Civil Engineering Report (Planning Application)

Project:

Modular Labs Extension at Questum Acceleration Centre,
Clonmel,
Co. Tipperary

Applicant:

Tipperary County Council

Date of Report:

01/12/2022

Project Ref. No.:

22151

Limerick
The Park
Lord Edward Street
Limerick
V94 840C
Tel 061 310701

Wexford
14 Crescent Mall
Henrietta Street
Wexford
Y35 XD1K
Tel 053 9152814

Dublin
20 Harcourt Street
Dublin 2
D02 H364
Tel 01 4007515

W: www.draconsulting.ie **E:** info@draconsulting.ie

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Document Control

Producer:	Date:	Reviewer:	Date:	Approver:	Date:	Revision Status:
E. Doorly	01/12/2022	J.Reidy	01/12/2022	A.Dennany	01/12/2022	1st
E. Doorly	13/01/2023	J.Reidy	13/01/2023	A.Dennany	13/01/2023	2nd
E. Doorly	28/02/2023	J.Reidy	27/02/230	A.Dennany	28/02/23	3rd
E. Doorly	14/03/2023	J.Reidy	14/03/230	A.Dennany	14/03/23	4th
E. Doorly	03/04/2023	J.Reidy	03/04/2023	A.Dennany	03/04/2023	5th

1.0 Introduction

DRA Consulting Engineers have been engaged by Tipperary County Council, via Kenneth Hennessy Architects to provide consulting civil engineering services for the development of Modular Labs as an extension of Questum Acceleration Centre, Clonmel, Co. Tipperary. The proposed development is located on a greenfield site with sloping topography.

The development will consist of the construction of 10 No. Lab Units and associated ancillary site works. Ancillary site works will include new drainage works, watermain works and access roads, footpaths & green areas.
Figure 1 below indicates the location of the proposed development site.

This Civil Engineering Report has been prepared to form part of the proposed Planning Application and to inform the Local Authority on the design approach adopted for the proposed development.

Figure 1: Site Location (Source: Google Maps)

2.0 Civil Engineering Elements

2.1 Overview

This report should be read in conjunction with the Architectural drawings prepared by Kenneth Hennessy Architects and the DRA Consulting Engineers drawings listed below:

DRA Consulting Engineers Planning Drawings:

- Drawing No. 22151-110-1: *Swept Path Analysis – Articulated Truck*
- Drawing No. 22151-150-1: *Proposed Foul and Surface Water Drainage Layout*
- Drawing No. 22151-151-1: *Proposed Foul and Surface Water Longitudinal Sections*
- *Drawing No. 22151-160-1: Proposed Water Main Layout*
- *Drawing No. 22151-170-1: Proposed Road Levels*

This report outlines how the proposed development will be serviced in terms of access (vehicular & pedestrians), car-parking, potable water supply & firefighting, surface water disposal and foul water disposal.

2.2 Existing Services.

A request was submitted to Tipperary County Council to provide records of water and drainage services in the area of the proposed development. We were furnished with a set of Irish Water asset maps showing foul drainage and watermain layouts in the vicinity of the proposed development site. A copy of these maps are contained in Appendix A of this report.

The asset maps show an existing 225mm diameter foul sewer and a 450mm diameter surface water sewer to the south of the site, at the Cahir roundabout. There is also an existing connection to the surface water network to the North East of the site, at the existing vehicle entrance to the Questum Centre.

