



BELLMOUNT  
DEVELOPMENTS

ENGINEERING  
SERVICES REPORT

VICTORIA CROSS ROAD  
STUDENT ACCOMMODATION SHD

Prepared By  
JODA Engineering Consultants  
Ballycurreen House, Ballycurreen,  
Cork, T12 P4AY

4539/RM 07-22

## Contents

1	INTRODUCTION.....	4
1.1	Objectives.....	4
1.2	Development Description.....	4
1.3	Site Location.....	5
1.4	Topography.....	5
2	STORM WATER DRAINAGE.....	6
2.1	Existing Surface Water Drainage.....	6
2.2	Surface Water Drainage Strategy.....	6
2.3	Storm Water Design Calculations.....	7
2.4	Interception Volume.....	7
2.4.1	Summary of Flow Control Details and Attenuation Tank.....	7
2.5	Compliance with Standards.....	8
3	FOUL WATER DRAINAGE.....	9
3.1	Existing Foul Water Drainage.....	9
3.2	Foul Water Design Strategy.....	9
3.3	Foul Water Design Calculations.....	9
3.4	Irish Water Pre-Connection Enquiry.....	10
3.5	Compliance with Irish Water Standards.....	10
4	WATER SUPPLY SERVICES.....	11
4.1	Existing Water Supply.....	11
4.2	Water Supply Design Strategy.....	11
4.3	Water Supply Design Calculations.....	12
4.4	Compliance with Irish Water Standards.....	12

APPENDIX:

- A. Appendix - Irish Water Confirmation of Feasibility
- B. Appendix - Irish Water Statement Of Design Acceptance (SODA)
- C. Appendix – Hydrocarbon interceptor
- D. Appendix – Storm Water Calculation
- E. Appendix – Storm Water Management And Suds Assessment
- F. Appendix – Correspondence with The Planning Authority
- G. Appendix – Engineering Drawing associated with this submission

Figure 1: Site Location Map ..... 5

Table 1: Extract of Input figures..... 7

Table 2: Foul Drainage Design Criteria..... 9

Table 3: Water Supply Design Criteria ..... 12

<b>DOCUMENT CONTROL</b>				
<b>Revision</b>	<b>Date</b>	<b>Comments</b>	<b>Author</b>	<b>Checked</b>
-	19.07.22	Issued for Planning	RM	TON

## **1 INTRODUCTION**

This report is prepared in support of a Strategic Housing Development (SHD) planning application by Bellmount Development for a proposed student accommodation development on a circa 0.2-hectare (ha) site at Victoria Cross Road, Bishopstown, Cork. JODA Engineering Consultants were commissioned to undertake an infrastructure design report.

### **1.1 Objectives**

This report aims to consider the development's main infrastructure elements, including the following:

- Surface water strategy and servicing.
- Foul sewer strategy and servicing.
- Water supply and servicing.

This report and calculations should be read in conjunction with all relevant Joda Engineering Consultants drawings (refer to drawing schedule in this report).

### **1.2 Development Description**

The proposed development is for a Strategic Student Accommodation Development at the former Finbarr Galvin Motor Dealership, fronting on to Victoria Cross Road and Orchard Road, Bishopstown, Cork. The development will consist of:

1. The demolition of existing structures on site; and
2. The construction of 78 no. student accommodation apartments (ranging in size from single bed studio apartments to 8-bed apartments) comprising a total of 206 no. bed spaces in 1 no. 6 storey block;
3. Student amenity facilities including a study area, games room, lounge space, laundry room and server/ICT room;
4. The provision of landscaping and amenity areas including a courtyard space (including modifications to the external amenity area of the student accommodation scheme permitted under An Bord Pleanála Ref. 19/38385), 1 no. rooftop terrace and a riverfront amenity incorporating a pedestrian and cycle path accessing onto Ashbrook Heights and Orchard Road;
5. The provision of a set down area, 1 no. access point (for emergency vehicles only), footpaths and repositioned pedestrian crossing and associated tactile paving on Orchard Road;
6. The provision of a new junction build out at the junction of Orchard Road and Victoria Cross Road;
7. The provision of footpaths and landscaped areas along Victoria Cross Road; and
8. All associated ancillary development including pedestrian/cyclist facilities, lighting, drainage, boundary treatments, bin and bicycle storage and plant at ground and roof top levels.

### 1.3 Site Location

The site for the proposed development is located Victoria Cross Road at the junction of Orchard Road and Wilton Road. The site is indicated in Figure 1 below:

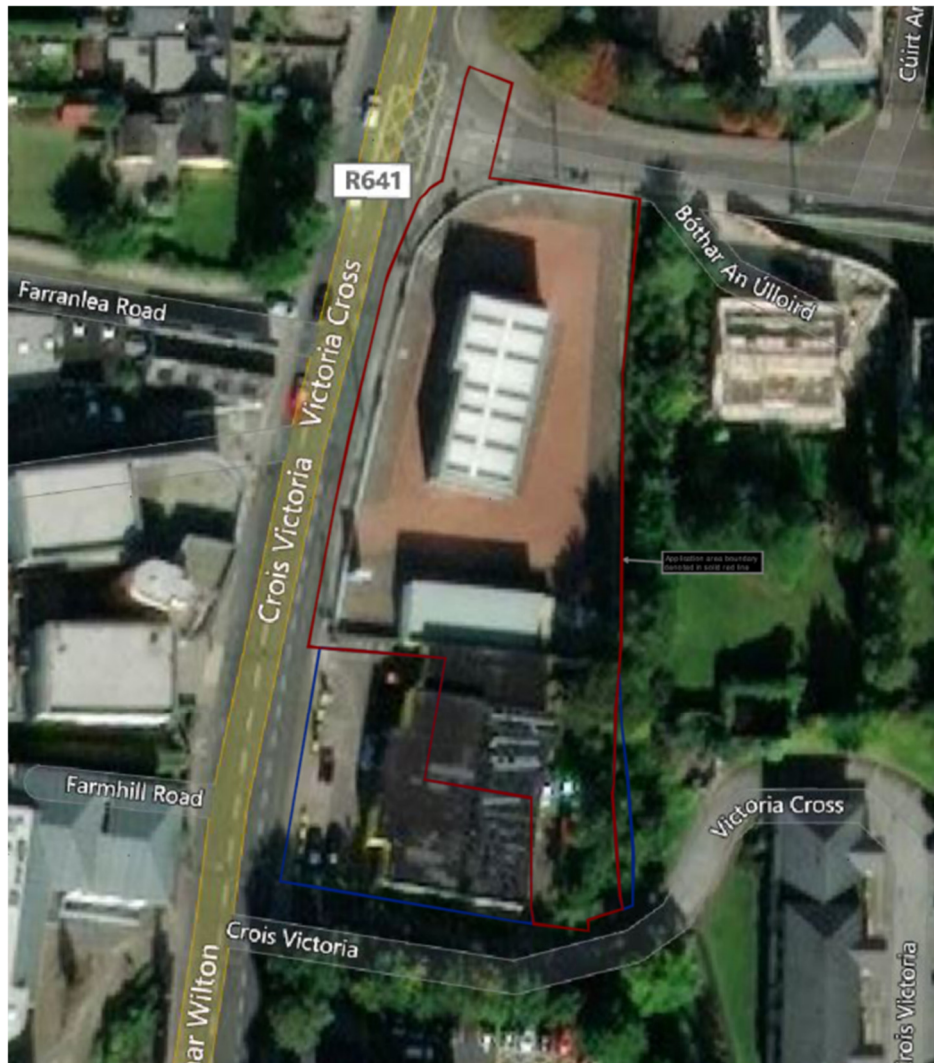


Figure 1: Site Location Map

The site is bounded by:

