Proposed LRD at Taylors Lane, Ballyboden, Dublin 16

Infrastructure Design Report

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INFRASTRUCTURE

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1 Introduction

1.1 Background

DBFL have been instructed to prepare an Infrastructure Design Report for the proposed residential development at the existing Good Counsel site in Ballyboden, Dublin 12.

The proposed development is located to the south of Taylors Lane and to the East of Edmondstown Road.

1.2 Location & Topography

The proposed site is located on the corner of Edmondstown Road and Taylors Lane and the subject site is approximately net 3.50Ha. The site currently is unoccupied and consists of the old Good Counsel building and associated maintenance buildings. To the north and east there is a large area of open space, which historically was a pitch and putt course, and this also forms part of the overall site.

The site is bound by Edmondstown Road to the west, Taylors Lane to the north, a private lane to the Augustinian Order to the east and an old mill race to the south.

As per South Dublin County Council's development plan, the site has been zoned RES, to protect and/or improve residential amenity.

Generally, the site is relatively flat although the levels bank up towards the exiting mill race to the south of the site.

The existing topography levels range from 76m AOD in the northern extent of the site to circa 79m AOD in the southern extents of the site.

There are no EPA watercourses within the site boundary, although as previously stated, an old mill race bounds the southern boundary. The site has been identified to be within the riparian corridor of the Owendoher River located to the west of the subject site as per SDCC's 2022 Development Plan's Strategic Flood Risk Assessment.

The nearest watercourses other than the mill race is the Owendoher River located to the west of the subject site, directly adjacent to Edmondstown Road. The Whitechurch Stream is also located approximately 750m east the development as shown in figure 1.1.

Figure 1.1 Site Location (Site Boundary Indicative Only)

Site Boundary

1.3 Existing Ground Conditions

A ground investigation was undertaken by Ground Investigations Ireland, and this revealed that the strata encountered consisted mainly of:

- Topsoil
- Made ground
- Granular Deposits
- Cohesive Deposits

The strata is consistent over the site with differing levels of made ground up to 1.5m in places. The cohesive deposits generally consist of brown sandy or very sandy gravelly CLAY with occasional cobbles and boulders. The granular deposits were encountered at varying depths across the site and can be typically described as brown slightly clayey slightly gravelly SAND or a grey brown sandy fine to course sub-angular GRAVEL.

Rock was not encountered within the site investigation.

No groundwater was noted during the investigation, although standpipes were installed in BH01 and BH03 to allow groundwater monitoring to occur.

1.4 Proposed Development

The proposal is for a large-scale residential development on this site of net 3.5ha comprising the following:

- Demolition of existing former Institutional buildings and associated outbuildings (c.5231 sq.m);
- Construction of 402 residential units within 3 apartment/duplex blocks ranging in height from 2-5 storeys and comprising of 39 no. 1-Beds; 302 no. 2-Beds; and 61 no. 3-Beds all with associated private balconies/terraces to the north/south/east/west elevations;
- Provision of one crèche and two retail units.
- Provision of a new public park along Taylor's Lane
- Provision of 290 no. car parking spaces.
- Vehicular access to the site via Edmondstown Road to the west.
- Pedestrian Access to the site via Edmondstown Road to the west and Taylor's Lane to the north.

Please see the statutory notices for a full development description.

2 Flood Risk

Based on a review of the Eastern Catchment Flood Risk Assessment and Management (CFRAM) study, the Irish Coastal Protection Strategy Study (ICPSS) and South Dublin County Council's Strategic Flood Risk Assessment (SFRA), we note that the majority of the development lands are located within Flood Zone C, although the north-eastern corner of the subject site is located in Flood Zone B.

The review concluded that although a portion of the site is located within Flood Zone B, as indicated in the CFRAMS flood extents and SDCC SFRA, all 'Highly Vulnerable development is located within Flood Zone C.

Flood risk has been assessed in a Site-Specific Flood Risk Assessment (SSFRA). Please refer to DBFL report 190068-X-X-X-XXX-RP-DBFL-CE-0001.

3 Site Access and Road Layout

3.1 Existing Access

The proposed development site has a single vehicular entry point on Edmondstown Road, to the west of the subject site.

3.2 Proposed Access & Edmondstown Road Signalised Junction

Access to the site for all users will be via Edmondstown Road to the west of the proposed development site, to the south of the existing site entrance.

The subject development proposals include the upgrading of the existing Scholarstown Road/ Edmondstown Road signalised junction to increase capacity at the junction. The site access will be incorporated into these works, creating a four-arm signalised crossroads junction, refer to figure 3.1 and DBFL drawing 190068-X-04-00-XXX-DR-DBFL-CE-1201.

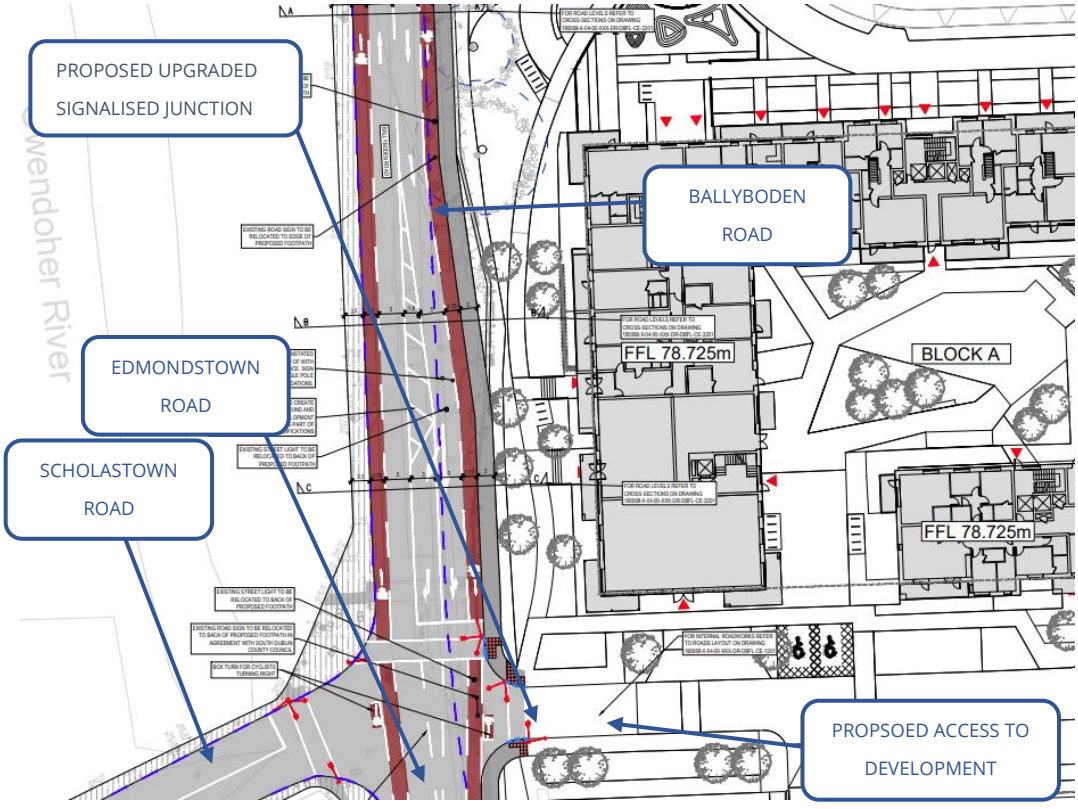


Figure 3.1 Proposed Junction and Access for Development

A pedestrian and cycle link to Taylors Lane has been proposed as shown in Figure 3.2. This access point also serves as an alternative access and egress for residents and emergency services should the primary site access be blocked due to an accident.

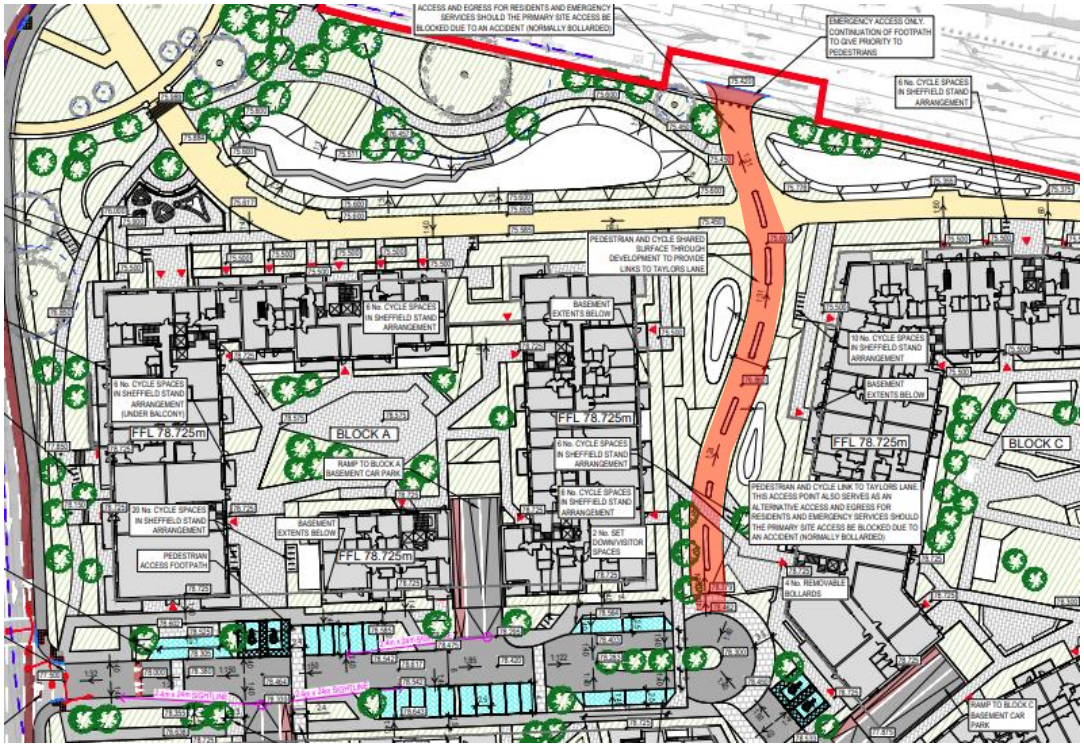


Figure 3.2 Proposed Emergency Access to Taylors Lane

3.3 Proposed Parking

As part of the planning application, the parking strategy has been defined and a separate report has been produced to outline the principles. This can be found in DBFL report 190068-X-X-X-XXX-RP-DBFL-CE-0005.

3.4 Vehicle Tracking and Servicing Strategy

The designation of parking at this level has been further explained in the parking strategy DBFL report 190068-X-X-X-XXX-RP-DBFL-CE-0005.

The proposed road layout and hard landscaping areas have been tracked to demonstrate that the site's proposed corner radii and turning heads will accommodate everyday vehicles such as normal delivery and cars. Other vehicles such as refuse trucks and fire tender have been tracked to ensure they can turn and manoeuvre around the development.

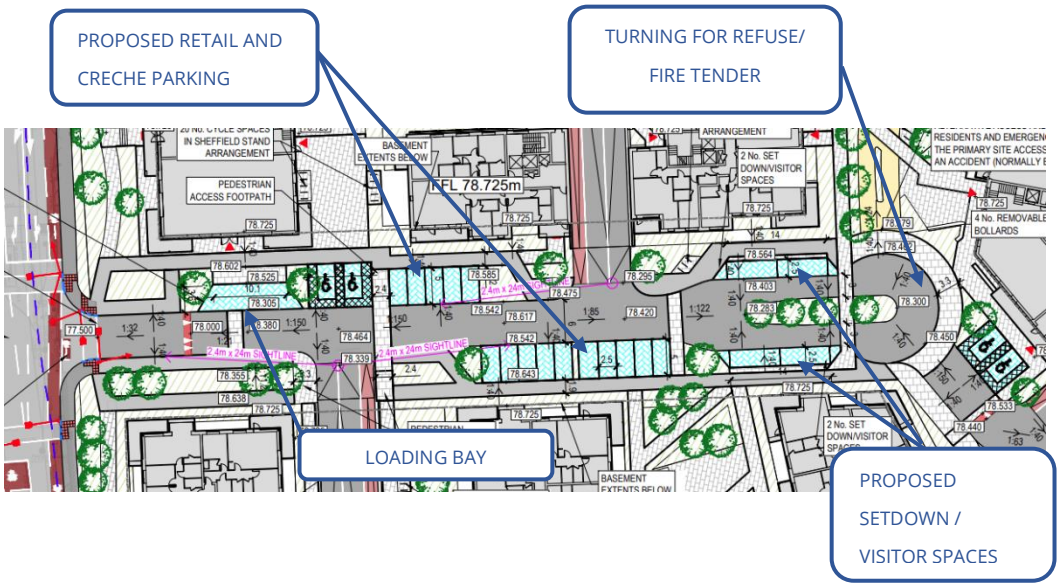


Figure 3.3 Servicing Proposals for Development

4 Existing Services and Utilities

4.1 General

A comprehensive topographical survey was carried out for the subject site and existing drainage and utility records in the vicinity of the site obtained and surveyed in detail. A summary of the existing main services is provided below, and the Irish Water records can be found in appendix D.

4.2 Surface Water Drainage

The proposed site is serviced by an existing surface water sewer which crosses Edmondstown Road and discharges to the Owendoher River located to the west of the site. The records also show a 900mm diameter surface water culvert on the north-eastern boundary which crosses Taylors Lane, after investigations it is found the only connection to this culvert is an obsolete surface water drain which serviced an old water feature that is no longer used. No further surface water infrastructure serves the development.

