overland flow, resulting from rainfall events, cannot infiltrate into the ground, when drainage systems exceed their capacity or are blocked and when the water cannot discharge due to a high water level in the receiving watercourse.

The *Department of Housing, Planning, Community & Local Government (DHPCLG)* have collated the draft Flood mapping from the OPW for predicted pluvial flooding for the 1% AEP flood event. Refer to *Figure 7.6* for details of the predicted pluvial flood extent. The extent of the area modelled to show pluvial flooding does not extend to the area of the proposed development.