- to the West by the Wilton Road.
- to the North by the Orchard Road.
- to the East and by Glasheen River.
- to the South by a Tyres shop and service centre.

### 1.4 Topography

The existing ground profile is generally gently sloping with a main orientation from South to North. Levels vary from 5.00m to 4.90m OD.

## 2 STORM WATER DRAINAGE

### 2.1 Existing Surface Water Drainage

The existing site is fully hard surfaced, with paving, parking, and buildings. The existing topography generally falls from high points at the South of the site which falls in a northern direction. There is an existing surface water drainage to the western boundary of the site. The overall services layout developed for the Victoria Cross has made an allowance for the development of this site to drain to Glasheen River.

The layout of the Existing surface water drainage is shown on JODA drawing 4539-002.

### 2.2 Surface Water Drainage Strategy

The layout of the proposed surface water drainage is shown on JODA drawing 4539-004.

It is proposed to divert the existing storm water pipe moving along the West of the Site, Bellmount has previous planning application approved in P.A. 19/38385, and re-locate under the existing footpath as shown on JODA drawing 4539-004 to get a sufficient distance to the edge of the foundation of the building in accordance with Section 3.5.9 of the Irish Water Waster Code of Practice.

The proposed surface water drainage will discharge in the existing stormwater network located at the Northwest of the Site.

The surface water drainage system will collect storm-water run-off generated from the proposed residential development, collecting run-off from impermeable road surfaces via gullies and adjoining areas.

A 49.2m<sup>3</sup> Attenuation tank is proposed for the site. The primary function of this tank is to provide flow attenuation form limiting the discharge of the surface water to the Glasheen River during any storm event.

## 2.3 Storm Water Design Calculations

The storm water design seeks to achieve the following:

- No surcharging or flooding for the 1 in 1 year storm all durations.
- Surcharging for the 1 in 30-year storms for all durations.
- Surcharging for the 1 in 100-year returns with volumes arising being stored on site.

*Table 1: Extract of Input figures*

Design Criteria	Input Value	Reference
Gross Catchment Area (Ha) Roof + Hardstanding	0.3	Site Layout
Soil Type	Class 2	Flood Studies/Wallingford
Roughness Co-efficient (ks mm)	0.6	Precast Pipes with 'O' Ring Joints- Colebrook White Storm Drainage
SAAR (mm) – Standard Average Annual Rainfall	1147	Flood Studies Report- HR Wallingford
M5-60 (mm)	16.400	Flood Studies Report – Met Eireann
Ratio r (mm)	0.222	Flood Studies Report – Met Eireann
Time of Entry (minutes)	4	Run off time–farthest point to head of run
Runoff Factors - Permeability Coefficient	1.0	Roofs, Roads and Paved Areas
Runoff Factors - Permeability Coefficient	0	Landscaped/Grassed Areas – Pervious Surfaces
Climate Change Allowance	1.1	10% Increase Met Eireann
Rainfall intensity for initial pipe sizing (mm/hr)	50	Greater Dublin Strategic Drainage Study

## 2.4 Interception Volume

A Class 1 Klargestor bypass hydrocarbon and silt interceptor will be incorporated in the system prior to the discharge to the river, to intercept and retain contaminants. See Appendix B for details. For further details see the Water Management and Sustainable Urban Drainage Systems (SUDS) assessment in Appendix D.

### 2.4.1 Summary of Flow Control Details and Attenuation Tank

The discharge flow from the site will be limited by a Hydrobrake or similar approved flow control device prior to the outfall to the Glasheen River, with an online attenuation system provided to store excess rainwater during storm events.

It is proposed to limit the discharge rate at the flow control device to **2.0 l/s**.

It is proposed for the new surface water network to discharge into the Glasheen River. A **49.2 m<sup>3</sup>** Tank has been proposed for the site with a base area of **41 m<sup>2</sup>** and **1.2 m** deep.

The tank has two functions:

- the primary function is to attenuate the 1:100 years storm event + 10% climate change allowance, the resulting surface water attenuation volume storage requirement is 49.2 m<sup>3</sup>.
- The second function is to provide compensation flood storage for the loss of River Lee flood plain storage due to the proposed development. This is an interim measure pending on the implementation of the River Lee Flood Relief Scheme, the flood compensation volume is 45 m<sup>3</sup>.

The proposed Storm Water Storage Tank Volume of 49.2 m<sup>3</sup> is considered to be sufficient for both surface water attenuation and compensation flood storage as the surface water attenuation storage is a short term requirement and is unlikely to occur concurrently with flood attenuation storage which may be required many hours or days after the storm event.

## **2.5 Compliance with Standards**

The proposed connection to the existing surface water network will be constructed with adequate spacing (in accordance with Irish Water's Wastewater Code of Practice) from the existing foul sewer.

Surface water management for the proposed development is designed to comply with the Greater Dublin Strategic Drainage Study (GDSDS) policies and guidelines.



### 3 FOUL WATER DRAINAGE

#### 3.1 Existing Foul Water Drainage

There is an existing 1050mm sewer on the Eastern side of the site. This sewer cannot be diverted and must be protected during the construction stage of the site, ensuring a 5m wayleave.

#### 3.2 Foul Water Design Strategy

A pre-connection enquiry form was submitted to Irish Water in respect to the foul connection from the proposed development. Subsequently, Irish Water have confirmed that based on the size of the proposed development and on the capacity currently available, that subject to a valid connection agreement being put in place, the proposed connection to the Irish Water network can be facilitated. The developer shall carry out site investigations to confirm the exact route of the combined sewer. On completion of SI works, the proposed development layout shall be submitted to Irish Water for approval. A wayleave in favour of Irish Water over the Sewers will be required. The layout of the proposed foul water network is shown on JODA drawing 4539-003.

The pipework will be a network of 225mm diameter, and the material will be un-plasticised PVC. The foul sewer will discharge to the existing 1050mm sewer located on the Eastern side of the site. All foul sewers and manholes will be constructed in accordance with the Irish Water Standard Details and the Irish Water Code of Practice for Wastewater.

