ENGINEERING SERVICES REPORT

White Heather, South Circular Road
for U and I (White Heather) LTD

PROJECT NO. U067
16 March 2022

OCSC
O'CONNOR | SUTTON | CRONIN
Multidisciplinary
Consulting Engineers

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for

Residential Development,

at White Heather, South Circular Road,

Dublin 8, Co. Dublin.

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ENGINEERING SERVICES REPORT

1 INTRODUCTION

1.1 Appointment

O'Connor Sutton Cronin & Associates (OCSC) have been appointed by *U and I (White Heather) Ltd* to carry out the design of the civil engineering services associated for a Strategic Housing Development at the White Heather Industrial Estate, South Circular Road, Dolphins Barn, Dublin 8.

1.2 Administrative Jurisdiction

The proposed development is located in the jurisdiction of Dublin City Council (DCC), and therefore the engineering services design was carried out with reference to the following:

- Dublin City Development Plan 2016-2022 (as varied);
- Greater Dublin Strategic Drainage Study (GDSDS);
- Greater Dublin Regional Code of Practice for Drainage Works (GDRCOP);
- The Planning System and Flood Risk Management Guidelines for Planning Authorities (Department of Environment, Heritage and Local Government and the Office of Public Works);

1.3 Site Location

The subject site is located in the north eastern environs of Dublin South Central, as shown in ***Figure 1.1* - Site Location**, and is immediately bound by:

- Priestfield Cottages, to the east;
- South Circular Road, to the north east;
- Existing residential units and a church, to the north;
- St. James Terrace residential units, to the west;
- Grand Canal to the south.

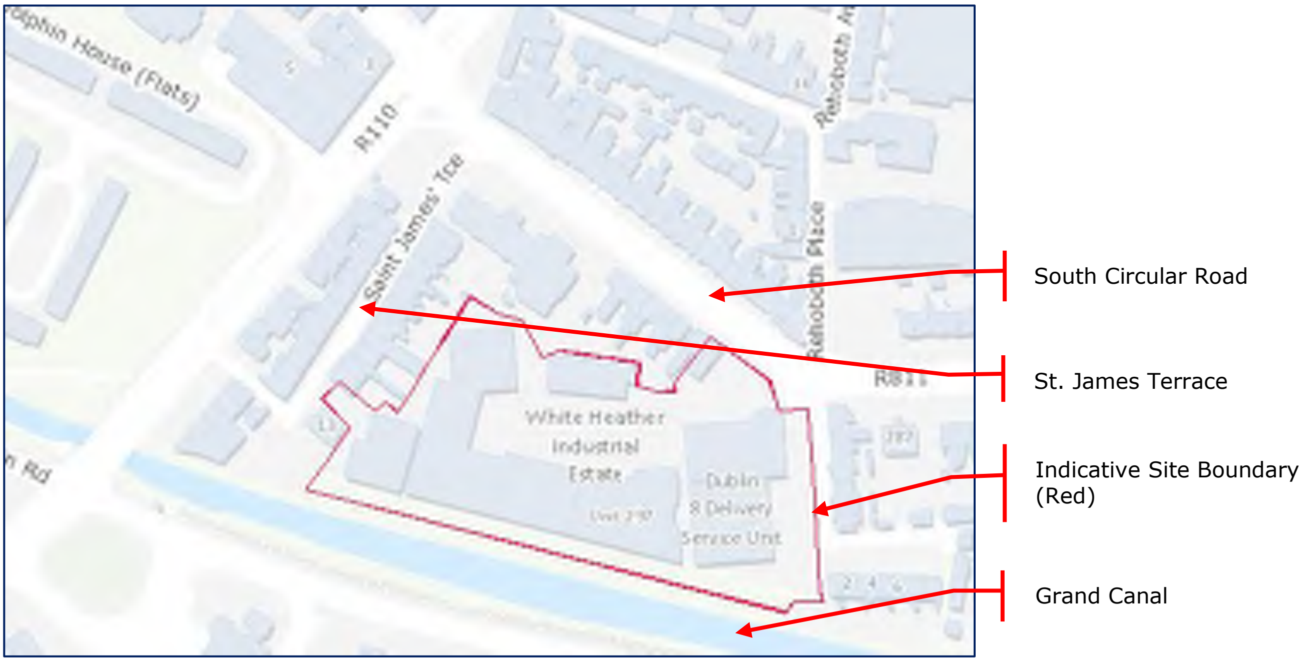


Figure 1.1 - Site Location (www.myplan.ie)

1.4 Existing Site Overview

The proposed development has a site area of **c.1.44-hectares**, the site is zoned by Dublin City Council for **Z1 Sustainable Residential Neighbourhoods** that seeks *'to provide for new residential development'.*

Refer to **Figure 1.1** for details of the indicative extent of the site and its location.

The site currently comprises an industrial estate and associated concrete yard and hardstanding, with all existing buildings to be demolished.

The existing ground levels across the overall site are typically graded from south west to north east, the highest points are approximately +23.0mOD at the access road from St. James Terrace at the south-western boundary, and existing levels at the lowest point are circa of +22.1mOD at the access road from South Circular Road at the north-eastern boundary.

1.5 Proposed Development Context

The proposed Strategic Housing Development is located at the White Heather Industrial Estate, South Circular Road, Dolphins Barn, Dublin 8 and No. 307/307a South Circular Road, Dublin 8 and an industrial building at 12a St James Terrace. The 1.535ha site is bounded by the Grand Canal to the south; Our Lady of Dolour's Church and residential dwellings on the South Circular Road to the north; Priestfield Cottages to the east; and residential dwellings at St James's Terrace to the west.

Across 7 no. blocks, the residential mix of the proposed 335 no. units includes a combination of studio units, 1-bedroom apartments, 2-bedroom apartments, units and a terrace of 3-bedroom townhouse units. A change of use of an existing residential building at 307/307a South Circular Road to be used as a workspace. The proposed Part V social housing requirement is provided at 10% in 2 no. blocks within the proposed scheme. This Build to Rent scheme will also include 2 no. cafés and a 2-storey creche, while the residents will also have access to residential amenity areas at ground floor level and fifth floor level with access to a roof terrace area overlooking the canal. A landscaped square will be accessible to the public, with private open space and amenity areas for the residents also provided including children's play areas. Building heights range from 2 no. to 10 no. storeys, with finger blocks arranged in a north-south direction and height tapering down from the centre of the site to the boundary.

The entrance to the scheme will be from the existing junction at the South Circular Road, which will be reconfigured and upgraded. The existing access road at St James's Terrace will provide pedestrian access only to the development. Car parking is proposed at undercroft and at surface levels, with a number of dedicated car sharing spaces in convenient locations. Covered and secure bicycle storage facilities are located also at undercroft and surface level, adjacent to individual block entrances.

A new street will run east-west across the north of the site and the creation of a new public space at the heart of the proposed scheme will connect to a publicly accessible linear park along the canal to the south.

As part of the proposed development, the existing surface water and wastewater networks are to be decommissioned and new surface water and wastewater networks are to be constructed. The proposed surface water and wastewater networks are to discharge to the local public 990x640 brick combined sewer on South Circular Road via a 225mm-dia. combined sewer.

Figure 1.2 – Site Layout

2 SCOPE OF SERVICES REPORT

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

- Surface Water Drainage;
- Wastewater Drainage;
- Potable Water Supply;

This report should be read in conjunction with the OCSC Civil Engineering design drawings that accompany this submission. Refer also to the document **U067-OCSC-XX-XX-RP-C-0001** Site-Specific Flood Risk Assessment report, which has been submitted under separate cover.

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

- Dublin City Council Development Plan 2016-2022 (as varied);
- Greater Dublin Strategic Drainage Study (GDSDS);
- Greater Dublin Regional Code of Practice for Drainage Works (GDRCOP);
- Irish Water Code of Practice for Wastewater, IW-CDS-5030-03 Revision 2;
- Irish Water Code of Practice for Water Supply, IW-CDS-5020-03 Revision 2;
- The Building Regulations – Technical Guidance Document Part H;
- BE EN 752 – Drainage Outside Buildings;
- BS 7533-13 – Guide for Design of Permeable Pavements;
- The Office of Public Works, the Planning System and Flood Risk Management;
- Dublin City Council and Irish Water Drainage and Water main Records;
- CIRIA 753 – The SuDS Manual.

Members of the wider design team cover all other elements of the application pertaining to traffic, sustainability, landscaping, planning and architectural detail.

3 SURFACE WATER DRAINAGE

3.1 Overview

Any planning permission sought on the subject lands are required to adhere to the Local Authority requirements, the Dublin City Council Development Plan and as such, the Greater Dublin Strategic Drainage Study (Dublin City Council, 2005).

New development must ensure that a comprehensive Sustainable Drainage System, SuDS, is incorporated into the development. SuDS requires that post development run-off rates be maintained at equivalent, or lower, levels than pre-development levels. Thus, the development must be able to retain, within its boundaries, surface water volumes from extreme rainfall events up to a 1 in 100-year rainfall event, more commonly expressed as a 1.0% AEP (Annual Exceedance Probability), *while also allowing for an additional climate change factor of* ***20%*** *increase in rainfall intensity*. Any new development must also have the physical capacity to retain surface water volumes as directed under the Greater Dublin Strategic Drainage Strategy (GDSDS) and, if necessary, release these attenuated surface water volumes to an outfall at a controlled flow rate.

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

Proposed sustainable drainage systems designed in accordance with best practice and the CIRIA C753 (The SuDS Manual) guidance material.

3.2 Existing Site Drainage

3.2.1 Existing Site Catchment Areas

As detailed in *Section 1.4*, the existing site is primarily brownfield, with a number of industrial warehouse units that are to be demolished. The existing development appears to have two catchments. The major catchment consists of all industrial warehouse units that surround the concrete yard with access to the South Circular Road and the minor catchment encompasses the industrial warehouse unit on the access road from the St. James Terrace. Refer to the ***Figure 3.1*** for context of the existing site catchment areas.

Figure 3.1 - Existing Site Catchment Areas

The existing site comprises of c.0.56ha concrete yard area, c.0.66ha roof area and c.0.22ha of Grand Canal bank area, summing up c.1.44ha of developable area. Refer to ***Figure 3.2*** for aerial image of the existing site.

Figure 3.2 - Existing Site, Aerial Overview (Google Earth)

3.2.2 Existing Surface Water Drainage Infrastructure

The site is currently not served by independent surface water drainage network, as indicated in ***Figure 3.3***. There is, however, existing 990x640mm brick combined sewer on South Circular Road which receives the development's wastewater and surface water discharge.

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

The existing development's drainage infrastructure is separated into two drainage networks that discharges to existing public combined sewers. The major catchment area to the east that contains most of the warehouse units discharge to an existing 990x640 brick combined sewer on South Circular Road. The minor catchment area to the west that contains the westernmost warehouse unit discharges to an existing 300mm vitrified clay combined sewer on St. James Terrace.

Refer to ***Figure 3.1*** for site catchment areas and to ***Figure 3.3*** for an excerpt of the existing drainage infrastructure adjacent to the site.

Figure 3.3 – Existing Surface Water Infrastructure (Irish Water Public Records)

3.2.3 Existing Site Rainfall Runoff

All surface water runoff on the existing site is currently drained by road gullies on the concrete yard and the roof that discharges to the existing development drainage networks. The network serving the major catchment area discharges to the existing public 990x640mm brick combined sewer on South Circular Road, while the network serving the minor catchment area discharges to the existing public 300mm vitrified clay on St. James Terrace. The rainfall runoff in the grassed area, which is between the industrial warehouse units and the Grand Canal, naturally infiltrates into the bank of the canal or it runs off towards the canal. Refer to *Section 1.4* and *Section 3.2.1* for further details of existing site context.

The soil index of the catchment greatly impacts on the greenfield run-off rate, the Figure 1.4.18 from the Flood Studies Report (FSR) or the winter rain acceptance potential (WRAP) from the Wallingford Procedure Volume 3 allow the classification of the soil index. The Table 6.7 of the Greater Dublin Strategic Drainage Study Volume 2 shows the soil indexes and the SPR values which is the soil input in Micro Drainage for the computation of the greenfield run-off rate (QBAR), as shown in ***Figure 3.4***.

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

Figure 3.4 – SPR Values for Soil (Table 6.7 from GDSD Volume 2)

A site investigation was carried out in June 2010, indicating the existing ground has low permeability in the clay soils, thereby, unsuitable for infiltration. The soil index considered for the proposed development is the **Soil Index 4** with a SPR value of 0.47.

The Standard Average Annual Rainfall (SAAR) value for the development site, as sourced directly from Met Éireann, is 721mm.

Using the ICP SuDS Input, (Flood Studies Report (FSR)) Method, the rainfall runoff discharging from the brownfield site area that is to be developed (i.e. c.1.22ha of the overall c.1.44ha), in its existing condition, has been estimated at $QBAR_{RURAL}$ = 6.1 l/s (5.0 l/s/ha).

However, Irish Water stated on the Confirmation of Feasibility in **Appendix D** that the storm water inflow into the receiving combined sewer is to be limited to 2 l/s/ha, **$QBAR_{RURAL}$ = 2.4 l/s**.

3.3 Proposed Surface Water Drainage Design Strategy

3.3.1 Proposed Surface Water Strategy Overview

An independent surface water and wastewater network will be provided as part of this development. However, it is noted that there is no public surface water network in the vicinity of the proposed site. Therefore, it is proposed to connect the development's attenuated and treated surface water network to the existing public combined sewer, as agreed with Irish Water.

The development's surface water network will combine with the wastewater network at the site boundary, prior to discharge from site, as per GDRCOP requirements.

A capped spur connection will be provided from the last surface water manhole, in order to facilitate a future connection to a public surface water network, should one be installed in the area.

As detailed in *Section 3.2.3*, the site investigation performed in 2010 confirmed that the existing ground for the proposed development has poor infiltration rates.

In order to provide some level of infiltration, improve the quality of water and increase the retention time of the rainfall runoff, it is proposed a range of sustainable drainage systems (SuDS), namely green roofs, rain gardens, geocellular attenuation systems, filter trenches, trapped road gullies, silt traps, flow control devices and a fuel separator. Refer to *Section 3.4* for further information on the proposed SuDS.

Refer to drawing **U067-OCSC-ZZ-GF-DR-C-0500** for details of the proposed drainage design layout.

3.3.2 Proposed Surface Water Design Criteria

The proposed surface water network has been designed in accordance with the regulations and guidelines outlined in *Section 2* using Micro Drainage by Innovyze Inc., which simulates the performance of the integrated drainage network for different rainfall return periods and storm events.

Rainfall design data, such as return period rainfall depths for sliding durations, which determine the $\mathbf{M_{5\text{-}60}}$ and **R** values, and the standard annual average rainfall (SAAR) value were sourced from Met Éireann.

