Cork City Council Modular Housing – Clover Hill Court

Engineering Planning Report

194191-PUNCH-XX-XX-RP-C-001

Document Control

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P01	Issue for comment	11/07/22	D Trkulja	M O'Connor	M O'Connor
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1 Introduction

This report was prepared to accompany a planning application for the proposed development on a site located on Bessboro Road. The site location is shown in Figure 1-1 below.

The site is a brownfield site that was previously home to Hormann Electronics from 1977 until 2008 when the firm closed. It is approximately 1.02 hectares in area. Hormann Electronics assembled and tested printed circuit boards when in operation. It is not considered likely that such processes would have led to any possible contamination of the site. More than 90% of the site area is made up of hardstanding, comprising of macadam access road, carparking facilities and the foundations of the old Hormann Electronics building.

It is intended that the existing foundation will be demolished as part of the development. Asbestos was found in the remaining floors on the site and needs to be safely removed as part of the demolition process for the floor slab. The existing foul, storm water, and watermain connections will be retained and utilized as part of the new development. The site is relatively flat and is bounded by the Bessboro Road to the east, Riverview Business Park to the south, Jacobs Engineering Consultancy to the northeast and the Clover Hill housing estate to the northwest.

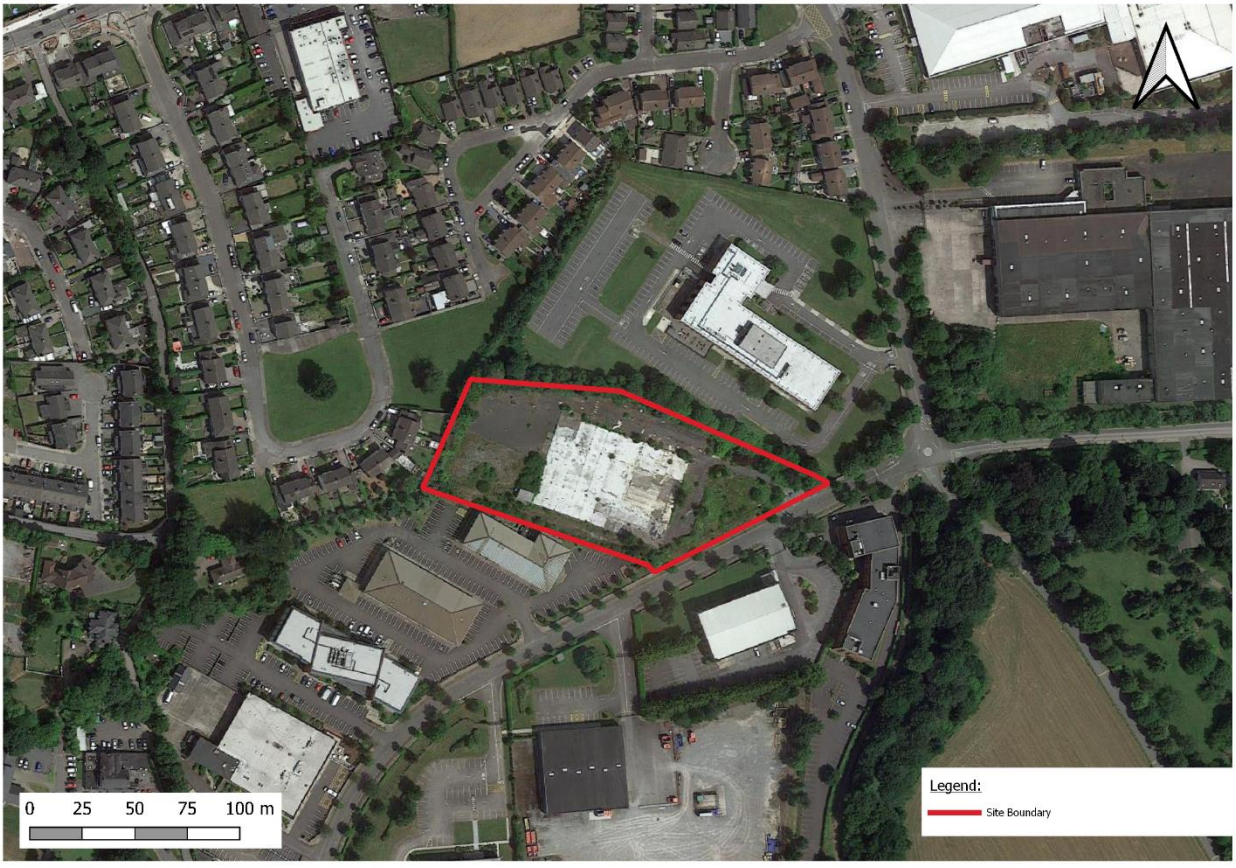


Figure 1-1: Site Location

1.1 Proposed Development

The proposed works are outlined in a series of architectural drawings prepared by O'Mahony Pike Architects and engineering drawings prepared by PUNCH Consulting Engineers and supplied as part of the planning documentation. The proposed development consists of construction of 28 no. 1-bed & 56 no. 2-bed apartments in two blocks ranging from 3 to 5 storeys, and 6 no. 3-bed 2-storey terraced houses provided to secure the site boundary with existing housing at Clover Lawn estate. It is intended that the construction of the scheme will be modular (3D volumetric or 2D panelised system). In addition to the structures, the development will consist of road infrastructure and car parking spaces, relocation of ESB substation within site and all other associated site development, drainage, and landscaping works. An extract from the proposed site layout is shown in Figure 1-2 below.

Figure 1-2: Proposed site layout

2 Stormwater Drainage Design

2.1 Existing Stormwater Drainage

Cork City Council record drawings indicate that there is an existing 1200mm gravity sewer traversing the site from the Clover Hill Estate to the Bessboro Road. The sewer is laid such as to allow storm water to flow in an easterly direction, with the sewer invert levels approximately 4m below existing ground levels which will allow for connection of proposed storm water infrastructure without a requirement for pumping.

A GPR survey conducted by Geodata confirmed the Cork County Council record drawings. The GPR survey confirmed the existence of 100mm and 150mm storm water sewers around the perimeter of the demolished structure which connect into the main stormwater line. These 100mm and 150mm sewer lines will be removed as part of the demolition works.

Please refer to Appendix A for Cork County Council Record Drawings illustrating the existing stormwater drainage arrangement. An extract is shown in Figure 2-1 below.