4.3 Foul Sewer

By reviewing records, the surrounding area predominately uses a separated drainage network. The subject site is serviced by an existing 225mm diameter foul sewer on Edmondstown Road which runs from south to north, continuing north within Ballyboden Road.

Figure 4.1 Existing Sewer Records

4.4 Water Supply

The site is well served by a series of watermains in Edmondstown Road and Taylor's Lane. The existing site is served by a 4 "Cast Iron watermain in Edmondstown Road.

Existing fire hydrants are located along the site frontage in Edmondstown Road.

Figure 4.2 Existing Watermain Records

By reviewing the existing records and liaising with the Local Authority, it is known that a 1m diameter trunk watermain runs through the north of the site. Investigations have been undertaken to locate the watermain and this was found in the eastern part of the site at approximately 3m deep.

The watermain could not be located on the western side of the site, but meeting Christy Bennet from the Local Authority, the line of the watermain could be tracked using the existing infrastructure such as the chamber within the adjacent open space to the west and the Scour valve which discharges to Owendoher River. (Refer to figure 4.3).

Figure 4.3 Existing Watermain Infrastructure

The watermain location can be seen in figure 4.4 and on drawing 190068-X-93-00-XXX-DR-DBFL-CE-1501 and an 8m wayleave either side of the trunk main has been implemented to ensure the development proposals are set back from Irish Water key infrastructure.

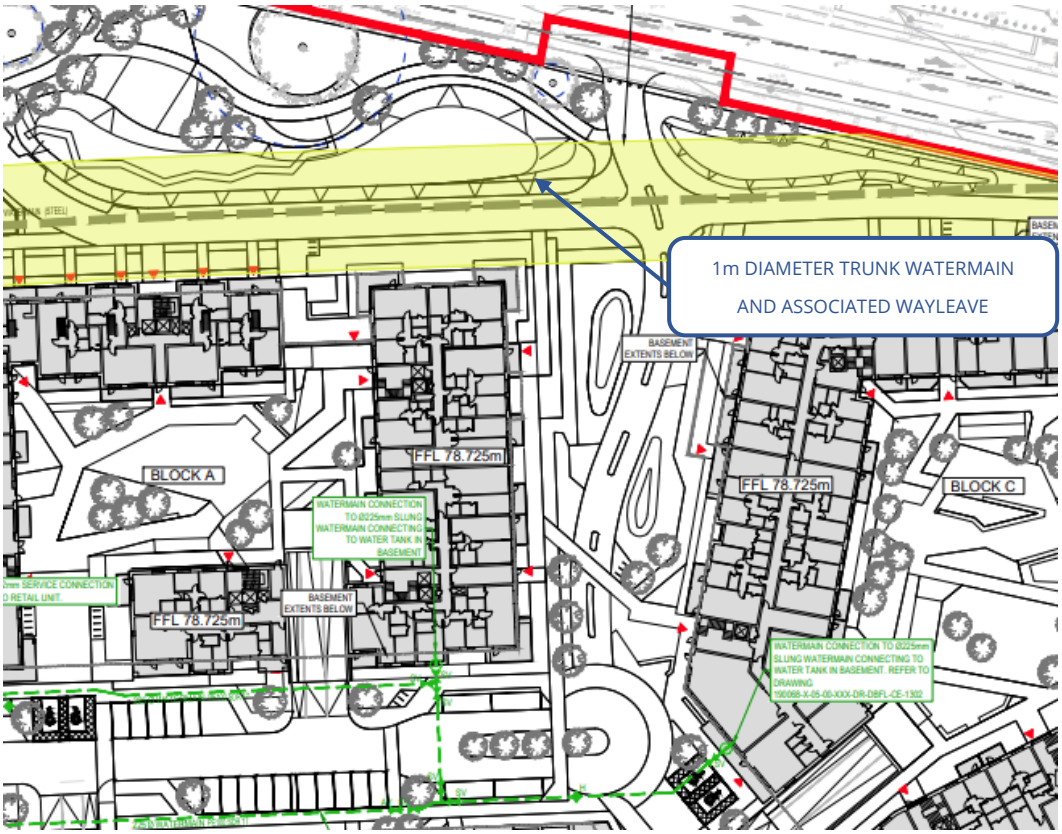


Figure 4.4 Existing Watermain Location overlaid on Development proposals

5 Proposed Surface Water Drainage

5.1 Surface Water Policy

The management of surface water for the proposed development has been designed to comply with the policies and guidelines outlined in the Greater Dublin Strategic Drainage Study (GDSDS) and with the requirements of South Dublin County Councils Sustainable Drainage Explanatory Design & Evaluation Guide (2022). The guidelines require the following 4 main criteria to be provided by the design:

- Criterion 1: River Water Quality Protection – satisfied by providing interception storage and treatment within the green roof, bio-retention/filter drains and green courtyard and garden.
- Criterion 2: River Regime Protection – satisfied by attenuating to greenfield run-off rates.
- Criterion 3: Level of Service (flooding) for the site – satisfied by the development's surface water drainage design, planned flood routing, run-off contained within site, flood storage and building set greater than 0.5m above 100-year flood level.
- Criterion 4: River flood protection – attenuation volume and discharge limit designed to greenfield run-off rates (long term storage not provided).

5.2 SDCC Chapter 11 Infrastructure and Environmental Services

The objectives of the Development Plan relating to the foul drainage and water network are noted below along with how DBFL have considered the objective in the design process.

Policy IE2 of the Development Plan 2022-2028 aims to *"ensure that water supply and wastewater infrastructure is sufficient to meet the growing needs of the population and to support growth in jobs over the lifetime of the Development Plan facilitating environmental protection and sustainable growth."*

IE2 Objective 1:

To work in conjunction with Irish Water to protect existing water and drainage infrastructure and to promote the ongoing upgrade and expansion of water supply and wastewater services to meet the future needs of the County and the Region.

- DBFL have received a Confirmation of Feasibility from Irish Water confirming that the existing drainage network can accommodate the foul flows and water demand from the development. Both the foul and watermain network will be designed to adhere to the Irish Water Code of Practice.

IE2 Objective 3:

To promote and support the implementation of the Greater Dublin Strategic Drainage Study, Dublin Region Local Authorities (2005) GDSDS.

- DBFL's proposed surface water design has been modelled in accordance with the guidelines set out by the GDSDS.

IE2 Objective 5:

To prohibit the connection of surface water outflows to the foul drainage network where separation systems are available.

- A new separate foul and surface water network is proposed throughout the development site.

IE2 Objective 9:

To ensure that all new developments in areas served by a public foul sewerage network connect to the public sewerage system.

- DBFL's proposed foul water network will be designed in accordance with the Irish Water Code of Practice will connect to the public foul sewer network which is under the responsibility of Irish Water in accordance with the objective. A Confirmation of Feasibility received from Irish Water for the development has confirmed that the connection to the network is viable.

Policy IE3: Surface Water and Groundwater aims to *"Manage surface water and protect and enhance ground and surface water quality to meet the requirements of the EU Water Framework Directive"*

IE3 Objective 2:

To maintain and enhance existing surface water drainage systems in the County and to require Sustainable Drainage Systems (SuDS) in new development in accordance with objectives set out in section 4.2.2 of this Plan including, where feasible, integrated constructed wetlands, at a local, district and County level, to control surface water outfall and protect water quality.

- DBFL surface water drainage strategy as set out in the IDR, SSFRA and drawings proposes the extensive use of Suds measures throughout the development. These proposals will improve the water quality and reduce the runoff from hardstanding areas on the site.

Policy IE4 Flood Risk aims to *"ensure the continued incorporation of Flood Risk Management into the spatial planning of the County, to meet the requirements of the EU Flood Directive and the EU Water Framework Directive and to promote a climate resilient County. manage surface water and protect and enhance ground and surface water quality to meet the requirements of the EU Water Framework Directive."*

IE4 Objective 1:

To require site specific flood risk assessments to be undertaken for all new developments within the County in accordance with The Planning System and Flood Risk Management – Guidelines for Planning Authorities (2009) and the requirements of DECLG Circular P12 / 2014 and the EU Floods Directive and Chapter 12: Implementation and Monitoring and the policies and objectives of this chapter.

- DBFL have prepared a Site-Specific Flood Risk Assessment for the proposed development in accordance with The Planning System and Flood Risk Management – Guidelines for Planning Authorities (2009) and the requirements of DECLG Circular P12 / 2014 and the EU Floods Directive and Chapter 12: Implementation and Monitoring and the policies and objectives of this chapter.

5.3 SDCC Chapter 4 Green Infrastructure

The 'Green Infrastructure' chapter of the SDCC Development Plan 2022-2028 sets out guidelines and objectives on promoting development of a Green Infrastructure (GI) network to '*enhance existing biodiversity and natural heritage, improving our resilience to climate change and enabling the role of GI in delivering sustainable communities to provide environmental, economic and social benefits.'*

The GI policy is centred around 5 Strategic Themes

1. Biodiversity;
2. Sustainable Water Management;
3. Climate Resilience;
4. Recreation and Amenity (Human Health and Wellbeing)
5. Landscape, Natural, Cultural and Built Heritage

DBFL have worked closely with Doyle & O'Troithigh Landscape Architects in coordinating the civil and landscape strategies for the proposed development to adhere to the Strategic Themes mentioned in this document.

The SDCC Development Plan 2022-2028 specifies objectives for the provision of SuDS in Policy GI4. This policy states the council "*require the provision of Sustainable Urban Drainage Systems (SUDS) in the County and maximise the amenity and biodiversity value of these systems.*"

DBFL's proposed surface water sewer design has considered the following relevant objectives:

GI4 Objective 1:

To limit surface water run-off from new developments through the use of Sustainable Urban Drainage Systems (SuDS) using surface water and nature-based solutions and ensure that SuDS is integrated into all new development in the County and designed in accordance with South Dublin County Council's Sustainable Drainage Systems (SuDS) Explanatory, Design and Evaluation Guide.

- DBFL's proposed surface water design for the development includes limiting the surface water run-off from the site to QBARrural for the 1 in 100-year rainfall event with allowance for climate change. The proposed SUDS features for the development have been outlined earlier in the report and are in line with the SDCC's Sustainable Drainage Systems (SuDS) Explanatory, Design and Evaluation Guide.

GI4 Objective 2:

To incorporate a SuDS management train during the design stage whereby surface water is managed locally in small sub-catchments rather than being conveyed to and managed in large systems further down the catchment.

- DBFL's proposed surface water catchment strategy drawings show that the site is broken down in to two sub catchments each to local suds features including swales, tree pits, permeable paving, bioretention areas before ultimately discharging to a detention basin and proprietary attenuation systems.

GI4 Objective 3:

To require multifunctional open space provision within new developments to include provision for ecology and sustainable water management.

- DBFL's proposed SUDS measures include areas of the site to be used as swales, bioretention areas, and detention basins. Some of these SUDS measures are also intended to function as play areas and places of interest in accordance with GI4 objective 3. These features will also act to improve ecology and promote sustainable water management by attracting wildlife and serving as a habitat, while also accommodating flood waters during flood events.

GI4 Objective 4:

To require that all SuDS measures are completed to a taking in charge standard.

- DBFL's proposed SUDS measures are designed to meet SDCC's taking in charge standard in accordance with GI objective 4 however they are all located within privately owned and managed lands.

GI4 Objective 5:

To promote SuDS features as part of the greening of urban and rural streets to restrict or delay runoff from streets entering the storm drainage network.

- DBFL have included swales, tree pits, permeable paving, bioretention areas as a SUDS features in the surface water design which will act to restrict and delay the flow of surface water runoff from hardstanding areas across the site.

GI4 Objective 6:

To maintain and enhance existing surface water drainage systems in the County and promote and facilitate the development of Sustainable Urban Drainage Systems (SUDS), including integrated constructed wetlands, at a local, district and County level, to control surface water outfall and protect water quality.

- DBFL's proposed surface water design has considered SUDS features to improve and protect water quality of the surface water from the site and has considered the condition of the existing drainage system. The surface water runoff from the site will be restricted to green field runoff rates. Any change/upgrade that is proposed to the existing drainage network will be to SDCC standards and requirements.

5.4 Surface Water Strategy

To meet the requirements of the surface water policy above and following SDCC's Design and Evaluation Guidelines, the surface water strategy has been described in this section to give a clearer indication of how the design development has progressed to the submitted design. To give a clearer understanding of each SUDS element, and the different stages of the treatment train, has been explained in detail in this section. An overview of the different SUDS features incorporated within the development proposals can be seen on DBFL Drawing 190068-X-05-00-XXX-DR-DBFL-CE-1301 and 190068-X-91-00-XXX-DR-DBFL-CE-1401.

The site investigation shows relatively good infiltration rates to the north of the site with tests recording results between 4x10-4 ms^{-1} and 4x10-5 ms^{-1}.

Due to these results, infiltration techniques will be considered if only in part within the SUDS strategy.

All runoff from impermeable surfaces on the site will initially drain via source control SUDS features as the first step in the management train. Where feasible, subsequent SUDS features have been linked to increase interception losses along the management train. For the remaining storage requirements, a number of attenuation features have been designed (discussed under section 5.3). A large portion of the open area of the site to the north has been reserved for open conveyance and detention basins. The remaining storage requirements were fulfilled using economical and sustainable underground attenuation features which promote infiltration. Outflows from the development will be restricted to greenfield rates before being discharged via a single outfall to the Owendoher River at the north-western corner of the subject site. The surface water network and the outfall have been designed to ensure that the network can continue to drain during high water levels in the Owendoher River.