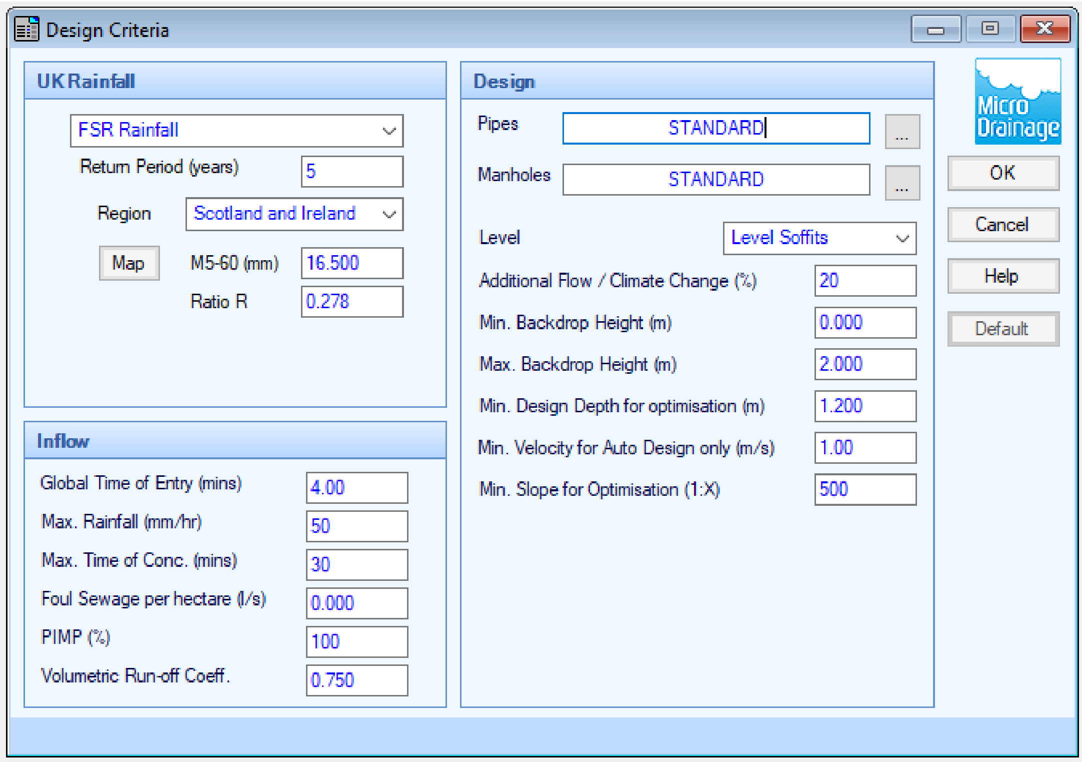


Figure 3.5 - Surface Water Design Criteria (MicroDrainage Excerpt)

As indicated in ***Figure 3.5***, the proposed network was designed to allow for an additional 20% increase in rainfall intensity, to allow for Climate Change, in accordance with the Dublin City Council Development Plan 2016-2022 and the GDSDS.

3.3.3 Proposed Development Rainfall Runoff

As discussed in *Section 1.4 approximately* 1.22-hectares of the overall site is to become residential development, with the remaining c.0.22-hectares to comprise a mixture of hard and soft landscaping and amenity value, which will be drained via landscaping, thereby, it will not contribute to the development's surface water drainage network.

It is proposed to reduce and restrict the rainfall runoff, discharging from the proposed development, to the greenfield equivalent, $QBAR_{RURAL}$, runoff rate, as per the FSR ICP SuDS method, which is based on the IH124 method for catchments smaller than 25km^2 (25ha) in area.

This is to be achieved with the provision of a flow restrictor (Hydro-Brake Optimum by Hydro-International, or similar approved) prior to discharging to the existing public 990x640mm brick combined sewer on South Circular Road, with the appropriate measures of attenuation provided. Flow-control devices and associated attenuation are also to be strategically provided, in order to maximise SuDS benefits.

As stated by Irish Water on the Confirmation of Feasibility in **Appendix D**, the discharge rate of the proposed surface water network, the greenfield equivalent ($QBAR_{RURAL}$), is to be **2.4 l/s** (2.0 l/s/ha) along with the calculated runoff for varying Average Recurrence Intervals (ARI).

For the purpose of the surface water network design simulation, we have considered the external areas that include roads, footpaths, driveways and roofs as being 100% impermeable; giving a <u>*winter*</u> global runoff coefficient, C_v, of 0.84, in accordance with the HR Wallingford and Modified Rational Method for runoff.

3.3.4 Proposed Surface Water Pipe Network Design

The overall surface water drainage system, serving the proposed development, is to consist of a gravity surface water pipes that will convey runoff from the roofs and paved areas to the outfall manhole. The new gravity surface water network is to discharge a restricted flow rate through a vortex controlled device to the existing public 990x640mm brick combined sewer on South Circular Road.

The proposed piped-network has been designed in accordance with BS EN 752 and all new infrastructure is to be compliant with the requirements of the GDSDS and the GDRCOP for Drainage Works, with minimum full bore velocities of 1.0 m/s achieved throughout.

All main surface water carrier pipes have been sized to ensure no surcharging of the proposed drainage network for rainfall events up to, and including, the 1 in 5-year ARI event, with a projected climate change allowance of 20% increase in rainfall intensity.

Refer to **U067-OCSC-ZZ-GF-DR-C-0500** for the proposed drainage design layout.

3.3.5 Proposed Surface Water Attenuation Storage

Temporary underground attenuation is to be provided in both locations, the northern amenity space and in the main public route. The attenuation storage will be provided in the form of proprietary modular systems (such as the geocellular Y-ESS Pluvial Cube, or similar approved). The total attenuation storage volume within the proposed development to be provided is $510m^3$.

Aiming to restrict discharge rates from the development's surface water network to the greenfield equivalent flow rate, the attenuation has been designed to temporarily store the surface water runoff for design rainfall events up to, and including, the 1% AEP with a 20% increase in rainfall intensity.

Refer to **U067-OCSC-ZZ-GF-DR-C-0500** for the proposed surface drainage design layout.

3.4 Specific SuDS Measures Proposed

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

3.4.1 Green Roofs

Extensive green roofs are to be considered for use, where large flat roofs are to be provided. Green roofs are designed to intercept and retain initial rainfall, which reduces the volume and rate at which it enters the surface water network.

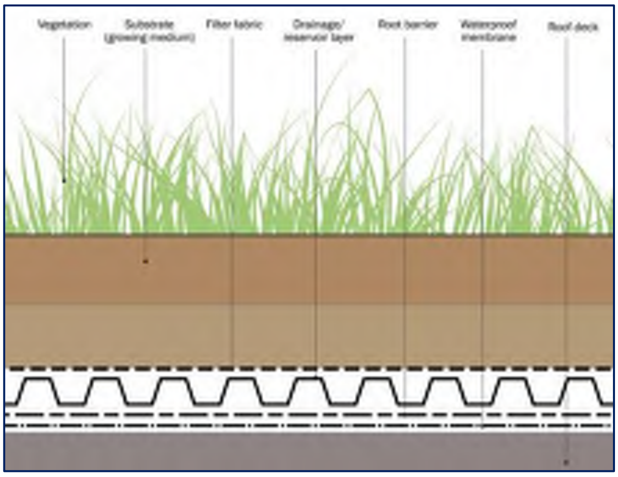


Figure 3.6 – Typical Green Roof Build-up

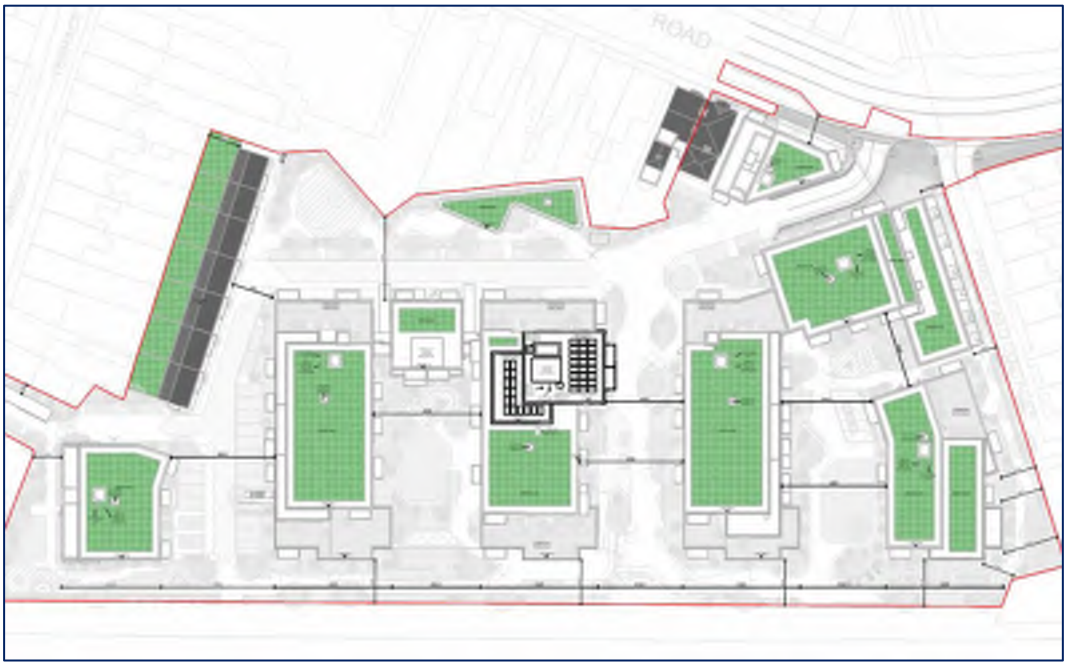


Figure 3.7 – Proposed Development's Green Roof Extents

3.4.2 Rain Gardens

Rain gardens are typically small systems that can reduce runoff rates and volumes, and treat pollution through the use of engineered soils and vegetation. These systems provide initial interception of the storm water at source, treatment and reduction of runoff from frequent rainfall events and improvement of the storm water quality by removing retaining pollutants prior to discharge to the surface water network.

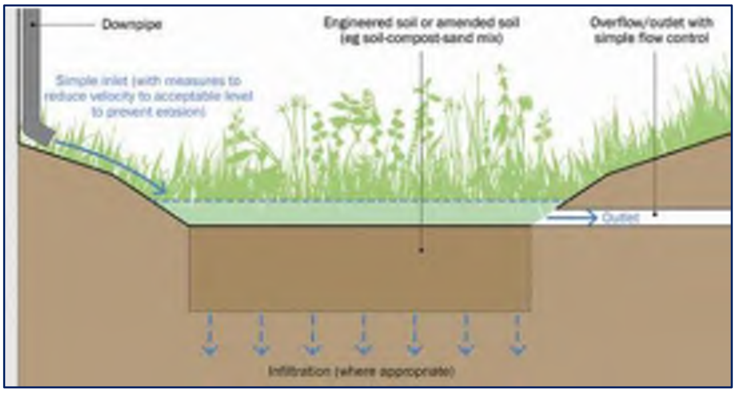


Figure 3.7 – Rain Garden (Typical Detail)

3.4.3 Filter Trench

Filter trenches are shallow trenches filled with stone/ gravel that create temporary subsurface storage for the attenuation, conveyance and filtration of surface water runoff. They can help reduce pollutant levels in runoff by filtering out fine sediments, metals, hydrocarbons and other pollutants. They can also encourage absorption and biodegradation processes.

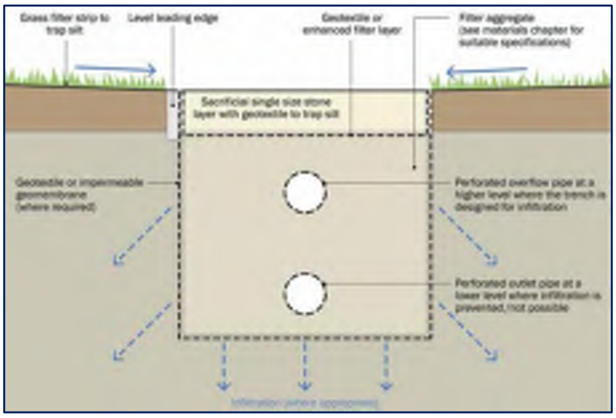


Figure 3.9 – Filter Trench (Typical Detail)

3.4.4 Trapped Road Gullies

All road gullies serving the proposed development are to be trapped, to help prevent sediment and gross pollutants from entering the surface water network, and thus improving the water quality discharging from site.

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

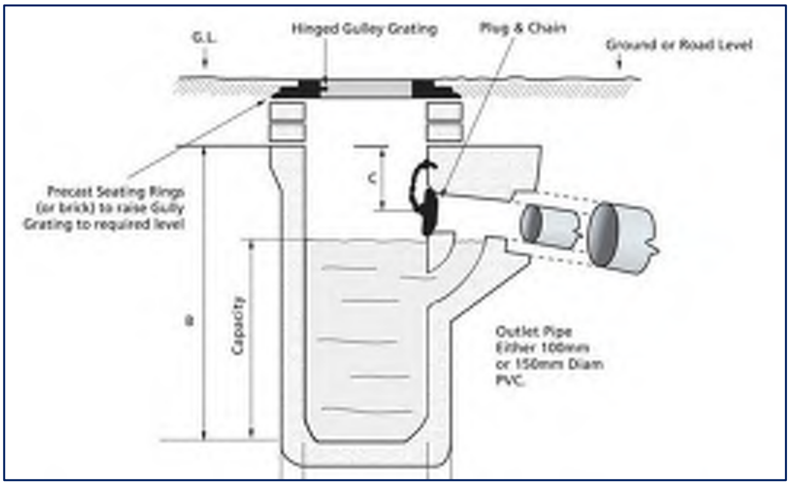


Figure 3.10 - Trapped Road Gully (Typical Detail)

3.4.5 Underground Pipe Network

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

3.4.6 Silt Traps

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

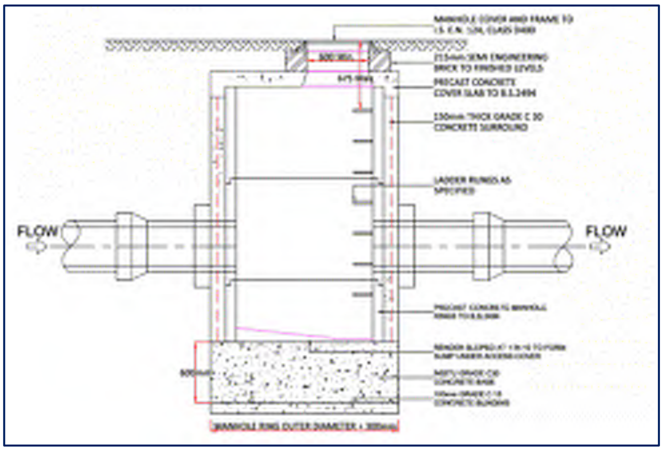


Figure 3.11 - Silt Trap Manhole (Typical Detail)

3.4.7 Geocellular Storage Systems

Unlined proprietary geocellular storage units are to be provided for the attenuation of rainfall runoff for the overall development area.

These systems are to provide sufficient temporary storage volume for rainfall events up to, and including, the design 1% AEP rainfall event (including climate change). Typical geocellular storage systems comprise plastic cellular units of high porosity (typically >95%), structurally arranged in rows and layers, with a perforated distribution pipe through the centre.

These systems also allow for interception of initial rainfall to be provided at the base of the system, by elevating the outlet relative to the systems base.

Interception is concerned with preventing runoff from the site for the first 5mm of rainfall for most events. The delivery of interception ensures that the runoff frequency from the site more closely mimics greenfield characteristics, and constrains the number of potentially polluting discharge events.

Access chambers for inspection and maintenance are also to be provided. Each attenuation system is to provide sufficient interception volume to remove a minimum of the first 5mm rainfall from the surface water network.

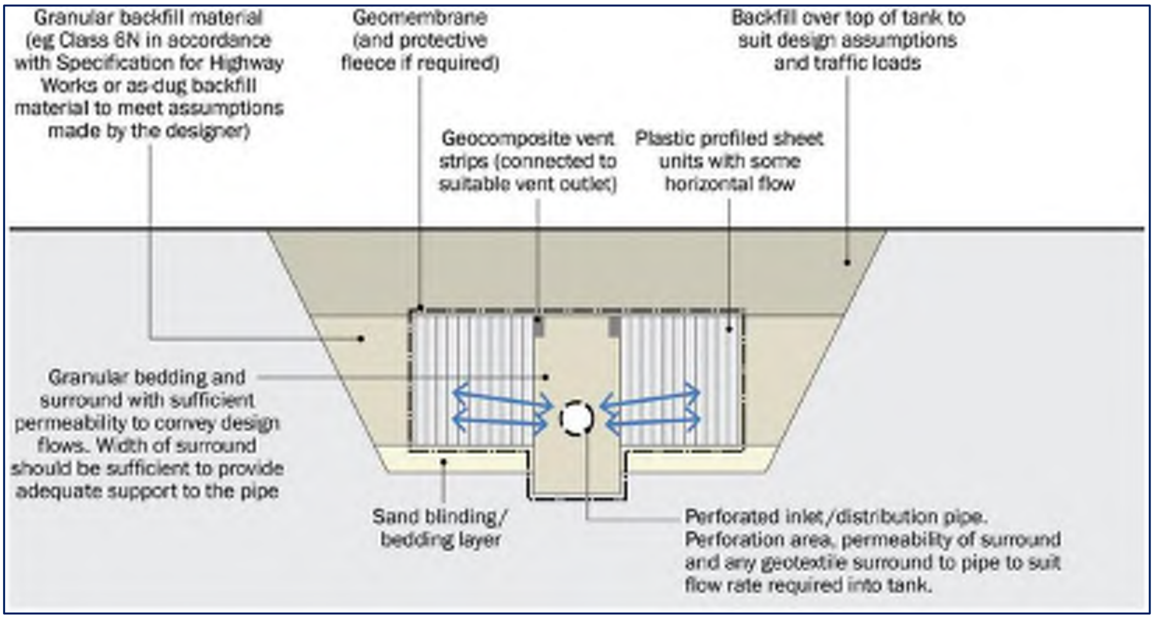


Figure 3.12 - Typical Section of Geocellular System (CIRIA C753)

3.4.8 Flow Control Device

Flow Control device is to be provided immediately downstream of manhole in the junction of both attenuation systems, in order to restrict the surface water discharge from site to a flow rate equivalent, or below, the natural greenfield runoff rate.