Longitudinal sections for the proposed foul sewers are detailed on drawing 4539-006.

The Statement of Design Acceptance has been issued from Irish Water, please refer to Appendix B.

#### 3.3 Foul Water Design Calculations

*Table 2: Foul Drainage Design Criteria*

Design Criteria	Input Value	Reference
Flow/person/day (L)	150	Irish Water
Occupancy ratio (Person/bed space)	1	-
Proposed Bed units	202	-
New Property Infiltration Allowance (%)	10	Irish Water- New Property
Peak Flow (DWF)	6	Irish Water- Domestic Population (0-750)
Roughness co-efficient (ks mm)	1.5	Colebrook White – Foul drainage

Works which carry domestic Wastewater shall be designed to carry a Wastewater volume of between 6 times and 2.5 times the dry weather flow depending on the size of the development, as outlined in IW-CDS-5030-03.

The proposed Development has a total peak flow of 2.31 l/s.

Gradients are selected so that self-cleansing velocities can be maintained under normal operating conditions. The range of flow velocity within the sewers are between 0.75m/s at low flow and 3.0m/s,

when flowing full. In general, pipes of 150mm diameter are proposed at a minimum gradient of 1:150. Pipes of 225mm diameter or greater have a minimum gradient of 1:200.

### **3.4 Irish Water Pre-Connection Enquiry**

A pre-connection enquiry form was submitted to Irish Water in respect to the foul connection from the proposed development. Subsequently, Irish Water have confirmed that based on the size of the proposed development and on the capacity currently available, that subject to a valid connection agreement being put in place, the proposed connection to the Irish Water network can be facilitated, please find attached in Appendix A the Pre-Connection Enquiry for more information.

### **3.5 Compliance with Irish Water Standards**

The proposed foul sewer design and layout is in accordance with the Irish Water Code of Practice for Wastewater Infrastructure and The Irish Water Wastewater Infrastructure Standard Details.

No clashes occur between the storm and foul network and there is a minimum of 300mm gap (in accordance with Irish Water's Wastewater Code of Practice) between crossings of the networks.

The design acceptance issued by Irish Water can be found in Appendix B.

## 4 WATER SUPPLY SERVICES

### 4.1 Existing Water Supply

There is an existing 200mm diameter cast iron watermain and an existing 300mm ductile iron watermain running along Wilton Road to the East of the proposed development.

### 4.2 Water Supply Design Strategy

The layout of the proposed mains water supply and system is shown on JODA drawings 4539-005.

A new connection to the 200mm diameter watermain will be constructed across the road and detailed in accordance with the Irish Water specification. A feed to each new building will be provided from the new HDPE internal watermain pipes. The watermain will be laid at a depth of 900mm. The main will be fitted with fire hydrants to ensure no occupied building is more than 46m from a hydrant.

To allow for low pressure in the network as Irish Water adjusts the pressure in the network from time to time, a pressure booster set, and tank have been incorporated into the design. These boosters will be able to deliver water with sufficient pressure and flow to accommodate the requirements at each floor.

The proposed watermain design and layout is in accordance with the Irish Water Code of Practice for Water Infrastructure and the Irish Water Infrastructure Standard Details. The Irish Water Pre-Connection Enquiry Form response letter is attached in Appendix A of this report and Statement of Design Acceptance attached in Appendix B. The anticipated peak flow for the student apartments is 2.18 l/s as per the above table. Within the development, a 150mm diameter watermain and hydrant have been provided to ensure adequate fire flows. In addition to this, a hydrant has been proposed to the south-west of the site in the footpath. The required fire flow for the entire student accommodation is 20 to 35 l/s. The hydrants have been located around the buildings footprint to serve the development in accordance with the Building Control Fire Safety Requirements.

Locations of these hydrants will be confirmed in the fire consultation. Each hydrant will supply 20 to 35 l/s in accordance with the national guidance document for the provision of water for firefighting and BS 5306: Part 1: Hydrant systems, hose reels and foam inlets. Refer to JODA drawing 4539-005, for further details. Tests undertaken on hydrants on the existing 200mm main serving the development confirm that the hydrant flows are generally in line with the above requirements.

The water connections off the main public supply is routed to a booster tank set located in the proposed developments plant room. This system accounts for the low pressure in the public mains to provide adequate flow and pressure in the water supply to each unit.

The effective capacity of the break tank has been based on the total water storage and the pump output will exceed 15 minutes. The tank will be sealed and suitably insulated so that the water temperature will not exceed 20°C.

### 4.3 Water Supply Design Calculations

*Table 3: Water Supply Design Criteria*

Design Criteria	Input Value	Reference
Flow/person/day (L)	150	Irish Water
Occupancy ratio (Person/bed space)	2.7	Irish Water
Average Day/Peak Week Demand Factor	1.25	Irish Water
Peak Demand Factor	5	Irish Water

The total peak water demand of the proposed development was estimated at 2.18 l/s

### 4.4 Compliance with Irish Water Standards

The proposed water main design and layout is in accordance with the Irish Water Code of Practice for Water Infrastructure and The Irish Water Infrastructure Standard Details. The Irish Water Statement of Design Acceptance can be found in Appendix B.

*A. APPENDIX - Irish Water Confirmation of Feasibility*

Roberto Mione

Joda Engineering Cons  
 Ballycurreen House  
 Ballycurreen  
 Co. Cork  
 T12P4AY

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](http://www.water.ie)