Figure 2: Extract for Irish Water Wastewater Map

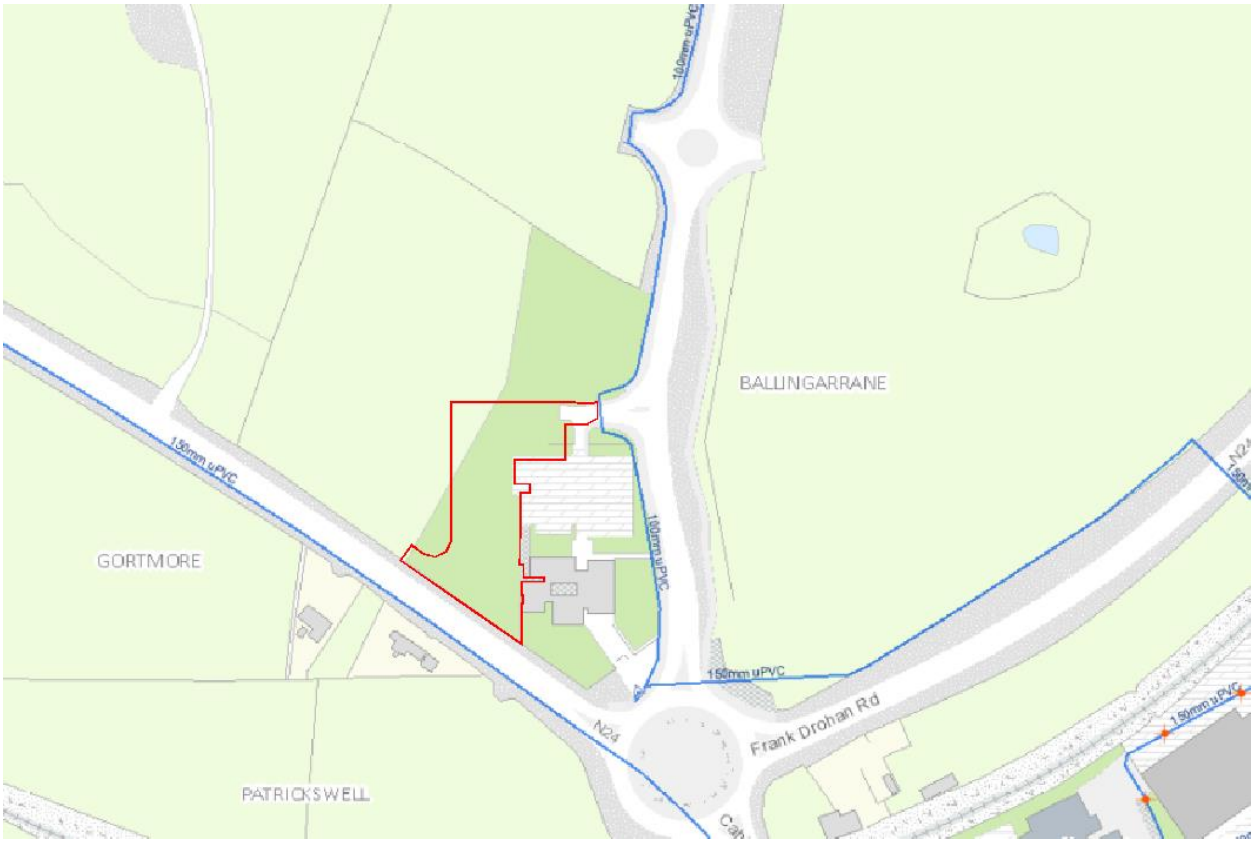


Figure 3: Extract for Irish Water Water Mains Map

Figure 4: Extract from Tipperary County Council Surface Water Map

2.3 Proposed Site Access

The site is accessed from the existing road which services the Questum Acceleration Centre. It is proposed to extend the existing road to the west of the Acceleration Centre to service the new modular labs.

Questum Acceleration Centre is located just off the N24, north of the Cahir Roundabout.

2.4 Road Design

Drawing No. *22151-170*: *Proposed Road Levels*. Road access, internal road and footpaths shall be constructed in accordance with Design Manual for Urban and Streets (DMURS).

2.5 Swept Path Analysis

A vehicle swept path analysis has been undertaken by as part of this planning submission and has demonstrated the proposed layout can appropriately accommodate the manoeuvring and circulation of all users.

2.6 Car-parking Facilities.

As per the Tipperary County Development Plan 2022-2028, a Science & Technology Park / Business Park development requires 1 parking space per staff member and 1 parking space per 25 sqm of floor space. By this calculation the proposed extension to the Questum Centre would require 44 additional parking spaces.

Applying the same rate of parking provision as above to the current parking provided at the Questum Centre. There is currently office space allocated for 32 staff, plus 600sqm of flexible enterprise space, labs, meeting rooms etc.. This gives a requirement for 56 parking spaces at the Questum Centre. There are currently 71 parking spaces provided at the Questum Centre. By this calculation there are 15 excess car parking spaces.

However, it is our understanding that there is in excess of 20 spaces left vacant daily. We propose to share the current parking area with the new extension, utilising these excess spaces.

Therefore, we are proposing to provide 24 new car parking spaces under this application for the extension to the Questum Centre, including 2 disabled car parking spaces. We believe that the existing excess parking spaces shared with the new 24 parking spaces will allow sufficient parking for the development.

The design of the parking spaces is in accordance with DMURS and the disabled space design is in accordance with Best Practice Access Guidelines published by Irish Wheelchair Association. There will be 5 no. electrical vehicle charging parking spaces. There will also be ducting in place to accommodate future e-scooter and e-bike charging facilities.

2.7 Proposed Storm Water

Our drawing no. 21229-150-1: *Proposed Foul and Surface Water Drainage* has been prepared to show the proposed surface water layout for the proposed 10 laboratory units and ancillary site works. This drawing includes details for proposed and existing pipework, road gullies and manholes.