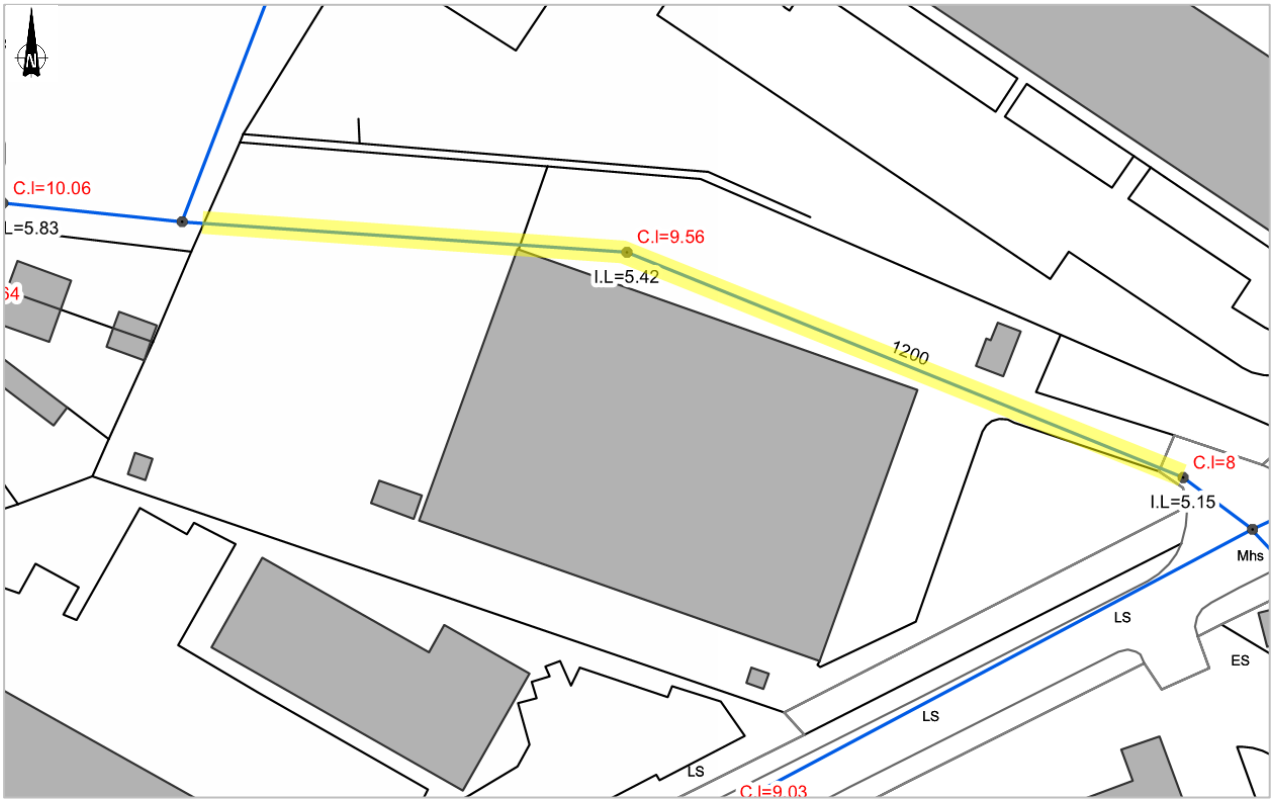


Figure 2-1: Existing stormwater drainage surrounding the site (Extract from Council records)

2.2 Proposed Stormwater Drainage

The proposed surface water drainage system has been designed using Causeway Flow software in accordance with the Department of Environment and Local Government's guidance document "Recommendations for Site Development Works for Housing Areas", with guidance taken from the "Greater Dublin Strategic Drainage Study" (GDSDS) and the Cork City Development Plan 2015-2021.

A new surface water sewer network shall be provided for the proposed development which will be entirely separated from the foul water sewer network. All surface water run-off from roof areas and hardstanding areas are designed to be collected by a gravity pipe network and connected to the existing stormwater network running through the site at Manhole No. S1-8. Refer to PUNCH drawing CLO-PUNCH-XX-XX-DR-C-0100 for details of connection location.

Notwithstanding that this is a brownfield site, in line with best practice, the storm flows from the development will be restricted by means of a Hydrobrake to the equivalent peak greenfield runoff rate (Q-BAR), which has been calculated as 8.43 litres per second in accordance with the IH124 report published by the Institute of Hydrology. As a consequence of this flow limitation, an attenuation tank will be required to store surface waters in extreme events.

Levels and drainage have been designed to ensure that no surface water generated by the development site outfalls to the Bessboro Road.

Proposed finished floor levels range between 9.850mAOD and 10.300mAOD. All floor levels are at least 500mm above maximum drainage water levels for a 100 year return period.

Table 2-1 describes the stormwater drainage design parameters used and detailed calculations are enclosed in Appendix B.

Table 2-1: Stormwater Drainage Design Parameters

Description	Value
Total site area	1.02 ha
Return period target	Pipe Design 1 in 5 year. Network Design 1 in 30 year + CC. Design 1 in 100 year + CC for flooding.
Climate Change	20%
M5-60	16.900
Ratio R	0.223
Soil type and runoff value	4 Clayey - 0.47
SAAR	1110 mm
Pipe surface roughness	0.6mm
Flow reduction parameter	Q-Bar
Controlled Outflow	Hydrobrake - 8.43 l/s
Attenuation Storage Volume	236 m^3

2.3 SUDs Proposals

The proposed development has been assessed in relation to Sustainable Urban Drainage Systems (SuDS). A variety of SuDS measures may be adopted to comply with Council recommendations. All SuDS measures are to be implemented with reference to the UK Suds Manual and Cork City Council drainage requirements.

2.3.1 Attenuation Tank

The proposed attenuation tank is sized to reduce the peak runoff from the site to the peak greenfield discharge rate of 8.43 l/s. The proposed attenuation tank is 1.6m deep and has a plan area of 155m^2. The minimum free storage volume of the tank is 236 m^3. See PUNCH drawing CLO-PUNCH-XX-XX-DR-C-0100 for a layout of the attenuation tank.

2.3.2 Petrol Interceptor

It is proposed that all surface water run-off from car park areas will outfall via a Class 1 Kingspan Klargester NSBE010 or approved equivalent Bypass Separator, located upstream of the connection to the existing storm water drain on site. This device will remove hydrocarbons and fine sediment particles from the site runoff and lower the risk of downstream contamination following an oil spillage on site.

Please refer to Appendix C for calculations regarding the proposed Petrol Interceptor Nominal size in accordance with EN 858-2.

Bypass separators fully treat all flows generated by rainfall rates of up to 6.5mm/hr. This covers over 99% of all rainfall events. Flows above this rate are allowed to bypass the separator. These separators are used when it is considered an acceptable risk not to provide full treatment for high flows, for example where the risk of a large spillage and heavy rainfall occurring at the same time is small.

Class 1 devices are designed to achieve a concentration of less than 5mg/l of oil under standard test conditions.

3 Foul Water Drainage Design

3.1 Existing Foul Water Drainage

Irish Water and Cork City Council record drawings indicate that there is an existing 375mm gravity sewer traversing the site from the Clover Hill Estate to the Bessboro Road. The gradient of the sewer is from west to east, with the sewer invert levels approximately 2.5m below cover levels which will allow for connection of future foul sewers without need for pumping.

A GPR survey conducted by Geodata found the existing foul sewer to be 500mm and confirmed the location foul sewer. Due to dense undergrowth, the foul sewer was not able to be surveyed near the entrance of the site. The GPR survey confirmed the existence of a 100mm and 150mm foul sewer line to the south and east of the site which connect into the main foul sewer line. These 100mm and 150mm foul sewer lines will be scrubbed and removed as part of the demolition works.

Please refer to Appendix A for Cork City Council drawings illustrating the existing foul water drainage arrangement. An extract is shown in Figure 3-1.