Roof & Terrace Level:

As the first part of the treatment train, the SUDS features have been designed to prioritise, interception and reduction of flow rates. The features that will be incorporated into the design are:

- Green roof - this will be a mixture of intensive and extensive type with 80mm minimum construction depth. All necessary safety requirements will be designed and constructed to ensure safe maintenance can occur. The green roof will provide interception and reduction of flow rates at the beginning of the treatment train, providing source control for a large area of the development. After surface water has passed through the Green Roof, this will discharge to the surface water network.

Podium Level (Ground Floor):

- At podium level the subject development will implement permeable pavement and green landscaping.

  The green landscaped areas will constitute what is similar to an intensive Green Roof build-up, allowing surface water run-off to slowly percolate through the build-up medium, reducing the flows through the drainage network and also allowing vegetation to intercept run-off creating a reduction in run-off volumes.
- In areas of permeable paving a free draining aggregate sub-base will be used between the permeable paving and the podium slab allowing a reduction in flows within the drainage network.
- Once the rainwater has filtered through the various build-up mediums, run-off will drain to gullies located at the structural slab level and then conveyed to the below ground system via slung drainage.

- In addition to the above, smaller SUDS elements will also be located on podium such as Bio-swales, raised planters and rain gardens (refer to fig 5.1). These will be specified in co-ordination with the landscape design to slow any areas of hardstanding that need to be drained and also provide additional treatment and subsequent improvement of discharge quality.
- The site requires three attenuation features to provide the required volume to ensure the development does not flood in the 1 in 100-year storm event plus climate change. The main attenuation storage tanks for the subject site will be along the driveways between the blocks, while another attenuation system, a detention basin located within the park to the north of the development. Attenuation is discussed further under Section 5.3.

Figure 5.1 Examples of Urban Swales/Bio-swales – Various Sources

Ground Floor (Ground Bearing):

- The proposed basements cover the majority of the development proposals although where hard landscaping is proposed on ground bearing strata it is mostly smaller paths which will drain to the green landscaping and utilise the relatively effective infiltration rates to drain to ground.
- Tree pits and vegetation planters will also be connected to the surface water drainage and allow run-off to pass through planters and tree pits allowing interception of this vegetation, further reducing volume and flow rates within the drainage system. Where over the edge discharge to tree pits is not feasible, this will be achieved using gulleys with an overflow connected back to the surface water sewer system. The use of smaller sustainable conveyance techniques will also be implemented where possible.
- Bio retention systems will be included around the proposed development which will allow surface water to drain through to the ground. Underdrains will also be included in the bio retention systems to connect back to the surface water network.
- The above source control SUDS measures being included within the design have been co-ordinated into the landscape design to ensure the surface water strategy is integral to

the Landscape. This has reduced the sites reliance on attenuation tanks to reduce peak run-off flow rates. Although due to the design storm event, and the need to incorporate climate change within the design a certain attenuation volume is still required.

- SUDS elements as described previously on ground floor will also be connected to these attenuation tanks, decreasing the reliance on attenuation systems, and using a co-ordinated multi element SUDS network to service the site.

The incorporation of the above SUDS elements will provide a sustainable manner in which to disperse surface water from the site and provide treatment of run-off and subsequent improvement of discharge quality.

5.5 Attenuation

Attenuation volumes have been calculated based on an allowable outflow / green field runoff rate of 7.9l/sec (QBARRURAL calculated in accordance with Institute of Hydrology Report 124, see Appendix A). Refer to Appendix A for calculations sheets.

The drainage design uses SOIL type 2 for the site's QBar greenfield run-off calculations. To derive the soil type, table 4.5 of the Flood Studies Report was used as recommended by the GDSDS. The following is a summary of the site characteristics used in the selection of the pre-development soil value.

Run-off from the new development will be attenuated using number of SUDS elements although the main volume will be based in stormtech attenuation systems and detention basin which will work in parallel with 'hydrobrake optimum' or similar approved as a flow control device.

The impermeable areas contributing to the attenuation volume have had the following reduction factors applied:

Roof Level:

- Green roofs, the proposed build-up will be a mix of intensive and extensive type with 80mm minimum construction depth. The soil build-up will primarily absorb some of the initial run-off and once saturated will reduce the flow of run-off through the green roof medium. Therefore, a reduction of volume and flow rate will occur due to the presence of the green roof. Also, the green roof plant life will absorb a percentage of the run-off, further reducing volume that will drain to the surface water network. Therefore a 25% reduction factor has been applied.
- Flat impermeable roof and roads, a 10% reduction of the surface area is applied to take account of run-off not collected and stored within the micro and macro texture of the surfacing (various sources recommend different reduction coefficients e.g., IS EN752 recommends Runoff Coefficient (C for the Rational Method) of 0.9 to 1.0 for impermeable areas and steeply sloping roofs. For flat roofs it recommends 0.5 to 1.0 depending on area).

Podium Level & Ground Floor:

- Green areas over podium, a reduction factor of 30% has been applied. The deep soil build-up will primarily absorb a substantial amount of the initial run-off and once saturated will reduce the flow of run-off through the green roof medium.
- Permeable Paving on podium and ground will have a free draining material within the build-up and will reduce the flow rate from these areas. Rainfall will 'wet' the initial surface of the paving allowing water to be stored in the micro and macrotexture of the surfacing and will be lost to evapotranspiration, as the run-off drains through the free draining aggregate, this build-up will also 'wet' giving another volume reduction due to evapotranspiration and natural storage within the SUDS feature. A reduction in velocity will also occur as the aggregate used will slow the run-off at source, changing the input hydrograph which will ultimately reduce the peak inflow for attenuation calculations. A reduction factor of 30% has been applied for these reasons.
- Areas draining to Filter Drains and conveyance swales and/or Treepits, a reduction factor of 40% has been applied for these areas not located over podium. Firstly, rainfall will 'wet' the initial surface of the paving, allowing water to be stored in the micro and macrotexture of the surfacing and will be lost to evapotranspiration, giving a reduction in volume. As run-off drains to these SUDS elements and through the build-up, the aggregate/soil surface area will also 'wet' giving another reduction of volume due to evapotranspiration and natural storage within the SUDS feature. There will also be a reduction of velocity as the aggregate/filter material used in the SUDS feature slows the run-off at source, changing the input hydrograph which will ultimately reduce the peak inflow for attenuation calculations. The SUDS Manual outlines that they "can help reduce flow rates from a site by providing some attenuation storage and can reduce storage volume requirements where infiltration occurs".

Throughout the site, a combination 2 no. arch-based attenuation systems (stormtech or similar approved) and 1 no. detention basin have been selected and designed to provide the required volume for the 100-year storm event (+20% climate change) using Micro Drainage source control software, refer to Appendix B for summary of results for various storm durations. Attenuation systems will be unlined to allow infiltration to the ground where possible, but calculations have been undertaken without infiltration as a conservative approach. Calculations indicate that 1240m^3 of storage volume for the 100-year event (+20% climate change) is needed.

The subject site is split into two separate sub-catchments. The catchment draining to the Stormtech Attenuation Tank number 1 includes Blocks A and B as well as the main access from Edmonstown Road. Attenuation Tank Number 1 has 460 m^3 of online storage and the Hydrobrake flow control to be installed in the outlet manhole limits the discharge from this catchment to a proportional greenfield rate of 5.1 l/s (out of the total permissible 7.9 l/s).

The catchment draining to Attenuation Tank Number 2 and the proposed detention basin comprises of Block C and the surrounding areas. The catchment initially drains to the 490 m^3 online attenuation tank number 2. If the storm event exceeds the capacity of this online attenuation tank, the network is allowed to overflow via surcharge to the offline detention basin (285 m^3 capacity) and conveyance swale in the park to the north of Blocks A and C. The Hydrobrake flow control to be installed in the outlet manhole limits the discharge from this catchment to a proportional greenfield rate of 2.8 l/s (out of the total permissible 7.9 l/s).

Micro-Drainage calculations indicate the storage void required at the selected design head and a separate calculation sheet has been provided to demonstrate how the dimensions of the storage systems provide the necessary volume.

Surface water attenuation calculations can be found in Appendix B.

5.6 Design Standards

Storm-water drainage has been designed in accordance with the Greater Dublin Code of Practice for Drainage Works. The following design parameters are applicable to the design:

- Time of entry: 4 minutes
- Pipe Friction (Ks): 0.6 mm
- Minimum Velocity: 1.0 m/s
- Standard Average Annual Rainfall: 841 mm
- M5-60: 18.9 mm
- Ratio r (M5-60/M5-2D): 0.28
- Attenuation Tank Storm Return Event GDSDS Volume 2, p61, Criterion 3
  30 year no flooding on site.
  100-year check no internal property flooding. Flood routing plan. FFL freeboard above 100-year flood level. No flooding to adjacent areas.
- Climate Change 20% for rainfall intensities

Surface water sewers have been designed in accordance with IS EN 752 and the recommendations of the 'Greater Dublin Strategic Drainage Study', (GDSDS).

The minimum pipe diameter for public surface water sewers is 225mm. Private drains comprise of diameters from 100mm.

5.7 Climate Change

Surface water calculations for the development made use of rainfall values for the Ballyboden area as provided by Met Eireann. Rainfall intensities were increased by a factor of 20% to take account of climate change, as required by the SDCC for attenuation storage design.

5.8 Flooding Provision

In the case that that an exceedance storm event occurs, in excess of the 1% AEP. The development's layout is designed to ensure over-land flows are directed away from the buildings. In larger than the 100-year storm events, there will be additional volume within the surface water network which will be able to surcharge before flooding. When this tolerance has been exceeded the attenuation storage features will flood and overtop, with overland flows expected to pass from the site onto Edmondstown Road/ Taylors Lane following the topography of the land (refer to figure 5.2).

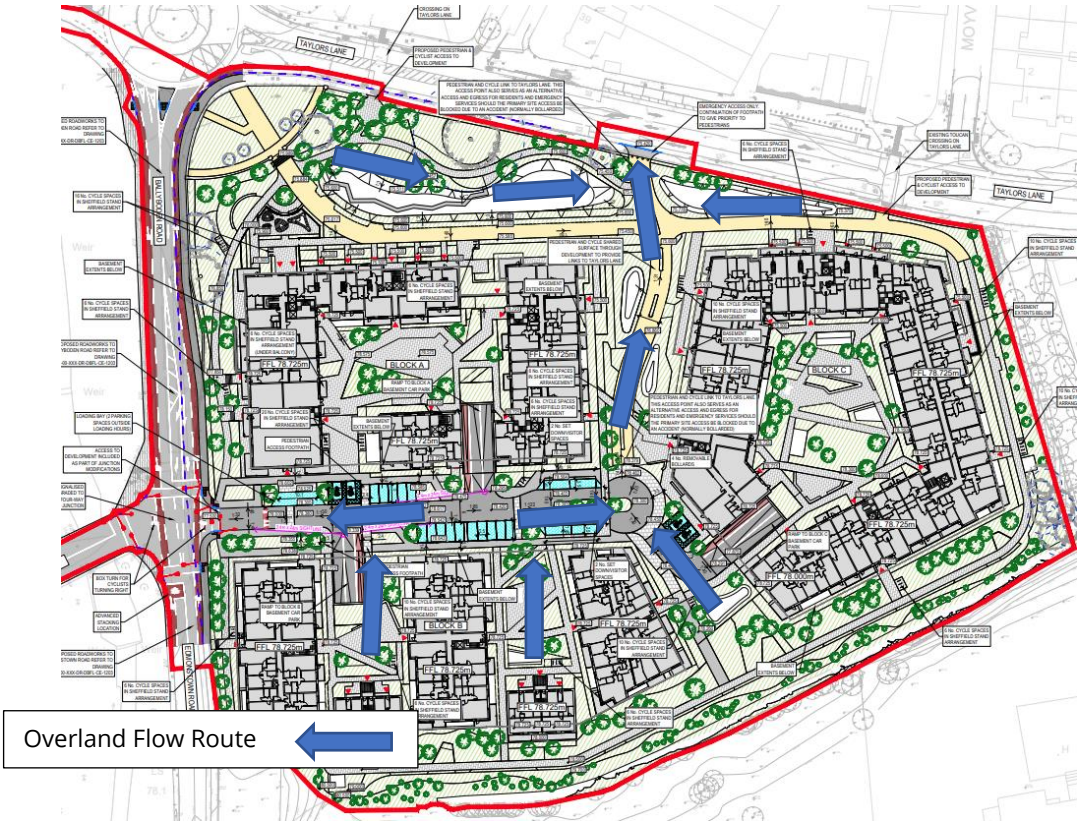


Figure 5.2 Overland Flow route in exceedance event

5.9 Surface Water Quality Impact

The type of development is low risk i.e. it does not present a high risk of run-off contamination. The development's design and layout further reduce the risk of contaminants entering the

surface water network as the majority of the site coverage will either be roof area or green / pedestrianised podium areas with the majority of vehicle parking provided at basement level. Run-off from roofs will have a first stage of treatment by draining through green-roof medium which in turn drain to the on-line attenuation storage systems. Soft and hard landscaped podiums will drain via their build-ups to a slung system which in turn also drain via the online stormtech attenuation storage systems which provide further secondary removal of pollutants due to the geotextiles and filter stone before final discharge to the sewer. A level of infiltration will also occur at the base and sides of the stormtech attenuation system and the detention basin further reducing peak flow rates.

The highest risk of contaminated surface water run-off from the site would be from the access road and entrances to the car park which are relatively small areas.

All incidental drainage from the car park is discharged separately via a Class 2 Light Liquid Separator to the foul sewer. In this way it is considered that the development provides treatment of collected run-off, provides a SUDS treatment train approach and is low risk of pollutants.

The proposed surface water system has therefore been designed to incorporate SUDS techniques which naturally reduce pollutants and improve water quality.