This flow rate would be no greater than **2.4l/s** (2.0 l/s/ha), which is the greenfield runoff equivalent, as described in *Section 3.3.3*.

It is proposed to provide the Hydro-brake optimum vortex flow control unit (or similar approved by DCC) at the strategic locations, downstream of the attenuation systems.

Further, it is noted that the required aperture of the proposed Hydro-Brake outlets have been designed to be **<u>greater than 150mm diameter</u>**, to mitigate the risk of blockage.

The flow control chamber is to be fitted with a penstock valve at the inlet and a bypass lever at the outlet (if required), to allow for easy access and maintenance.

Figure 3.13 -Vortex Hydro-Brake Flow Control Unit (Hydro International)

3.4.9 Oil Separator

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

A Class 1 bypass fuel separator is to be provided downstream of the attenuation systems, as an additional and final mitigation measure, prior to surface water discharge from the surface water network.

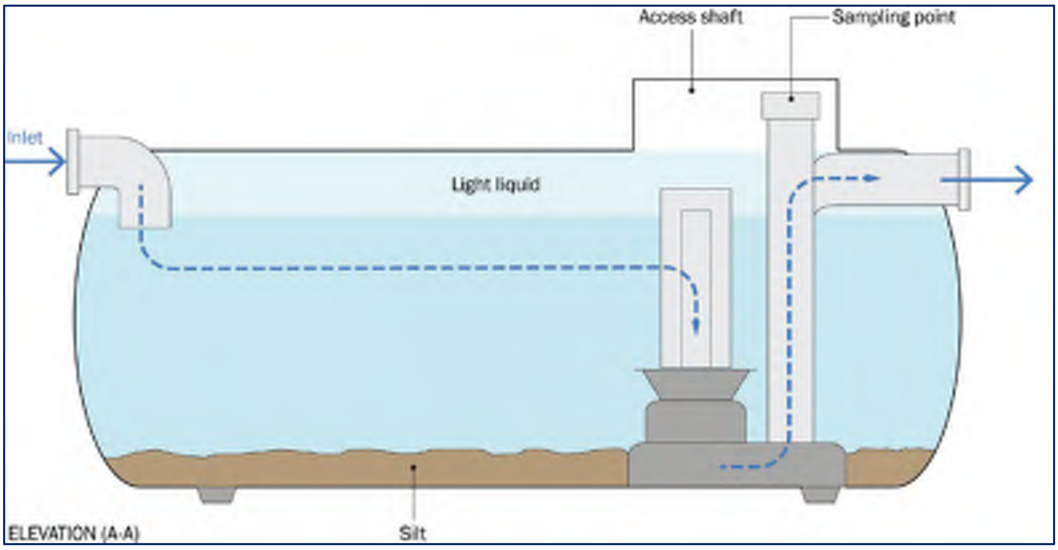


Figure 3.14 - Typical Section Detail of Fuel Separator (CIRIA C753)

3.5 Water Quality

The quality of the surface water discharging from site is to be improved through the following provisions, each of which is discussed in greater detail in *Section 3.4*:

- Green Roofs;
- Intensive landscaping;
- Filter trenches;
- Trapped road gullies on all road carriageways, to trap silt and gross pollutants;
- Silt traps to be provided on manholes immediately upstream of attenuation systems, as a further preventative measure to trap silt and other gross pollutants;
- Rain gardens to be provided in amenity spaces surrounded by apartment blocks, to remove sediments, fine particulates, contaminants and dissolved pollutants;
- Interception of initial 5mm rainfall provided as part of attenuation storage, rain gardens and green roofs, the latter is generally significant during the summer due to the evapotranspiration processes and temporary storage;
- Class 1 Bypass fuel separator to be provided prior to discharging from site.

3.6 Maintenance

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

- Trapped road gullies;
- Silt trap manholes;
- Rain gardens;
- Green roofs;
- Flow control devices with a diameter greater than 150mm.

All devices, including road gullies, silt traps, flow control device and attenuation system, should be inspected regularly and maintained, as appropriate and in accordance with manufacturer's recommendations and guidelines.

Items such as the flow control and fuel separator have been located so as to provide easy vehicular access for inspection and maintenance.

3.7 Surface Water Impact Assessment

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

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

3.8 Criterion 1 – River Water Quality Protection

It is proposed that the overall drainage system, serving this development, will contain a range of surface water treatment methods, as outlined previously in *Section 3.4,* which will improve the quality of surface water being discharged from the proposed development.

Gross pollutants, sediments, hydrocarbons, and other impurities, will be removed at source with the following provisions:

a) Intensive landscaping, where practicable;
b) Interception storage as outlined in *Section 3.5*;
c) Silt-traps prior to attenuation storage area.
d) All road gullies are to be trapped;
e) Rain gardens in amenity areas;
f) Class 1 fuel separator prior to discharge from the development.

3.9 Criterion 2 – River Regime Protection

Surface water discharge from the overall masterplan development will be restricted to an equivalent rural runoff rate of **2.4 l/s** (2.0 l/s/ha), as stated in the Confirmation of Feasibility in **Appendix D**. Refer to *Section 3.3.4* for further details.

This will be achieved with the provision of a flow restrictor (Hydro-Brake Optimum, by Hydro-International, or similar approved) upstream of the outfall manhole.

3.10 Criterion 3 – Level of Service (Flooding) Site

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

- No flooding on site except where planned (30-year high intensity rainfall event);
- No internal property flooding (100-year high intensity rainfall event);
- No internal property flooding (100-year river event and critical duration for site) and;
- No flood routing off site except where specifically planned. (100-year high intensity rainfall event).

3.10.1 Sub-Criterion 3.1

The surface water drainage systems, serving the proposed development, have been designed to accommodate the 100-year return period rainfall event (including an allowance of 20% increase in rainfall intensity for climate change) without flooding. Therefore, the system has capacity for the 30-year return period rainfall event without flooding.

The performance of the proposed drainage system has been analysed for design rainfall events up to, and including, the 1% AEP event (incl. 20% climate change allowance) using the *MicroDrainage Network Design Software*, by Innovyze Inc. Refer to **Appendix B** for details of design criteria, calculations and results. The analyses indicate that no flooding will occur for design rainfall events up to, and including, the 1% AEP.

3.10.2 Sub-Criterion 3.2

The surface water drainage systems, serving the proposed development, have been designed to accommodate the 100-year return period rainfall event (including an allowance of 20% increase in rainfall intensity for climate change) without flooding.

The performance of the proposed drainage system in 100-year return period storm events (incl. 20% climate change allowance) has been analysed – Refer **Appendix B** for calculations. The analyses show that no flooding will occur in 100-year return period storm events.

3.10.3 Sub-Criterion 3.3

Details of the flood risk assessment associated with the proposed development is outlined the document **U067-OCSC-XX-XX-RP-C-0001** Site-Specific Flood Risk Assessment report, which has been submitted under separate cover.

The assessment indicates that there is no apparent risk of internal property flooding for a design 100-year return period pluvial rainfall event (including 20% climate change allowance).

3.10.4 Sub-Criterion 3.4

The surface water drainage systems, serving the proposed development, have been designed to accommodate the 100-year return period rainfall event (including an allowance of 20% increase in rainfall intensity for climate change) without flooding, so no flood routing off site will be experienced for such a rainfall event.

The performance of the proposed drainage system in 100-year return period storm events (incl. 20% climate change allowance) has been analysed – Refer **Appendix B** for calculations. The analyses show that no flooding will occur in 100-year return period storm events.

Details of the flood risk assessment associated with the proposed development is outlined in the report **U067-OCSC-XX-XX-RP-C-0001**.

This assessment, along with the network design simulation results, from the MicroDrainage Network Analysis, indicates that no internal property flooding will occur in a 100-year return period fluvial flood event (including 20% climate change allowance).

3.11 Criterion 4 – River Flood Protection

As outlined in *Section 3.9*, the surface water runoff from the development's masterplan catchment will be limited to a maximum of **2.4 l/s** (2.0 l/s/ha).

Refer to *Section 3.2.3* and *Section 3.3* for further details on the limiting discharge rates. The *GDSDS Volume 2, Appendix E* states that this practice ensures *"that sufficient stormwater runoff retention is achieved to protect the river during extreme events".*

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

Refer to **Appendix B** for details of hydraulic modelling calculations of attenuation and flow control facilities, as carried out using MicroDrainage software by Innovyze Inc.

3.12 Taking In Charge

All proposed surface water infrastructure installed within the proposed development **is not** to be offered to Dublin City Council to be taken-in-charge. The development area is to remain under private management, with all surface water infrastructure located within private lands.

4 WASTEWATER DRAINAGE

4.1 Overview

All proposed wastewater sewer design has been carried out in accordance with Irish Water's Code of Practice for Wastewater Infrastructure. The existing site is currently brownfield, with an existing combined sewer discharging to the public combined network infrastructure.

A Pre-Connection Enquiry Form *(**IW Ref No. CDS20006559**)* was submitted to Irish Water for a total of 337no. domestic units (this planning application is for a total of 335nr. domestic units plus a creche and 2nr. cafes), with confirmation of feasibility confirmed by return of letter. Refer to **Appendix D** for a copy of the Confirmation of Feasibility letter, as issued on 7th April 2021.

A subsequent Statement of Design Acceptance was issued by Irish Water on 2nd March 2022. A copy of this letter is provided in **Appendix D**.

4.2 Existing Wastewater Drainage

There is no apparent public gravity wastewater infrastructure in the immediate vicinity of the proposed development. However, the Irish Water public drainage records indicated 2no. combined sewers near the site.

Along South Circular Road there is an existing 990x640 brick combined sewer that starts close to the junction of St. James Terrace with South Circular Road towards the east.

The existing 300mm vitrified clay combined sewer on St. James Terrace connects to the 750mm concrete combined sewer on Dolphin's Barn Street that travels toward the north.

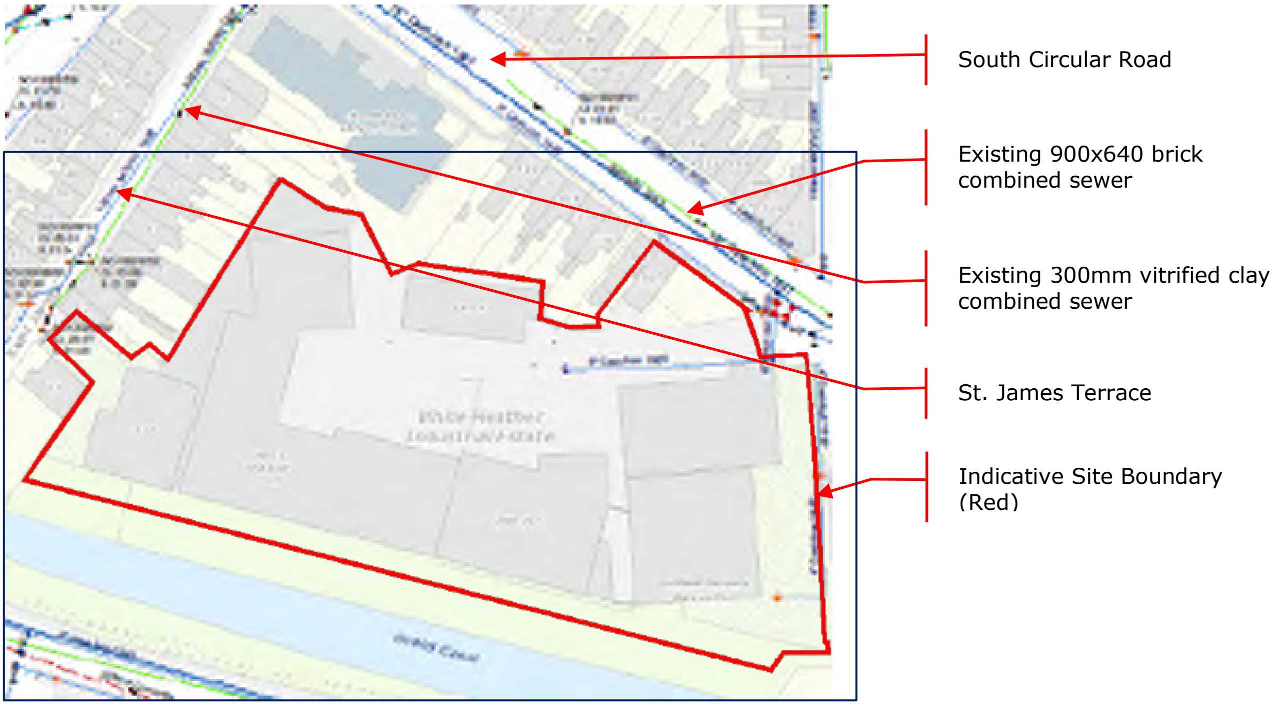


Figure 4.1 – Existing Wastewater Infrastructure (Irish Water Public Records)

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

Irish Water confirmed the wastewater connection from the proposed development to the combined sewer is feasible and subject to upgrades. Refer Confirmation of Feasibility Letter in **Appendix D**.

The comments and conditions noted within the Confirmation of Feasibility Letter are noted, and these works are to be carried out ahead of construction, as required.

4.3 Proposed Wastewater Drainage Network

An independent surface water and wastewater network will be provided as part of this development. However, it is noted that there is no public surface water network in the vicinity of the proposed site. Therefore, it is proposed to combine the surface water and wastewater drainage networks, prior to discharging to the local public 990x640mm combined sewer network at South Circular Road. Refer to *Section 3* for details of the proposed surface water drainage design strategy.

Based on the topography of the existing development, the gravity wastewater network goes from the highest point at the south-western boundary to the north-eastern boundary, the network is to receive the discharge from each apartment block and terrace unit within the proposed development and discharge to the existing 990x640 brick combined sewer on South Circular road.

4.4 Wastewater Network Design Calculations

Wastewater calculations were performed in accordance with *Irish Water's Code of Practice Wastewater Infrastructure, IW-CDS-5030-03* and are included in **Appendix C**. The total peak design flow from the proposed development has been calculated as **11.63 l/s**.

The calculations demonstrate that conveyance capacity is provided for all development within the catchment, the self-cleansing velocity will be achieved with the expected design flow rates and that the flow velocities will not exceed the upper limit of 3.0m/s.

All proposed wastewater infrastructure is to be carried out in accordance with the Building Regulations Part H and Irish Water's Code of Practice for Wastewater Infrastructure.

4.5 Taking In Charge

All new wastewater drainage infrastructure, installed to serve the proposed development **is not** to be offered to Irish Water for to be taken-in-charge.

4.6 Layout

Refer to drawing **U067-OCSC-ZZ-GF-DR-C-0500** for the proposed drainage design layout, which has been designed in accordance with the Irish Water Code of Practice for Wastewater Infrastructure.

5 POTABLE WATER SUPPLY

All proposed potable water design has been carried out in accordance with Irish Water's Code of Practice for Water Infrastructure, IW-CDS-5020-03. The pre-existing site was typically commercial in nature with all water usage sourced directly from the local public water infrastructure.

A Pre-Connection Enquiry Form *(**IW Ref No. CDS20006559**)* was submitted to Irish Water for a total of 337no. domestic units, with confirmation of feasibility confirmed by return of letter. Refer to **Appendix D** for a copy of the Confirmation of Feasibility letter, as issued on 7th April 2021.

A subsequent Statement of Design Acceptance was issued by Irish Water on 2nd March 2022. A copy of this letter is provided in **Appendix D**.