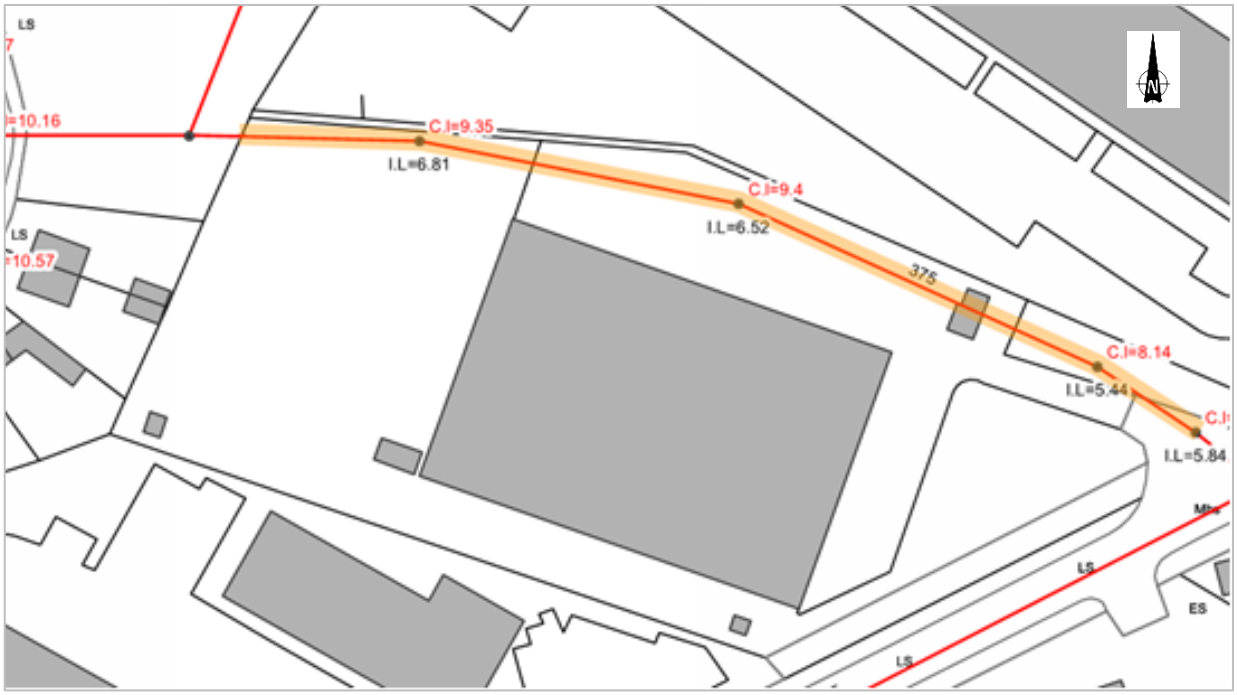


Figure 3-1: Existing foul drainage surrounding the site (Extract from Cork City Council records)

3.2 Proposed Foul Water Drainage

The proposed foul water sewers have been designed using Causeway Flow software in accordance with the DOE's "*Recommendations for Site Development Works for Housing Areas*". The foul loading has been calculated in accordance with "Code of Practice for Wastewater Infrastructure" (particularly clause 36, Appendix C and Appendix D) published by Irish Water.

It is proposed that the foul sewer will discharge by gravity to the existing foul sewer traversing the site at Manhole No. F1-9.

Table 3-1 describes the foul water drainage design parameters used and detailed calculations are enclosed in Appendix D.

Table 3-1: Foul Water Drainage Design Parameters

Description	Value
Residential Flow Rate	2471 l/per dwelling/day
Persons per Dwelling	2.7
Persons total	243
Infiltration allowance	10%
Peaking Factor	6 DWF (Residential)
Pipe surface roughness	0.15mm
Minimum Self Cleansing Velocity	0.75m/s
Minimum Pipe Diameter	150mm

Table 3-2: Foul Water Drainage Design Calculations

Category	Quantity	Flow Rate	Daily Flow (l/day)	DWF (l/s)	Design Peak Flow (XDWF) (l/s)
Residential	90 units =>243persons	150 l/per/day + 10%	40,095 l/day	0.464 l/s	2.573 l/s

A Pre-Connection Enquiry Form has been issued to Irish Water in relation to the proposed development. Irish water has provided a response, advising that waste water connection is feasible without any infrastructure upgrade. Please refer to Appendix E for the Confirmation of Feasibility from Irish Water.

4 Watermain Design

4.1 Existing Watermain

Irish Water record drawings indicate that there is an existing 300mm watermain running along Bessboro Road outside the site, and that there are 2 existing connections brought up to the site boundary from this watermain. There is also an existing watermain running through the Clover Hill Estate to the east of the site.

A GPR survey conducted by Geodata confirmed the location of the watermain within the site and along Bessboro Road.

Please refer to Appendix F for Irish Water Record Drawings illustrating the existing watermain arrangement in the area. An extract is shown in

Figure 4-1 below.

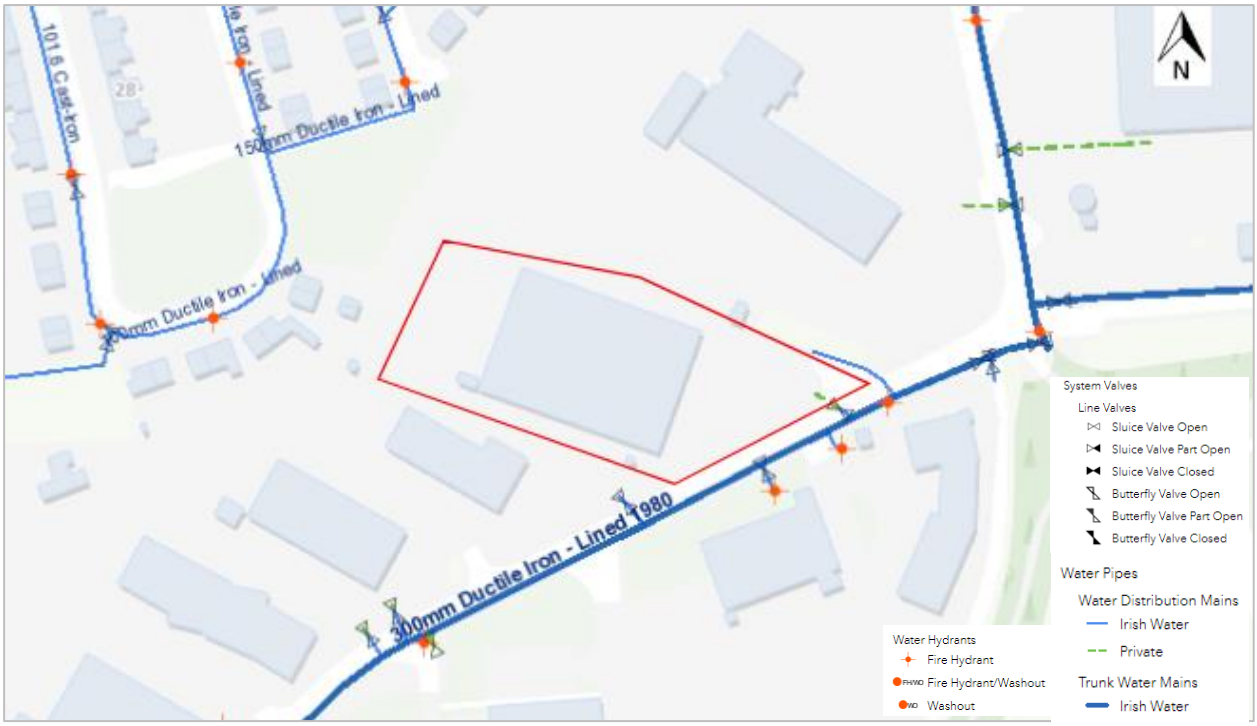


Figure 4-1: Existing watermain surrounding the site (Ref: Irish Water records)

4.2 Proposed Watermain

It is generally accepted that the design loading for foul drainage can be used to evaluate an approximation of the water demand on the site. With reference to Irish Water's Code of Practice for Water Infrastructure, the average daily flow is calculated as the number of persons multiplied by the flow rate per person. The average day peak week flow is taken to be 1.25 x the average flow, and the peak demand is taken to be the average day peak week flow multiplied by a peaking factor of 5.

Table 4-1 describes the watermain design parameters used.

Table 4-1: Watermain Design Parameters

Description	Value
Residential Flow Rate	150 l/per/day
Persons per Dwelling	2.7
Persons total	243
Average Demand	1.25 DWF
Peak Demand	5 DWF

Table 4-2: Watermain Design Calculation

Category	Quantity	Flow Rate	Daily Flow (l/day)	DWF (l/s)	Average Demand (1.25DWF) (l/s)	Peak Demand (5DWF) (l/s)
Residential	90 units =>243 persons	150 l/per/day	36,450 l/day	0.422 l/s	0.527 l/s	2.109 l/s

On the basis of the above tables, the development will have an increase in average water demand of 0.527 l/s and a peak water demand of 2.109 l/s.

It is proposed to construct a 100mm nominal diameter HDPE watermain to serve the proposed development based on the above calculated demand and hydrant requirements for the development. The proposed watermain will connect to the existing 300mm nominal diameter ductile iron watermain on Bessboro Road.

This feed will provide potable and firefighting water to the proposed development. A bulk water meter shall be provided at the site boundary at the location of the proposed connection to the existing watermain. The watermain layout has been designed in accordance with "Irish Water Code of Practice for Water Infrastructure". All watermains are to be constructed in accordance with Irish Water Code of Practice and the Local Authority's requirements. Fire coverage is to be reviewed and certified by the fire consultant.