5.10 Interceptance

The GDSDS recommends that no run-off should pass directly to a river for rainfall depths of 5mm and up to 10mm if possible, i.e., interception. The development's drainage design allows for collection of a majority of the site's run-off via SUDS features e.g. Greenroofs, filter drains and conveyance swales, providing interception at source. In turn resulting runoff is conveyed to on-line attenuation storage system which allows infiltration to ground, removes pollutants and provides a level of further interception. Calculations in accordance with the GDSDS recommendations can be found in Appendix A and indicate a minimum of 41.4m3 of interception volume should be provided. This interception will occur within elements such as Green-roof, green podium, and infiltration within the attenuation systems.

6 PROPOSED FOUL DRAINAGE

6.1 Proposed Foul Layout

The proposed foul drainage has been designed to drain via one outfall to the Irish Water combined sewer in Edmondstown Road.

The foul drainage network can be found on DBFL drawing 190068-X-05-00-XXX-DR-DBFL-CE-1301 & 1302.

As part of the pre-planning stage, a confirmation of feasibility has received from Irish Water which can be found in appendix E.

6.2 Design Calculations

Minimum gradients and pipe diameters for gravity collector and main sewers are designed in accordance with the Building Regulations and Irish Water's Code of Practice for wastewater infrastructure and Standard Details for wastewater infrastructure.

The sewer network is designed in accordance with the principles and methods set out in Irish Water's Code of Practice for Wastewater Infrastructure, IS EN 752 (2008), IS EN12056: Part2 and Building Regulations Part H.

Foul sewer design criteria are as follows:

Pipe Roughness Coefficient	1.5 mm
Minimum Velocity	0.75 m/s (self-cleansing)
Maximum Velocity	3.0 m/s

Estimated peak foul loading generated by the proposed development is provided in Table 6.1 and 6.2 below:

Table 6.1 Estimated Foul Loading for residential development

RESIDENTIAL - PREDICTED DEVELOPMENT FOUL FLOWS						
Use Type	**No. of Units**	**Occupancy Rate**	**Population (P)**	**Loading (G) (l/day/person) ***	**Daily Loading (PG) (l/day)**	**Daily Loading (l/s)**
Residential	402	2.7 people/dwelling	1085	150	162,810	1.88
					Daily Loading	**1.88**
					Growth factor	1.00
					Infiltration @ 10% (as CoP Appendix C - 1.2.4)	0.19
					Dry Weather Flow (l/s)	**2.07**
					Residential Peaking Factor (as CoP Appendix C - 1.2.5)	3.00
					Design Foul Flow (l/s)	**6.22**
***Flow rates extracted from IW CoP for Wastewater Infrastructure - Appendix D**						

Table 6.2 Estimated Foul Loading for commercial development

COMMERCIAL - PREDICTED DEVELOPMENT FOUL FLOWS						
Use Type	**Floor Space (m^2)**	**Occupancy Rate (m^2/person)**	**Population (P)**	**Loading (G) (l/day/person) ***	**Daily Loading (PG) (l/day)**	**Daily Loading (l/s) ** **
Creche	656	4	164	60	9,825	0.114
Retail	359	10	36	12	431	0.005
					Daily Loading	**0.12**
					Growth factor	1.00
					Infiltration @ 10% (as CoP Appendix C - 1.2.4)	0.01
					Dry Weather Flow (l/s)	**0.13**
					Commercial Peaking Factor (as CoP Appendix C - 1.2.7)	4.50
					Design Foul Flow (l/s)	**0.59**
***Flow rates extracted from IW CoP for Wastewater Infrastructure - Appendix D** ****For commercial premises, a working day is assumed to be over 12 hours**						

Overall design flows from the development are calculated using IW CoP for Wastewater Infrastructure Appendix C, as outlined below.

Dry Weather Flow = PG + I + E

Design Foul Flow = $[Pf_{Dom} \times PG] + [Pf_{Dom, Ind} \times P_E G_E] + I + [Pf_{Trade} \times E]$ (Eqn1)

Design Flow = Eqn 1 + $[SW + SW_E]$

For the creche premises a working day is assumed to be over 12 hours when flows will be contributing to the public sewer network.

Growth rates are not assumed as the proposed application is for a fixed quantum of development (G = 1).

7 WATER SUPPLY AND DISTRIBUTION

7.1 Proposed Water main and Supply

As part of the development proposals the existing water main on site will be removed and a new connection to the existing 6" diameter watermain in Edmondstown Road will be made (refer to DBFL Drawings 190068-X-93-00-XXX-DR-DBFL-CE-1501). This will feed a cold-water storage tank located at basement level.

7.2 Water main Standards and Details

The water main layout and details including valves, hydrants, metering etc. will be in accordance with Irish Water's Code of Practice and Standard Details for water infrastructure.

7.3 Hydrants

As stated previously, Existing fire hydrants are located along the site frontage in Edmondstown Road. These will be maintained to cater for any fire at the proposed development. Additional hydrants will be provided in the proposed development.

Hydrants shall comply with the requirements of BS 750:2012 and shall be installed in accordance with Irish Water's Code of Practice and Standard Details.

7.4 Design Calculations

The water demand is designed in accordance with the principles and methods set out in Irish Water's Code of Practice for Water Infrastructure Connections and Developer Services Design & Construction Requirements for Self-Lay Developments:

Overall water demand is calculated using IW CoP for Water Infrastructure section 3.7.2, as outlined below:

Per-capita consumption	150l/person/day
Average day/week demand factor	1.25
Peak demand factor	5.0

Average daily domestic demand = Total occupancy * Per-capita consumption

Average day/peak week demand = Average daily domestic demand * Average day/week demand factor

Peak hour water demand = Average day/peak week demand * Peak demand factor

Estimated water demand for the proposed development is provided in Table 7.1:

Table 7.1 Estimated Water Demand for Residential Development

RESIDENTIAL WATER DEMAND							
Use Type	**No. of Units**	**Occupancy Rate**	**Population (P)**	**Average daily domestic demand (l/day)**	**Average daily domestic demand (l/s)**	**Average day/peak week demand (l/s)**	**Peak hour water demand (l/s)**
Residential	402	2.7 persons/dwelling	1085	162,810	1.88	2.36	11.78
						Peak hour water demand (l/s)	**11.78**

Table 7.2 Estimated Water Demand for Commercial Development

COMMERCIAL WATER DEMAND							
Use Type	**Floor Space (m^2)**	**Occupancy Rate (m^2/person)**	**Population (P)**	**Average daily domestic demand (l/day)**	**Average daily domestic demand (l/s)***	**Average day/peak week demand (l/s)**	**Peak hour water demand (l/s)**
Creche	655	4	164	24,563	0.28	0.35	1.75
Retail	359	10	36	5,385	0.06	0.075	0.375
						Peak hour water demand (l/s)	**2.17**
For commercial premises, a working day is assumed to be over 12 hours							

Appendix A : Permissible Outflow Calculations

PROJECT			JOB REF.
Taylors Lane, Ballyboden			190068
SUBJECT			**Calc. Sheet No.**
Surface Water Calculations - Permissible Site Discharge			1
Drawing ref.	**Calculations by**	**Checked by**	**Date**
190068	GK	NJF	22/03/2023

PERMISSIBLE SURFACE WATER DISCHARGE CALCULATIONS

Site Area

What is the overall site area? **3.50** Hectares (ha) Site is Less than 50 Hectares

Pre-Development Catchment Soil Characteristics

Are there different soil types present on the pre-developed site? No

Catchment (This refers to the entire site area)	1	
Area	3.50	Hectares (ha)
Drainage Group	1	Class
Depth to Impermeable Layers	2	Class
Permeability Group above Impermeable Layers	1	Class
Slope (0)	1	Class
SOIL Type	2	From FSR Table
[1]SOIL Index	0.30	

SOIL	SOIL Value	SPR
1	0.15	0.10
2	0.30	0.30
3	0.40	0.37
4	0.45	0.47
5	0.50	0.53

Site SOIL Index Value **0.30**

Site SPR Value **0.30**

Post-Development Catchment Characteristics

Is the development divided into sub-catchments? No

What is the overall site area for catchment? 3.50 Hectares (ha)

Catchment 1	Area (m^2)	Runoff Coeff.	Effective Area (m^2)
Roofs - Type 1 (Draining to gullies)	4183	0.90	3764.7
Roofs - Type 2 (Draining to SUDS features)	0	0.80	0.0
Green Roofs	6020	0.75	4515.0
Roads and Footpaths - Type 1 (Draining to gullies)	0	0.90	0.0
Roads and Footpaths - Type 2 (Draining to Suds features)	4926	0.70	3448.2
Permeable Paving on Podium	2398	0.75	1798.5
Car Permeable Paving	414	0.70	289.8
Green Podium	2898	0.70	2028.6
Grassed Areas	6189	0.20	1237.8
Public Open Space	7680	0.00	0.0

Include Public Open Space in Effective Catchment Area? No — Assumed open space area does not drain to surface water network

Effective Catchment Area **17082.6** m^2

Effective Catchment Runoff Coefficient **0.63**

Long-Term Storage

Is long-term Storage provided? No

Permissible Site Discharge

What is the Standard Average Annual Rainfall (SAAR)? 841.0 mm — From Met Eireann, Co-ordinates xxxxxxxx, xxxxxxxxx

Is the overall site area less than 50 hectares? Yes

[5]$QBAR_{Rural}$ calculated for 50 ha and linearly interpolated for area of site 7.9 Litres/sec

[7]Site Discharge = **7.9** Litres/sec

Notes and Formulae

1. SOIL index value calculated from Flood Studies Report - The Classification of Soils from Winter Rainfall Acceptance Rate (Table 4.5).
2. SPR value calculated from GDSDS - Table 6.7.
3. Rainfall depth for 100 year return period, 6 hour duration with additional 10% for climate change.
4. Long-term storage Vol_{xs} (m^3) = Rainfall.Area.10.[(PIMP/100)(0.8.α)+(1-PIMP/100)(β.SPR)-SPR]. (GDSDS Section 6.7.3).
   Where long-term storage cannot be provided on-site due to ground conditions, Total Permissible Outflow is to be kept to $QBAR_{(Rural)}$.
5. Total Permissible Outflow - $QBAR_{(Rural)}$ calculated in accordance with GDSDS - Regional Drainage Policies
   (Volume 2 - Chapter 6), i.e. $QBAR(m3/s)=0.00108x(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$ - For catchments greater than 50 hectares in area. Flow rates are linearly interpolated for areas samller than 50hectares.
6. Where Total Permissible Outflow is less than 2.0l/s and not achievable, use 2.0 l/s or closest value possible.
7. QBAR multiplied by growth factors of 0.85 for 1 year, 2.1 for 30 year and 2.6 for 100 year return period events, from GDSDS Figure C2.

Appendix B : Attenuation Calculations

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	76.388	0.488	4.7	136.5	O K
30 min Summer	76.569	0.669	4.7	187.4	O K
60 min Summer	76.759	0.859	4.7	240.6	O K
120 min Summer	76.956	1.056	4.7	295.8	O K
180 min Summer	77.069	1.169	4.7	327.4	O K
240 min Summer	77.144	1.244	4.7	348.2	O K
360 min Summer	77.234	1.334	4.7	373.5	O K
480 min Summer	77.281	1.381	4.7	386.7	O K
600 min Summer	77.303	1.403	4.7	392.9	O K
720 min Summer	77.313	1.413	4.7	395.6	O K
960 min Summer	77.322	1.422	4.7	398.1	O K
1440 min Summer	77.312	1.412	4.7	395.4	O K
2160 min Summer	77.270	1.370	4.7	383.6	O K
2880 min Summer	77.215	1.315	4.7	368.2	O K
4320 min Summer	77.093	1.193	4.7	334.0	O K
5760 min Summer	76.965	1.065	4.7	298.1	O K
7200 min Summer	76.829	0.929	4.7	260.2	O K
8640 min Summer	76.653	0.753	4.7	210.9	O K
10080 min Summer	76.518	0.618	4.7	173.0	O K
15 min Winter	76.448	0.548	4.7	153.5	O K
30 min Winter	76.653	0.753	4.7	210.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	98.750	0.0	140.3	29
30 min Summer	67.934	0.0	193.3	42
60 min Summer	44.102	0.0	253.6	72
120 min Summer	27.889	0.0	320.8	128
180 min Summer	21.187	0.0	365.6	186
240 min Summer	17.390	0.0	400.1	244
360 min Summer	13.136	0.0	453.2	362
480 min Summer	10.753	0.0	494.5	482
600 min Summer	9.202	0.0	528.8	600
720 min Summer	8.102	0.0	558.4	660
960 min Summer	6.626	0.0	608.0	782
1440 min Summer	4.986	0.0	678.7	1042
2160 min Summer	3.745	0.0	777.6	1468
2880 min Summer	3.053	0.0	845.3	1880
4320 min Summer	2.288	0.0	949.3	2724
5760 min Summer	1.864	0.0	1032.8	3528
7200 min Summer	1.589	0.0	1101.0	4336
8640 min Summer	1.396	0.0	1160.1	5024
10080 min Summer	1.251	0.0	1212.4	5664
15 min Winter	98.750	0.0	157.3	29
30 min Winter	67.934	0.0	216.5	43