5.1 Existing Watermain Infrastructure

The proposed development area contains a number of existing water mains there is an existing 18" Cast Iron 1927 water main on South Circular Road that crosses Dolphin's Barn Street serving both sides of the road.

Along St. James Terrace, there is a 100mm MOPVC 1998 water main that branches off from the water main on South circular Road and connects to the 150mm ductile iron 1992 water main on Dolphin's Barn Street which in turn connects north to the 18" water main on South Circular Road and south to the 300mm ductile iron 1992 that crosses the Grand Canal.

Finally, there is an existing 6" Cast Iron 1920 water main with a cap that goes into the existing development and serves the industrial warehouse units.

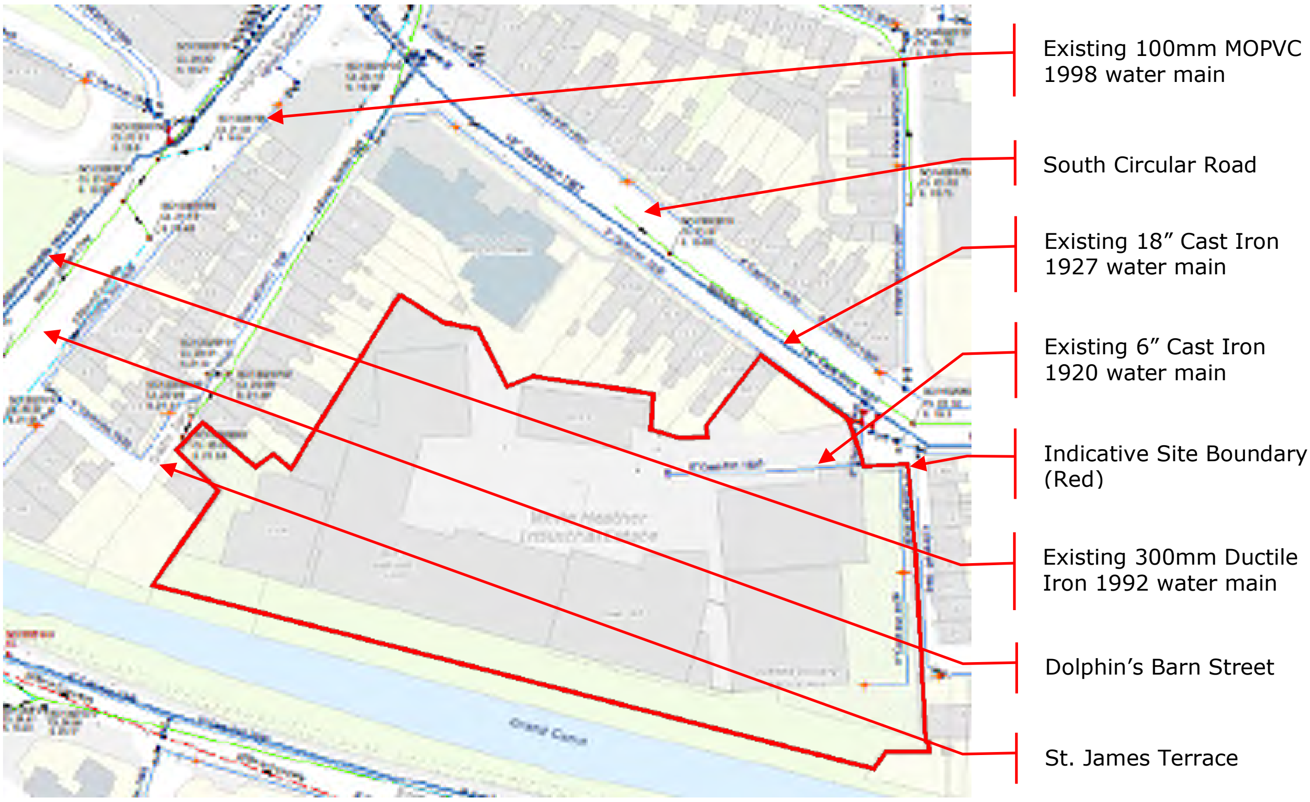


Figure 5.1 – Existing Watermain Infrastructure (Irish Water Public Records)

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

5.2 Connection to the Existing Network

As noted in the returned Confirmation of Feasibility Letter, from Irish Water, it is proposed to provide a 200mm high density polyethylene (HDPE) connection to the existing 150mm ductile iron main in Dolphin's Barn Street. This connection requires an installation of approximately 50m new watermain from the existing main to a new 200mm HDPE main that has to be laid for the connection with installation of a bulk meter and associate telemetry system in order to serve the proposed development.

The proposed connection is to be carried out in accordance with Irish Water's Code of Practice for Water Infrastructure, following agreement with Irish Water.

Refer to ***Figure 5.2*** for the watermain connection as stated in the confirmation of feasibility letter issued by Irish Water, **Appendix D** for a copy of the Confirmation of Feasibility letter and **Appendix A** for further details of existing watermain infrastructure records.

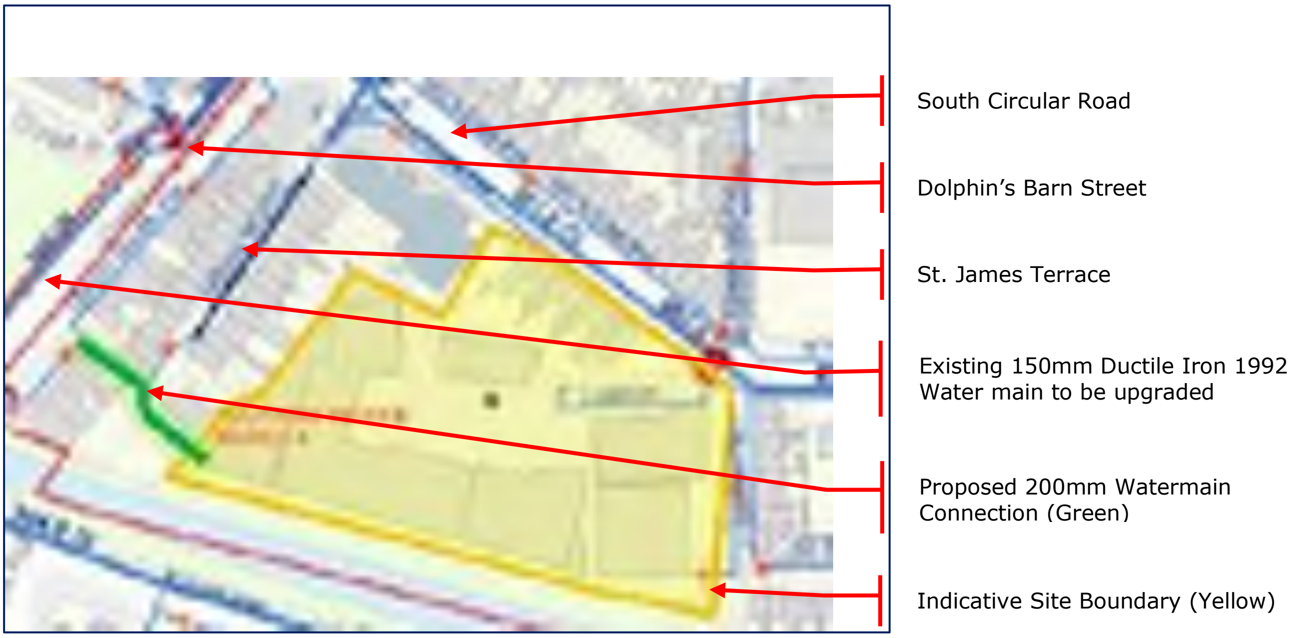


Figure 5.2 – Water Connection (Confirmation of Feasibility)

5.3 Water Saving Devices

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

5.4 Water Meters

A bulk water meter is to be provided at the connection to the public water main, at the development entrance, with individual boundary box meters provided at the connection to each individual terrace property and a bulk meter with a booster pump to be provided at the connection to each apartment block.

5.5 Taking in Charge

All new watermain infrastructure, installed to serve the proposed development after the bulk meter **is** to be offered to Irish Water for to be taken-in-charge.

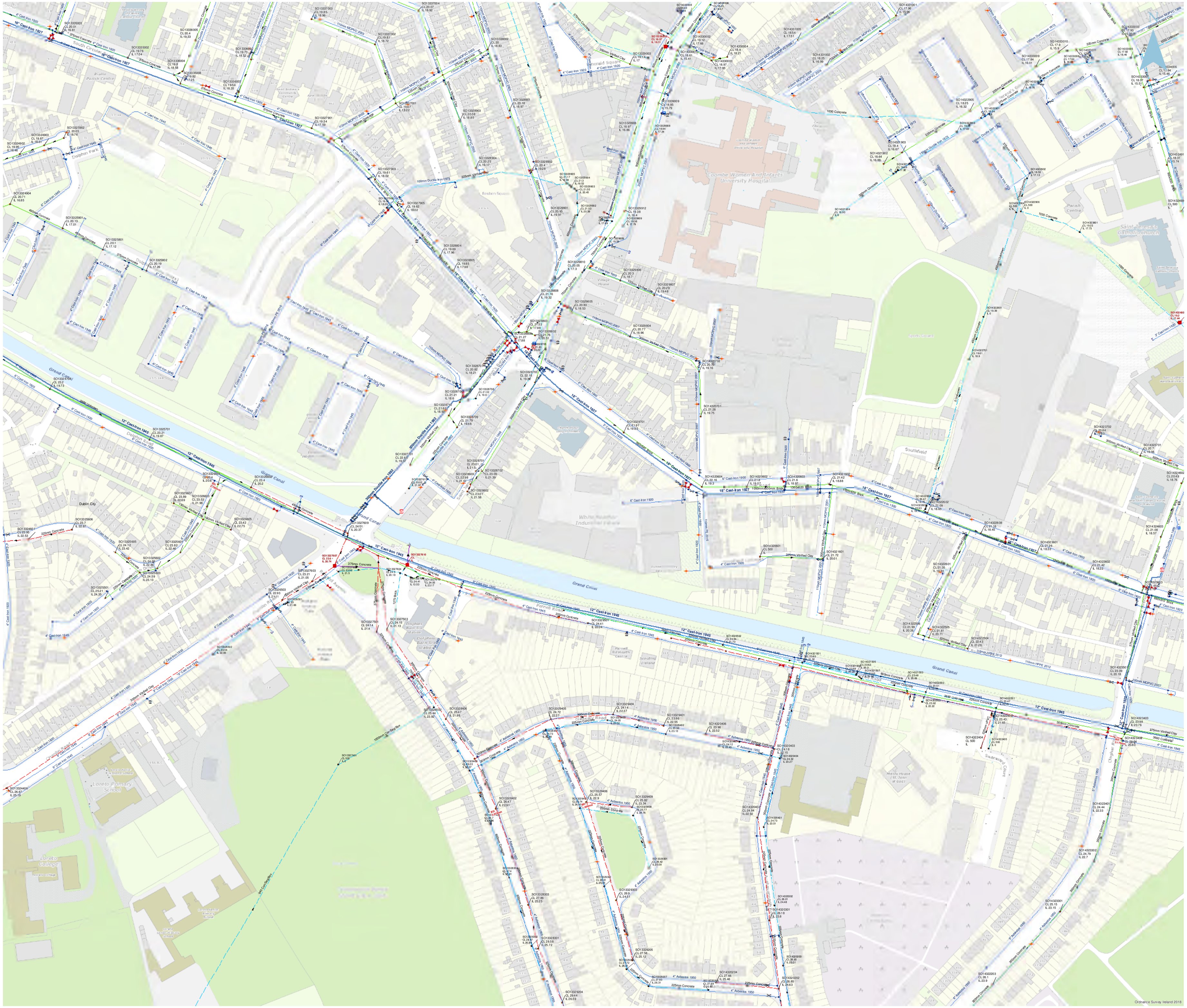
5.6 Layout

Refer to drawing **U067-OCSC-ZZ-GF-DR-C-0550** for the proposed water main design layout, which has been designed in accordance with the Irish Water Code of Practice for Water Infrastructure.

APPENDIX A. DUBLIN CITY COUNCIL AND IRISH WATER PUBLIC RECORDS

Appendix A

Dublin City Council & Irish Water Public Records



UISCE
ÉIREANN : IRISH
WATER

Legend

- Boundary Meter
- Unknown Meter ; Other Meter
- Non-Return
- Sluice Valve Open
- Sluice Valve Closed
- Sluice Valve Open
- Sluice Valve Closed

Water Hydrants

Hydrant Function

- Fire Hydrant
- Water Pump Stations
- Water Kiosk
- Cap
- Other Fittings
- Tap

Water Distribution Mains

Owned By

- Irish Water
- Irish Water
- Irish Water

Sewer Manholes

Manhole Type

- Standard
- Other ; Unknown
- Sewer Chambers
- Gravity - Combined
- Gravity - Foul
- Gravity - Overflow

Storm Manholes

Manhole Type

- Standard
- Other ; Unknown

Storm Discharge Points

Discharge Type

- Outfall
- Surface Gravity Mains

1:1,000 at A0

Last edited:
28/09/2020

Metres

0 25 50 100

2. Whilst every care has been taken in its compilation, Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water.
Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions.This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network 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.

APPENDIX B. SURFACE WATER DESIGN & ATTENUATION CALCULATIONS

- Design Criteria;
- Area Summary;
- Network Design & Results Table;
- Simulation Criteria;
- Hydrobrake / Controls & Storage Design;
- Summary of Results.

Appendix B

Surface Water Design and Attenuation Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes SW PIPE Manhole Sizes MH DCC

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	20.000
M5-60 (mm)	16.500	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	0.750
Ratio R	0.278	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	20	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.000		

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.129	4-8	0.195	8-12	0.000

Total Area Contributing (ha) = 0.324

Total Pipe Volume (m³) = 33.192

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	7.536	0.200	37.7	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.06	21.375	0.000	0.0	0.0	0.0	2.14	85.0	0.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.000	11.921	0.200	59.6	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	10.172	0.200	50.9	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	7.529	0.200	37.6	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	9.809	0.200	49.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	19.152	0.064	300.0	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	7.974	0.100	79.7	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S7.000	10.771	0.100	107.7	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S8.000	9.217	0.100	92.2	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.000	50.00	4.12	21.375	0.000	0.0	0.0	0.0	1.70	67.5	0.0
S3.000	50.00	4.09	21.375	0.000	0.0	0.0	0.0	1.84	73.1	0.0
S4.000	50.00	4.06	21.375	0.000	0.0	0.0	0.0	2.14	85.0	0.0
S5.000	50.00	4.09	21.375	0.000	0.0	0.0	0.0	1.87	74.4	0.0
S1.001	50.00	4.54	21.175	0.035	0.0	0.0	1.0	0.75	29.8	5.8
S6.000	50.00	4.09	21.275	0.000	0.0	0.0	0.0	1.47	58.3	0.0
S7.000	50.00	4.14	21.275	0.000	0.0	0.0	0.0	1.26	50.1	0.0
S8.000	50.00	4.11	21.275	0.000	0.0	0.0	0.0	1.36	54.2	0.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S9.000	7.717	0.100	77.2	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	19.663	0.066	300.0	0.010	0.00	0.0	0.600	o	225	Pipe/Conduit	
S10.000	7.094	0.042	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S11.000	6.146	0.036	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	15.693	0.052	300.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S12.000	4.945	0.029	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S13.000	6.976	0.041	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	24.025	0.080	300.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S9.000	50.00	4.09	21.275	0.000	0.0	0.0	0.0	1.49	59.2	0.0
S1.002	50.00	4.98	21.111	0.045	0.0	0.0	1.2	0.75	29.8	7.3
S10.000	50.00	4.12	21.175	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S11.000	50.00	4.10	21.175	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S1.003	50.00	5.33	21.046	0.045	0.0	0.0	1.2	0.75	29.8	7.3
S12.000	50.00	4.08	21.175	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S13.000	50.00	4.12	21.175	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S1.004	50.00	5.86	20.993	0.045	0.0	0.0	1.2	0.75	29.8	7.3