6 December 2021

**Re: CDS21008060 pre-connection enquiry - Subject to contract | Contract denied**

**Connection for Housing Development of 240 unit(s) at Wilton Road, Victoria Cross, Cork**

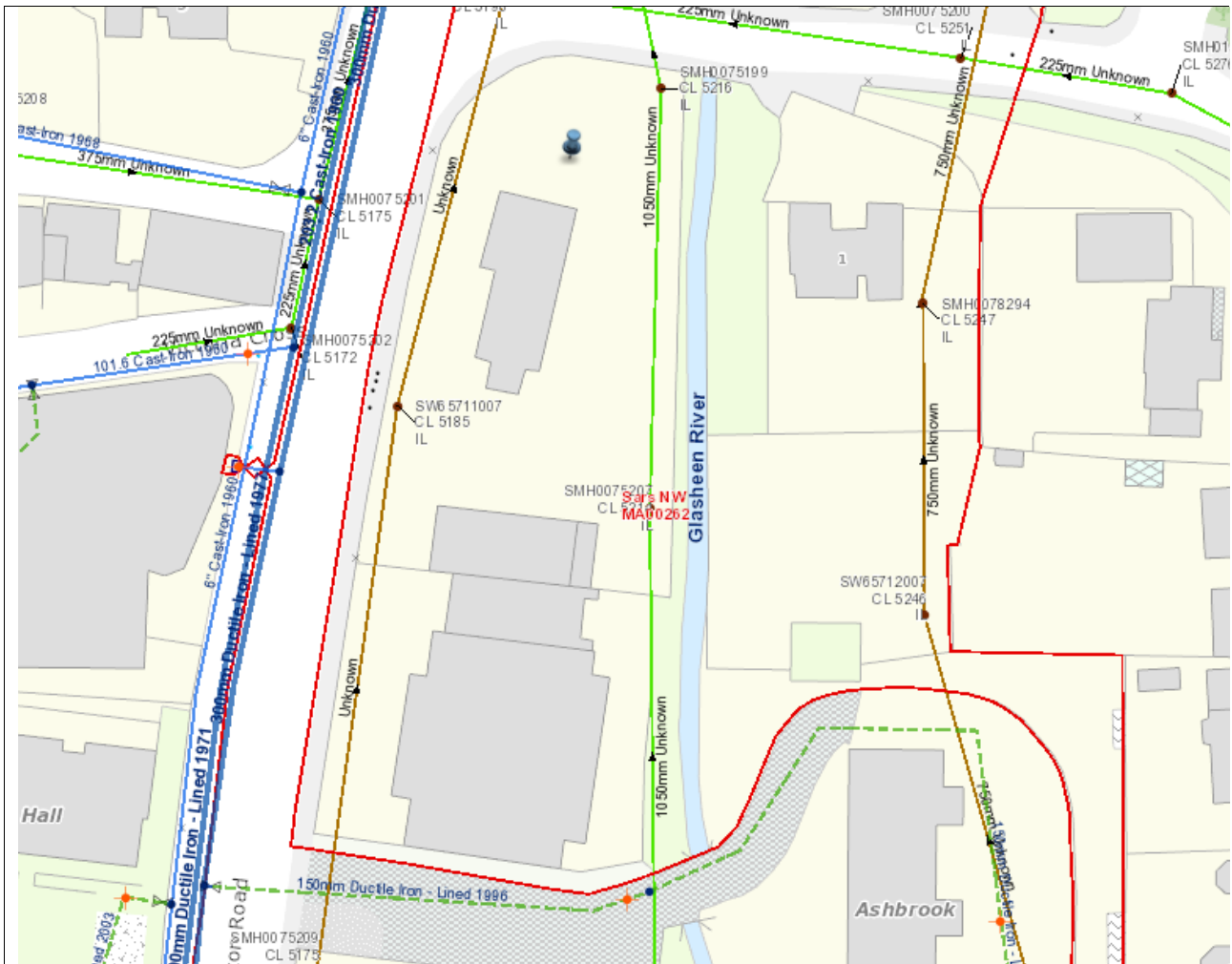
Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Wilton Road, Victoria Cross, Cork (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	<b>OUTCOME OF PRE-CONNECTION ENQUIRY</b> <u><b>THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.</b></u>
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible without infrastructure upgrade by Irish Water
<b>SITE SPECIFIC COMMENTS</b>	
Water Connection	200mm Watermain to the west
Wastewater Connection	There is an existing 1050mm sewer on the Eastern side of the site. This sewer cannot be diverted and must be protected during the construction stage and no structure is permitted within 5m of either side of the pipeline. The developer shall carry out site investigations to confirm the exact route of the combined sewer. On completion of SI works, the proposed development layout shall be submitted to Irish Water for approval. A wayleave in favour of Irish Water over the Sewers will be required.

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:



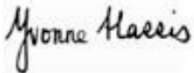
Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish 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](mailto: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 Brian Lavelle from the design team on or email [brian.lavelle@water.ie](mailto:brian.lavelle@water.ie) For further information, visit **[www.water.ie/connections](http://www.water.ie/connections)**.

Yours sincerely,



**Yvonne Harris**

**Head of Customer Operations**



*B. Appendix - Irish Water Statement Of Design Acceptance (SODA)*



Roberto Mione  
Joda Engineering Cons  
Ballycurreen House  
Ballycurreen  
Co. Cork T12P4AY

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](http://www.water.ie)

24 June 2022

**Re: Design Submission for Wilton Road, Victoria Cross, Cork (the “Development”)  
(the “Design Submission”) / Connection Reference No: CDS21008060**

Dear Roberto Mione,

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](http://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/](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: Tom O’ Flaherty  
Email: [toflahert@water.ie](mailto:toflahert@water.ie)

Yours sincerely,

**Yvonne Harris**  
**Head of Customer Operations**

## Appendix A

### Document Title & Revision

- [4539-003-Proposed Foul Sewer Layout]
- [4539-006-Proposed Watermain Layout]
- [4539-006\_B Foul Sewer Long Sections]
- [4539-010-Proposed Combined Foul and Storm Layout]

For further information, visit [www.water.ie/connections](http://www.water.ie/connections)

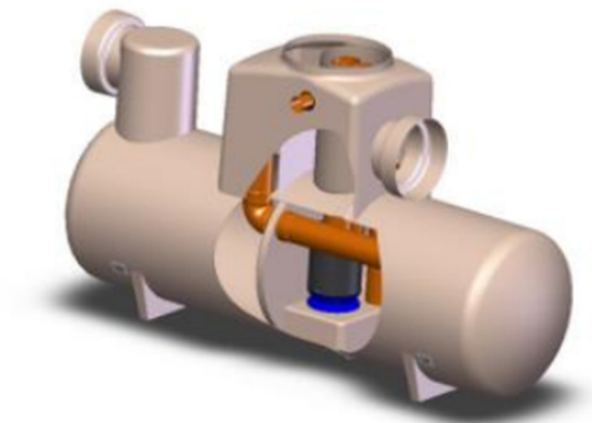
*Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Irish Water will not, in any way, render Irish Water liable for any elements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

*C. Appendix - Hydrocarbon interceptor*

Total drainage area circa 1600m<sup>2</sup>

⇒ Using NSBP003 Klargester Hydrocarbon Bypass Separator.