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	76.868	0.968	4.7	271.1	O K
120 min Winter	77.092	1.192	4.7	333.8	O K
180 min Winter	77.223	1.323	4.7	370.6	O K
240 min Winter	77.312	1.412	4.7	395.3	O K
360 min Winter	77.423	1.523	4.9	426.5	O K
480 min Winter	77.486	1.586	5.0	444.1	O K
600 min Winter	77.522	1.622	5.0	454.0	O K
720 min Winter	77.540	1.640	5.1	459.1	O K
960 min Winter	77.545	1.645	5.1	460.7	O K
1440 min Winter	77.529	1.629	5.1	456.1	O K
2160 min Winter	77.457	1.557	5.0	436.0	O K
2880 min Winter	77.364	1.464	4.8	409.9	O K
4320 min Winter	77.161	1.261	4.7	353.2	O K
5760 min Winter	76.952	1.052	4.7	294.6	O K
7200 min Winter	76.676	0.776	4.7	217.2	O K
8640 min Winter	76.449	0.549	4.7	153.6	O K
10080 min Winter	76.298	0.398	4.7	111.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	44.102	0.0	284.0	70
120 min Winter	27.889	0.0	359.3	126
180 min Winter	21.187	0.0	409.4	184
240 min Winter	17.390	0.0	448.1	242
360 min Winter	13.136	0.0	507.5	356
480 min Winter	10.753	0.0	553.6	470
600 min Winter	9.202	0.0	591.9	580
720 min Winter	8.102	0.0	624.7	688
960 min Winter	6.626	0.0	679.0	886
1440 min Winter	4.986	0.0	727.1	1110
2160 min Winter	3.745	0.0	871.0	1580
2880 min Winter	3.053	0.0	946.7	2044
4320 min Winter	2.288	0.0	1062.9	2940
5760 min Winter	1.864	0.0	1156.7	3808
7200 min Winter	1.589	0.0	1233.2	4608
8640 min Winter	1.396	0.0	1299.4	5184
10080 min Winter	1.251	0.0	1358.1	5752

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	18.900	Shortest Storm (mins)	15
Ratio R	0.265	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.770

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.350	4	8	0.220	8	12	0.100	12	16	0.100

Model Details

Storage is Online Cover Level (m) 78.000

Tank or Pond Structure

Invert Level (m) 75.900

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	280.0	1.650	280.0	1.651	0.0	2.100	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0097-5100-1650-5100
Design Head (m)	1.650
Design Flow (l/s)	5.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	97
Invert Level (m)	75.900
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.650	5.1
Flush-Flo™	0.426	4.7
Kick-Flo®	0.864	3.8
Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.1	1.200	4.4	3.000	6.7	7.000	10.1
0.200	4.3	1.400	4.7	3.500	7.2	7.500	10.4
0.300	4.6	1.600	5.0	4.000	7.7	8.000	10.7
0.400	4.7	1.800	5.3	4.500	8.2	8.500	11.0
0.500	4.7	2.000	5.6	5.000	8.6	9.000	11.3
0.600	4.6	2.200	5.8	5.500	9.0	9.500	11.6
0.800	4.1	2.400	6.1	6.000	9.3		
1.000	4.0	2.600	6.3	6.500	9.7		

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	74.143	0.483	2.2	169.1	O K
30 min Summer	74.289	0.629	2.2	232.4	O K
60 min Summer	74.430	0.770	2.2	299.6	O K
120 min Summer	74.572	0.912	2.2	373.5	O K
180 min Summer	74.655	0.995	2.3	420.0	O K
240 min Summer	74.714	1.054	2.4	454.0	O K
360 min Summer	74.795	1.135	2.4	502.6	O K
480 min Summer	74.849	1.189	2.5	536.6	O K
600 min Summer	74.889	1.229	2.5	562.0	O K
720 min Summer	74.918	1.258	2.5	581.7	O K
960 min Summer	74.959	1.299	2.6	609.8	O K
1440 min Summer	75.000	1.340	2.6	638.2	O K
2160 min Summer	75.010	1.350	2.6	646.0	O K
2880 min Summer	75.006	1.346	2.6	642.9	O K
4320 min Summer	74.990	1.330	2.6	631.5	O K
5760 min Summer	74.972	1.312	2.6	618.9	O K
7200 min Summer	74.952	1.292	2.6	604.7	O K
8640 min Summer	74.929	1.269	2.5	589.3	O K
10080 min Summer	74.905	1.245	2.5	573.1	O K
15 min Winter	74.193	0.533	2.2	190.0	O K
30 min Winter	74.350	0.690	2.2	260.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	98.750	0.0	172.6	30
30 min Summer	67.934	0.0	172.5	44
60 min Summer	44.102	0.0	308.5	74
120 min Summer	27.889	0.0	353.7	132
180 min Summer	21.187	0.0	355.2	190
240 min Summer	17.390	0.0	358.2	248
360 min Summer	13.136	0.0	369.0	366
480 min Summer	10.753	0.0	380.9	486
600 min Summer	9.202	0.0	389.4	604
720 min Summer	8.102	0.0	395.7	724
960 min Summer	6.626	0.0	404.2	962
1440 min Summer	4.986	0.0	411.0	1442
2160 min Summer	3.745	0.0	777.3	2008
2880 min Summer	3.053	0.0	789.9	2360
4320 min Summer	2.288	0.0	778.6	3124
5760 min Summer	1.864	0.0	1252.2	3976
7200 min Summer	1.589	0.0	1334.7	4824
8640 min Summer	1.396	0.0	1374.3	5624
10080 min Summer	1.251	0.0	1317.1	6456
15 min Winter	98.750	0.0	179.6	30
30 min Winter	67.934	0.0	169.1	44

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	74.502	0.842	2.2	336.5	O K
120 min Winter	74.656	0.996	2.3	420.5	O K
180 min Winter	74.747	1.087	2.4	473.7	O K
240 min Winter	74.811	1.151	2.4	512.9	O K
360 min Winter	74.900	1.240	2.5	569.3	O K
480 min Winter	74.959	1.299	2.6	609.4	O K
600 min Winter	75.002	1.342	2.6	640.0	O K
720 min Winter	75.035	1.375	2.6	664.2	O K
960 min Winter	75.083	1.423	2.7	700.0	O K
1440 min Winter	75.135	1.475	2.7	740.9	O K
2160 min Winter	75.162	1.502	2.7	762.4	O K
2880 min Winter	75.160	1.500	2.7	760.8	O K
4320 min Winter	75.138	1.478	2.7	743.5	O K
5760 min Winter	75.109	1.449	2.7	720.1	O K
7200 min Winter	75.078	1.418	2.7	696.0	O K
8640 min Winter	75.042	1.382	2.6	669.4	O K
10080 min Winter	75.004	1.344	2.6	641.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	44.102	0.0	345.4	72
120 min Winter	27.889	0.0	355.2	130
180 min Winter	21.187	0.0	360.1	186
240 min Winter	17.390	0.0	368.4	244
360 min Winter	13.136	0.0	385.9	362
480 min Winter	10.753	0.0	397.4	478
600 min Winter	9.202	0.0	405.4	596
720 min Winter	8.102	0.0	411.2	712
960 min Winter	6.626	0.0	418.4	944
1440 min Winter	4.986	0.0	422.9	1400
2160 min Winter	3.745	0.0	813.5	2060
2880 min Winter	3.053	0.0	823.1	2680
4320 min Winter	2.288	0.0	810.5	3332
5760 min Winter	1.864	0.0	1402.2	4272
7200 min Winter	1.589	0.0	1486.9	5192
8640 min Winter	1.396	0.0	1444.3	6136
10080 min Winter	1.251	0.0	1409.7	6976

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	18.900	Shortest Storm (mins)	15
Ratio R	0.265	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.933

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.520	4	8	0.213	8	12	0.100	12	16	0.100

Model Details

Storage is Online Cover Level (m) 75.600

Tank or Pond Structure

Invert Level (m) 73.660

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	290.0	1.680	925.0	1.690	645.0
1.190	635.0	1.681	635.0	1.900	670.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0070-2800-1700-2800
Design Head (m)	1.700
Design Flow (l/s)	2.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	70
Invert Level (m)	73.546
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	2.8
Flush-Flo™	0.311	2.2
Kick-Flo®	0.631	1.8
Mean Flow over Head Range	-	2.2

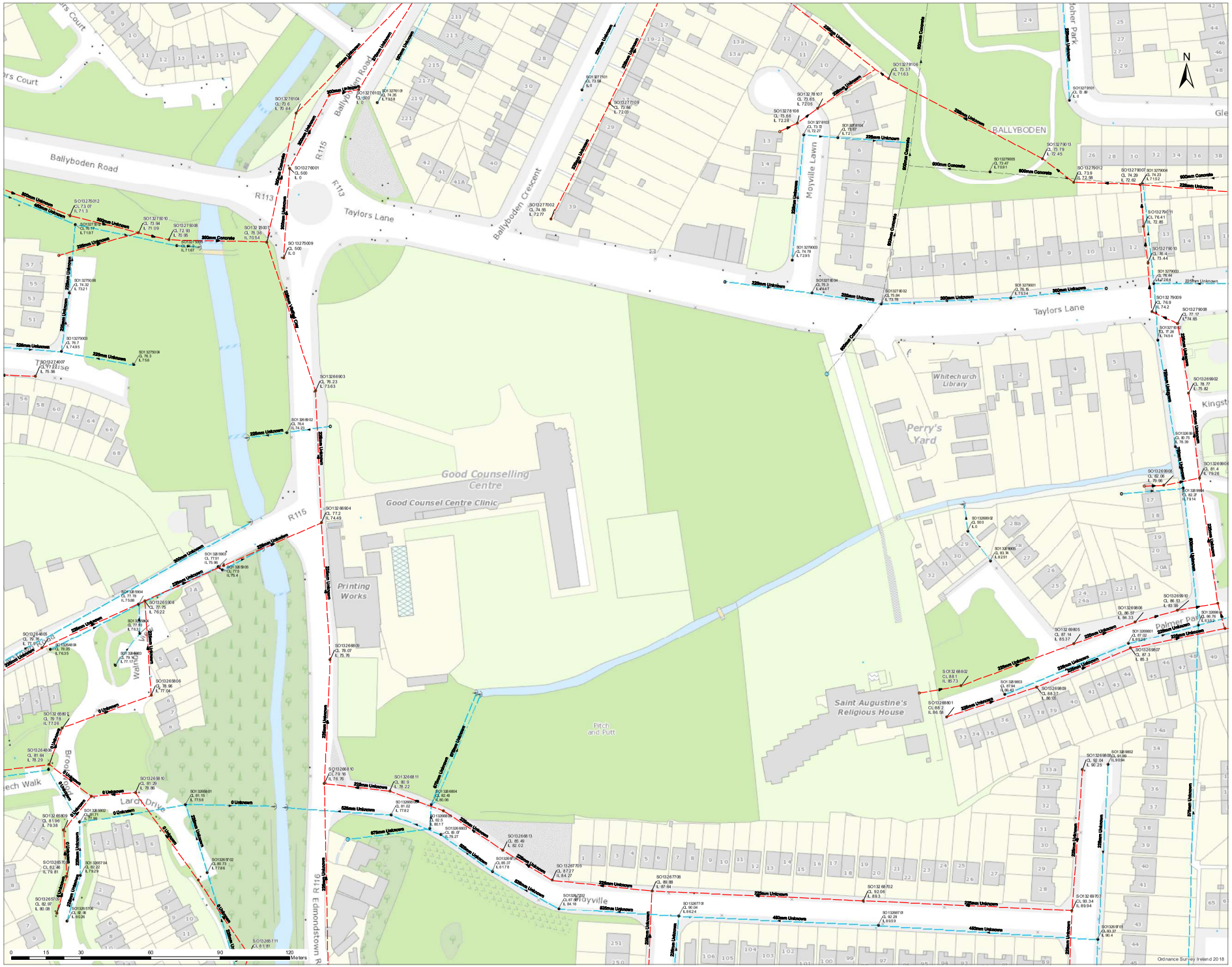
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.8	1.200	2.4	3.000	3.6	7.000	5.4
0.200	2.1	1.400	2.6	3.500	3.9	7.500	5.6
0.300	2.2	1.600	2.7	4.000	4.2	8.000	5.8
0.400	2.2	1.800	2.9	4.500	4.4	8.500	5.9
0.500	2.1	2.000	3.0	5.000	4.6	9.000	6.1
0.600	1.9	2.200	3.1	5.500	4.8	9.500	6.2
0.800	2.0	2.400	3.3	6.000	5.0		
1.000	2.2	2.600	3.4	6.500	5.2		

Appendix C : Topographical Survey


Owendoher Haven
Haven
Owendoher
Taylors Court
BALLYBODEN CRESCENT
MOYVILLE LAWN
Glendoher Park
GLENDOHER
PARK
TAYLORS
LANE
Library
KINGSTOWN COUR
PALMER
PARK
PALMER
Owendoher River
Weir
WALNUT VIEW
Brookwood
LARCH DRIVE
Owendoher River
Pitch & Putt Course
CF
UND
UND