It is proposed to discharge the surface water run-off generated from the proposed development to the existing 450mm diameter surface water network at 2 No. manhole locations thus creating 2 No. independent surface water networks that will cater for the overall site.

Surface water run-off will be collected from impermeable surfaces (roofs, roads, footpaths, parking spaces etc.) via rainwater pipes and road gullies. The collected surface water will be directed towards a proprietary flow control devices fitted to manholes SW MH 2.1 and EXSWMH 07 set at an outflow of 5 litres per second.

Surcharge surface water upstream from the flow control device fitted to SW MH 2.1 is directed to an impermeable surface water attenuation tank providing with a storage capacity for the 100-year storm event plus a 20% storage allowance for climate change to minimise the downstream impact. Surface water downstream from the flow control device will finally pass through a proprietary 'class 1' by-pass petrol inceptor before being discharged into an existing surface water manhole EX. SWMH 02. The attenuation tank storage capacity is 56m³. Surcharge surface water upstream from the flow control device fitted to EXSWMH 07 will be accommodated within the pipe network. There is sufficient capacity for the 100-year storm event plus a 20% storage allowance for climate change.

The following specifications and requirements have been followed in respect to surface water design:

Minimum depth	1.2m cover under roadways 0.9m elsewhere
Minimum sewer size	225mm
Runoff factors for pipe sizing	100% paved and roof surfaces
Rainfall for initial pipe sizing	50mm/hr rainfall intensity
Minimum velocity (pipe full)	0.8 m/sec
Flooding	Check made for adequate protection. No surcharging in respect of flow for return period less than 30 years No flooding in respect of flow for return period less than 100 years.
Roughness	Ks 0.6mm

Surface water attenuation has been designed in accordance with the requirements of the Greater Dublin Strategic Drainage Study (GDSDS). Included in Appendix B of this report is hydraulic modelling calculations (carried out using Causeway Flow, a specialist software) to demonstrate the following:

- Drainage pipework designed for the 1 in 5 year return period;
- No flooding occurring for the 1 in 30 year return period; and
- Properties protected against flooding for the 1 in 100 year return period.

It is proposed that measures included in the Greater Dublin Strategic Drainage Study (GDSDS) for surface water management (i.e. SuDS – sustainable urban drainage systems) will be implemented as far as is practicable on this development. It is proposed to direct surface water from impermeable surfaces (roofs, roads, footpaths, hardstanding areas, etc.) to an underground proprietary permeable surface water modular attenuation tank.

The attenuation tanks will be lined with an impervious membrane to prevent infiltration to or from the surrounding ground. The impervious liner will prevent any infiltration from surrounding groundwater as it may rise and fall with the seasons.

The proposed Green Infrastructure measures for the subject site will consist primarily of maximising the area of permeable surfacing throughout the site so that the surface water run-off from the site to the public surface water sewer will be kept to an absolute minimum. Permeable surfacing on site will consist of grassed areas. Attenuation tanks are sized to carter run-off from permeable driveways and on-street parking in case those fail / silt up in time.

Drawing no. 21229-151-1 *Proposed Foul and Surface Water Longitudinal Sections* has been prepared to capture the longitudinal sections through the proposed pipework including cover levels, invert levels, pipe lengths, gradients and manholes for the site.

2.8 Foul Water Drainage

Our drawing no. 21229-150-1: *Proposed Drainage Layout* has been prepared to show the foul water layout for the proposed development. This drawing includes details for proposed and existing pipework and manholes.

It is proposed that the foul effluent from the development site will be discharged into the existing 225mm diameter foul sewer located on the site. The proposed foul system will be a closed, gravity system. This foul line will extent to the far north of the new access road, to allow for any possible future development within the site.

A separate foul and surface water drainage systems will be constructed to serve the proposed development site, with separate outfalls to the respective foul and surface water public systems. Therefore, no foul water will discharge to the public surface water system.

The Causeway Flow analysis has demonstrated that the pipe design for the foul network is adequate. The detailed Causeway Flow calculations are presented in Appendix B.

Drawing no. 21229-151-1 (*Proposed Foul and Surface Water Longitudinal Sections*) has been prepared to capture the longitudinal sections through the proposed pipework including cover levels, invert levels, pipe lengths, gradients and manholes for the site.

All proposed wastewater services and connections to the existing wastewater network are to be constructed in accordance with details contained within the following documents:

- Irish Water Document IW-CDS-5030-01 – Wastewater Infrastructure Standard Details – Connection and Developer Services – Construction Requirements for Self-Lay Developments.
- Irish Water Document IW-CDS-5030-03 – Code of Practice for Wastewater Infrastructure – Connection and Developer Services – Construction Requirements for Self-Lay Developments.