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S14.000	9.567	0.056	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S15.000	6.987	0.041	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S16.000	7.675	0.045	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S14.001	28.401	0.167	170.1	0.047	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.000	13.538	0.080	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S18.000	10.252	0.060	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S14.002	40.892	0.439	93.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S19.000	10.055	0.059	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S14.000	50.00	4.16	22.175	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S15.000	50.00	4.12	22.175	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S16.000	50.00	4.13	22.175	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S14.001	50.00	4.63	22.119	0.047	0.0	0.0	1.3	1.00	39.7	7.6
S17.000	50.00	4.23	22.175	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S18.000	50.00	4.17	22.175	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S14.002	50.00	5.14	21.952	0.047	0.0	0.0	1.3	1.36	53.9	7.6
S19.000	50.00	4.17	21.775	0.000	0.0	0.0	0.0	1.00	39.8	0.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S20.000	11.432	0.067	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	41.528	0.083	500.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S21.000	9.925	0.300	33.1	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S22.000	18.626	0.300	62.1	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S23.000	5.737	0.034	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S24.000	9.523	0.056	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S25.000	6.515	0.038	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.006	11.299	0.066	170.0	0.068	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S20.000	50.00	4.19	21.775	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S1.005	50.00	7.06	20.913	0.092	0.0	0.0	2.5	0.58	23.0	15.0
S21.000	50.00	4.07	21.775	0.000	0.0	0.0	0.0	2.28	90.8	0.0
S22.000	50.00	4.19	21.775	0.000	0.0	0.0	0.0	1.66	66.1	0.0
S23.000	50.00	4.10	21.375	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S24.000	50.00	4.16	21.375	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S25.000	50.00	4.11	21.825	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S1.006	50.00	4.19	20.830	0.000	1.0	0.0	0.2	1.00	39.8	1.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S26.000	18.815	0.111	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S27.000	6.125	0.100	61.3	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S28.000	13.392	0.100	133.9	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.007	6.480	0.038	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S29.000	10.684	0.100	106.8	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S30.000	10.314	0.100	103.1	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S31.000	6.523	0.100	65.2	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S32.000	6.347	0.100	63.5	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S26.000	50.00	4.31	21.375	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S27.000	50.00	4.06	21.375	0.000	0.0	0.0	0.0	1.67	66.6	0.0
S28.000	50.00	4.20	21.375	0.000	0.0	0.0	0.0	1.13	44.9	0.0
S1.007	50.00	4.42	20.764	0.000	1.0	0.0	0.2	1.00	39.8	1.2
S29.000	50.00	4.14	21.475	0.000	0.0	0.0	0.0	1.26	50.3	0.0
S30.000	50.00	4.13	21.475	0.000	0.0	0.0	0.0	1.29	51.2	0.0
S31.000	50.00	4.07	21.475	0.000	0.0	0.0	0.0	1.62	64.5	0.0
S32.000	50.00	4.06	21.475	0.000	0.0	0.0	0.0	1.64	65.4	0.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S29.001	29.959	0.176	170.0	0.058	0.00	0.0	0.600	o	225	Pipe/Conduit	
S33.000	12.620	0.074	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S34.000	17.912	0.105	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S35.000	6.907	0.041	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S36.000	14.701	0.086	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S29.002	20.893	0.123	170.0	0.002	0.00	0.0	0.600	o	225	Pipe/Conduit	
S37.000	7.937	0.047	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S38.000	2.942	0.017	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S29.001	50.00	4.64	21.375	0.058	0.0	0.0	1.6	1.00	39.8	9.4
S33.000	50.00	4.21	21.375	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S34.000	50.00	4.30	21.375	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S35.000	50.00	4.12	21.375	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S36.000	50.00	4.25	21.375	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S29.002	50.00	4.99	21.199	0.060	0.0	0.0	1.6	1.00	39.8	9.7
S37.000	50.00	4.13	21.375	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S38.000	50.00	4.05	21.375	0.000	0.0	0.0	0.0	1.00	39.8	0.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S29.003	10.035	0.059	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S39.000	7.704	0.045	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S40.000	14.070	0.150	93.8	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S41.000	6.329	0.150	42.2	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S42.000	3.920	0.150	26.1	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S40.001	42.409	0.249	170.0	0.039	0.00	0.0	0.600	o	225	Pipe/Conduit	
S40.002	9.139	0.054	170.0	0.020	0.00	0.0	0.600	o	225	Pipe/Conduit	
S29.004	16.534	0.033	500.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S29.005	11.172	0.066	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S29.003	50.00	5.16	21.076	0.060	0.0	0.0	1.6	1.00	39.8	9.7
S39.000	50.00	4.13	21.475	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S40.000	50.00	4.17	21.425	0.000	0.0	0.0	0.0	1.35	53.7	0.0
S41.000	50.00	4.05	21.425	0.000	0.0	0.0	0.0	2.02	80.3	0.0
S42.000	50.00	4.03	21.425	0.000	0.0	0.0	0.0	2.57	102.2	0.0
S40.001	50.00	4.88	21.275	0.039	0.0	0.0	1.1	1.00	39.8	6.3
S40.002	50.00	5.03	21.026	0.059	0.0	0.0	1.6	1.00	39.8	9.6
S29.004	50.00	5.63	21.017	0.119	0.0	0.0	3.2	0.58	23.0	19.3
S29.005	50.00	4.19	20.984	0.000	1.0	0.0	0.2	1.00	39.8	1.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S29.006	31.592	0.186	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S29.007	8.286	0.049	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.008	19.159	0.113	170.0	0.029	0.00	0.0	0.600	o	225	Pipe/Conduit	
S43.000	5.720	0.034	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.009	22.945	0.135	170.0	0.017	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.010	2.940	0.017	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.011	1.997	0.012	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S29.006	50.00	4.71	20.918	0.000	1.0	0.0	0.2	1.00	39.8	1.2
S29.007	50.00	4.85	20.732	0.000	1.0	0.0	0.2	1.00	39.8	1.2
S1.008	50.00	5.17	20.684	0.029	2.0	0.0	1.2	1.00	39.8	7.0
S43.000	50.00	4.10	21.062	0.000	0.0	0.0	0.0	1.00	39.8	0.0
S1.009	50.00	4.38	20.571	0.000	2.4	0.0	0.4	1.00	39.8	2.4
S1.010	50.00	4.43	20.336	0.000	2.4	0.0	0.5	1.00	39.8	2.9
S1.011	50.00	4.46	20.319	0.000	2.4	0.0	0.5	1.00	39.8	2.9

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.000	0.000	0.000
1.001	Classification	Hardstanding	100	0.035	0.035	0.035
6.000	-	-	100	0.000	0.000	0.000
7.000	-	-	100	0.000	0.000	0.000
8.000	-	-	100	0.000	0.000	0.000
9.000	-	-	100	0.000	0.000	0.000
1.002	Classification	Grass	70	0.014	0.010	0.010
10.000	-	-	100	0.000	0.000	0.000
11.000	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
12.000	-	-	100	0.000	0.000	0.000
13.000	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
14.000	-	-	100	0.000	0.000	0.000
15.000	-	-	100	0.000	0.000	0.000
16.000	-	-	100	0.000	0.000	0.000
14.001	Classification	Hardstanding	100	0.011	0.011	0.011
	Classification	Hardstanding	100	0.036	0.036	0.047
17.000	-	-	100	0.000	0.000	0.000
18.000	-	-	100	0.000	0.000	0.000
14.002	-	-	100	0.000	0.000	0.000
19.000	-	-	100	0.000	0.000	0.000
20.000	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
21.000	-	-	100	0.000	0.000	0.000
22.000	-	-	100	0.000	0.000	0.000
23.000	-	-	100	0.000	0.000	0.000
24.000	-	-	100	0.000	0.000	0.000
25.000	-	-	100	0.000	0.000	0.000
1.006	Classification	Hardstanding	100	0.068	0.068	0.068
26.000	-	-	100	0.000	0.000	0.000
27.000	-	-	100	0.000	0.000	0.000
28.000	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
29.000	-	-	100	0.000	0.000	0.000
30.000	-	-	100	0.000	0.000	0.000
31.000	-	-	100	0.000	0.000	0.000
32.000	-	-	100	0.000	0.000	0.000
29.001	Classification	Hardstanding	100	0.041	0.041	0.041
	Classification	Pervious Paving	80	0.010	0.008	0.049
	Classification	Pervious Paving	80	0.004	0.003	0.052
	Classification	Pervious Paving	80	0.005	0.004	0.056
	Classification	Pervious Paving	80	0.002	0.002	0.058
33.000	-	-	100	0.000	0.000	0.000
34.000	-	-	100	0.000	0.000	0.000
35.000	-	-	100	0.000	0.000	0.000
36.000	-	-	100	0.000	0.000	0.000
29.002	Classification	Pervious Paving	80	0.002	0.002	0.002
37.000	-	-	100	0.000	0.000	0.000
38.000	-	-	100	0.000	0.000	0.000
29.003	-	-	100	0.000	0.000	0.000
39.000	-	-	100	0.000	0.000	0.000
40.000	-	-	100	0.000	0.000	0.000
41.000	-	-	100	0.000	0.000	0.000
42.000	-	-	100	0.000	0.000	0.000
40.001	Classification	Hardstanding	100	0.027	0.027	0.027
	Classification	Pervious Paving	80	0.013	0.010	0.038
	Classification	Pervious Paving	80	0.002	0.001	0.039
40.002	Classification	Hardstanding	100	0.020	0.020	0.020
29.004	-	-	100	0.000	0.000	0.000
29.005	-	-	100	0.000	0.000	0.000
29.006	-	-	100	0.000	0.000	0.000
29.007	-	-	100	0.000	0.000	0.000
1.008	Classification	Pervious Paving	80	0.004	0.003	0.003
	Classification	Hardstanding	100	0.025	0.025	0.029
43.000	-	-	100	0.000	0.000	0.000
1.009	Classification	Hardstanding	100	0.017	0.017	0.017
1.010	-	-	100	0.000	0.000	0.000
1.011	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.336	0.324	0.324

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.011	S	22.100	20.307	20.290	0	0

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S8, DS/PN: S1.006, Volume (m³): 7.2

Unit Reference	MD-SHE-0042-1000-1600-1000	Sump Available	Yes
Design Head (m)	1.600	Diameter (mm)	42
Design Flow (l/s)	1.0	Invert Level (m)	20.830
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	75
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	1.0	Kick-Flo®	0.373	0.5
Flush-Flo™	0.185	0.6	Mean Flow over Head Range	-	0.7

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.6	0.600	0.6	1.600	1.0	2.600	1.2	5.000	1.7	7.500	2.0
0.200	0.6	0.800	0.7	1.800	1.1	3.000	1.3	5.500	1.7	8.000	2.1
0.300	0.6	1.000	0.8	2.000	1.1	3.500	1.4	6.000	1.8	8.500	2.1
0.400	0.5	1.200	0.9	2.200	1.1	4.000	1.5	6.500	1.9	9.000	2.2
0.500	0.6	1.400	0.9	2.400	1.2	4.500	1.6	7.000	2.0	9.500	2.3

Hydro-Brake® Optimum Manhole: S16, DS/PN: S29.005, Volume (m³): 4.1

Unit Reference	MD-SHE-0042-1000-1600-1000	Sump Available	Yes
Design Head (m)	1.600	Diameter (mm)	42
Design Flow (l/s)	1.0	Invert Level (m)	20.984
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	75
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	1.0	Kick-Flo®	0.373	0.5
Flush-Flo™	0.185	0.6	Mean Flow over Head Range	-	0.7

Hydro-Brake® Optimum Manhole: S16, DS/PN: S29.005, Volume (m³): 4.1

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.6	0.600	0.6	1.600	1.0	2.600	1.2	5.000	1.7	7.500	2.0
0.200	0.6	0.800	0.7	1.800	1.1	3.000	1.3	5.500	1.7	8.000	2.1
0.300	0.6	1.000	0.8	2.000	1.1	3.500	1.4	6.000	1.8	8.500	2.1
0.400	0.5	1.200	0.9	2.200	1.1	4.000	1.5	6.500	1.9	9.000	2.2
0.500	0.6	1.400	0.9	2.400	1.2	4.500	1.6	7.000	2.0	9.500	2.3

Hydro-Brake® Optimum Manhole: S20, DS/PN: S1.009, Volume (m³): 4.4

Unit Reference	MD-SHE-0065-2400-1650-2400	Sump Available	Yes
Design Head (m)	1.650	Diameter (mm)	65
Design Flow (l/s)	2.4	Invert Level (m)	20.571
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.650	2.4	Kick-Flo®	0.585	1.5
Flush-Flo™	0.288	1.8	Mean Flow over Head Range	-	1.8

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	0.600	1.5	1.600	2.4	2.600	3.0	5.000	4.0	7.500	4.8
0.200	1.8	0.800	1.7	1.800	2.5	3.000	3.2	5.500	4.2	8.000	5.0
0.300	1.8	1.000	1.9	2.000	2.6	3.500	3.4	6.000	4.4	8.500	5.1
0.400	1.8	1.200	2.1	2.200	2.7	4.000	3.6	6.500	4.5	9.000	5.3
0.500	1.7	1.400	2.2	2.400	2.8	4.500	3.8	7.000	4.7	9.500	5.4

Storage Structures for Storm

Filter Drain Manhole: S2, DS/PN: S1.002

Infiltration Coefficient Base (m/hr)	0.00336	Trench Width (m)	0.6	Slope (1:X)	300.0
Infiltration Coefficient Side (m/hr)	0.00336	Trench Length (m)	19.0	Cap Volume Depth (m)	0.075
Safety Factor	2.0	Pipe Diameter (m)	0.225	Cap Infiltration Depth (m)	0.000
Porosity	0.30	Pipe Depth above Invert (m)	0.075		
Invert Level (m)	21.111	Number of Pipes	1		

Complex Manhole: S3, DS/PN: S1.003

Filter Drain

Infiltration Coefficient Base (m/hr)	0.00336	Trench Width (m)	0.6	Slope (1:X)	300.0
Infiltration Coefficient Side (m/hr)	0.00336	Trench Length (m)	19.6	Cap Volume Depth (m)	0.075
Safety Factor	2.0	Pipe Diameter (m)	0.225	Cap Infiltration Depth (m)	0.000
Porosity	0.30	Pipe Depth above Invert (m)	0.075		
Invert Level (m)	21.045	Number of Pipes	1		

Infiltration Basin

Invert Level (m)	21.949	Infiltration Coefficient Side (m/hr)	0.00336	Porosity	1.00
Infiltration Coefficient Base (m/hr)	0.00336	Safety Factor	2.0		

Depth (m)	**Area (m^2)**	**Depth (m)**	**Area (m^2)**	**Depth (m)**	**Area (m^2)**
0.000	47.0	0.450	111.5	0.650	138.6

Filter Drain Manhole: S4, DS/PN: S1.004

Infiltration Coefficient Base (m/hr)	0.00336	Trench Width (m)	0.6	Slope (1:X)	300.0
Infiltration Coefficient Side (m/hr)	0.00336	Trench Length (m)	15.6	Cap Volume Depth (m)	0.075
Safety Factor	2.0	Pipe Diameter (m)	0.225	Cap Infiltration Depth (m)	0.000
Porosity	0.30	Pipe Depth above Invert (m)	0.075		
Invert Level (m)	20.984	Number of Pipes	1		

Filter Drain Manhole: S6, DS/PN: S14.002

Infiltration Coefficient Base (m/hr)	0.00336	Trench Width (m)	0.6	Slope (1:X)	93.0
Infiltration Coefficient Side (m/hr)	0.00336	Trench Length (m)	40.8	Cap Volume Depth (m)	0.075
Safety Factor	2.0	Pipe Diameter (m)	0.225	Cap Infiltration Depth (m)	0.000
Porosity	0.30	Pipe Depth above Invert (m)	0.075		
Invert Level (m)	21.952	Number of Pipes	1		

Cellular Storage Manhole: S8, DS/PN: S1.006

Invert Level (m)	20.830	Infiltration Coefficient Side (m/hr)	0.00336	Porosity	0.95
Infiltration Coefficient Base (m/hr)	0.00336	Safety Factor	2.0		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	220.0	0.0	1.600	220.0	220.0	1.601	0.0	220.0

Cellular Storage Manhole: S16, DS/PN: S29.005

Invert Level (m)	20.984	Infiltration Coefficient Side (m/hr)	0.00336	Porosity	0.95
Infiltration Coefficient Base (m/hr)	0.00336	Safety Factor	2.0		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	100.0	0.0	1.600	100.0	100.0	1.601	0.0	100.0