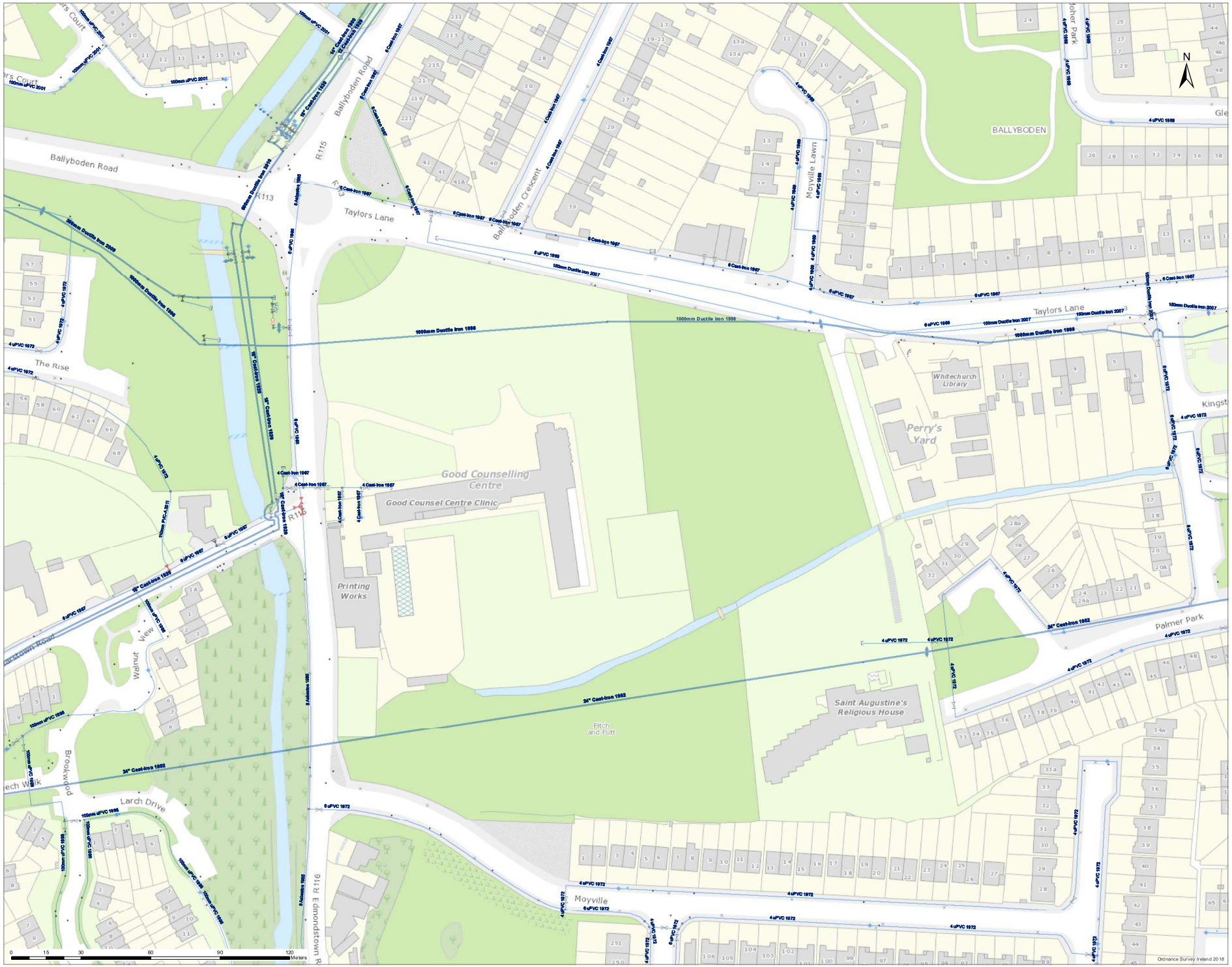
Appendix D : Irish Water Records



UISCE ÉIREANN : IRISH WATER

Legend

- Gravity - Combined
- Gravity - Foul
- Gravity - Overflow
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Overflow
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Syphon - Overflow
- Overflow
- Gravity - Combined
- Gravity - Foul
- Gravity - Overflow
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Overflow
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Syphon - Overflow
- Overflow
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private



UISCE ÉIREANN : IRISH WATER

Legend

- Pump Stations
- Irish Water
- Private
- Irish Water
- Non IW

Appendix E : Irish Water Confirmation of Feasibility & Statement of Design Acceptance

CONFIRMATION OF FEASIBILITY

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

Melissa Crouch

DBFL Construction Engineering
14 South Mall
Cork
T12CT91
Ireland

28 July 2022

Our Ref: CDS22004797 Pre-Connection Enquiry
Taylors's Lane, Ballyboden, Dublin 16

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Irish Water has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 400 unit(s) at Taylors's Lane, Ballyboden, Dublin 16, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection** - Feasible without infrastructure upgrade by Irish Water

- Connection should be at Ballyboden Road with a new 200mm ID connection main. PRV setting in the area may need to be adjusted for the connection and it is subject to a pressure test report at a connection application stage.
- The proposed Development indicates that Irish Water assets are present on the site. The Developer has to demonstrate that proposed structures and works will not inhibit access for maintenance or endanger structural or functional integrity of the assets during and after the works. Drawings (showing clearance distances, changing to ground levels) and Method Statements should be included in the Detailed Design of the Development. A wayleave in favour of Irish Water will be required over the assets that are not located within the Public Space. For design submissions and queries related to diversion/build near or over, please contact IW Diversion Team via email address diversions@water.ie

The easement/wayleave strip should be in accordance with the minimum separation distances which can be found in the tables here: https://www.water.ie/connections/developer-services/diversion-and-build-over/

- **Wastewater Connection**
  - Feasible without infrastructure upgrade by Irish Water

- The connection should be made into the existing 300mm sewer in Ballyboden Road.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Irish Water.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

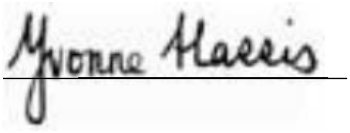
Where can you find more information?

- **Section A -** What is important to know?
- **Section B -** Details of Irish Water's Network(s)

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Irish Water's network(s). This is not a connection offer and capacity in Irish Water's network(s) may only be secured by entering into a connection agreement with Irish Water.

For any further information, visit **www.water.ie/connections**, **email newconnections@water.ie** or contact 1800 278 278**.**

Yours sincerely,



Yvonne Harris
Head of Customer Operations

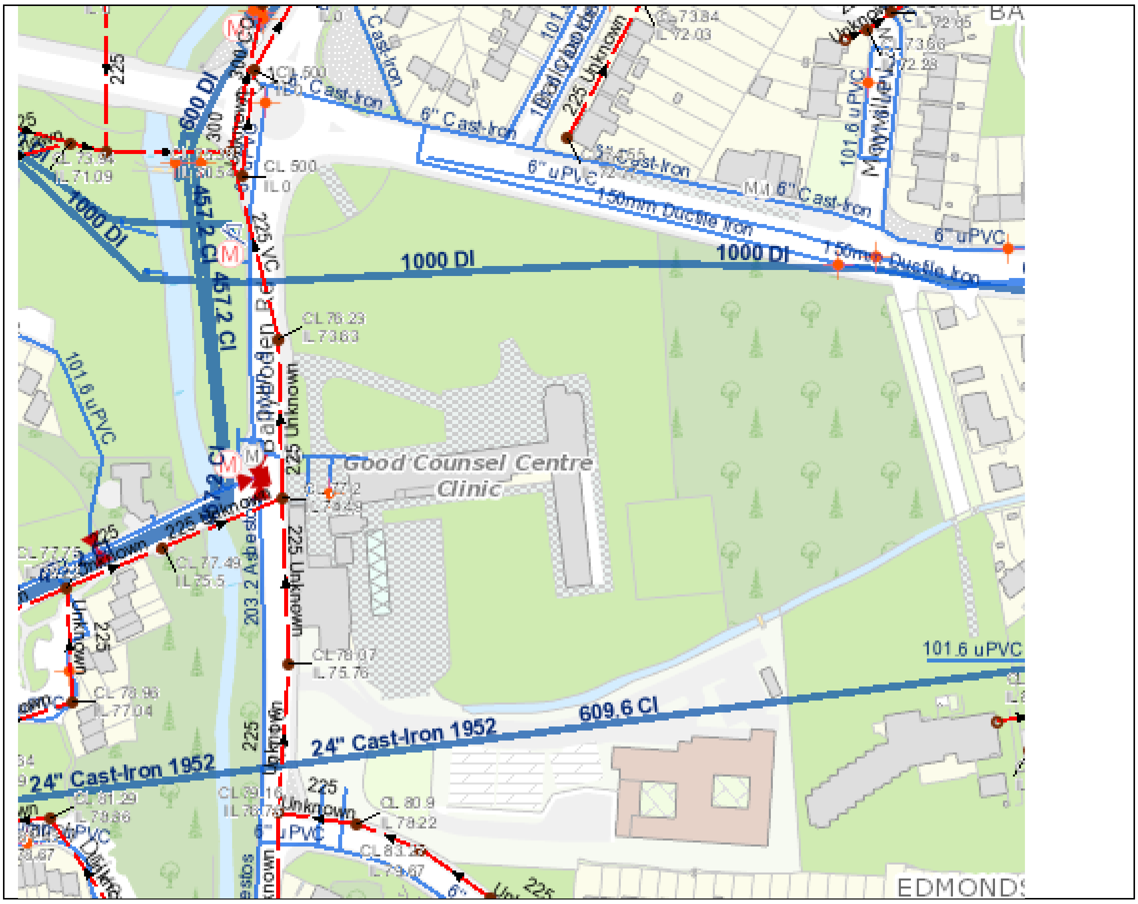
Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Irish Water's network(s). • Before the Development can connect to Irish Water's network(s), you must submit a connection application and be granted and sign a connection agreement with Irish Water.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Irish Water connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Irish Water's network(s), including works in the public space, must be carried out by Irish Water*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • **What to do?** - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Irish Water's network(s)?	• Requests for maps showing Irish Water's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Irish Water Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

Section B – Details of Irish Water's Network(s)

The map included below outlines the current Irish Water infrastructure adjacent the Development: To access Irish Water Maps email datarequests@water.ie



Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

Note: The information provided on the included maps as to the position of Irish Water's underground network(s) is provided as a general guide only. The information is based on the best available information provided by each Local Authority in Ireland to Irish Water.

Whilst every care has been taken in respect of the information on Irish Water's network(s), Irish Water assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Irish Water's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Irish Water's underground network(s) is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

Melissa Crouch
DBFL Construction Engineering
14 South Mall
Cork
T12CT91
Ireland

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

27 March 2023

Re: Design Submission for Taylors's Lane, Ballyboden, Dublin 16 (the "Development") (the "Design Submission") / Connection Reference No: CDS22004797

Dear Melissa Crouch,

Many thanks for your recent Design Submission.

We have reviewed your proposal for the connection(s) at the Development. Based on the information provided, which included the documents outlined in Appendix A to this letter, Irish Water has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before you can connect to our network you must sign a connection agreement with Irish Water. This can be applied for by completing the connection application form at www.water.ie/connections. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities (CRU)(https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/).

You the Customer (including any designers/contractors or other related parties appointed by you) is entirely responsible for the design and construction of all water and/or wastewater infrastructure within the Development which is necessary to facilitate connection(s) from the boundary of the Development to Irish Water's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Irish Water does not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Irish Water representative:
Name: Antonio Garzón
Email: Antonio.garzon@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

- 190068-X-05-Z00-XXX-DR-DBFL-CE-1301-P1-0-Site Services Layout
- 190068-X-92-Z00-XXX-DR-DBFL-CE-3501-P1-0-Foul Drainage Longitudinal Sections
- 190068-X-93-Z00-XXX-DR-DBFL-CE-1601-P1-0-Watermain Layout

Standard Details/Code of Practice Exemption:

1. *Proprietary wastewater slung foul and rising main pumping arrangement from basements*
2. *Proprietary watermain connections to Ø225mm slung watermain connecting to water tank in basement*

Additional Comments

The design submission will be subject to further technical review at connection application stage.

Irish Water cannot guarantee that its Network in any location will have the capacity to deliver a particular flow rate and associated residual pressure to meet the requirements of the relevant Fire Authority, see Section 1.17 of Water Code of Practice.

While Irish Water notes that the water and wastewater services infrastructure will remain private and not be vested, we have the following comments:

- It is recommended that the foul sewer shall have 3 m clearance from proposed or existing structures.
- It is recommended that the pumped wastewater discharge initially to a standoff (rising main discharge) manhole before discharging by gravity to the sewer network.

For further information, visit ***www.water.ie/connections***

Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Irish Water will not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

Appendix F : Stage 2 LRD Opinion – Statement of Response

Appendix F – Stage 2 LRD Opinion: Statement of Response

In response to the LRD Opinion issued by SDCC after a Stage 2 Pre-Planning Application was submitted for the subject development, please find below and enclosed responses to items related to the Civil Engineering design. Note that where relevant, additional information may be provided elsewhere by other members of the design team.

1.1 Response to: Sustainable Drainage Systems

Sustainable Drainage Systems
Underground attenuation should only feature in new developments as a last resort, when ground or higher-level features have been exhausted, in particular natural features. This requirement is set out in the South Dublin County Development Plan 2022 – 2028. The use of underground attenuation under public open space is unacceptable and will not be supported. Attenuation tanks are indicated under roadways within the development. Neither Public Realm and Water Services have raised a particular issue with this proposal however, the applicant must ensure that all calculations are accurate, and a strong justification is provided for the provision of underground attenuation tanks in the **final application**.

It is noted that some of the documents submitted refer to the provision of green roofs across the scheme, in other documents this provision appears absent. Application documents should be consistent and the inclusion of green roofs across the development is encouraged, noting that all buildings have flat roofs.

For the final application, the applicant should be able to show that the scheme maximises the potential use of natural SUDs features, including those which have a wet or dry amenity use, such as tiered detention basins.

DBFL Response:

Green roofs have been proposed across all three apartment blocks, details of which can be found in Section 5 of the Infrastructure Design Report. DBFL drawing 190068-X-91-Z00-XXX-DR-DBFL-CE-1401 shows the extent of coverage of the proposed green roofs. Application documents have been revised across all disciplines to ensure the inclusion of green roofs in the scheme is coordinated and apparent.

For further justification and explanation of the use of attenuation & SuDS features, please refer to F Section 1.3 (Appendix F) of this response.

1.2 Response to: Infrastructure and Environmental Services

Infrastructure and Environmental Services

Water Services

The Water Services Report states further information is required from the applicant in relation to surface water attenuation catchments and calculations. In relation to flood risk, all floor levels should be a minimum of 500mm above the highest known flood level for the site. The full Water Services Report is provided at Appendix 5.