Product code	Flow (l/s)	Peak Flow Rate (l/s)	Drainage area (m <sup>2</sup> )	Storage Capacity (Ltrs)	Storage Capacity (Ltrs)	Length (mm)	Diameter (mm)	Access Shaft Diameter (mm)	Base Inlet Invert (mm)	Base to Outlet Invert (mm)
-	-	-	-	Silt	Oil	-	-	-	-	-
NSBP003	3	30	1670	300	45	1700	1350	600	1420	1320
NSBP004	4.5	45	2500	450	60	1700	1350	600	1420	1320
NSBP006	6	60	3335	600	90	1700	1350	600	1420	1320
NSBE010	10	100	5560	1000	150	2069	1220	750	1450	1350
NSBE015	15	150	8335	1500	225	2947	1220	750	1450	1350



*D. Appendix – Storm Water Calculation*

**Design Settings**

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	16.400	Minimum Backdrop Height (m)	0.200
Ratio-R	0.222	Preferred Cover Depth (m)	1.400
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

**Nodes**

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
✓ 1	0.130	8.00	5.230	Manhole	Adoptable	1200	565144.474	571093.112	1.700
✓ Attenuation Tank			5.100	Junction			565148.309	571109.156	1.735
✓ 2			5.000	Manhole	Adoptable	1200	565151.971	571124.904	1.797
✓ 3			4.950	Manhole	Adoptable	1200	565154.408	571129.195	1.773
✓ 4			4.950	Manhole	Adoptable	1200	565163.664	571128.002	1.827
✓ Outfall			5.000	Junction			565186.268	571127.787	2.011
✓ Trench	0.036	4.00	5.200	Junction			565185.595	571122.863	1.300

**Simulation Settings**

Rainfall Methodology	FSR	Summer CV	0.750	Drain Down Time (mins)	240
FSR Region	Scotland and Ireland	Winter CV	0.840	Additional Storage (m <sup>3</sup> /ha)	0.0
M5-60 (mm)	16.400	Analysis Speed	Normal	Check Discharge Rate(s)	x
Ratio-R	0.222	Skip Steady State	✓	Check Discharge Volume	x

**Storm Durations**

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0	100	10	0	0
30	10	0	0				

**Node 4 Online Hydro-Brake® Control**

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	3.123	Product Number	CTL-SHE-0062-2000-1425-2000
Design Depth (m)	1.425	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

**Node Attenuation Tank Depth/Area Storage Structure**

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.365
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )
0.000	41.0	0.0	1.200	41.0	0.0	1.201	0.0	0.0

**Node Trench Lined Soakaway Storage Structure**

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.300	Pit Length (m)	45.000
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	16	Depth (m)	0.900
Safety Factor	2.0	Ring Diameter (m)	0.225	Inf Depth (m)	0.600
Porosity	0.30	Pit Width (m)	0.600	Number Required	1

**Results for 1 year Critical Storm Duration. Lowest mass balance: 99.59%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
180 minute winter	1	136	3.601	0.071	4.7	0.0800	0.0000	OK
180 minute winter	Attenuation Tank	140	3.601	0.236	7.6	9.6649	0.0000	OK
240 minute winter	2	180	3.601	0.398	4.6	0.4502	0.0000	SURCHARGED
240 minute winter	3	180	3.601	0.424	2.3	0.4798	0.0000	SURCHARGED
180 minute winter	4	132	3.601	0.478	2.7	0.5411	0.0000	SURCHARGED
15 minute summer	Outfall	1	2.989	0.000	1.6	0.0000	0.0000	OK
15 minute winter	Trench	10	3.954	0.054	4.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
180 minute winter	1	1.000	Attenuation Tank	4.7	0.736	0.042	0.5939	
180 minute winter	Attenuation Tank	1.001	2	4.7	0.446	0.042	1.0494	
240 minute winter	2	1.002	3	2.3	0.399	0.060	0.1963	
240 minute winter	3	1.003	4	1.6	0.156	0.040	0.3712	
180 minute winter	4	Hydro-Brake®	Outfall	1.6				25.6
15 minute winter	Trench	2.000	4	4.0	0.698	0.275	0.1282	



**Results for 30 year +10% CC Critical Storm Duration. Lowest mass balance: 99.59%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	1	368	4.268	0.738	5.8	0.8347	0.0000	SURCHARGED
480 minute winter	Attenuation Tank	368	4.268	0.903	6.0	37.0170	0.0000	SURCHARGED
480 minute winter	2	360	4.271	1.068	4.5	1.2076	0.0000	SURCHARGED
480 minute winter	3	368	4.268	1.091	2.5	1.2341	0.0000	SURCHARGED
480 minute winter	4	360	4.270	1.147	2.5	1.2977	0.0000	SURCHARGED
15 minute summer	Outfall	1	2.989	0.000	1.6	0.0000	0.0000	OK
480 minute winter	Trench	360	4.274	0.374	1.6	0.0000	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	1	1.000	Attenuation Tank	5.7	0.682	0.051	1.1616	
480 minute winter	Attenuation Tank	1.001	2	4.5	0.432	0.040	1.1385	
480 minute winter	2	1.002	3	2.5	0.395	0.068	0.1963	
480 minute winter	3	1.003	4	2.4	0.151	0.061	0.3712	
480 minute winter	4	Hydro-Brake®	Outfall	1.8				64.8
480 minute winter	Trench	2.000	4	1.6	0.540	0.112	0.3965	

**Results for 100 year +10% CC Critical Storm Duration. Lowest mass balance: 99.59%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
480 minute winter	1	368	4.612	1.082	7.2	1.2232	0.0000	SURCHARGED
480 minute winter	Attenuation Tank	376	4.611	1.246	7.0	49.2205	0.0000	SURCHARGED
480 minute winter	2	368	4.612	1.409	5.1	1.5933	0.0000	SURCHARGED
480 minute winter	3	376	4.612	1.435	2.9	1.6226	0.0000	SURCHARGED
480 minute winter	4	368	4.611	1.488	2.8	1.6833	0.0000	SURCHARGED
15 minute summer	Outfall	1	2.989	0.000	1.6	0.0000	0.0000	OK
480 minute winter	Trench	376	4.611	0.711	2.0	2.5348	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
480 minute winter	1	1.000	Attenuation Tank	7.0	0.712	0.063	1.1616	
480 minute winter	Attenuation Tank	1.001	2	5.1	0.434	0.046	1.1385	
480 minute winter	2	1.002	3	2.9	0.407	0.076	0.1963	
480 minute winter	3	1.003	4	1.9	0.153	0.048	0.3712	
480 minute winter	4	Hydro-Brake®	Outfall	2.0				73.0
480 minute winter	Trench	2.000	4	1.9	0.558	0.131	0.3965	

*E. Appendix – Storm Water Management And Suds Assessment*



BELLMOUNT  
DEVELOPMENTS

STORM WATER  
MANAGEMENT  
AND SUDS  
ASSESSMENT

VICTORIA CROSS ROAD  
STUDENT ACCOMMODATION SHD



Prepared By:  
JODA Engineering Consultants  
Ballycurreen House, Ballycurreen  
Cork