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coefficient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 43
Number of Online Controls 3 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 16.500 Cv (Summer) 0.750
Region Scotland and Ireland Ratio R 0.278 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep 2.5 Second Increment (Extended) Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 20, 20, 20

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S1.000	SGR	5760 minute 100 year Winter I+20%	22.800	22.545	0.945	0.000	0.02		2.154	51.304	0.3	1.2	FLOOD RISK
S2.000	SGR	5760 minute 100 year Winter I+20%	22.800	22.544	0.944	0.000	0.01		2.154	16.782	0.1	0.8	FLOOD RISK
S3.000	SGR	5760 minute 100 year Winter I+20%	22.800	22.544	0.944	0.000	0.01		2.154	15.568	0.1	0.8	FLOOD RISK
S4.000	SBR	5760 minute 100 year Winter I+20%	22.800	22.544	0.944	0.000	0.02		2.154	10.650	0.1	1.0	FLOOD RISK
S5.000	SBR	5760 minute 100 year Winter I+20%	22.800	22.544	0.944	0.000	0.01		2.154	10.806	0.1	0.9	FLOOD RISK
S1.001	S1	5760 minute 100 year Winter I+20%	22.600	22.545	1.145	0.000	0.19		4.122	143.414	0.3	5.0	FLOOD RISK
S6.000	SGR	5760 minute 100 year Winter I+20%	22.700	22.544	1.044	0.000	0.01		2.338	27.047	0.1	0.6	FLOOD RISK
S7.000	SGR	5760 minute 100 year Winter I+20%	22.700	22.544	1.044	0.000	0.01		2.338	19.916	0.1	0.5	FLOOD RISK
S8.000	SBR	5760 minute 100 year Winter I+20%	22.700	22.544	1.044	0.000	0.01		2.338	10.434	0.1	0.5	FLOOD RISK
S9.000	SBR	5760 minute 100 year Winter I+20%	22.700	22.544	1.044	0.000	0.01		2.338	2.204	0.0	0.6	FLOOD RISK
S1.002	S2	5760 minute 100 year Winter I+20%	22.600	22.544	1.208	0.000	0.13		4.808	211.433	0.3	3.6	FLOOD RISK
S10.000	SGR	5760 minute 100 year Winter I+20%	22.600	22.544	1.144	0.000	0.02		2.522	40.190	0.2	0.5	FLOOD RISK

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S11.000	SBR	5760 minute 100 year Winter I+20%	22.600	22.544	1.144	0.000	0.01		2.522	8.675	0.0	0.3	FLOOD RISK
S1.003	S3	5760 minute 100 year Winter I+20%	22.600	22.544	1.273	0.000	0.10		56.321	229.509	0.3	2.7	FLOOD RISK
S12.000	SGR	5760 minute 100 year Winter I+20%	22.600	22.546	1.146	0.000	0.02		2.527	24.541	0.1	0.5	FLOOD RISK
S13.000	SBR	5760 minute 100 year Winter I+20%	22.600	22.546	1.146	0.000	0.01		2.527	5.585	0.0	0.3	FLOOD RISK
S1.004	S4	5760 minute 100 year Winter I+20%	22.600	22.556	1.337	0.000	0.09		4.044	254.352	0.4	2.6	FLOOD RISK
S14.000	SGR	5760 minute 100 year Winter I+20%	23.600	22.548	0.148	0.000	0.01		0.680	39.875	0.3	0.4	SURCHARGED
S15.000	SBR	5760 minute 100 year Winter I+20%	23.600	22.548	0.148	0.000	0.01		0.681	6.442	0.0	0.3	SURCHARGED
S16.000	SBR	5760 minute 100 year Winter I+20%	23.600	22.548	0.148	0.000	0.01		0.681	5.004	0.0	0.3	SURCHARGED
S14.001	S5	5760 minute 100 year Winter I+20%	23.600	22.549	0.205	0.000	0.02		1.587	110.547	0.5	0.8	SURCHARGED
S17.000	SGR	5760 minute 100 year Winter I+20%	23.600	22.547	0.147	0.000	0.01		0.678	18.199	0.1	0.3	SURCHARGED
S18.000	SBR	5760 minute 100 year Winter I+20%	23.600	22.547	0.147	0.000	0.01		0.678	13.978	0.1	0.3	SURCHARGED
S14.002	S6	5760 minute 100 year Winter I+20%	23.600	22.551	0.374	0.000	0.02		3.562	138.921	0.7	1.1	SURCHARGED
S19.000	SGR	5760 minute 100 year Winter I+20%	23.200	22.547	0.547	0.000	0.01		1.419	18.030	0.1	0.2	SURCHARGED
S20.000	SBR	5760 minute 100 year Winter I+20%	23.200	22.547	0.547	0.000	0.01		1.419	9.690	0.1	0.2	SURCHARGED
S1.005	S7	5760 minute 100 year Winter I+20%	23.200	22.556	1.418	0.000	0.16		6.249	419.695	0.3	3.5	SURCHARGED
S21.000	SGR	5760 minute 100 year Winter I+20%	23.200	22.548	0.548	0.000	0.00		1.421	34.973	0.3	0.3	SURCHARGED
S22.000	SGR	5760 minute 100 year Winter I+20%	23.200	22.547	0.547	0.000	0.01		1.419	60.015	0.4	0.4	SURCHARGED
S23.000	SGR	5760 minute 100 year Winter I+20%	22.800	22.549	0.949	0.000	0.01		2.163	29.044	0.2	0.2	FLOOD RISK
S24.000	SBR	5760 minute 100 year Winter I+20%	22.800	22.549	0.949	0.000	0.01		2.162	11.516	0.1	0.2	FLOOD RISK
S25.000	SBR	5760 minute 100 year Winter I+20%	22.800	22.550	0.500	0.000	0.01		1.331	6.920	0.1	0.2	FLOOD RISK
S1.006	S8	5760 minute 100 year Winter I+20%	22.900	22.555	1.500	0.000	0.03		340.978	480.970	0.4	0.9	SURCHARGED
S26.000	SGR	1440 minute 100 year Winter I+20%	22.800	22.102	0.502	0.000	0.02		1.336	21.734	0.5	0.6	SURCHARGED
S27.000	SBR	1440 minute 100 year Winter I+20%	22.800	22.101	0.501	0.000	0.00		1.334	4.447	0.1	0.1	SURCHARGED
S28.000	SBR	1440 minute 100 year Winter I+20%	22.800	22.102	0.502	0.000	0.00		1.335	6.779	0.2	0.2	SURCHARGED
S1.007	S9	1440 minute 100 year Winter I+20%	22.700	22.102	1.113	0.000	0.04		4.223	130.850	0.4	1.1	SURCHARGED
S29.000	SGR	2880 minute 100 year Winter I+20%	22.800	22.535	0.835	0.000	0.01		1.952	21.732	0.3	0.3	FLOOD RISK
S30.000	SGR	2880 minute 100 year Winter I+20%	22.800	22.535	0.835	0.000	0.00		1.952	14.829	0.2	0.2	FLOOD RISK
S31.000	SBR	2880 minute 100 year Winter I+20%	22.800	22.535	0.835	0.000	0.00		1.951	6.449	0.1	0.1	FLOOD RISK
S32.000	SBR	2880 minute 100 year Winter I+20%	22.800	22.535	0.835	0.000	0.00		1.951	5.473	0.1	0.1	FLOOD RISK
S29.001	S10	2880 minute 100 year Winter I+20%	22.800	22.535	0.935	0.000	0.04		3.267	106.706	0.5	1.4	FLOOD RISK
S33.000	SGR	2880 minute 100 year Winter I+20%	22.800	22.534	0.934	0.000	0.01		2.135	25.027	0.3	0.3	FLOOD RISK
S34.000	SGR	2880 minute 100 year Winter I+20%	22.800	22.534	0.934	0.000	0.01		2.135	21.899	0.2	0.3	FLOOD RISK
S35.000	SBR	2880 minute 100 year Winter I+20%	22.800	22.534	0.934	0.000	0.01		2.135	14.340	0.1	0.2	FLOOD RISK
S36.000	SBR	2880 minute 100 year Winter I+20%	22.800	22.534	0.934	0.000	0.00		2.135	1.301	0.0	0.0	FLOOD RISK
S29.002	S11	2880 minute 100 year Winter I+20%	22.800	22.535	1.111	0.000	0.06		5.456	167.165	0.5	2.1	FLOOD RISK
S37.000	SGR	2880 minute 100 year Winter I+20%	22.800	22.533	0.933	0.000	0.00		2.133	10.518	0.1	0.1	FLOOD RISK

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S38.000	SBR	2880 minute 100 year Winter I+20%	22.800	22.533	0.933	0.000	0.00		2.133	1.450	0.0	0.1	FLOOD RISK
S29.003	S12	2880 minute 100 year Winter I+20%	22.800	22.533	1.233	0.000	0.06		3.788	177.236	0.4	2.1	FLOOD RISK
S39.000	SBR	2880 minute 100 year Winter I+20%	22.900	22.533	0.833	0.000	0.00		1.947	0.600	0.0	0.1	SURCHARGED
S40.000	SGR	2880 minute 100 year Winter I+20%	22.850	22.533	0.883	0.000	0.00		2.040	12.556	0.1	0.2	SURCHARGED
S41.000	SGR	2880 minute 100 year Winter I+20%	22.850	22.533	0.883	0.000	0.00		2.041	20.407	0.2	0.3	SURCHARGED
S42.000	SGR	2880 minute 100 year Winter I+20%	22.850	22.533	0.883	0.000	0.00		2.041	16.461	0.2	0.2	SURCHARGED
S40.001	S13	2880 minute 100 year Winter I+20%	22.700	22.533	1.033	0.000	0.03		3.123	88.710	0.5	1.1	FLOOD RISK
S40.002	S14	2880 minute 100 year Winter I+20%	22.800	22.533	1.282	0.000	0.04		4.411	107.498	0.1	1.4	FLOOD RISK
S29.004	S15	2880 minute 100 year Winter I+20%	22.900	22.533	1.291	0.000	0.20		3.784	284.074	0.2	3.5	SURCHARGED
S29.005	S16	2880 minute 100 year Winter I+20%	22.900	22.531	1.322	0.000	0.02		150.423	220.140	0.4	0.8	SURCHARGED
S29.006	S17	1440 minute 100 year Winter I+20%	22.750	22.103	0.960	0.000	0.02		2.572	107.855	0.5	0.8	SURCHARGED
S29.007	S18	1440 minute 100 year Winter I+20%	22.700	22.101	1.144	0.000	0.03		3.725	105.827	0.4	0.9	SURCHARGED
S1.008	S19	1440 minute 100 year Winter I+20%	22.700	22.101	1.192	0.000	0.06		3.091	259.822	0.5	2.0	SURCHARGED
S43.000	SGR	1440 minute 100 year Winter I+20%	22.600	22.097	0.810	0.000	0.01		1.905	17.470	0.3	0.4	SURCHARGED
S1.009	S20	1440 minute 100 year Winter I+20%	22.450	22.097	1.301	0.000	0.06		3.694	289.571	0.5	2.3	SURCHARGED
S1.010	S21	1440 minute 100 year Winter I+20%	22.200	20.380	-0.181	0.000	0.09		0.072	289.519	0.4	2.3	OK
S1.011	S22	1440 minute 100 year Winter I+20%	22.200	20.361	-0.183	0.000	0.08		0.076	289.429	0.4	2.3	OK

APPENDIX C. WASTEWATER CALCULATIONS & DESIGN NETWORK TABLES

- As per Irish Water Code of Practice for Wastewater Infrastructure, IW-CDS-5030-03
- Network Design Tables

Appendix C

Wastewater Calculations & Design Network Tables

JOB NAME:	JOB NO:	DATE:
White Heather, Dolphins Barn, Dublin 4	U067	04.02.2021
TITLE:	CALCS BY:	CHECKED:
Wastewater Design Calculations	AB	MK

OCSC O'CONNOR | SUTTON | CRONIN Multidisciplinary Consulting Engineers

Zone	Area (m^2)	No. of Units (nr)	Area/person (m^2)	Occupancy (nr/unit)	Population Equivalent	Flow (l/unit/day)	Infiltration Allowance (% of flow)	Total Flow (m^3/day)	DWF (l/s)	Peak Factor for Pipe Sizing	Peak Flow (l/s)
Pembroke Park											
Domestic											
Houses/ Apartments		342		2.7	923.4	150	10%	152.4	1.76		10.58
Total Domestic		**342**			**923**			**152.4**	**1.76**	**4.5**	**7.94**
Non-Domestic											
Retail	n/a										
Restaurants	n/a										
Café/Bars	n/a										
Retail shops	n/a										
Retail shops	n/a										
Office/Work Space	n/a										
Hotel	n/a										
Créche	n/a										
TOTAL Non-Domestic	**0**				**0**			**0.0**	**0.00**	**6.0**	**0.00**
TOTAL FLOW	**0**	**342**			**923**		**0**	**152.4**	**1.76**		**7.94**

Residential Occupancy rates from Appendix C of IW Code of Practice for Wastewater Infrastructure, July 2020 (IW-CDS-5030-03)
Flow rates from Appendix D of IW Code of Practice for Wastewater Infrastructure, July 2020 (IW-CDS-5030-03)
Infiltration rates from Appendix C of IW Code of Practice for Wastewater Infrastructure, July 2020 (IW-CDS-5030-03)
Peaking Factor from Appendix C of IW Code of Practice for Wastewater Infrastructure, July 2020 (IW-CDS-5030-03)

FOUL SEWERAGE DESIGN

Design Criteria for Foul - Main

Pipe Sizes WW PIPE Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Domestic (l/s/ha)	0.00	Maximum Backdrop Height (m)	2.000
Industrial Peak Flow Factor	0.00	Domestic Peak Flow Factor	4.50	Min Design Depth for Optimisation (m)	1.200
Flow Per Person (l/per/day)	150.00	Add Flow / Climate Change (%)	10	Min Vel for Auto Design only (m/s)	0.75
Persons per House	2.70	Minimum Backdrop Height (m)	0.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
WW1.000	14.690	0.073	200.0	0.000	32	0.0	1.500	o	225	Pipe/Conduit	
WW2.000	19.464	0.097	200.0	0.000	12	0.0	1.500	o	225	Pipe/Conduit	
WW1.001	8.745	0.044	200.0	0.000	10	0.0	1.500	o	225	Pipe/Conduit	
WW1.002	22.881	0.114	200.0	0.000	20	0.0	1.500	o	225	Pipe/Conduit	
WW1.003	65.460	0.327	200.0	0.000	111	0.0	1.500	o	225	Pipe/Conduit	
WW1.004	9.121	0.046	200.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
WW1.000	21.825	0.000	0.0	32	0.1	24	0.33	0.81	32.2	0.7
WW2.000	21.825	0.000	0.0	12	0.0	15	0.24	0.81	32.2	0.3
WW1.001	21.728	0.000	0.0	54	0.1	30	0.39	0.81	32.2	1.3
WW1.002	21.684	0.000	0.0	74	0.2	36	0.43	0.81	32.2	1.7
WW1.003	21.570	0.000	0.0	185	0.4	56	0.56	0.81	32.2	4.3
WW1.004	21.242	0.000	0.0	185	0.4	56	0.56	0.81	32.2	4.3

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
WW3.000	44.969	0.225	199.9	0.000	40	0.0	1.500	o	225	Pipe/Conduit	
WW3.001	8.884	0.044	200.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
WW1.005	37.880	0.189	200.0	0.000	25	0.0	1.500	o	225	Pipe/Conduit	
WW1.006	8.703	0.044	200.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
WW4.000	32.796	0.164	200.0	0.000	40	0.0	1.500	o	225	Pipe/Conduit	
WW4.001	19.834	0.099	200.0	0.000	15	0.0	1.500	o	225	Pipe/Conduit	
WW4.002	14.085	0.070	200.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
WW5.000	28.924	0.145	200.0	0.000	32	0.0	1.500	o	225	Pipe/Conduit	
WW4.003	32.921	0.165	200.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
WW4.004	13.349	0.067	200.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
WW3.000	22.225	0.000	0.0	40	0.1	26	0.35	0.81	32.2	0.9
WW3.001	22.000	0.000	0.0	40	0.1	27	0.35	0.81	32.2	0.9
WW1.005	21.197	0.000	0.0	250	0.5	65	0.61	0.81	32.2	5.8
WW1.006	21.007	0.000	0.0	250	0.5	65	0.61	0.81	32.2	5.8
WW4.000	21.525	0.000	0.0	40	0.1	27	0.35	0.81	32.2	0.9
WW4.001	21.361	0.000	0.0	55	0.1	31	0.39	0.81	32.2	1.3
WW4.002	21.262	0.000	0.0	55	0.1	31	0.39	0.81	32.2	1.3
WW5.000	21.425	0.000	0.0	32	0.1	24	0.33	0.81	32.2	0.7
WW4.003	21.191	0.000	0.0	87	0.2	38	0.45	0.81	32.2	2.0
WW4.004	21.027	0.000	0.0	87	0.2	38	0.45	0.81	32.2	2.0