The final application should address the concerns of Water Services, as this is necessary to allow for full assessment of the application.

Irish Water

The Irish Water report states no objection subject to connection agreements. It is considered advisable that the applicant obtain a Confirmation of Feasibility from Irish Water and submit as part of the **final application**.

DBFL Response

A confirmation of feasibility has been received from Irish Water and is appended to the Infrastructure Design Report.

Please refer to Section 1.4 (Appendix F) of this document for a detailed response in relation to flood risk.

1.3 Response to: Specified Information required in addition to Article 23 of the Planning and Development Regulations (as per Article 16A(7))

15. SUDs Strategy, to include:
    a. SUDs Design details
    b. Revised report showing surface water attenuation calculations for proposed development
    c. Increase surface water attenuation or explain the in more detail how surface water attenuation was calculated.
    d. If underground tanks present, why these cannot be excluded from the design.
    e. Revised attenuation capacity as per the advice of the Water Services report.
    f. SUDs Layout identifying the different types of SUDs features.
    g. To demonstrate adherence to SDCC SUDs guidance.
    h. Drawing showing cross sectional views of all SuDS features

DBFL Response

a) SuDS Design Details – Our proposed surface water drainage strategy and details of each individual SUDs components used are explained fully in section 5 of this report. All runoff from impermeable surfaces on the site will initially drain via source control SUDS features as the first step in the management train. Where feasible, subsequent SUDS features have

been linked to increase interception losses along the management train. For the remaining storage requirements, several attenuation features have been designed (discussed under section 5.3). A large portion of the open area of the site to the north has been reserved for open conveyance and detention basins. The remaining storage requirements were fulfilled using economical and sustainable underground attenuation features which promote infiltration.

b) Surface Water Attenuation Calculations – Please refer to section 5.3 of this report for a detailed explanation of the surface water attenuation calculations for the proposed development. Attenuation volumes have been calculated based on an allowable outflow / green field runoff rate of 7.9l/sec (QBARRURAL calculated in accordance with Institute of Hydrology Report 124, see Appendix A). Refer to Appendix A for calculations sheets. The calculations outputs from Microdrainage can be found in Appendix B of this report.

c) DBFL have reviewed the proposed attenuation for this development and have found that it is appropriately sized. Attenuation volumes have been calculated based on an allowable outflow / green field runoff rate of 7.9 l/sec. This flow rate was calculated using an approximate site area of 3.5 ha. Based on a 100-year storm event, we quantified (using the simulation software Microdrainage) the volume of runoff based on the effective catchment areas for the site as detailed in Appendix A of this report and the Catchment & Surface Water Strategy drawing 190068-X-91-Z00-XXX-DR-DBFL-CE-1401. The overall site area is 3.8 ha, but this reduces down to 3.5 ha when you exclude SDCC lands (i.e. works on Edmonstown Road which we are not developing on). Of the 3.5 ha catchment, the effective impermeable area is calculated as 1.7 ha which corresponds to the total area used in the microdrainage simulation. There is 7680 m^2 of "public open space" determined in the permissible discharge calculation in Appendix A. "Open public space" is grassed areas of the site which do not drain to the surface water network but form part of the overall site area. "Grassed Areas" are similar to "public open space" areas with the exception that they do eventually drain to the surface water network and therefore are included in the effective catchment runoff areas.

d) Throughout the site, a combination 2 no. arch-based attenuation systems (Stormtech) and 1 no. detention basin have been selected and designed to provide the required volume for the 100-year storm event (+20% climate change) using Micro Drainage source control software, refer to Appendix B for summary of results for various storm durations. Attenuation systems will be unlined to allow infiltration to the ground where possible, but calculations have been undertaken without infiltration as a conservative approach. Calculations indicate that 1240m^3 of storage volume for the 100-year event (+20% climate change) is needed. We have been able to provide 285 m^3 of attenuation using a detention basin in the park area to the north of the site. Due to the required 1:100-year design events (and 20% climate change) we have had to proposed additional underground attenuation features as described. We have reduced the size of these underground attenuation features as far as possible by ensuring all impermeable areas are initially drained to a SUDs feature such as a green roof, bioretention area, permeable paving, tree pit etc.

e) DBFL have reviewed the proposed attenuation for this development and have found that it is appropriately sized. Attenuation volumes have been calculated based on an allowable outflow / green field runoff rate of 7.9 l/sec. This flow rate was calculated using an approximate site area of 3.5 ha. Based on a 100-year storm event, we quantified (using the simulation software Microdrainage) the volume of runoff based on the effective catchment

areas for the site as detailed in Appendix A of this report and the Catchment & Surface Water Strategy drawing 190068-X-91-Z00-XXX-DR-DBFL-CE-1401.

f) DBFL drawing 190068-X-91-Z00-XXX-DR-DBFL-CE-1401 identifies all proposed SuDS features on plan.

g) Please refer to Section 5.3 of the Infrastructure Design Report which demonstrates compliance.

h) Please refer to DBFL drawings 190068-X-91-Z00-XXX-DR-DBFL-CE-3401 & 3402 and 190068-X-91-Z00-XXX-DR-DBFL-CE-5401 to 5404 for cross-sectional details of the SuDS features proposed.

1.4 Response to Appendix 5 – Water Services Report

Appendix 5 – Water Services Report

Register Reference No.:	LRDOP003/22
Development:	Demolition of existing former Institutional buildings and associated outbuildings c.5231 sq.m. Construction of 398 residential units within 3 apartment/duplex blocks (over basement carparks) ranging in height from 2-5 storeys.
Location:	Location: Taylors Lane, Dublin 16
Report Date :	23rd Nov 2022

Surface Water Report: **Further Information Required:**

1.1 The sub area sizes of catchment areas do not add up to the total site area in Hectare (Ha). Submit a revised report showing surface water attenuation calculations for proposed development. Include the size of different surface types such as buildings, roads, green roofs, permeable paving and their respective run off coefficients. The total areas of catchments should equal the site area in Hectares (Ha). Explain what the difference in surface types between Grassed areas and Public open space areas.

1.2 The surface water attenuation proposed of 1,303m^3 in total is undersized by approximately 15% for 1 in 100 year storm event. Submit increase surface water attenuation or explain the in more detail how surface water attenuation was calculated. Prior to submission of revised surface water attenuation calculations contact Water Services in South Dublin County Council to discuss same.

1.3 Submit a drawing showing cross sectional views of all SuDS features. Swales shall have side slope gradients of approximately 1 in 4. Larger green areas should have a maximum gradient of 1 in 6 side slopes.

Flood Risk **No Objection**

2.1 Ensure that development does not adversely affect properties upstream or downstream of proposed development site.

2.2 All floor levels shall be a minimum of 500mm above the highest known flood level for the site.

DBFL Response

1.1- Please refer to the response to item c) outlined previously for **Section 1.3 Specified Information required in addition to Article 23 of the Planning and Development Regulations (as per Article 16A(7))**

1.2- Please refer to the response to item c) outlined previously for **Section 1.3 Specified Information required in addition to Article 23 of the Planning and Development Regulations (as per Article 16A(7)).** DBFL has contacted and held a meeting (22nd February) with SDCC Water Services in relation to this point.

1.3- Please refer to DBFL drawings 190068-X-91-Z00-XXX-DR-DBFL-CE-3401 & 3402 and 190068-X-91-Z00-XXX-DR-DBFL-CE-5401 to 5404 for cross-sectional details of the SuDS features proposed. The 2022 SDCC SuDS Explanatory, Design and Evaluation Guide notes both for Swales (page 113) and Basins, Wetlands and Ponds (page 118) that *"slopes should not exceed 1in 3 or 1 in 4"*. It should be noted that slopes of 1 in 3 are only used where areas of the detention basis are narrow and it most other cases a much flatter gradient is used.

2.1 The Site-Specific Flood Risk Assessment for the proposed residential development at Taylor's Lane was undertaken in accordance with the requirements of the "Planning System and Flood Risk Management Guidelines for Planning Authorities", November 2009 ensuring no properties upstream or downstream of the proposed development site are affected.

2.2 As part of the mitigation measures to reduce the associated Flood risk for site users, was by ensuring all 'highly vulnerable' finished floor levels are located above the 0.1% AEP flood level plus 500mm freeboard. As the flood extents relate to overland flows, the CFRAMS flood depth maps and site-specific topographical survey were used to calculate the levels at the flood extents. Where the difference between the calculated flood level and the FFL is not 500mm, landscaping will ensure the 500mm freeboard is included to ensure no further overland flow paths are created within the site.

Appendix G : Stage 1 Road Safety Audit

Proposed LRD at Taylors Lane, Ballyboden, Dublin 16

Stage 1 Road Safety Audit

190068-X-X-XXX-X-RP-DBFL-CE-0007

TRANSPORTATION

March 2023

DBFL CONSULTING ENGINEERS

Project Title:	**Proposed LRD at Taylors Lane, Ballyboden, Dublin 16**		
Document Title:	**Stage 1 Road Safety Audit**		
File Ref:	**190068-X-X-XXX-X-RP-DBFL-CE-0007**		
Status:	**P3 - Planning**	Rev:	**1**
	S - Issued		

Rev.	Date	Description	Prepared	Reviewed	Approved
P00	24/03/23	First Issue	Sayed Ahmad Saeed	Thomas Jennings	Thomas Jennings
P01	29/03/23	Final	Sayed Ahmad Saeed	Thomas Jennings	Thomas Jennings

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1 INTRODUCTION

1.1 BACKGROUND

This report describes a Stage 1 Road Safety Audit (RSA) carried out for a proposed Large Residential Development (LRD) scheme at a site located on Taylor's Lane in Ballyboden, Dublin 16.

The subject lands are situated to the south of Taylor's Lane and east of the R115 Ballyboden Road/Edmondstown Road in Ballyboden, Dublin 16.

The general location of the subject site in relation to the surrounding road network is illustrated in Figure 1-1 below, whilst Figure 1-2 illustrates the indicative extent of the subject site lands.

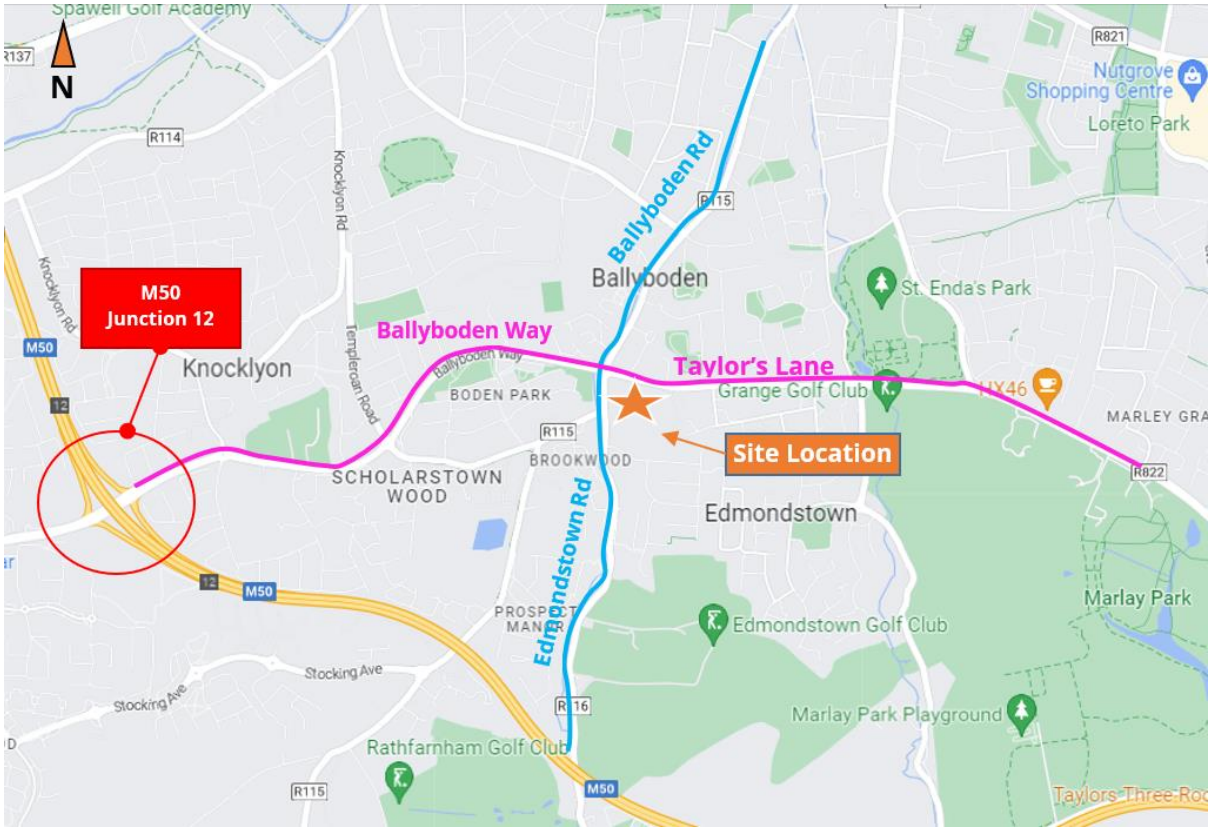


Figure 1-1 Subject Site Location

Figure 1-2 Indicative Site Boundary

1.2 Scheme Description

The development proposals include the following;

- Demolition of existing former Institutional buildings and associated outbuildings (c.5,231 sq.m);
- Construction of 402 residential units within 3 apartment/duplex blocks ranging in height from 2-5 storeys and comprising of 39 no. 1-Beds; 302 no. 2-Beds; and 61 no. 3-Beds all with associated private balconies/terraces to the north/south/east/west elevations;
    - Provision of one crèche and two retail units.
    - Provision of 290 no. car parking spaces

- Provision of 1054 no. cycle parking spaces
- Vehicular access to the site via Edmondstown Road to the west.
- Pedestrian Access to the site via Edmondstown Road to the west and Taylor's Lane to the north.