4539/RM/07-22



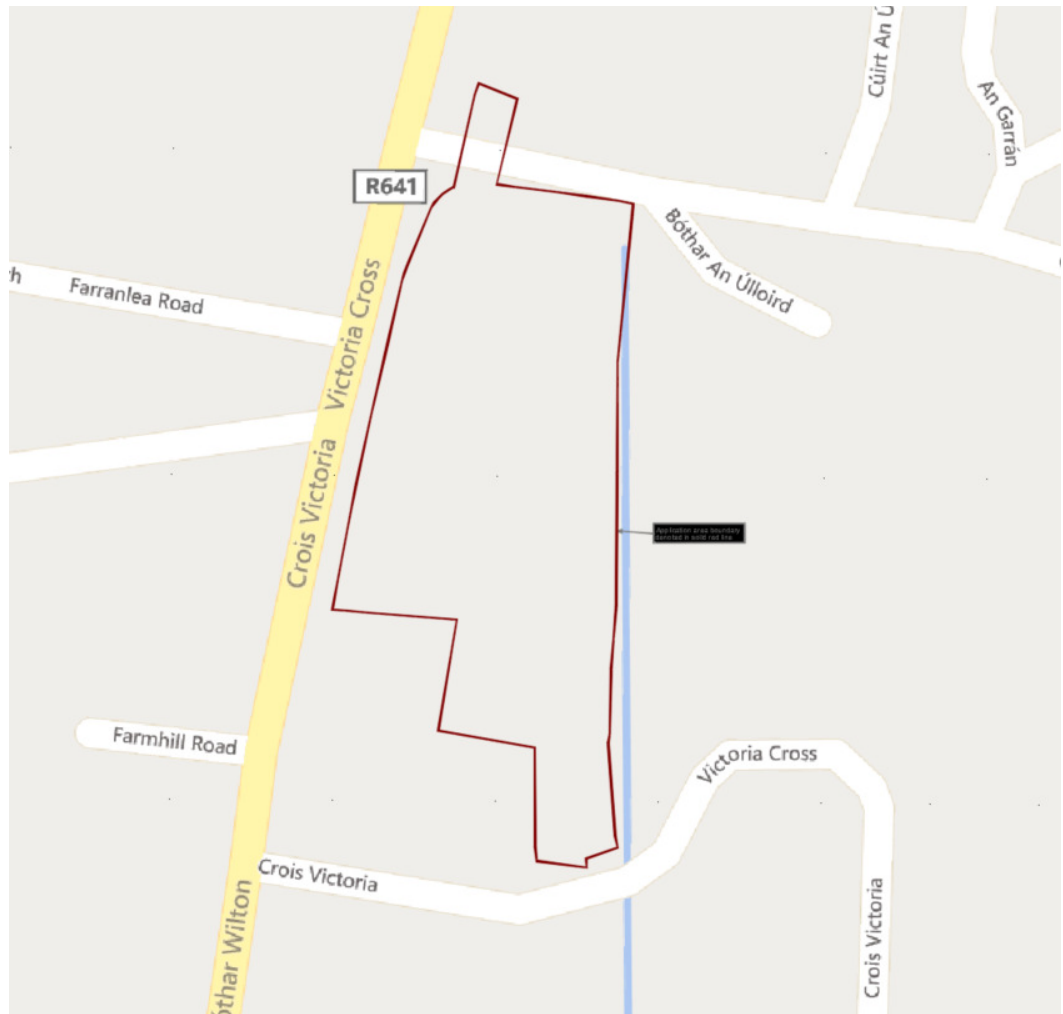
## **1. Wilton Road Student Accommodation, Cork.**

### **1.1. Introduction**

JODA Engineering Consultants has been commissioned to prepare a Storm Water management and SUDS Assessment to accompany a SHD application for Student accommodation at Victoria Cross Road, Bishopstown, Cork City.

## 1.2. Stormwater Management/SUDS Assessment

<i>Design Parameter</i>	<i>Audit Result</i>
<p><i>Proposed Development</i></p>	<p>The proposed development is for a Strategic Housing Development at Victoria Cross Road, Bishopstown, Cork comprising:</p> <ul style="list-style-type: none"> <li>• <i>The demolition of existing structures on site; and</i></li> <li>• <i>The construction of 78 no. student accommodation apartments (ranging in size from single bed studio apartments to 8-bed apartments) comprising a total of 206 no. bed spaces in 1 no. 6 storey block;</i></li> <li>• <i>Student amenity facilities including a study area, games room, lounge space, laundry room and server/ICT room;</i></li> <li>• <i>The provision of landscaping and amenity areas including a courtyard space (including modifications to the external amenity area of the student accommodation scheme permitted under An Bord Pleanála Ref. 19/38385), 1 no. rooftop terrace and a riverfront amenity incorporating a pedestrian and cycle path accessing onto Ashbrook Heights and Orchard Road;</i></li> <li>• <i>The provision of a set down area, 1 no. access point (for emergency vehicles only), footpaths and repositioned pedestrian crossing and associated tactile paving on Orchard Road;</i></li> <li>• <i>The provision of a new junction build out at the junction of Orchard Road and Victoria Cross Road;</i></li> <li>• <i>The provision of footpaths and landscaped areas along Victoria Cross Road; and</i></li> <li>• <i>All associated ancillary development including pedestrian/cyclist facilities, lighting, drainage, boundary treatments, bin and bicycle storage and plant at ground and roof top levels.</i></li> </ul> <p>A Topographical survey of the proposed development site has been undertaken. The survey confirms that the existing topographical levels within the proposed development site range from 5.00m OD to 4.90m OD. The existing ground profile is generally flat or sloping gently northwards.</p>



**Figure 1.1 – Site Location**


The site area is 0.2 ha.

**Relevant Studies/References**

- Greater Dublin Strategic Drainage Strategy (GSDS)
- Greater Dublin Regional Code of Practice for Drainage Works;
- The SUDs Manual (CIRIA C753).

<p><b>Key Considerations &amp; Benefits of SUDS</b></p>	<p>The key benefits and objectives of SUDs considered as part of this SWM and listed below include:</p> <ul style="list-style-type: none"> <li>• Reduction of run-off rates.</li> <li>• Provision of volume storage.</li> <li>• Volume treatment provided.</li> <li>• Reduction in volume run-off.</li> <li>• Water quality improvement.</li> <li>• Biodiversity.</li> </ul>
---	--

**HR Wallingford Report for Soil and Hydrological characteristics**



**Greenfield runoff rate estimation for sites**

www.uksuds.com | Greenfield runoff tool

Calculated by: Roberto Mione  
 Site name: Wilton Road  
 Site location: Victoria Cross, Cork

**Site Details**  
 Latitude: 51.89094° N  
 Longitude: 8.50619° W  
 Reference: 2034245494  
 Date: Dec 06 2021 11:53

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach: IH124

**Site characteristics**  
 Total site area (ha): 0.2

**Methodology**  
 Q<sub>BAR</sub> estimation method: Calculate from SPR and SAAR  
 SPR estimation method: Calculate from SOIL type

**Soil characteristics**      Default      Edited

SOIL type:      2      2  
 HOST class:      N/A      N/A  
 SPR/SPRHOST:      0.3      0.3

**Hydrological characteristics**      Default      Edited

SAAR (mm):      1147      1147  
 Hydrological region:      13      13  
 Growth curve factor 1 year:      0.85      0.85  
 Growth curve factor 30 years:      1.65      1.65  
 Growth curve factor 100 years:      1.95      1.95  
 Growth curve factor 200 years:      2.15      2.15

**Notes**

**(1) Is Q<sub>BAR</sub> < 2.0 l/s/ha?**

When Q<sub>BAR</sub> is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

**(2) Are flow rates < 5.0 l/s?**

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

**(3) Is SPR/SPRHOST ≤ 0.3?**

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.