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
WW1.007	8.957	0.045	200.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
WW1.007	20.307	0.000	0.0	337	0.7	76	0.67	0.81	32.2	7.8

APPENDIX D. IRISH WATER CORRESPONDENCE

Appendix D

Irish Water Correspondence

Mark Killian

9 Prussia Street
Stoneybatter
Dublin 7
D07KT57

7 April 2021

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

Re: CDS20006559 pre-connection enquiry - Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 376 units at White Heather Industrial Estate, Dolphins Barn, Dublin 8, Co. Dublin

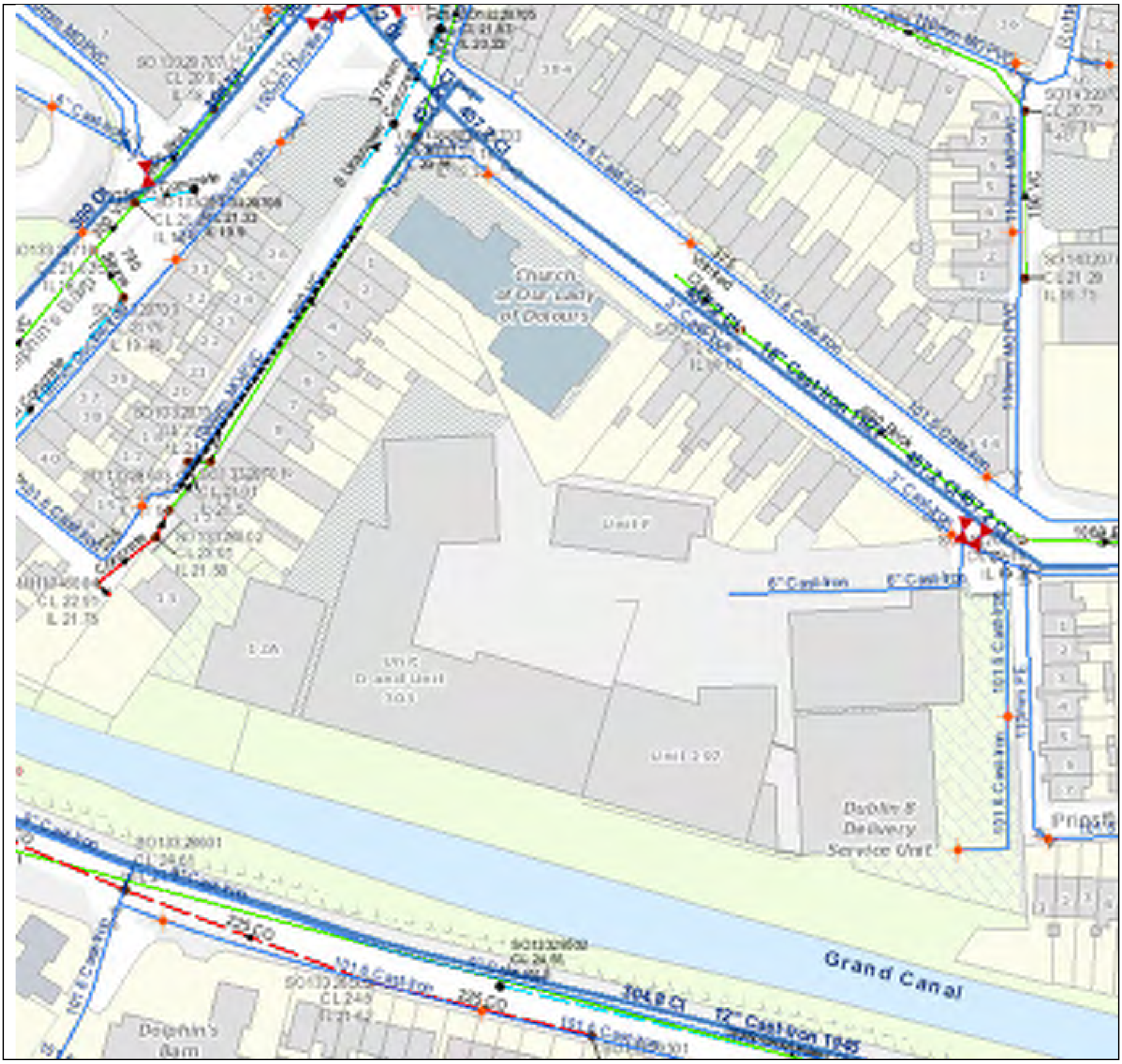
Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at White Heather Industrial Estate, Dolphins Barn, Dublin 8, Co. Dublin (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	**OUTCOME OF PRE-CONNECTION ENQUIRY** **THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.**
Water Connection	Feasible Subject to upgrades
Wastewater Connection	Feasible Subject to following conditions
SITE SPECIFIC COMMENTS	
Water Connection	The connection should be made to the existing 150mm DI main in Dolphin’s Barn Street. Approximately 50m of a new 200mm ID pipe has to be laid for the connection (see green line in figure below) with installation of a bulk meter and associated telemetry system. The Applicant will be required to fund the upgrade works and be responsible for any 3rd party consents related to the connection.

	On site water storage will be required for the average day peak week demand rate of the commercial section for 24-hour period with a re-fill time of 12 hours. 
Wastewater Connection	The Development has to incorporate Sustainable Drainage Systems/ Attenuation in the management of stormwater and to reduce surface and storm water inflow into the receiving combined sewer. Storm water discharge is limited to 2l/s/ha for a 1 in 100-year storm event. A report regarding the current storm connection and contributing surface water area, verified by independent surveys, should be provided at a connection application stage and before any existing infrastructure is demolished.
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 that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.	

The map included below outlines the current Irish Water infrastructure adjacent to your site:



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Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network 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.

General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**
2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.
3) The feedback provided is subject to a Connection Agreement/contract being signed at a later date.
4) A Connection Agreement will be required to commencing the connection works associated with the enquiry this can be applied for at https://www.water.ie/connections/get-connected/
5) A Connection Agreement cannot be issued until all statutory approvals are successfully in place.
6) Irish Water Connection Policy/ Charges can be found at https://www.water.ie/connections/information/connection-charges/
7) Please note the Confirmation of Feasibility does not extend to your fire flow requirements.
8) Irish Water is not responsible for the management or disposal of storm water or ground waters. You are advised to contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges
9) To access Irish Water Maps email datarequests@water.ie
10) All works to the Irish Water infrastructure, including works in the Public Space, shall have to be carried out by Irish Water.

If you have any further questions, please contact Marina Byrne from the design team via email mzbyrne@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,

Yvonne Harris

Yvonne Harris

Head of Customer Operations

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

Mark Killian
9 Prussia Street
Stoneybatter
Dublin 7
D07KT57

2 March 2022

Re: Design Submission for White Heather Industrial Estate, Dolphins Barn, Dublin 8, Co. Dublin (the "Development")
(the "Design Submission") / Connection Reference No: CDS20006559

Dear Mark Killian,

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: Dario Alvarez
Email: dalvarez@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

- [U067-OCSC-ZZ-GF-DR-C-0500-S3-P03]
- [U067-OCSC-ZZ-GF-DR-C-0550-S3-P04]
- [U067-OCSC-XX-GF-DR-C-0515-S2-P01]

Standard Details/Code of Practice Exemption:

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 should have 3 m clearance from the proposed building.*

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

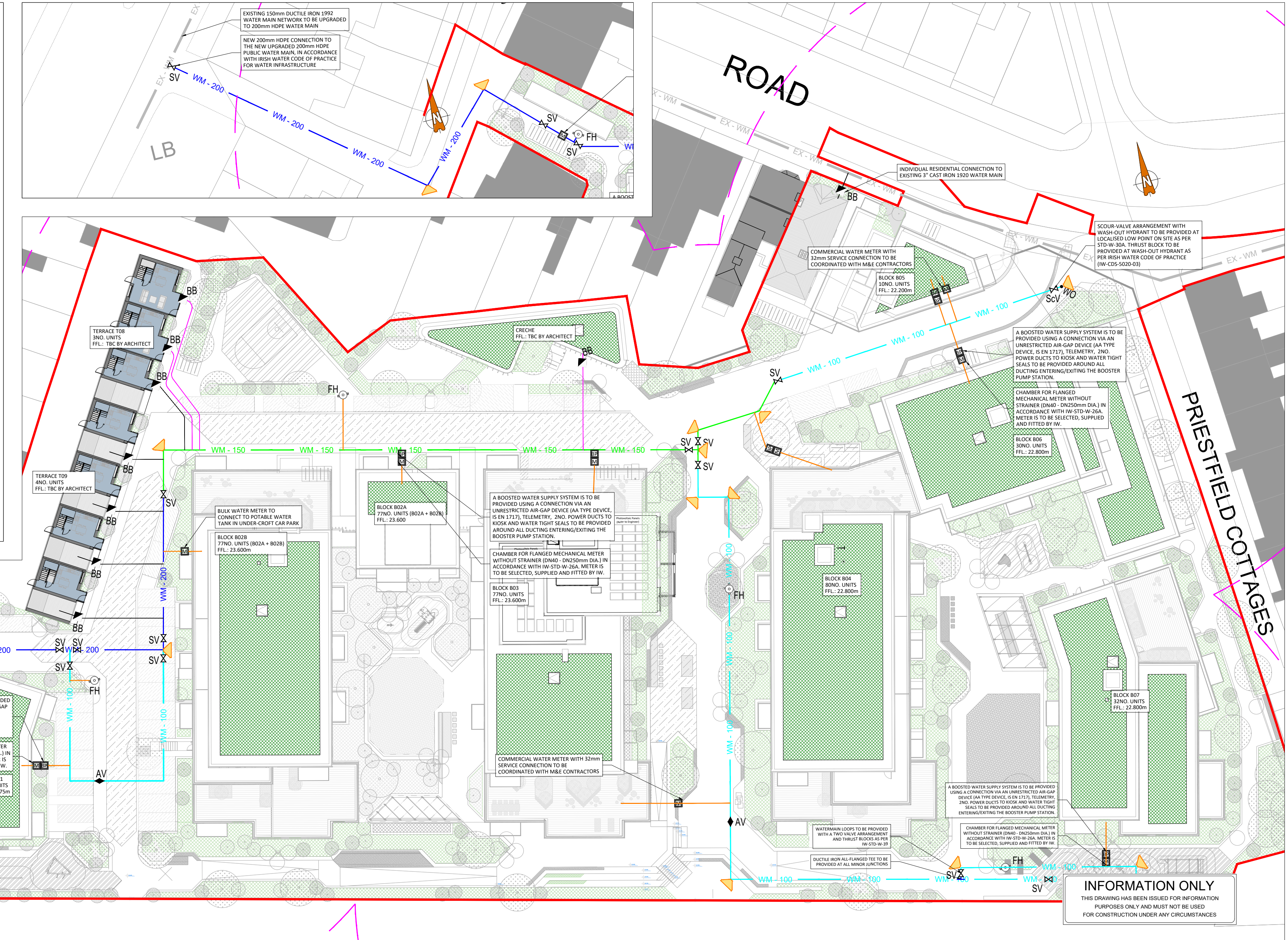
Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Irish Water will not, in any way, render Irish Water liable for any elements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

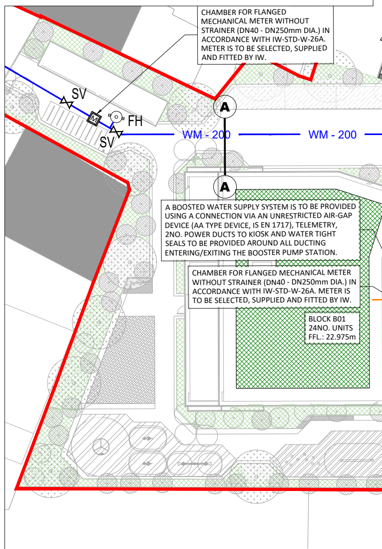
LEGEND:

PROPOSED 200mmØ HDPE WATER MAIN (STD-W-11 / 13)	WM - 200
PROPOSED 150mmØ HDPE WATER MAIN (STD-W-11 / 13)	WM - 150
PROPOSED 100mmØ HDPE WATERMAIN (STD-W-11 / 13)	WM - 100
PROPOSED 25mmØ SERVICE CONNECTION	
PROPOSED 32mmØ SERVICE CONNECTION	
PROPOSED SERVICE CONNECTION 80mm HDPE (STD-W-03)	
EXISTING WATERMAIN	EX - WM
FIRE HYDRANT COVERAGE AREA	
PROPOSED BULK METER (STD-W-26 / 26A)	M
PROPOSED BOOSTER PUMP STATION (STD-W-25)	BP
PROPOSED FIRE HYDRANT -STD-W-18)	FH
PROPOSED SLUICE VALVE (STD-W-15)	SV
PROPOSED SCOUR VALVE (STD-W-30)	SV
PROPOSED SCOUR VALVE (STD-W-30)	ScV
PROPOSED WASHOUT HYDRANT (STD-W-30A)	WO
PROPOSED AIR VALVE (STD-W-22)	AV
PROPOSED BOUNDARY BOX (STD-W-03)	BB
PROPOSED THRUST BLOCK (IW-STD-W-28)	

NOTES

1. ALL NOTED LEVELS ARE TO ORDNANCE DATUM, MALIN HEAD.
2. REFER TO ARCHITECT'S LAYOUT FOR ALL SET-OUT INFORMATION.
3. REFER TO ARCHITECT / LANDSCAPE ARCHITECT'S DESIGN DRAWINGS FOR DETAILS OF PROPOSED SURFACE FINISHES AND LANDSCAPING.
4. ALL WATER INFRASTRUCTURE IS TO BE INSTALLED IN ACCORDANCE WITH THE IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE, THE SITE DEVELOPMENT SPECIFICATION AND TO THE LOCAL AUTHORITY'S SATISFACTION.
5. THE DEPTH OF COVER, FROM THE FINISHED GROUND LEVEL TO THE EXTERNAL CROWN OF THE WATERMAIN SHALL TYPICALLY BE 1200mm, WITH A MINIMUM DEPTH OF 900mm TO COMPLY WITH REQUIREMENTS OF 3.11 OF IRISH WATER CODE OF PRACTICE.
6. SERVICE CONNECTIONS SHALL HAVE A DESIRABLE MINIMUM DEPTH OF 750mm TO BE IN ACCORDANCE WITH STD-W-02/ 03.
7. AIR VALVES TO BE PROVIDED AT ALL HIGH POINTS IN NEW WATER MAIN.
8. SCOUR VALVES TO BE LOCATED AT ALL SAG POINTS IN NEW WATER MAIN.
9. MARKER PLATES, IN ACCORDANCE WITH IRISH WATER REQUIREMENTS, TO BE PROVIDED FOR ALL NEW WATERMAIN FITTINGS.
10. ANCHOR/THRUST BLOCKS SHALL BE PROVIDED ON WATER MAINS AT DEAD ENDS, AT TEE JUNCTIONS, AT BENDS OF CURVATURE GREATER THAN 11.25 DEGREES, AT END CAPS, AT BOTH SIDES OF SLUICE VALVE CHAMBERS, AT ANY ABRUPT CHANGE IN VERTICAL OR HORIZONTAL DIRECTION, AND AT ANY LOCATION WHERE WATER PRESSURE IS LIKELY TO DISTORT THE PIPE LINE INSTALLATION OR CAUSE DISPROPORTIONATE MOVEMENT TO BE IN ACCORDANCE WITH STD-W-28.
11. PLASTIC AND POLYETHYLENE PIPES SHALL BE WRAPPED IN PLASTIC SHEETING HAVING A COMPOSITION IN ACCORDANCE WITH BS 6076 BEFORE BEING CAST AGAINST OR INTO ANCHOR/THRUST BLOCKS.
12. THE CONTRACTOR IS TO VERIFY DEPTH AT PROPOSED CONNECTION TO EXISTING NETWORK, PRIOR TO ANY OTHER WORKS BEING CARRIED OUT, AND MAKE ANY DISCREPANCIES KNOWN TO THE ENGINEER.
13. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMATION OF PRESENCE ALL EXISTING UTILITIES, IF ANY, ALONG ROUTE OF PROPOSED WATERMAIN NETWORK - BY INTRUSIVE INVESTIGATION OR EQUAL.
14. WATER MAIN "T" JUNCTIONS TO BE IN ACCORDANCE WITH THE STANDARD DETAIL STD-W-07.
15. METERS SHALL BE SUPPLIED AND FITTED BY IRISH WATER AND INSTALLED IN METER BOUNDARY BOXES OR METER CHAMBERS TO IRISH WATER REQUIREMENTS AND BE COMPATIBLE WITH THE AUTOMATIC METER READING (AMR) SYSTEM.
16. ALL WATERMAIN INFRASTRUCTURE IS TO BE INSTALLED AS PER IW-STD-W-12/ IW-STD-W-12A TO REDUCE THE RISK OF ROOT INGRESS ON ANY INFRASTRUCTURE





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-
- ANY DISCREPANCIES NOTICED SHOULD BE DISCUSSED AND CLARIFIED PRIOR TO PROCEEDING.