To reduce the water demand on Local Authority water supplies and to reduce the foul discharge from the development, water conservation measures will be incorporated in the sanitary facilities throughout the development.

A Pre-Connection Enquiry Form has been issued to Irish Water in relation to the proposed development. Irish water has provided a response, advising that water servicing is feasible without any infrastructure upgrade. Please refer to Appendix E for the Confirmation of Feasibility from Irish Water.

5 Flooding

Planning guidelines on flood risk and development have been published by the OPW and Department of Environment, Heritage and Local Government (DoEHLG). The below sections summarise how the development's design will be assessed in accordance with the main principles of the guidelines.

5.1 Sequential Approach

The sequential approach makes use of flood zones for river and coastal flooding, as described below:

Zone A – High probability. This zone defines areas with the highest risk of flooding. For river flooding it is defined as more than 1% probability or more than 1 in 100 year, and for coastal flooding it is defined as 0.5% probability or more than 1 in 200 year.

Zone B – Moderate probability. This zone defines areas with a moderate risk of flooding. For river flooding it is defined as 0.1% to 1% probability or between 1 in 100 and 1 in 1,000 years, and for coastal flooding 0.1% and 0.5% probability or between 1 in 200 and 1 in 1,000 years.

Zone C – Low probability. This zone defines areas with a low risk of flooding less than 0.1% probability or less than 1 in 1,000 years.

The flood zones are then to be looked at with the vulnerability of the building proposed;

Highly Vulnerable	– Hospitals, Garda stations, homes, motorways etc.
Less Vulnerable	– Commercial, retail, offices etc.
Water Compatible	– Marina's, green areas

A sequential approach is then taken to assess the most favourable location for the development based on its vulnerability.

Zone A - Water Compatible or Justification Test

Zone B - Less Vulnerable if no other lands are available or highly vulnerable with Justification Test

Zone C - Any development

5.2 Development Sequential Test

5.2.1 Coastal Flood Risk

Coastal flooding results from sea levels which are higher than normal and result in sea water overflowing onto the land. Coastal flooding is influenced by the following three factors which often work in combination: high tide level, storm surges and wave action.

Preliminary CFRAM mapping below in Figure 5-2 indicates that the proposed development is located in Flood Zone C, and that there is no coastal flood risk to the site of the proposed development.

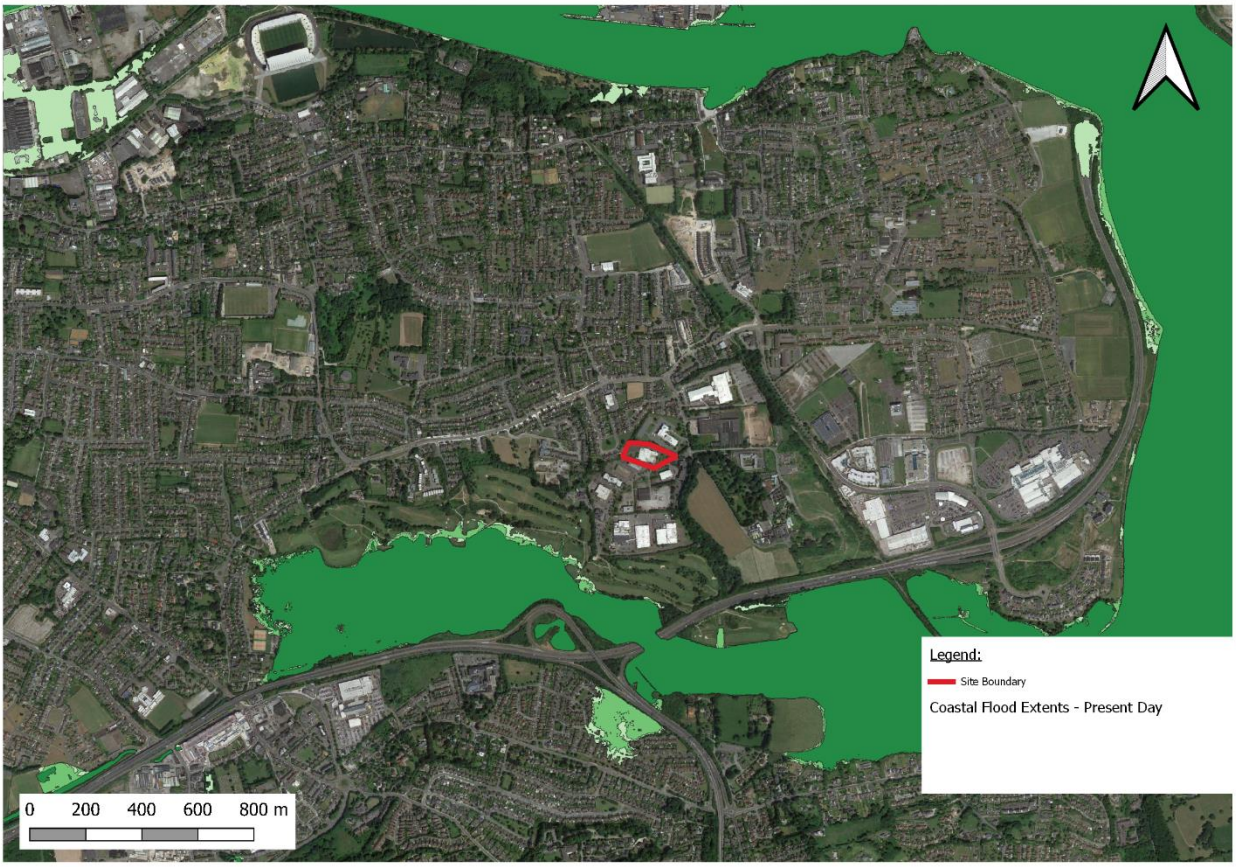


Figure 5-1: Coastal Flood Map (reference: CFRAM)

5.2.2 Fluvial Flood Risk

Fluvial flooding is the result of a river exceeding its capacity and excess water spilling out onto the adjacent floodplain.

Preliminary CFRAM mapping below in Figure 5-2 indicates that the proposed development is located in Flood Zone C, and that there is no fluvial flood risk to the site of the proposed development.

Figure 5-2: – Fluvial Flood Map (reference: CFRAM)

5.2.3 Pluvial Flood Risk

Pluvial flooding is the result of rainfall-generated overland flows which arise before run-off can enter any watercourse or sewer. It is usually associated with high intensity rainfall and typically occurs in the summer months. Pluvial flood risk has not been identified by the Preliminary Flood Risk Assessment (PFRA) mapping as being a risk to this site.

Additionally, the proposed drainage network will alleviate any concerns of pluvial flooding by catering for the 100 year return period plus 20% climate change allowance.

5.2.4 OPW Flood Maps

The OPW Flood Hazard Mapping Website is a record of historic flood events. This database indicates that there is no record of flooding incidents in the area of the proposed development.

5.3 Flood Risk Assessment Conclusions

The site has been assessed in accordance with the "The Planning System and Flood Risk Management" Guidelines. As part of the sequential test, the OPW flood hazard maps have been consulted, as have the Catchment Flood Risk Assessment Maps produced by the OPW.

In all cases it was found that the development is at low risk of flooding and the development is deemed appropriate within the proposed site location.

6 Roads and Access

6.1 Proposed Roads & Access

Access to the site will be via Bessboro Road. A 5m wide internal access road, and a 6m wide shared surface will be provided to access parking to the apartment blocks and the dwellings .

The proposed roads layout was designed in accordance with the Design Manual for Urban Roads and Streets (DMURS) and the Recommendations for Site Development Works. DMURS aims to aid the design of safer, more attractive and vibrant streets which will generate and sustain communities and neighbourhoods. As well as cars and other vehicles this encompasses pedestrians, cyclists and those using public transport. Research has shown that narrow carriageways are one of the most effective measures of traffic calming. This has been factored into the design of the development.

Sight lines at all junctions were designed in accordance with DMURS based on existing speed limits on Bessboro Road.