We confirm that a Pre-connection Enquiry has been submitted to Irish Water for the proposed development.

2.9 Water Supply

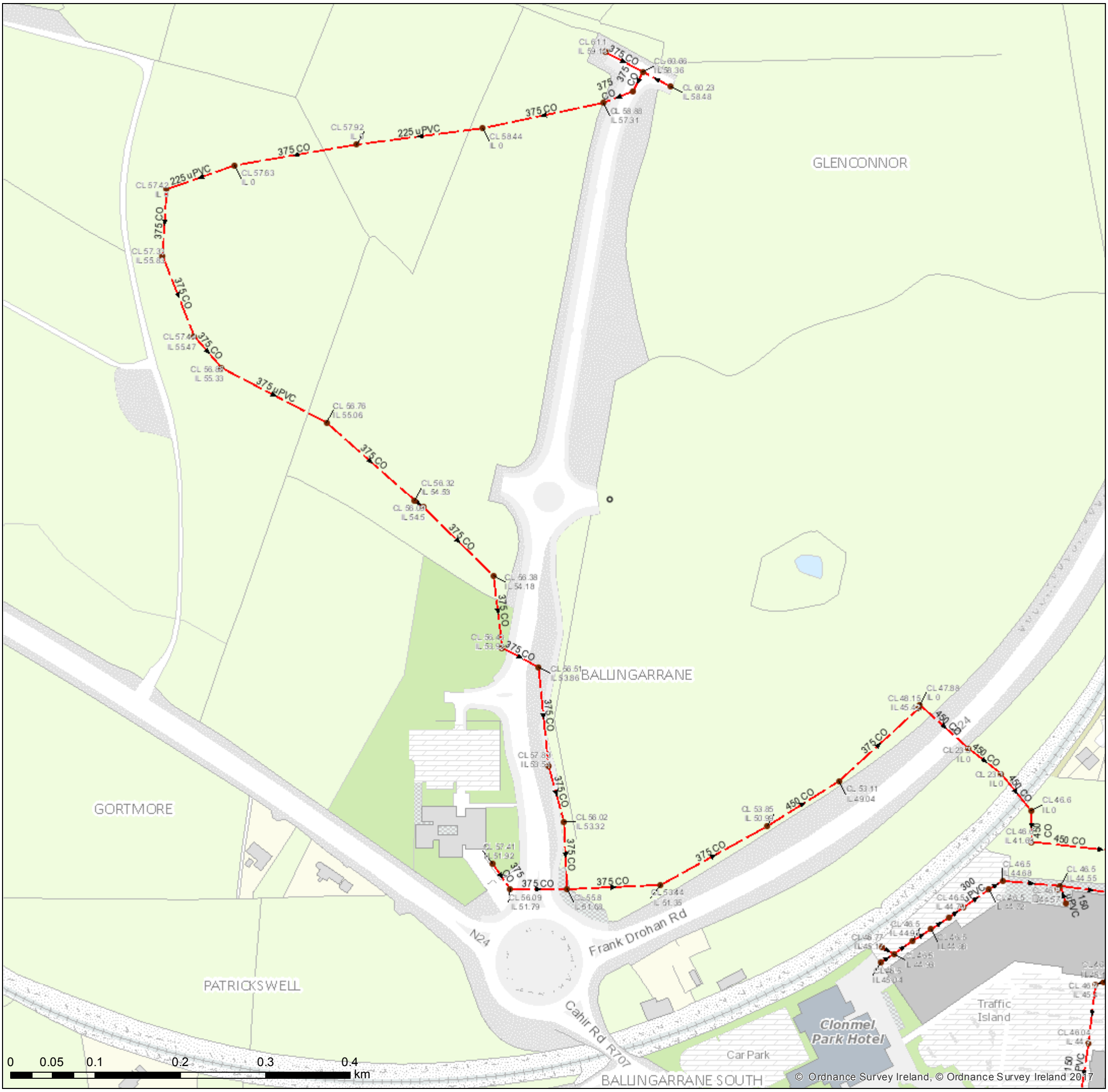
Our drawing no. 21229-160-1: *Proposed Watermain Layout* have been prepared to show the watermain layout for the proposed development. This drawing includes details for proposed and existing pipework together with thrust and support blocks, hydrants, air valves, sluice valves and scour valves. Boundary boxes are also shown indicatively at individual service connections.