**SUDS Measures Considered**

JODA has given due consideration to the SUDS measures most applicable for this site. Measures include;

<b>SUDS Technology</b>	<b>Comments</b>
<b>Petrol Interceptor</b>	Petrol Interceptor and silt traps have been proposed as part of development to <i>provide</i> River Water Quality Protection from hydrocarbons and silt debris.
<b>Green/Blue Roofs</b>	<p>Green roofs have been included as part of this development. An intensive green roof is planned for the development which will cover approximately 900m<sup>2</sup> of the proposed roof area. This layer will facilitate interception of the first 10mm of rainfall falling on the green roof surface. In line with the SuDS manual CIRIA C753 Table 24.6, Green Roofs are assumed to be compliant for zero run-off from the first 5.0mm rainfall.</p> <p>The proposed Green Roofs will benefit biodiversity by: Providing habitat for wildlife</p> <ul style="list-style-type: none"> <li>• Providing undisturbed areas for wildlife</li> <li>• Providing linkages or “steppingstones” between green spaces</li> <li>• Compensating for habitats that are lost through urban development</li> </ul> <p>Extensive Green roofs systems have a low substrate depths, simple planting and low maintenance requirements.</p>

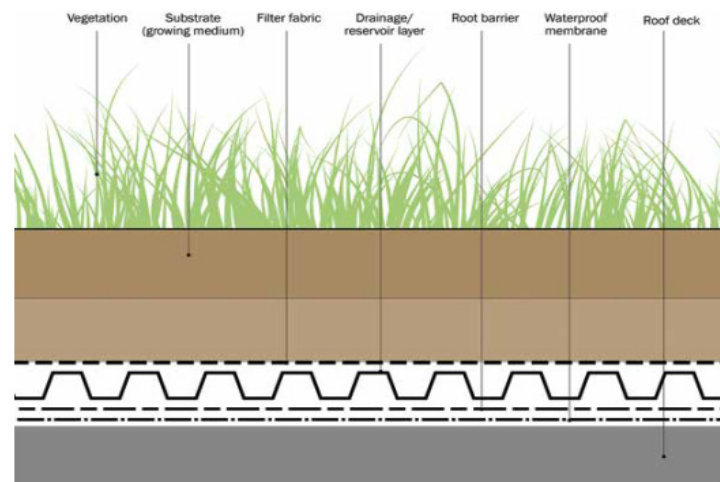


Figure 1.2 Section of typical extensive green roof components

	<b>Infiltration trench</b>	<p>Infiltration trench, filled with permeable granular material, designed to promote infiltration of surface water to the ground has been proposed as part of the development. A 45x0.6x0.9m Infiltration Trench will be located on the East side of the site to collect the runoff from the proposed Road to improve water quality and runoff mitigation. Please refer to JODA Proposed Storm Sewer Layout lodged with this application for more information.</p>	
	<b>Surface Water Attenuation</b>	<p>Surface Water Attenuation has been proposed as part of development. For more information refer to the attached JODA Engineering Report lodged with this application.</p>	
	<b>Site Run-off Rates</b>	<p>SuDS requires that post development run-off rates be maintained at the equivalent to, or lower than, the pre-development run-off levels. The proposed discharge rate from the site will be equal to the pre-development run-off levels in line with the SUDS requirement. It is proposed to limit the discharge rate with an Hydrobrake at 2l/s.</p>	
	<b>Rainwater Harvesting</b>	<p>RWH has not been proposed within the development due the following reasons:</p> <ul style="list-style-type: none"> <li>• The space constraint generated by the 1050mm foul interceptor wayleave and the site's overall size.</li> <li>• Rainwater Harvesting Systems are also expensive to build and maintain.</li> <li>• There's no significant control of the Runoff during low probability events in the wintertime because the harvesting tank would be most of the time full.</li> <li>• There's no significant improvement in the quality of water with this approach, other SuDS are more efficient in quality control.</li> <li>• Rainwater Harvesting tanks are not possible to locate under the roof of the development due to the space constraint.</li> </ul>	
	<b>Detention Basins, Retention Ponds, Stormwater Wetlands</b>	<p>Detention basins, retention ponds etc. have been deemed unsuitable due to space constraints</p>	

	<p><b>Tree Root Structural Cell Systems, Bio-retention, rain garden</b></p>	<p>Tree Pits, Bio-retention, rain gardens have been suitable for the proposed development, please refer to the landscape layout lodged with this application.</p>
<p><b>Surface Water Drainage Design</b></p>	<p>The surface water drainage system will collect storm-water run-off generated from the proposed residential development, collecting run-off from impermeable road surfaces via gullies and adjoining areas. It is proposed for the new surface water network to discharge into Glasheen River located at the East of the site.</p>	
<p><b>Climate Change</b></p>	<p>Rainfall values for the proposed development are sourced from Met Eireann to calculate the input hydrograph for the drainage design. The design rainfall intensities were increased by a factor of 10% to take account of climate change.</p>	
<p><b>Discharge Rate/Flow Control</b></p>	<p>The proposed Surface Water Network will discharge directly in the Glasheen River, to limit the</p>	
<p><b>Volume Storage</b></p>	<p>An underground storage tank capacity of 62.4 m<sup>3</sup> with a non-return valve will be constructed in the courtyard area. The storage tank capacity is equivalent to mitigate a storm event with a return period of 100years plus 10% of climate changes. As the river subsides post flood event, the stored water will then discharge to the Glasheen River.</p>	
<p><b>Biodiversity</b></p>	<p>Due to the limited size of the site it will not be possible to implement tree varieties.</p>	
<p><b>Return Period</b></p>	<p>A 100-year return period plus 10% for climate change has been used in the design for the attenuation Systems.</p>	
<p><b>Health &amp; Safety and Maintenance Issues</b></p>	<p>The proposed drainage system comprises SuDS devices, traditional gullies, manholes, attenuation systems, and underground pipes. These elements are considered acceptable from a Health &amp; Safety perspective once supplier/manufacturers guides are followed and complied with during the detailed design, construction and operation.</p>	
<p><b>Conclusion</b></p>	<p>JODA Engineering Consultants considers that the surface water drainage design for the proposed development is acceptable and meets all the requirements of the Stage 1 Stormwater Management and Suds Assessment.</p>	

*F. Appendix – Correspondence with The Planning Authority*

**RE: ABP- 312211-21 - Former Finbarr Galvin Motor Dealership Site, Victoria Cross Road / Orchard Rd,  
Bishopstown, Cork.**