Auto track assessments were carried out on the proposed road network and demonstrate that a fire tender can safely negotiate the proposed road network and turning heads.

Appendix A Existing Record Drawings

Drainage Records

Legend

IW_FoulNetwork
PIPE_FUNCT
- LOCAL COMBINED
- LOCAL FOUL
- PRIVATE FOUL
- UNPROCESSED

IW_FoulManholes
MANHOLE_
- Manhole

THE SEWERS SHOWN ON THIS MAP ARE FOR REFERENCE ONLY. THE LOCATION AND PROPERTIES OF ALL SEWERS, LEVELS, PIPESIZES, etc, MUST BE CONFIRMED ON SITE.

1:1,000

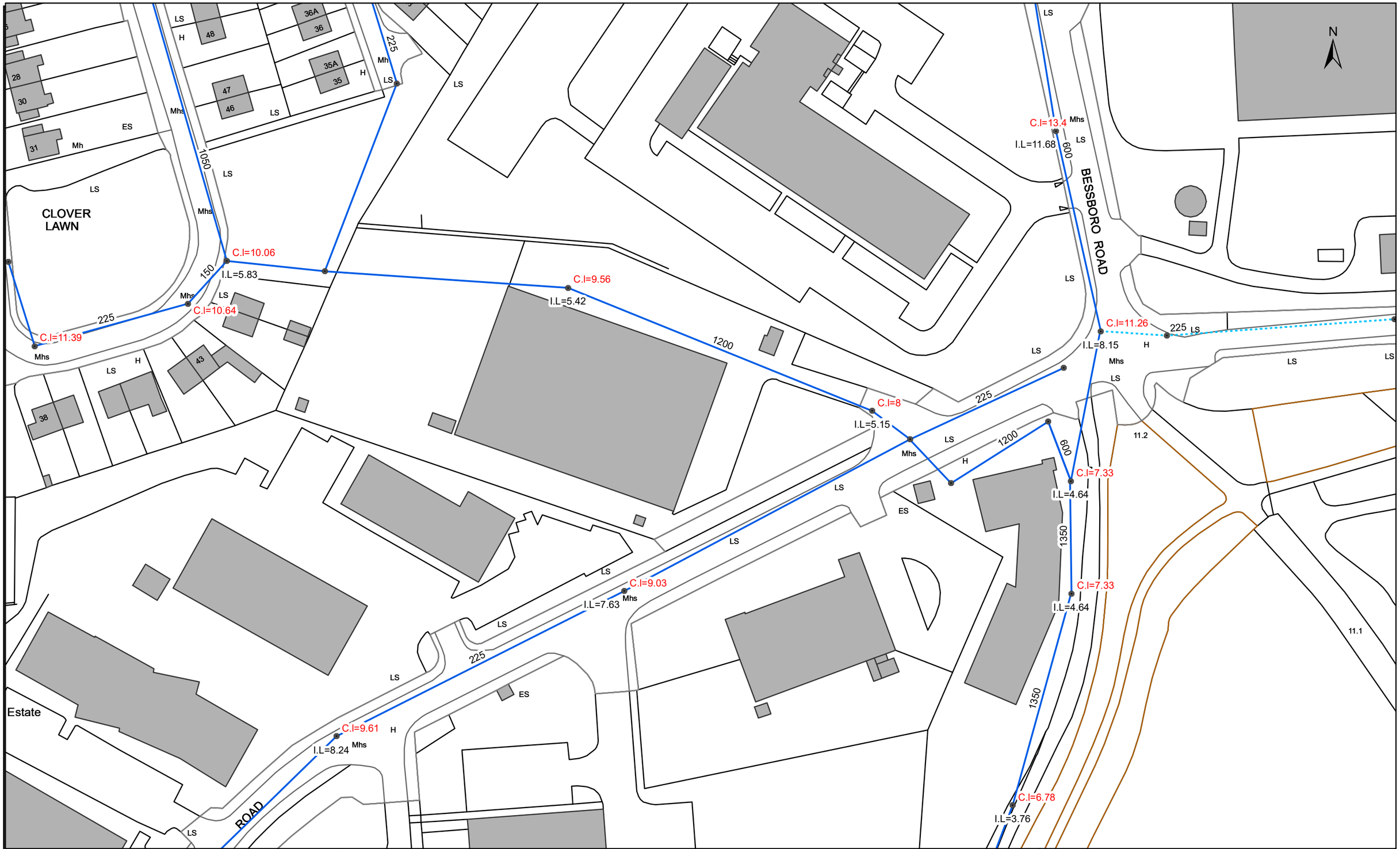
N

CORK CITY COUNCIL ENVIRONMENT DIRECTORATE
(As agents of Irish Water)

Drawn By: A. Homan

Checked by: G.R.

Date: 24/10/2018



Drainage Records

Legend

CCC_StormManholes

MANHOLE_

Manhole

CCC_StormNetwork

PIPE_FUNCT

LOCAL STORM

PRIVATE STORM

THE SEWERS SHOWN ON THIS MAP ARE FOR REFERENCE ONLY. THE LOCATION AND PROPERTIES OF ALL SEWERS, LEVELS, PIPESIZES, etc, MUST BE CONFIRMED ON SITE.

1:1,000

N

CORK CITY COUNCIL ENVIRONMENT DIRECTORATE
Storm Network

Drawn By: A. Homan

Checked by: G.R.

Date: 24/10/2018

Appendix B Causeway Stormwater Drainage 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)	0.75
FSR Region	Scotland and Ireland	Connection Type	Level Inverts
M5-60 (mm)	16.900	Minimum Backdrop Height (m)	0.600
Ratio-R	0.223	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
S1.000	S1-0	S1-1	22.553	0.600	8.600	8.420	0.180	125.0	225
S1.001	S1-1	S1-2	24.058	0.600	8.420	8.228	0.192	125.0	300
S1.002	S1-2	S1-3	24.316	0.600	8.228	8.005	0.223	109.0	300
S4.000	S4-0	S1-3	14.242	0.600	7.965	7.895	0.070	203.5	450
S1.003	S1-3	S1-4	34.433	0.600	7.895	7.723	0.172	200.0	300
S1.004	S1-4	S1-5	43.173	0.600	7.723	7.507	0.216	200.0	300
S1.005	S1-5	S1-6	36.185	0.600	7.507	7.326	0.181	200.0	300
S1.006	S1-6	S1-7	23.186	0.600	7.326	7.210	0.116	200.0	300
S3.000	S3-0	S3-1	10.801	0.600	8.700	8.640	0.060	180.0	300
S3.001	S3-1	S3-2	31.067	0.600	8.640	8.330	0.310	100.2	300
S3.002	S3-2	S3-3	19.463	0.600	8.330	8.136	0.194	100.3	300
S5.000	S5-0	S3-3	20.885	0.600	8.275	8.136	0.139	150.0	225
S3.003	S3-3	S2-1	41.346	0.600	8.136	7.929	0.207	200.0	375
S2.000	S2-0	S2-1	8.451	0.600	8.300	8.050	0.250	33.8	300
S2.001	S2-1	S1-7	9.646	0.600	7.929	7.833	0.096	100.0	375
S1.007	S1-7	S1-8	17.565	0.600	7.210	7.034	0.176	100.0	375
S1.008	S1-8	S1-9	8.072	0.600	7.034	6.953	0.081	100.0	375

Node S4-0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	7.965
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	200

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	155.0	0.0	1.600	155.0	0.0	1.601	0.0	0.0