- The development proposal also includes the creation of a new vehicular and pedestrian access from the existing 3 arm signalised junction (Scholarstown Road / Ballyboden Road / Edmondstown Road) which will result in the upgrade of the junction to a four-arm signalised junction.

1.3 RSA Scope

The geographical scope of this Stage 1 Road Safety Audit considers subject site access junctions and transport infrastructure along Taylor Lane and Ballyboden Road immediately adjacent the development as illustrated in Figure 1-3 below.

Figure 1-3 Geographical Scope of RSA

The Audit Team membership was as follows:

Team Leader: Thomas Jennings
BEng MSc MIEI MIHT CMILT
TII approval number: TJ 135381

Team Member: Sayed Ahmad Saeed
BEng Tech BEng (Hons) MEng MIEI
TII approval number: SS 3419515

The Audit comprised a desktop review of the information listed in Section 5 of this report in addition to an examination on-site of the existing local road network characteristics. The site was visited on Tuesday 21st March 2023 between 15:30 and 16:30. At the time of the site audit the weather was rainy with all road/footway surfaces being noted as wet.

This Audit has been carried out in reference to the relevant sections of the Transport Infrastructure Ireland guidance (TII) guidance GE-STY- 01024 December 2017 for Road Safety Audit.

The Audit Team has examined only those issues within the proposed design relating to the road safety implications of the scheme and has therefore not examined or verified the compliance of the design to any other design criteria. The objective of the site visit was quantifying:

- existing traffic (pedestrian, cyclist and vehicular) and travel demand characteristics,
- the provision of dedicated facilities availability for vulnerable road users,
- the likely travel desire lines/links to/from the subject site, and
- any issues that might impact the safety of non-motorised users (NMU's).

The problems identified and described in this report are considered by the Audit Team to require action in order to improve the safety of the Scheme and minimise accident occurrence.

1.4 Collision History

With the objective of ascertaining the road safety record of the immediate routes leading to/from the subject site, the collision statistics as detailed on the Road Safety Authority's (RSA) website (www.rsa.ie) have been examined. The RSA website includes basic information relating to reported collisions over the most recent ten-year period, from 2006 to 2016 inclusive.

The RSA database records details where collision events have been officially recorded such as the when the Garda being present to formally record details of the incident.

In reference to **Figure 2.19**, incident number 9 resulted in a serious casualty involving a car and pedestrian whilst the remaining incidents resulted in minor casualties. All minor collisions involved a car except two involving bicycles and one involving Goods Vehicles.

Figure 1-4 Collision Record

The available RSA data reveals that there is a concentration of collisions at the Taylor's Lane Roundabout. It is understood that South Dublin County Council are currently in the design stage in the upgrade of this key junction as part of the Tallaght to Knocklyon Active Travel Scheme. Whilst this upgrade should make the junction safer for all road users, for the purposes of this audit it is assumed that the active travel scheme is not yet implemented.

2 ITEMS RAISED DURING THIS STAGE 1/2 ROAD SAFETY AUDIT

2.1 PROBLEMS AT GENERAL LOCATIONS

2.1.1 Problem (G1) – Large Vehicles Accessing to/from the Site

The auditors are concerned that the proposed development's site access junctions may not safely accommodate the swept path requirements of large vehicles such as waste collection vehicles that may seek to enter an exit the proposed development. This may result in incidents or side impact collisions with vehicles/cyclists/pedestrians travelling along the road.

Recommendation:

Ensure sufficient width of the carriageway to allow large vehicles safely manoeuvre through the site access points. Swept Path analysis at the site access points for large vehicles such as waste collection and fire tenders should be undertaken. If found necessary the junctions design should be amened to accommodate the swept paths of such large motor vehicles.

2.1.2 Problem (G2) – Existing Poles along Edmondstown Road

The auditors noted that there are existing sign poles and public lighting columns located along Edmondstown Road west of the proposed development which will require relocation. The drawings submitted for the purpose of this audit do not provide details of where these poles will be relocated to accommodate the proposed pedestrian and cycle facility. Inappropriate retro positioning of such poles and columns could impede pedestrians, wheelchair users o and cyclists which could generate conflicts between active travel users or requirement them to walk into the carriageway thereby bringing them into conflict with motorised vehicles.

Recommendation:

The scheme designers should ensure that the streetlighting and signage designs do not result in the relocated poles / columns from being positioned in an area where they could impede pedestrians and cyclists and that the appropriate widths are provided / maintained along footpaths and cycle facilities.

2.1.3 Location (G3) – Road Drainage

Problem:

The drawings provided for the purpose of this Road Safety Audit do not provide any details of surface water drainage. Surface water can prove a trip hazard in both warm and cold weather conditions in addition to adversely impacting the skid resistance of bicycles and motorized vehicles.

Recommendation

During the detail design stage, the design team should provide adequate measures are taken to ensure that all surface areas benefit from having sufficient drainage and that localised ponding does not arise during wet weather conditions. All access routes leading to/from the subject site should have adequate surface water drainage.

2.1.4 Problem (G4) – Street Lighting

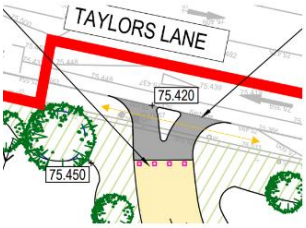
No details regarding the proposed schemes street lighting have been provided to the audit team. As a result, the audit team cannot comment upon the appropriateness of the proposed schemes street lighting strategy.

Recommendation:

Ensure appropriate street lighting is provided across All pedestrian, cycle, and vehicle routes. Also, ensure public lighting columns do not impede road pedestrians or give rise to conflicts.

2.2 PROBLEMS AT SPECIFIC LOCATIONS

2.2.1 Problem (S1) – Emergency Access



The design of the proposed emergency vehicle access arrangement on Taylors Lane prioritises vehicles through the junction above pedestrians even though this access may never be used by vehicles. The proposed design results in a discontinuity of existing external east-west public footpath along the southern side of Taylors Lane with no pedestrian facilities in the form of dropped kerbs and tactile paving proposed. Furthermore the proposed traffic management bollards are located set back from the Taylors Lane road carriageway within the development site and behind the site boundary treatment. In this location the bollards (and associated vehicle management arrangements / intentions) will not be visible and subsequently understood by vehicle drivers on Taylors Lane, particularly those unfamiliar with the area. This arrangement offers poor legibility and could result in some vehicle drivers not understating the function (emergency only) of this supplementary vehicle access, resulting in vehicle drivers seeking to turn into the residential site via this access before coming to a halt as the bollards. Such practices could contribute to conflicts between pedestrians and vehicles on Taylors Lane.

Recommendation:

The designers are requested to revisit the design of this junction treatment. In light of the infrequent vehicle movements likely to be traveling through this junction greater consideration of vulnerable road users should be given in light of DMURS road user hierarchy. It is recommended to provide a continuous footpath across this emergency access, relocate the proposed vehicle bollards to a more conspicuous location and install appropriate signage to inform vehicle drivers of the site access intended function.

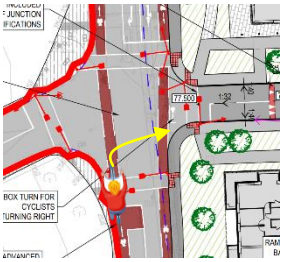
2.2.2 Problem Location (S2) – Uncontrolled Crossing on Roundabouts Southern Arm

The existing uncontrolled pedestrian crossing on the southern arm (R115 Ballyboden Road) of the Tayor's Lane / R115 / Ballydoden Way roundabout junction currently does not have tactile paving provided. The proposed LRD scheme design and associated off-site infrastructure works do not propose any works to address this issue. Failure to provide tactile paving at uncontrolled crossings could result in visually and mobility impaired people walking into the carriageway with live traffic.

Recommendation:

Tactile paving should be provided at all pedestrian crossing points to assist visually and mobility impaired pedestrians to locate the crossing points and cross the road carriageway in a safe manner.

2.2.3 Problem (S3) – Site Access Junction and Cyclists Turning Right into Development



The auditors are concerned how northbound cyclists, particularly inexperienced cyclists; traveling along Ballyboden Road and approaching the junction from the south can safely turn right into the proposed residential development. In the proposed arrangement right turning cyclists are required to wait in the centre of the junction where that would be susceptible to a collision with both northbound and southbound motor vehicles.

Recommendation:

It is recommended that Right Turn Box facility is provided on the western arm to accommodate cyclists seeking to enter the site from the southern arm of the site access junction.

2.2.4 Problem (S4) – Footpath Trip Hazard

The auditors noted that there are existing chambers / manholes with loose, old and poorly fitted covers and associated edge treatments in areas adjacent the pedestrian crossing facility at the Site Access/Edmondstown Road junction. This will lead to pedestrian being tripped / fall.

Recommendation:

A smooth surface free form trip hazards should be provided with appropriately specified chamber / manhole covers bedded in with the surrounding footpath surface.

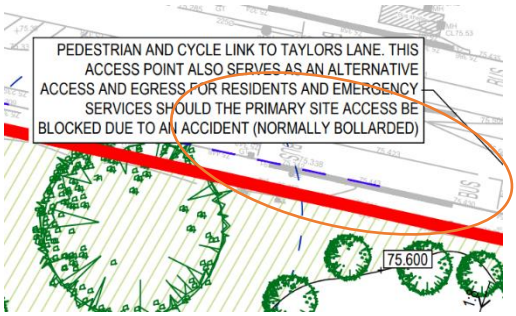
3 COMMENTS

3.1.1 Comment (C1) – Access to/from Bus Stop

The auditors noted substandard, damaged and poorly reinstated (from utility works) footpath surface along western side of Edmondstown Road carriageway leading to / from the existing Bus Stop. Future residents of the proposed development may find it difficult to gain safe (trip hazard) access to/from this Bus stop. The surface of this existing footpath should be to allow safer access to/from the bus stop.

3.1.2 Comment (C2) –Bus Stop on Taylor's Lane

The Bus stop on the southern side of Taylor's Lane immediately adjacent the development site does not currently benefit from having a shelter or seating. Passenger demand at this bus stop is likely to increase once the proposed residential development is completed.



4 AUDIT TEAM STATEMENT

4.1 AUDIT TEAM STATEMENT

I certify that I have examined the drawings and other information listed in Chapter 5. This Audit has been carried out with the sole purpose of identifying any features of the Design that could be removed or modified to improve the safety of the Scheme. The problems that I have identified have been noted in the report, together with suggestions for improvement which we recommend should be studied for implementation.

Audit Team Leader: Mr. Thomas Jennings *BEng MSc MIEI MIHT CMILT*

Signed: 

Date: 29/03/2023

Audit Team Member: Mr. Sayed Ahmad Saeed *BEng Tech BEng (Hons) MEng MIEI*

Signed: 

Date: 29/03/2023

5 LIST OF INFORMATION RECEIVED

Items Received		Yes/No	Details
1	Scheme Description	Yes	Brief description emailed
2	Project Brief	No	
3	Scheme / Project Drawings	Yes	• 190068-X-04-Z00-XXX-DR-DBFL-CE-1201 Roads Layout
4	Departures from Standard	No	
5	Traffic Signal Information	N/A	
6	Road Signs & Road Marking Details	No	
7	Traffic Count Information	No	
8	Speed Survey Data	No	
9	Collision Data	No	
10	Previous Road Safety Audit Reports	No	
11	Relevant Design Standards	No	
12	Public Transport Information	N	
13	Other Information	No	

Table 5-1 Information Received as basis for Road Safety Audit

Appendix A : Problem Location Figure

Project : **Proposed LRD at Taylor's Lane, Ballyboden, Dublin 16**	Designed :	SAS	Prepared :	SAS
	Date :	24/03/2023	Checked :	TJ
Client :	Scale :	NTS		
Drawing Title : **Stage 1 Road Safety Audit**	File Ref :	190068-Rep 0001 RSA Figure		
	Drawing No : **Road Layout**			

DBFL Consulting Engineers

Appendix B : Feedback Form

190068

ROAD SAFETY AUDIT FEEDBACK FORM

Scheme: Proposed LRD at Taylors Lane, Ballyboden, Dublin 16
Audit Stage: **1**

Date Audit Completed: 21st March 2023

To be Completed By Designer				To be Completed by Audit Team Leader
Problem No. in RSA Report	**Problem accepted (yes/no)**	**Recommended Measure accepted (yes/no)**	**Describe alternative measure(s). Give reasons for not accepting recommended measure. Only complete if recommended measure is not accepted.**	**Alternative measures or reasons accepted by Auditors (yes/no)**
G1	Yes	Yes		
G2	Yes	Yes		
G3	Yes	Yes		
G4	Yes	Yes	Existing street lighting along Edmondstown road will be relocated to not impede pedestrian and cyclists movements.	
S1	Yes	Yes		
S2	Yes	Yes		
S3	Yes	Yes		
S4	Yes	No	Problem identified is outside the scope of works of this development. Will notify the local authority of the auditors recommendation.	**Yes**

Signed: _____ **Designer:** **Gabriel Karpavicius** **Date:** **29.03.2023**

Signed: _____ **Audit Team Leader:** **Thomas Jennings** **Date:** **29/03/2023**

Signed: _____ **Employer:** Frank Fahy **Date:** 29.03.2023

Please complete and return to safety auditor.

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