All proposed water services and connections to the existing water services are to be constructed in accordance with details contained within the following documents:

- Irish Water Document IW-CDS-5020-01 – Water Infrastructure Standard Details – Connection and Developer Services – Construction Requirements for Self-Lay Developments.
- Irish Water Document IW-CDS-5020-03 – Code of Practice for Water Infrastructure – Connection and Developer Services – Construction Requirements for Self-Lay Developments.

Appendix A – Existing Services Maps

Irish Water Web Map



Water Distribution Network
- Water Treatment Plant
- Water Pump Station
- Storage Cell/Tower
- Dosing Point
- Meter Station
- Abstraction Point
- Telemetry Kiosk

Reservoir
- Potable
- Raw Water

Water Distribution Mains
- Irish Water
- Private

Trunk Water Mains
- Irish Water
- Private

Water Lateral Lines
- Irish Water
- Non IW
- Water Casings
- Water Abandoned Lines
- Boundary Meter
- Bulk/Check Meter
- Group Scheme
- Source Meter
- Waste Meter
- Unknown Meter ; Other Meter
- Non-Return
- PRV
- PSV
- Sluice Line Valve Open/Closed
- Butterfly Line Valve Open/Closed
- Sluice Boundary Valve Open/Closed
- Butterfly Boundary Valve Open/Closed
- Scour Valves
- Single Air Control Valve
- Double Air Control Valve
- Water Stop Valves
- Water Service Connections
- Water Distribution Chambers
- Water Network Junctions
- Pressure Monitoring Point
- Fire Hydrant
- Fire Hydrant/Washout

Water Fittings
- Cap
- Reducer
- Tap
- Other Fittings

Sewer Foul Combined Network
- Waste Water Treatment Plant
- Waste Water Pump station

Sewer Mains Irish Water
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow

Sewer Mains Private
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow
- Sewer Lateral Lines
- Sewer Casings

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Inlet Type
- Gully
- Standard
- Other; Unknown

Storm Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Gas Networks Ireland
- Transmission High Pressure Gasline
- Distribution Medium Pressure Gasline
- Distribution Low Pressure Gasline

ESB Networks

ESB HV Lines
- HV Underground
- HV Overhead
- HV Abandoned

ESB MVLV Lines
- MV Overhead Three Phase
- MV Overhead Single Phase
- LV Overhead Three Phase
- LV Overhead Single Phase
- MVLV Underground
- Abandoned

Non Service Categories
- Proposed
- Under Construction
- Out of Service
- Decommissioned

Water Non Service Assets
- Water Point Feature
- Water Pipe
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

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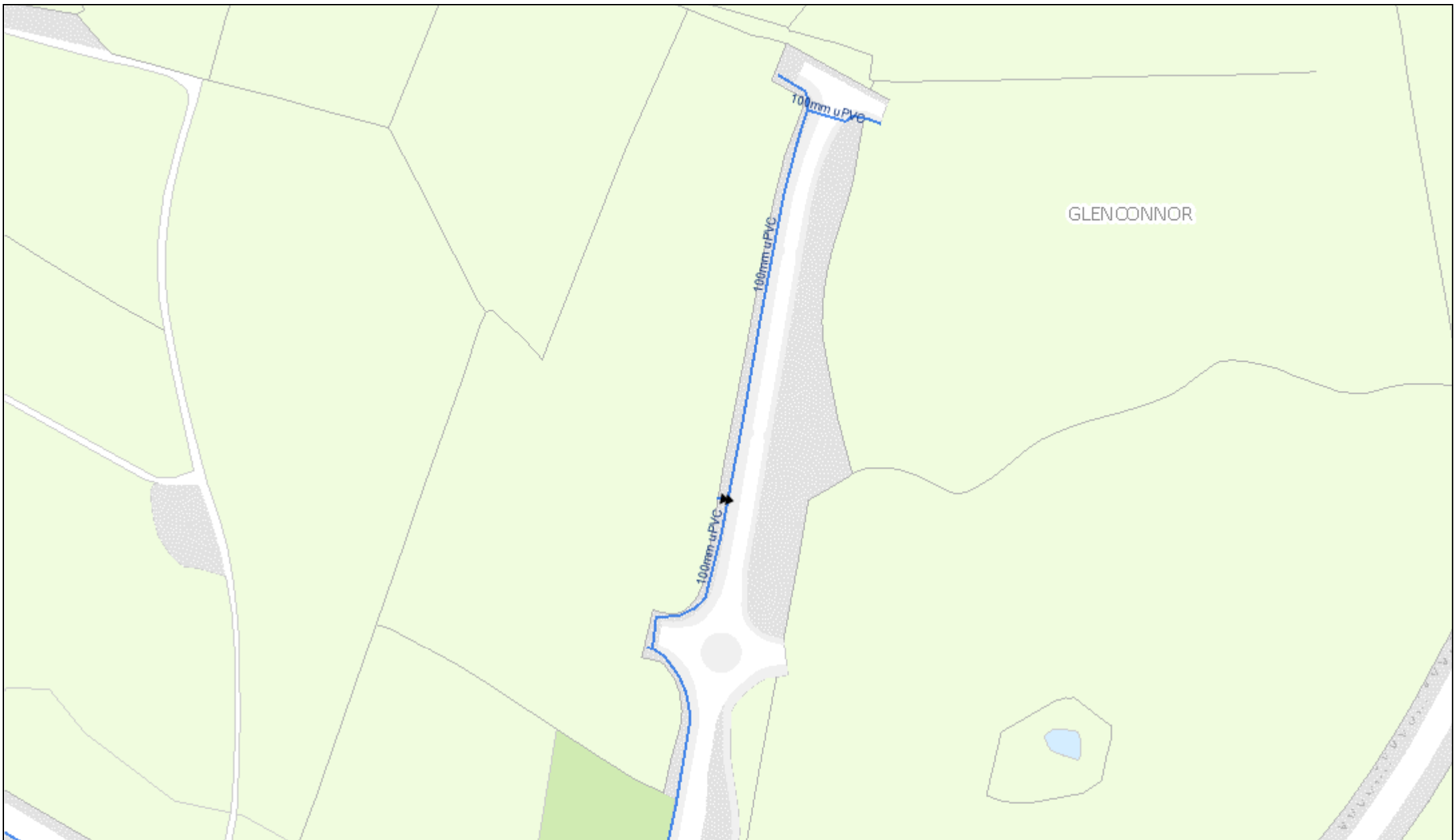