Results for 5 year +20% CC Critical Storm Duration. Lowest mass balance: 99.15%

Node Event	US Node	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1-0	0.075	10.9	0.1283	0.0000	OK
15 minute winter	S1-1	0.092	19.6	0.1605	0.0000	OK
360 minute winter	S1-2	0.199	5.9	0.3172	0.0000	OK
360 minute winter	S4-0	0.462	15.4	68.6445	0.0000	SURCHARGED
360 minute winter	S1-3	0.532	16.3	1.0198	0.0000	SURCHARGED
360 minute winter	S1-4	0.703	8.8	1.0326	0.0000	SURCHARGED
360 minute winter	S1-5	0.919	6.9	1.4705	0.0000	SURCHARGED
360 minute winter	S1-6	1.100	6.0	1.6065	0.0000	SURCHARGED
15 minute winter	S3-0	0.089	13.9	0.2085	0.0000	OK
15 minute winter	S3-1	0.088	20.6	0.1505	0.0000	OK
30 minute winter	S3-2	0.139	21.4	0.2084	0.0000	OK
15 minute winter	S5-0	0.209	19.8	0.5213	0.0000	OK
30 minute summer	S3-3	0.351	43.6	0.5472	0.0000	OK
30 minute summer	S2-0	0.158	5.3	0.2178	0.0000	OK
30 minute summer	S2-1	0.528	46.0	0.7560	0.0000	SURCHARGED
30 minute summer	S1-7	1.236	41.2	2.1848	0.0000	SURCHARGED
30 minute summer	S1-8	1.402	21.9	2.0058	0.0000	SURCHARGED
15 minute summer	S1-9	0.000	6.7	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap
15 minute winter	S1-0	S1.000	S1-1	10.7	0.801	0.231
15 minute winter	S1-1	S1.001	S1-2	19.3	0.974	0.194
15 minute winter	S1-2	S1.002	S1-3	27.7	1.220	0.260
30 minute summer	S4-0	S4.000	S1-3	-81.7	-1.313	-0.361
15 minute summer	S1-3	S1.003	S1-4	-41.1	0.947	-0.525
15 minute summer	S1-4	S1.004	S1-5	-38.5	0.906	-0.492
15 minute winter	S1-5	S1.005	S1-6	-38.6	0.890	-0.493
15 minute winter	S1-6	S1.006	S1-7	-36.2	0.746	-0.462
15 minute winter	S3-0	S3.000	S3-1	13.7	0.792	0.166
15 minute winter	S3-1	S3.001	S3-2	20.3	1.092	0.183
15 minute winter	S3-2	S3.002	S3-3	25.0	0.921	0.226
15 minute winter	S5-0	S5.000	S3-3	20.8	0.825	0.491
15 minute summer	S3-3	S3.003	S2-1	46.6	1.135	0.330
15 minute winter	S2-0	S2.000	S2-1	9.6	1.069	0.050
15 minute summer	S2-1	S2.001	S1-7	44.0	1.335	0.220
15 minute winter	S1-7	S1.007	S1-8	24.2	0.675	0.121
30 minute summer	S1-8	Hydro-Brake®	S1-9	6.9		

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.15%

Node Event	US Node	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	S1-0	0.185	2.7	0.3171	0.0000	OK
480 minute winter	S1-1	0.365	4.9	0.6353	0.0000	SURCHARGED
480 minute winter	S1-2	0.557	6.9	0.8893	0.0000	SURCHARGED
480 minute winter	S4-0	0.820	16.9	121.9413	0.0000	SURCHARGED
480 minute winter	S1-3	0.890	17.4	1.7072	0.0000	SURCHARGED
480 minute winter	S1-4	1.062	9.2	1.5583	0.0000	SURCHARGED
480 minute winter	S1-5	1.278	7.4	2.0444	0.0000	SURCHARGED
480 minute winter	S1-6	1.458	6.7	2.1304	0.0000	SURCHARGED
15 minute winter	S3-0	0.110	20.3	0.2583	0.0000	OK
30 minute summer	S3-1	0.160	28.2	0.2739	0.0000	OK
30 minute summer	S3-2	0.461	35.0	0.6928	0.0000	SURCHARGED
30 minute summer	S5-0	0.539	27.5	1.3464	0.0000	SURCHARGED
480 minute winter	S3-3	0.648	11.5	1.0109	0.0000	SURCHARGED
480 minute winter	S2-0	0.483	1.0	0.6676	0.0000	SURCHARGED
480 minute winter	S2-1	0.854	11.2	1.2215	0.0000	SURCHARGED
480 minute winter	S1-7	1.574	10.6	2.7804	0.0000	SURCHARGED
480 minute winter	S1-8	1.749	9.8	2.5030	0.0000	SURCHARGED
15 minute summer	S1-9	0.000	7.3	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap
15 minute winter	S1-0	S1.000	S1-1	15.8	0.901	0.340
30 minute summer	S1-1	S1.001	S1-2	27.1	1.056	0.273
15 minute winter	S1-2	S1.002	S1-3	46.4	1.289	0.436
15 minute winter	S4-0	S4.000	S1-3	-124.3	-1.594	-0.550
30 minute summer	S1-3	S1.003	S1-4	-72.6	-1.031	-0.927
30 minute summer	S1-4	S1.004	S1-5	-64.2	-0.912	-0.820
15 minute winter	S1-5	S1.005	S1-6	-52.6	0.893	-0.671
15 minute winter	S1-6	S1.006	S1-7	-47.0	0.722	-0.601
30 minute summer	S3-0	S3.000	S3-1	18.8	0.872	0.228
15 minute summer	S3-1	S3.001	S3-2	28.5	1.186	0.257
15 minute summer	S3-2	S3.002	S3-3	34.4	0.991	0.311
15 minute summer	S5-0	S5.000	S3-3	27.1	0.911	0.640
15 minute summer	S3-3	S3.003	S2-1	65.8	1.174	0.467
15 minute summer	S2-0	S2.000	S2-1	-19.4	1.151	-0.101
15 minute winter	S2-1	S2.001	S1-7	51.3	1.308	0.256
15 minute winter	S1-7	S1.007	S1-8	37.1	0.690	0.185
480 minute winter	S1-8	Hydro-Brake®	S1-9	7.7		

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.15%

Node Event	US Node	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	S1-0	0.555	4.1	0.9502	0.0000	SURCHARGED
360 minute winter	S1-1	0.735	7.5	1.2781	0.0000	SURCHARGED
360 minute winter	S1-2	0.927	10.2	1.4793	0.0000	SURCHARGED
360 minute winter	S4-0	1.190	29.1	176.9079	0.0000	SURCHARGED
360 minute winter	S1-3	1.260	29.6	2.4164	0.0000	SURCHARGED
360 minute winter	S1-4	1.432	18.1	2.1017	0.0000	SURCHARGED
360 minute winter	S1-5	1.647	15.5	2.6354	0.0000	SURCHARGED
360 minute winter	S1-6	1.827	11.9	2.6698	0.0000	SURCHARGED
360 minute winter	S3-0	0.453	5.3	1.0640	0.0000	SURCHARGED
360 minute winter	S3-1	0.513	7.9	0.8769	0.0000	SURCHARGED
360 minute winter	S3-2	0.823	9.8	1.2366	0.0000	SURCHARGED
360 minute winter	S5-0	0.878	7.5	2.1941	0.0000	SURCHARGED
360 minute winter	S3-3	1.017	16.2	1.5872	0.0000	SURCHARGED
360 minute winter	S2-0	0.852	1.5	1.1770	0.0000	SURCHARGED
360 minute winter	S2-1	1.225	17.9	1.7524	0.0000	SURCHARGED
360 minute winter	S1-7	1.943	16.8	3.4328	0.0000	SURCHARGED
360 minute winter	S1-8	2.118	10.8	3.0312	0.0000	SURCHARGED
15 minute summer	S1-9	0.000	7.9	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap
15 minute winter	S1-0	S1.000	S1-1	20.4	0.943	0.439
30 minute summer	S1-1	S1.001	S1-2	35.2	1.137	0.355
15 minute summer	S1-2	S1.002	S1-3	62.1	1.355	0.584
15 minute winter	S4-0	S4.000	S1-3	-168.6	-1.722	-0.746
30 minute summer	S1-3	S1.003	S1-4	-86.3	-1.226	-1.102
30 minute summer	S1-4	S1.004	S1-5	-76.2	-1.082	-0.973
30 minute summer	S1-5	S1.005	S1-6	-63.8	-0.906	-0.815
30 minute summer	S1-6	S1.006	S1-7	-55.1	-0.783	-0.704
15 minute winter	S3-0	S3.000	S3-1	26.1	0.929	0.316
15 minute summer	S3-1	S3.001	S3-2	36.9	1.272	0.332
15 minute winter	S3-2	S3.002	S3-3	40.6	1.035	0.366
15 minute winter	S5-0	S5.000	S3-3	35.5	0.983	0.839
15 minute winter	S3-3	S3.003	S2-1	71.2	1.163	0.505
15 minute winter	S2-0	S2.000	S2-1	7.1	1.181	0.037
15 minute summer	S2-1	S2.001	S1-7	59.2	1.314	0.296
15 minute winter	S1-7	S1.007	S1-8	25.3	0.745	0.126
360 minute winter	S1-8	Hydro-Brake®	S1-9	8.4		

Appendix C Petrol Interceptor Sizing Calculations

Petrol Interceptor Sizing

Project title: Clover Hill Court

Project no.: 194191

Designed: DT Date: 30/06/2022

Ref.