Rev No.	Date	Revision Note	Drn by	Chkd by
P01	30.04.21	SUITABLE FOR INFORMATION	AB	MK
P02	06.05.21	UPDATED WATER MAIN NETWORK	AB	MK
P03	24.02.22	REVISED AS PER IW COMMENTS	EH	MK
P04	01.03.22	REVISED AS PER IW COMMENTS	EH	MK

Rev No.	Date	Revision Note	Drn by	Chkd by

ENVIRONMENT ISO 14001:2015 NSAI Certified
QUALITY ISO 9001:2015 NSAI Certified
HEALTH & SAFETY OHSAS 18001:2007 NSAI Certified
bsi. BIM Verified Design & Construction Capital/Delivery PAS 1192-2

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Client: U AND I (WHITE HEATHER) LIMITED
Project: WHITE HEATHER
SOUTH CIRCULAR ROAD
Title: WATERMAIN DESIGN LAYOUT

Code	Originator	Zone	Level	Type	Role	Number	Status	Revision
U067	OCSC	ZZ	GF	DR	C	0550	S3	P04

Date: APR'21 Scale: 1:250 @ A1 Drn by:AB Chkd by:MK Aprvd by:AH

SURFACE WATER LEGEND:

- SURFACE WATER DRAINAGE PIPE uPVC TWINWALL OR SIMILAR APPROVED
- PERFORATED SURFACE WATER DRAINAGE PIPE uPVC TWINWALL OR SIMILAR APPROVED
- 150mmØ SURFACE WATER DRAINAGE SERVICE CONNECTION
- 1360X1360mm IN SITU SURFACE WATER MANHOLE
- 150mmØ PLANTER OVERFLOW PIPE
- TRAPPED ROAD GULLY
- PERMEABLE PAVING
- GREEN ROOF
- RAIN GARDEN
- PLUVIALCUBE GEOCELLULAR ATTENUATION SYSTEM OR SIMILAR APPROVED
- KLARGESTER BYPASS FUEL SEPARATOR CLASS 1 NSBP003 OR SIMILAR APPROVED

WASTEWATER LEGEND:

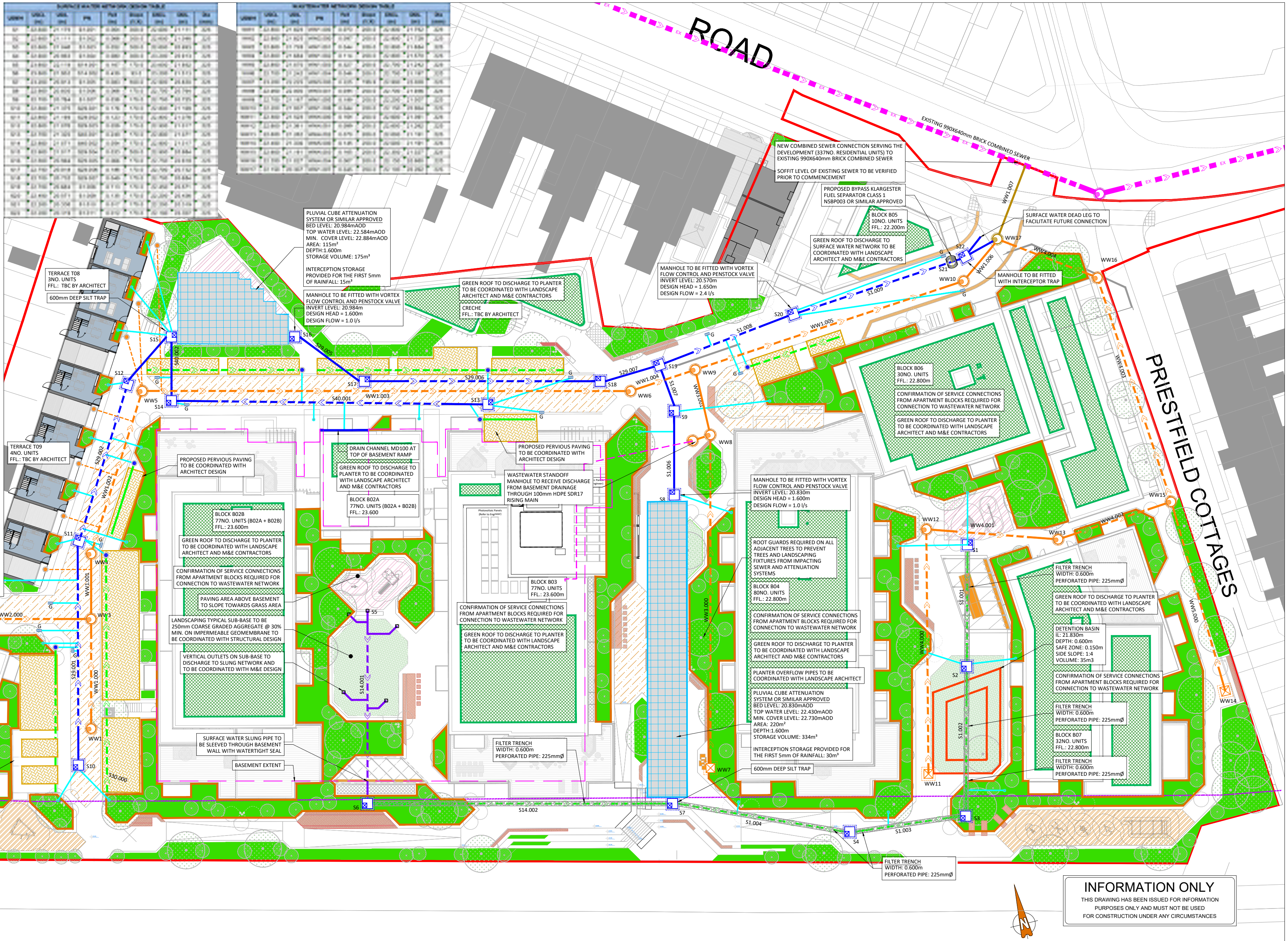
- WASTEWATER DRAINAGE PIPE uPVC SN8 OR SIMILAR APPROVED
- 1200mmØ WASTEWATER PRECAST MANHOLE
- 600X600mm WASTEWATER INSPECTION CHAMBER
- WASTEWATER INSPECTION CHAMBER WITH 150mmØ PRIVATE CONNECTION HDPE PIPE
- EXISTING 990x640mm BRICK COMBINED SEWER
- EXISTING COMBINED SEWER MANHOLE

GENERAL NOTES:

1. ALL NOTED LEVELS ARE TO ORDNANCE DATUM, MALIN HEAD.
2. REFER TO ARCHITECT'S LAYOUT FOR ALL SET-OUT INFORMATION.
3. REFER TO ARCHITECT / LANDSCAPE ARCHITECT'S DESIGN DRAWINGS FOR DETAILS OF PROPOSED SURFACE FINISHES AND LANDSCAPING.
4. ALL SURFACE WATER DRAINAGE IS TO BE INSTALLED IN ACCORDANCE WITH THE GREATER DUBLIN REGION CODE OF PRACTICE FOR DRAINAGE WORKS, THE BUILDING REGULATIONS PART H AND THE SITE DEVELOPMENT SPECIFICATION.
5. ALL WASTEWATER DRAINAGE IS TO BE INSTALLED IN ACCORDANCE WITH THE IRISH WATER CODE OF PRACTICE FOR WASTEWATER INFRASTRUCTURE, THE BUILDING REGULATIONS PART H AND THE SITE DEVELOPMENT SPECIFICATION.
6. ALL DRAINAGE COVER LEVELS ARE TO BE COORDINATED WITH THE PROPOSED ROAD DESIGN LEVELS AND ARCHITECT DESIGN FINISH DETAILS.
7. ALL CONNECTIONS TO NEW DRAINAGE NETWORKS ARE TO BE MADE AT AN ANGLE OF 90° OR IN THE DIRECTION OF FLOW.
8. THE CONTRACTOR IS TO VERIFY INVERT LEVEL AT PROPOSED CONNECTION TO EXISTING SEWERS, PRIOR TO ANY OTHER WORKS BEING CARRIED OUT, AND MAKE ANY DISCREPANCIES KNOWN TO THE ENGINEER.
9. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMATION OF PRESENCE ALL EXISTING UTILITIES, IF ANY, ALONG ROUTE OF PROPOSED DRAINAGE NETWORKS - BY INTRUSIVE INVESTIGATION OR EQUAL.
10. EXISTING PUBLIC SEWER TO BE JET CLEANED AND CCTV SURVEYED PRIOR TO, AND AFTER PROPOSED CONNECTIONS FROM NEW NETWORK.
11. ALL NEW DRAINAGE INFRASTRUCTURE TO BE JET CLEANED AND CCTV SURVEYED, WITH ANY NOTED DEFECTS REMEDIATED, ON COMPLETION OF WORKS, TO THE SATISFACTION OF THE LOCAL AUTHORITY.
12. REFER TO ARCHITECTS DRAWINGS FOR DETAILS OF PRIVATE DRAINAGE.
13. ALL COVER LEVELS ARE TO BE COORDINATED WITH ROAD DESIGN LEVELS AND LANDSCAPE ARCHITECT'S PROPOSED FINISH LEVELS.
14. WHERE MANHOLE COVERS ARE TO BE LOCATED IN SOFT LANDSCAPED/ GRASS AREAS, TO ENSURE THAT MANHOLE COVER ARE IDENTIFIABLE, ACCESSIBLE AND WILL NOT BECOME OVERGROWN, COVERS ARE TO BE SURROUNDED BY A CONCRETE PLINT, 200mm ALL ROUND, 100mm DEEP FORMED WITH C20/25 CONCRETE, 20mm AGGREGATE SIZE, BEDDD IN CLAUSE 804 MATERIAL
15. CONCRETE SURROUND TO BE PROVIDED WHERE COVER LEVELS ARE REDUCED TO LESS THAN 1.2m IN TRAFFICKED AREAS AS PER IRISH WATER CODE OF PRACTICE

SURFACE WATER NETWORK DESIGN TABLE

WASTEWATER NETWORK DESIGN TABLE



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P01	30.04.21	SUITABLE FOR INFORMATION	AB	MK
P02	24.02.22	REVISED AS PER IW COMMENTS	EH	MK
P03	01.03.22	REVISED AS PER IW COMMENTS	EH	MK

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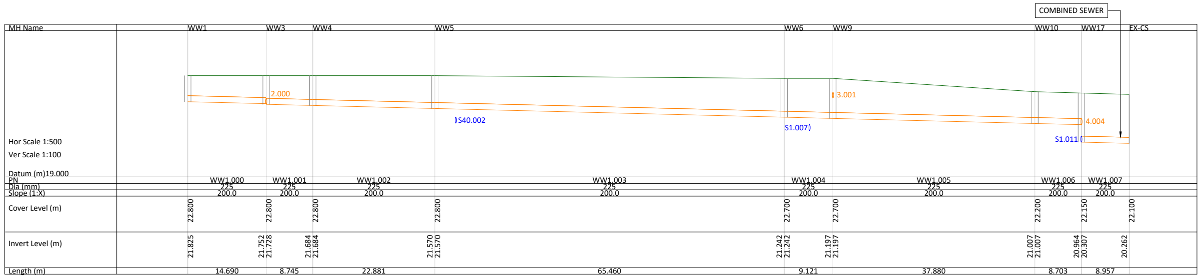
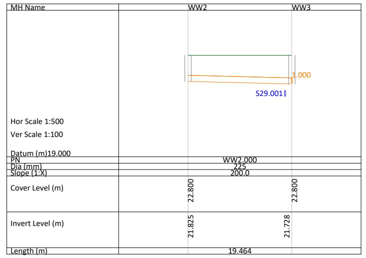
Client: U AND I (WHITE HEATHER) LIMITED
Project: WHITE HEATHER
SOUTH CIRCULAR ROAD
Title: DRAINAGE DESIGN LAYOUT

Code	Originator	Zone	Level	Type	Role	Number	Status	Revision
U067	OCSC	ZZ	GF	DR	C	0500	S3	P03

Date: APR'21 Scale: 1:250 @ A1 Drn by: AB Chkd by: MK Aprvd by: AH



WASTEWATER DRAINAGE BRANCH WW1.000



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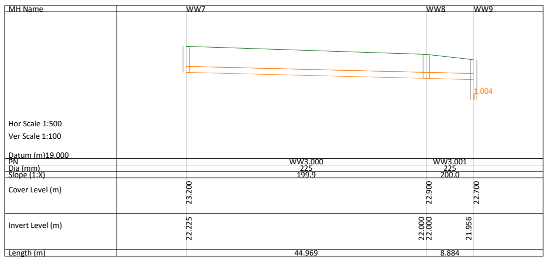
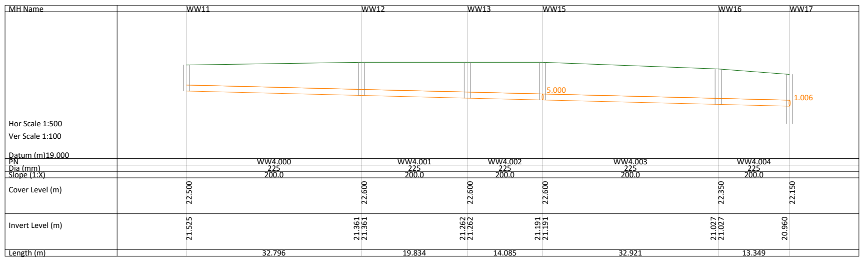
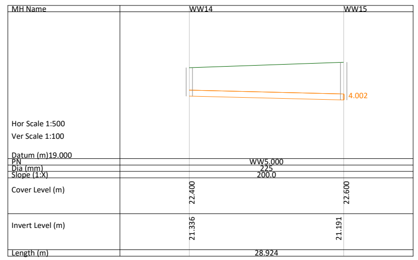


WASTEWATER DRAINAGE BRANCH WW3.000



WASTEWATER DRAINAGE BRANCH WW4.000



WASTEWATER DRAINAGE BRANCH WW5.000

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P01	30.04.21	SUITABLE FOR INFORMATION	AB	MK

Rev No.	Date	Revision Note	Drn by	Chkd by

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Client: U AND I (WHITE HEATHER) LIMITED
Project: WHITE HEATHER
SOUTH CIRCULAR ROAD
Title: WASTEWATER NETWORK
LONGITUDINAL SECTIONS

Code	Originator	Zone	Level	Type	Role	Number	Status	Revision
U067 -	OCSC -	XX -	GF -	DR -	C -	0515	S2	P01

Date: APR'21 Scale: SHWN @ A1 Drn by:AB Chkd by:MK Aprvd by:AH