Dear Sir/Madam,

Please see the responses below, to the pre-commencement conditions attached to the grant of planning:

Condition No.	Response
<p>Drainage Dept:</p> <p><b>1- Wastewater:</b></p> <p>i. Proposal to construct the storm water attenuation tank and discharge manhole within the existing Irish Water 1050mm foul sewer wayleave is not acceptable. This attenuation tank shall be located in an alternative location, outside of the wayleave.</p> <p>ii. There are serious concerns about the Applicant's proposal to locate the building in such proximity to the existing Irish Water 1050mm foul interceptor sewer. While it is noted that a pre-connection enquiry process has been completed with Irish Water, this relates only to assessment of the feasibility of connecting the proposed development to the existing public sewerage, in terms of capacity and connection point location. However, no "Building-over or Near an Irish Water Asset Application Form" has been submitted to Irish Water. Prior to submission of the full application, the Applicant shall complete the "building over / near an Irish Water Asset" process and incorporate Irish Water's requirements into the final layout submitted for permission.</p> <p>iii. It is noted from Irish Water's pre-connection enquiry response that a 5m set-back either side of the 1050mm foul interceptor sewer has been instructed; however, this set-back is not reflected on the drawings. The Applicant shall address this issue in detail.</p> <p>iv. The landscape layout plan shows significant public realm works and planting above the centre line of the existing 1050mm foul interceptor sewer. The Applicant shall agree all such details with Irish Water, prior to submission of the full application.</p>	<p>I. The location of the attenuation tank shown in the JODA drawing "4539-004 Proposed Storm Sewer Layout" is moved on the Western side of the Site.</p> <p>II. Please see attached with the following documentation the Statement of Design Acceptance from Irish Water, showing that the cantilever height is sufficient to guarantee any type of on-site work for the existing 1050mm foul interceptor, for this reason, the application is not conformed in this situation with building over an Irish Water Asset, please Refer to the JODA drawing "4539-010 Combined Foul and Storm Layout" in particular on Section A-A.</p> <p>III. Please see attached the updated site layout drawings incorporate with this application, showing the wayleave in conformity with Irish Water Confirmation of Feasibility Requests.</p> <p>IV. Please refer to the landscape layout plan and the Statement of Design Acceptance lodged with this application.</p>
<p><b>2 - Storm water:</b></p> <p>i. The proposed building footprint &amp; foundation appears to be too close to the existing 375mm storm sewer that passes from south to north, inside the western boundary of</p>	<p>I. Please refer to the attached "4539-004 Proposed Storm Sewer Layout" drawing showing the diversion of the existing 375mm storm sewer pipe that passes from south to north on the existing footpath located outside the western boundary of the site, Bellmount has the</p>

<p>the site (no setback dimensions have been included). If not already done, the exact location of this storm sewer should be surveyed on site (Rather than relying on the accuracy of the GIS records) and this location reflected on the layout drawings. Dimensioned building foundation setbacks shall be included along the length of the building.</p> <p>ii. The Applicant shall liaise with Cork City Council Drainage Section to carry out these survey works.</p> <p>iii. The building should then be appropriately set back from the existing storm sewer. Guidance in this regard can be taken from Section 3.5.9 of the Irish Water Code of Practice (noted that this document is for wastewater infrastructure; however, its guidance for gravity sewers is applicable to storm sewerage); in other words, the setback between the nearest edge of the building foundation and the outer face of the storm sewer shall be 3m, or a distance equivalent to the depth of the sewer, whichever is greater, in accordance with Section 3.5.9 of the Irish Water Wastewater Code of Practice.</p> <p>iv. If required, the building layout shall be amended, or proposals for diversion of the existing storm sewer submitted.</p>	<p>permission to Divert the existing storm Pipe, please refer to the planning application approved in the planning application 19/38385 .</p> <p>II. Following discussions with IW and Cork City Council the location of this pipe has been confirmed on site following cleaning and tracing by a specialist contractor. The location of this pipe has been surveyed and included in the storm and foul drainage drawings along with the required wayleaves.</p> <p>III. Following answer I, with the diversion of the existing storm pipe, even the foundation is piled, there will be no risk to undertake repairs to the existing sewer.</p> <p>IV. Following Answer I, Please refer to 4539-004 Proposed Storm Sewer Layout</p>
<p><b>3- Sustainable Urban Drainage Systems (SuDS):</b></p> <p>i. The Storm Water management and SuDS Assessment report submitted is noted.</p> <p>ii. While it is noted and welcome that green roof measures are to be included in the proposed development's SuDS management train, a number of other SuDS elements have been excluded, which may warrant further attention; namely, tree-pits, rain gardens and bio-retention areas. Considering the amount of hard landscaping proposed, the Applicant is requested to assess the feasibility and merits of these measures further, prior to submission of the application. In addition, while rainwater harvesting is not proposed for servicing the building, the Applicant is requested to update the SuDS report to assess whether any of the proposed public realm planting can be supplied by rainwater harvesting.</p> <p>iii. Noted that a petrol interceptor and attenuation has also be proposed.</p>	<p>I. Noted</p> <p>II. Please refer to JODA Suds Assessment with amended options to provide in the proposed development. Rainwater harvesting is not feasible on site due to the room constraints due to the Existing Foul Interceptor Wayleave, other SuDS options are provided for the proposed development to supply it, please refer to the landscaping layout and JODA SuDS Assessment lodged with this application for further details.</p> <p>III. Noted</p>

#### 4- Flooding:

i. I am satisfied with the flood risk assessment as presented; specifically:

- The proposed FFL of 5.97mOD
- The FRA's cognisance of the LLFRS.
- The proposal to discharge downpipes directly to the Glasheen River. Roof drainage is proposed to incorporate a green roof system, and in times of flood the Glasheen

River's flow will be orders of magnitude higher than any roof run-off.

- The proposal to provide compensatory storage (although, as outlined above, the location of this tank needs to be changed, to avoid the 1050mm foul sewer wayleave)

- The justification test has been passed

- I. No comments related, noted the proposed FFL is 5.90OD now, please refer to the updated Flood Risk Assessment Lodged with this application.

*G. Appendix – Engineering Drawing associated with this submission*

**SCHEDULE OF DRAWINGS**

<b>Ref</b>	<b>Title</b>	<b>Size</b>	<b>No. of pages</b>
4539-002	EXISTING DRAINAGE SERVICES	A1	1
4539-003	PROPOSED FOUL SEWER LAYOUT	A1	1
4539-004	PROPOSED STORM SEWER LAYOUT	A1	1
4539-005	PROPOSED WATERMAIN LAYOUT	A1	1
4539-006	FOUL SEWER LONGITUDINAL SECTION	A4	1
4539-007	STORM SEWER LONGITUDINAL SECTION	A3	3
4539-010	PROPOSED COMBINED FOUL AND STORM LAYOUT	A1	1