EN 858-2
4.3.5

Calculation of Mean Annual Peak Flow

$$Q_r = CiA$$

Where			**Units**
Q_r	=	Mean Annual Peak Flow	l/sec
A	=	Catchment area	ha
i	=	Rainfall Intensity	l/sec/ha
C	=	Runoff Coefficient	-

C = 1

Area = **0.585** ha

Impervious Area (ha) =	0.585
Storm Duration (hours)	1
Rainfall with Return Period of 100 years* (mm)	30.4
Rainfall with Return Period of 100 years (mm) + 20%	36.5
Intensity for 100 year event (I)	36.5
Volume of Runoff (m3) =	0.0
i (l/s/ha)	110.6

**Discharge rate equal to 1 in 100 year critical duration storm to be used in design.(Ref: Greater Dublin Strategic Drainage Study)*
Rainfall for different return periods from Met Eireann website
http://www.met.ie/climate/products03.asp

i = 110.622 l/sec/ha

Q_r **= 64.71 l/s**

Calculation of Petrol Interceptor Nominal Size

EN 858-2
4.3.1

$$NS = (Q_r + f_x Q_s) f_d$$

Where:

$NS = Nominal\ Size\ of\ Separator$
$Q_r = \max flow\ rate\ of\ rainwater$
$Q_s = \max flow\ rate\ of\ wastewater*$
$f_d = density\ factor\ of\ relevant\ light\ liquid$
$f_x = impediment\ factor\ depending\ on\ nature\ of\ discharge$

***No wastewater discharging in this case, $Q_s = 0$**

EN 858-2
Annex A
Table A1

f_d = 1.5

Q_r = 64.71 l/s

Nominal Size: 97.07 litres/second (peak flow rate)

Klargestor Bypass NSBE010 or equivalent product

Storage Capacity (litres)		Unit Length (mm)	Unit Diameter (mm)	Access Shaft Diameter (mm)
Silt	Oil			
1000	150	2069	1220	750

Appendix D Causeway Foul Water Drainage Design Calculations

Design Settings

Frequency of use (kDU)	1.00	Minimum Velocity (m/s)	0.75
Flow per dwelling per day (l/day)	2471	Connection Type	Level Inverts
Domestic Flow (l/s/ha)	0.0	Minimum Backdrop Height (m)	0.600
Industrial Flow (l/s/ha)	0.0	Preferred Cover Depth (m)	1.200
Additional Flow (%)	0	Include Intermediate Ground	✓

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
F1.000	F1-0	F1-1	21.042	0.150	8.525	8.420	0.105	200.0	225
F1.001	F1-1	F1-2	19.271	0.150	8.420	8.324	0.096	200.0	225
F1.002	F1-2	F1-3	20.233	0.150	8.324	8.223	0.101	200.0	225
F1.003	F1-3	F1-4	39.190	0.150	8.223	8.027	0.196	200.0	225
F1.004	F1-4	F1-5	50.983	0.150	8.027	7.772	0.255	200.0	225
F1.005	F1-5	F1-6	38.464	0.150	7.772	7.580	0.192	200.0	225
F1.006	F1-6	F1-7	15.360	0.150	7.580	7.503	0.077	200.0	225
F2.000	F2-0	F1-7	18.248	0.150	8.475	8.171	0.304	60.0	225
F1.007	F1-7	F1-8	33.860	0.150	7.503	7.334	0.169	200.0	225
F3.000	F3-0	F3-1	32.239	0.150	8.475	7.938	0.537	60.0	225
F3.001	F3-1	F3-2	26.926	0.150	7.938	7.489	0.449	60.0	225
F3.002	F3-2	F1-8	13.145	0.150	7.489	7.334	0.155	84.8	225
F1.008	F1-8	F1-9	1.996	0.150	7.334	7.324	0.010	200.0	225

Name	US Node	DS Node	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Velocity (m/s)
F1.000	F1-0	F1-1	42.4	5.9	1.200	1.305	0	35.0	0.0	0.759
F1.001	F1-1	F1-2	42.4	5.9	1.305	1.401	0	35.0	0.0	0.759
F1.002	F1-2	F1-3	42.4	5.9	1.401	1.502	0	35.0	0.0	0.759
F1.003	F1-3	F1-4	42.4	5.9	1.502	1.848	0	35.0	0.0	0.759
F1.004	F1-4	F1-5	42.4	6.1	1.848	2.003	6	35.0	0.0	0.766
F1.005	F1-5	F1-6	42.4	6.1	2.003	1.945	6	35.0	0.0	0.766
F1.006	F1-6	F1-7	42.4	6.1	1.945	1.972	6	35.0	0.0	0.766
F2.000	F2-0	F1-7	78.8	4.4	1.200	1.304	0	19.0	0.0	1.084
F1.007	F1-7	F1-8	42.4	7.5	1.972	2.091	6	54.0	0.0	0.810
F3.000	F3-0	F3-1	78.8	4.5	1.200	1.487	0	20.0	0.0	1.084
F3.001	F3-1	F3-2	78.8	4.5	1.487	1.786	0	20.0	0.0	1.084
F3.002	F3-2	F1-8	66.0	4.5	1.786	2.091	0	20.0	0.0	0.958
F1.008	F1-8	F1-9	42.4	8.8	2.091	2.126	6	74.0	0.0	0.845

Appendix E Irish Water Pre-connection Correspondence

CONFIRMATION OF FEASIBILITY

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

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

www.water.ie

Drazen Trkulja

Elm Court, Boreenmanna Rd
Cork
T12HHW2

26 August 2022

Our Ref: CDS22004946 Pre-Connection Enquiry
Cloverhill Court, Bessboro Road, Mahon, Cork

Dear Applicant/Agent,

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

Irish Water has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 90 unit(s) at Cloverhill Court, Bessboro Road, Mahon, Cork, (the **Development)**.

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

- **Water Connection**
  - Feasible without infrastructure upgrade by Irish Water
  - Connection can be made to the 150mm ductile iron water main at the entrance to the site.
- **Wastewater Connection**
  - Feasible without infrastructure upgrade by Irish Water
  - lease note that according to our records there is an existing sewer running through this site (see red dashed line in the drawing attached). It will not be permitted to build over any Irish water infrastructure. The layout of the development must ensure that this pipe is protected and adequate separation distances are provided between Irish Water infrastructure and any structures on site. Alternatively you may enter into a diversion agreement with Irish Water and divert the pipe to accommodate your development. If you wish to proceed with

this option please contact with Irish Water at Diversions@water.ie and submit detailed design drawings before submitting your planning application. Note there is also a 1200mm storm sewer shown in the drawing as a brown line. This is in the ownership and responsibility of Cork City Council.
It will be necessary to provide a wayleave over this pipe to the benefit of Irish Water and ensure that it is accessible for maintenance

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

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

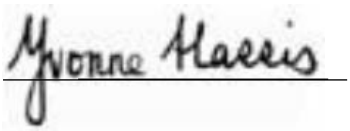
Where can you find more information?