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Discharge Type
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Cleanout Type
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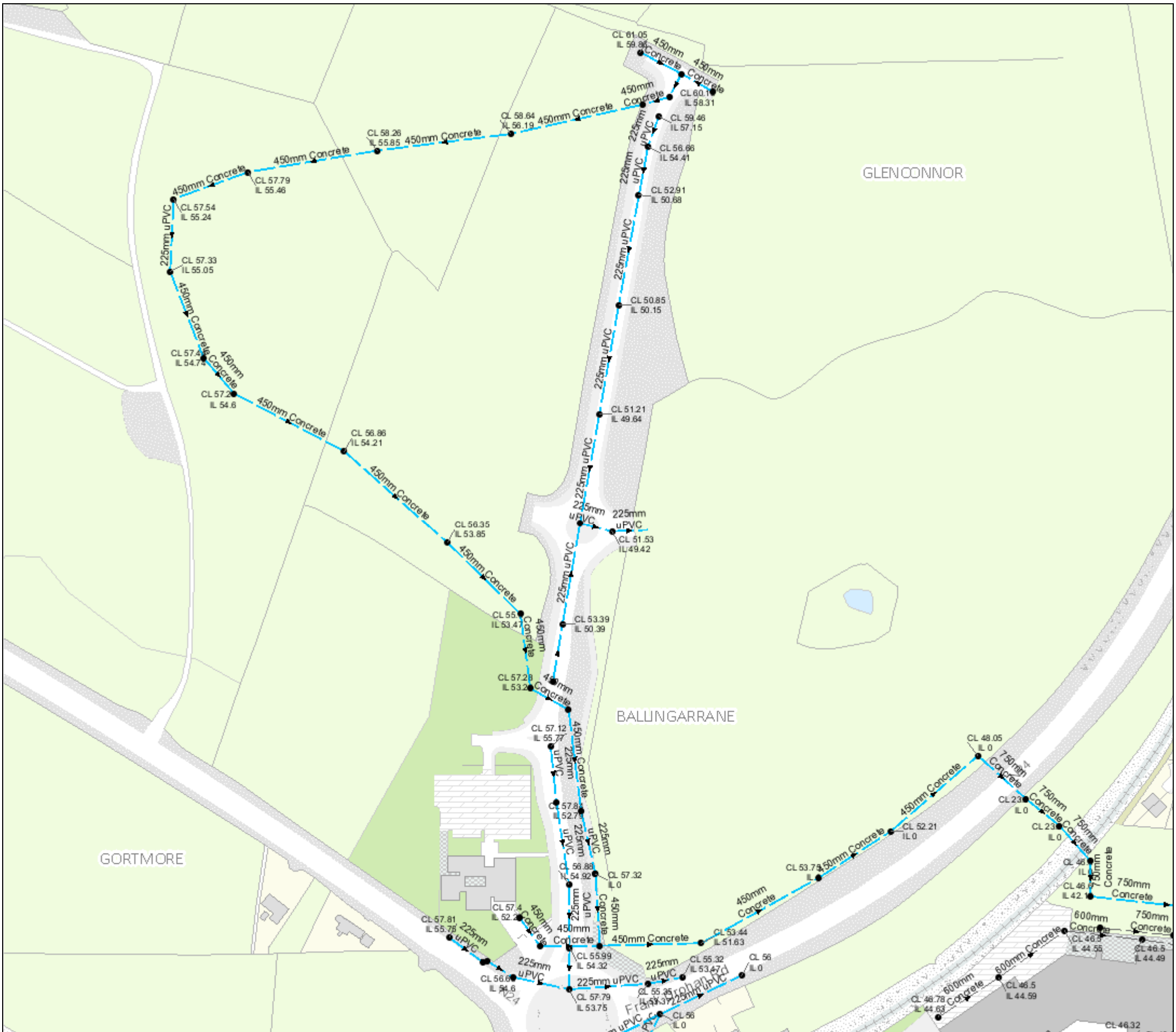

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Appendix B – Surface Water & Foul Water Networks: Design Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	0.80
FSR Region	Scotland and Ireland	Connection Type	Level Inverts
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.200	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	x
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SWMH 2.3	0.000	5.00	60.950	1200	617479.731	623045.045	1.650
SWMH 2.2	0.058	5.00	60.040	1200	617479.788	622999.155	1.640
SWMH 2.1	0.153	5.00	58.920	1200	617479.790	622944.423	2.070
EX. SWMH 02			58.440	1200	617510.108	622930.402	1.810
ATT TANK	0.000	5.00	59.090	1200	617471.887	622955.409	1.650
SWMH 05	0.008	5.00	59.020	1200	617525.305	623042.568	1.430
EXSWMH 07	0.040	5.00	57.970	1200	617553.955	623042.352	1.800
EXSWMH 08	0.000	5.00	57.120	1200	617584.637	623042.375	1.350

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.00	SWMH 2.3	SWMH 2.2	42.890	0.600	59.300	58.400	0.900	47.7	300	5.31	50.0
1.001	SWMH 2.2	SWMH 2.1	54.732	0.600	58.400	56.850	1.550	35.3	300	5.66	50.0
1.002	SWMH 2.1	EX. SWMH 02	33.403	0.600	56.850	56.630	0.220	151.8	225	6.18	50.0
2.000	ATT TANK	SWMH 2.1	13.600	0.600	57.440	57.290	0.150	90.7	225	5.17	50.0
2.0	SWMH 05	EXSWMH 07	28.500	0.600	57.590	56.170	1.420	20.1	300	5.13	50.0
3.001	EXSWMH 07	EXSWMH 08	30.682	0.600	56.170	55.770	0.400	76.7	225	5.48	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.00	2.283	161.4	0.0	1.350	1.340	0.000	0.0	0	0.000
1.001	2.654	187.6	7.9	1.340	1.770	0.058	0.0	41	1.327
1.002	1.058	42.1	28.6	1.845	1.585	0.211	0.0	136	1.135
2.000	1.373	54.6	0.0	1.425	1.405	0.000	0.0	0	0.000
2.0	3.525	249.1	1.1	1.130	1.500	0.008	0.0	14	0.891
3.001	1.494	59.4	6.5	1.575	1.125	0.048	0.0	50	0.984

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	Scotland and Ireland	Drain Down Time (mins)	240
M5-60 (mm)	17.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.200	Check Discharge Rate(s)	✓
Summer CV	0.750	100 year (l/s)	5.0
Winter CV	0.840	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
5	0	0	0
30	0	0	0
100	20	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Node SWMH 2.1 Online StormBrake™ Control

Flap Valve	x	Design Flow (l/s)	5.0
Replaces Downstream Link	✓	Product Code	FPM-SB1-01900-00500-1100
Invert Level (m)	56.850	Min Outlet Diameter (m)	0.150
Design Depth (m)	1.900	Min Node Diameter (mm)	1200

Node EXSWMH 07 Online StormBrake™ Control

Flap Valve	x	Design Flow (l/s)	5.0
Replaces Downstream Link	✓	Product Code	FPM-SB1-01700-00500-1100
Invert Level (m)	56.170	Min Outlet Diameter (m)	0.150
Design Depth (m)	1.700	Min Node Diameter (mm)	1200

Node ATT TANK Lined Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	57.440	Pit Length (m)	3.500
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	212	Depth (m)	0.800
Safety Factor	2.0	Ring Diameter (m)	0.800	Inf Depth (m)	
Porosity	0.95	Pit Width (m)	19.000	Number Required	1