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

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

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

Yours sincerely,



Yvonne Harris
Head of Customer Operations

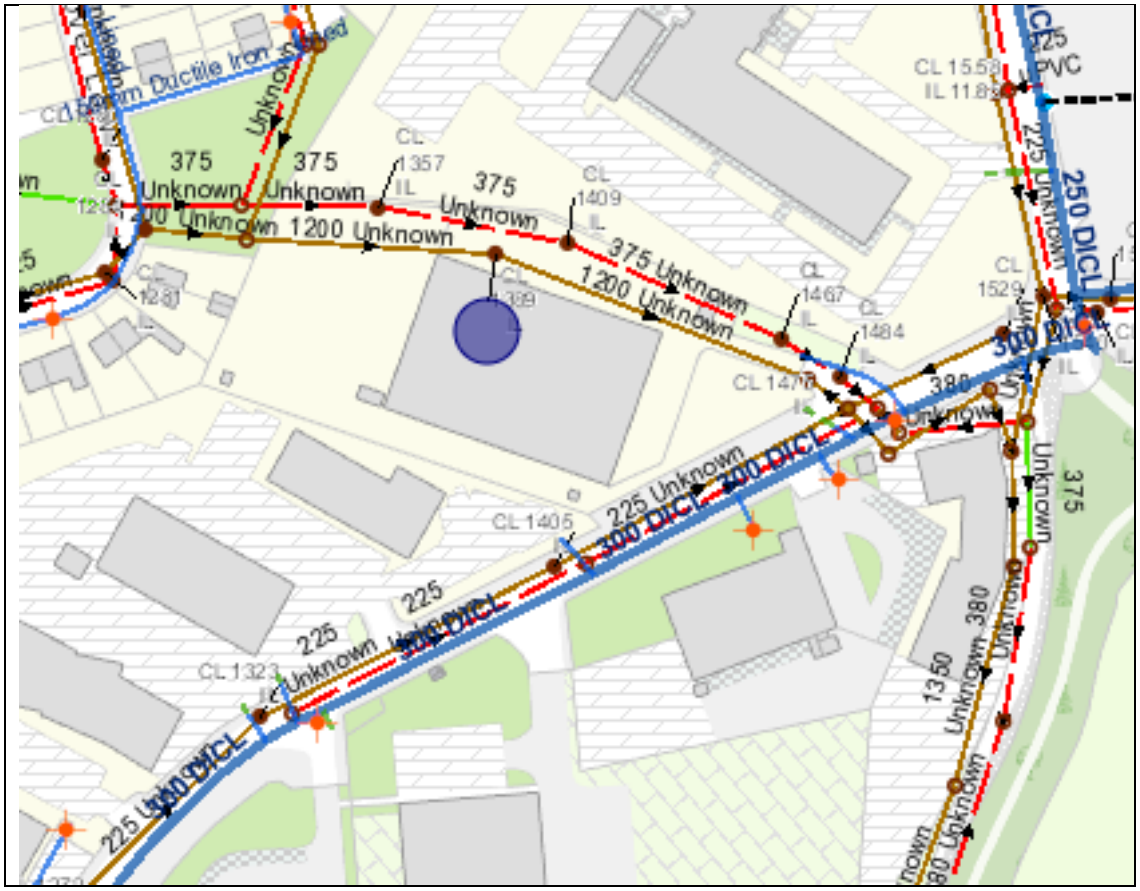
Section A - What is important to know?

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

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

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

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

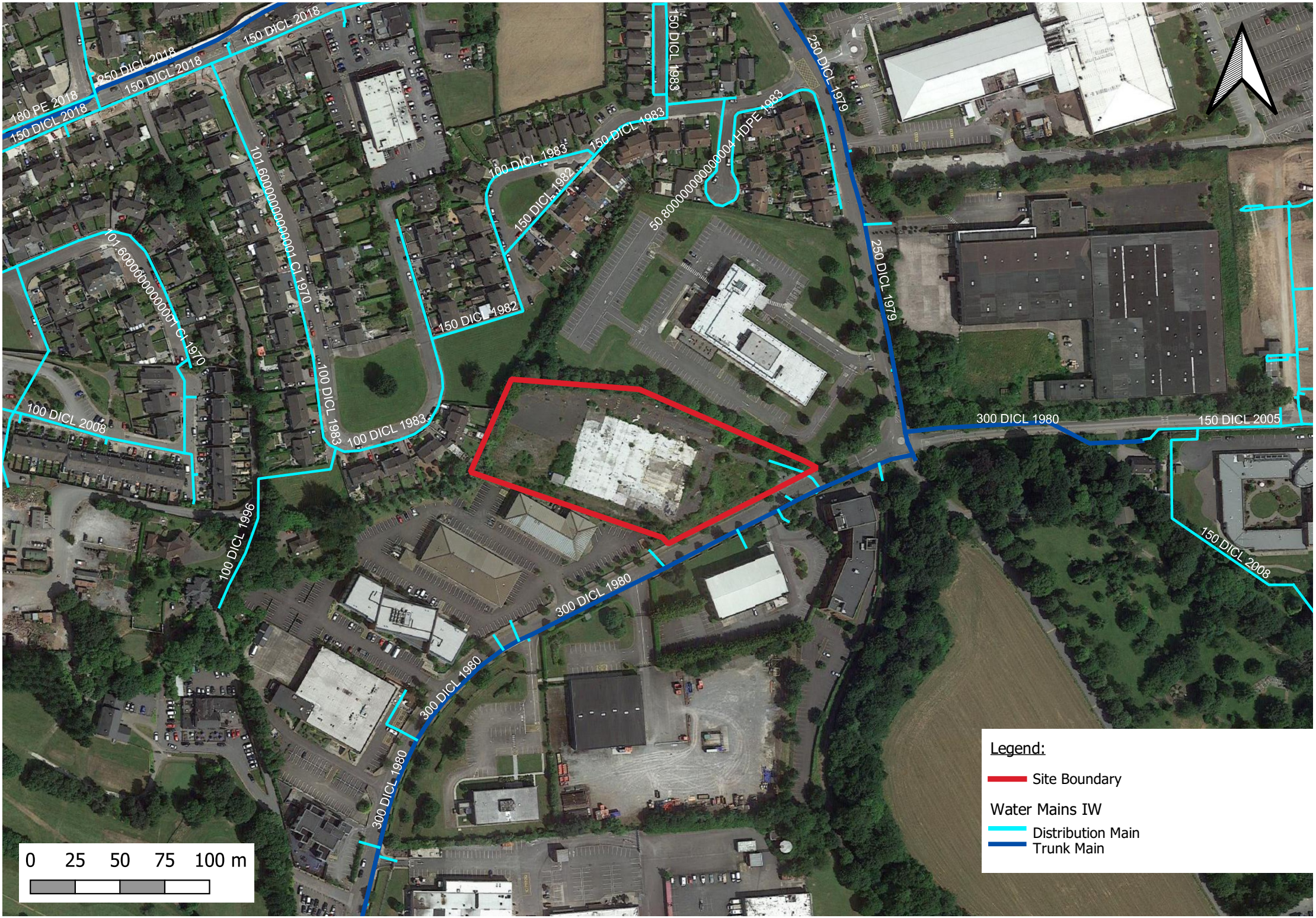


Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

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

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

Appendix F Irish Water Watermain Records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150 DICL 2018
150 DICL 2018
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101.6000000000001 CI 1970
100 DICL 2008
100 DICL 1983
100 DICL 1996
150 DICL 1983
250 DICL 1979
100 DICL 1983
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150 DICL 1982
50.8000000000004 HDPE 1983
150 DICL 1982
250 DICL 1979
300 DICL 1980
150 DICL 2005
150 DICL 2008
300 DICL 1980
300 DICL 1980
300 DICL 1980
0 25 50 75 100 m
Legend:
Site Boundary
Water Mains IW
Distribution Main
Trunk Main