Results for 5 year Critical Storm Duration. Lowest mass balance: 98.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 2.3	1	59.300	0.000	0.0	0.0000	0.0000	OK
15 minute winter	SWMH 2.2	10	58.444	0.044	9.3	0.0817	0.0000	OK
15 minute winter	SWMH 2.1	12	57.804	0.954	33.5	2.4892	0.0000	SURCHARGED
15 minute summer	EX. SWMH 02	1	56.630	0.000	4.7	0.0000	0.0000	OK
120 minute winter	ATT TANK	94	57.645	0.205	11.4	13.1638	0.0000	OK
15 minute winter	SWMH 05	10	57.606	0.015	1.3	0.0193	0.0000	OK
15 minute winter	EXSWMH 07	13	56.408	0.238	7.7	0.3743	0.0000	SURCHARGED
15 minute summer	EXSWMH 08	1	55.770	0.000	4.5	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH 2.3	1.00	SWMH 2.2	0.0	0.000	0.000	0.1347	
480 minute winter	SWMH 2.2	1.001	SWMH 2.1	1.8	0.249	0.010	1.9851	
15 minute winter	SWMH 2.1	StormBrake™	EX. SWMH 02	4.7				15.4
30 minute summer	ATT TANK	2.000	SWMH 2.1	-37.4	-1.292	-0.684	0.4134	
180 minute summer	SWMH 05	2.0	EXSWMH 07	0.6	0.213	0.002	0.3493	
15 minute winter	EXSWMH 07	StormBrake™	EXSWMH 08	4.6				3.5

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 2.3	1	59.300	0.000	0.0	0.0000	0.0000	OK
15 minute winter	SWMH 2.2	10	58.454	0.054	13.6	0.0986	0.0000	OK
15 minute summer	SWMH 2.1	11	57.981	1.131	46.6	2.9500	0.0000	SURCHARGED
15 minute summer	EX. SWMH 02	1	56.630	0.000	4.7	0.0000	0.0000	OK
180 minute winter	ATT TANK	144	57.885	0.445	11.7	28.6580	0.0000	SURCHARGED
15 minute winter	SWMH 05	10	57.609	0.019	1.9	0.0231	0.0000	OK
30 minute winter	EXSWMH 07	23	56.734	0.564	9.6	0.8878	0.0000	SURCHARGED
15 minute summer	EXSWMH 08	1	55.770	0.000	5.0	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH 2.3	1.00	SWMH 2.2	0.0	0.000	0.000	0.1763	
15 minute winter	SWMH 2.2	1.001	SWMH 2.1	13.2	0.278	0.070	2.1602	
15 minute summer	SWMH 2.1	StormBrake™	EX. SWMH 02	4.7				20.1
15 minute winter	ATT TANK	2.000	SWMH 2.1	-57.5	-1.897	-1.053	0.5193	
240 minute winter	SWMH 05	2.0	EXSWMH 07	0.5	0.212	0.002	0.3323	
30 minute winter	EXSWMH 07	StormBrake™	EXSWMH 08	5.0				7.5

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 98.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 2.3	1	59.300	0.000	0.0	0.0000	0.0000	OK
240 minute winter	SWMH 2.2	188	58.680	0.280	6.8	0.5148	0.0000	OK
240 minute winter	SWMH 2.1	188	58.680	1.830	21.4	4.7755	0.0000	FLOOD RISK
15 minute summer	EX. SWMH 02	1	56.630	0.000	4.7	0.0000	0.0000	OK
240 minute winter	ATT TANK	188	58.681	1.241	15.9	51.9947	0.0000	SURCHARGED
30 minute winter	SWMH 05	24	57.616	0.026	2.5	0.0323	0.0000	OK
30 minute winter	EXSWMH 07	25	57.618	1.448	15.1	2.2805	0.0000	SURCHARGED
15 minute summer	EXSWMH 08	1	55.770	0.000	5.0	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH 2.3	1.00	SWMH 2.2	0.0	0.000	0.000	0.2418	
15 minute winter	SWMH 2.2	1.001	SWMH 2.1	20.6	0.417	0.110	2.2456	
240 minute winter	SWMH 2.1	StormBrake™	EX. SWMH 02	4.9				114.6
15 minute winter	ATT TANK	2.000	SWMH 2.1	-88.6	-2.532	-1.623	0.5409	
360 minute winter	SWMH 05	2.0	EXSWMH 07	0.6	0.215	0.002	0.4800	
30 minute winter	EXSWMH 07	StormBrake™	EXSWMH 08	5.0				11.8