

Belmayne 110kV/38MW Distribution Substation
Planning and Environmental Report

Appendix B – Engineering Services Report



Energy for
generations

Belmayne 110 kV Substation

ESB Networks

Engineering Services Report

Document No.: PE595-F2687-R687-003

Date: March 2026

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Belmayne 110 kV Substation – Engineering Services Report

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Change History of Report

Date	New Revision	Author	Summary of Change
March 2026	001	D. Ryan	Uisce Éireann CoF added

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1 Introduction

1.1 Overview

ESB intend to apply for planning permission for the development of a new distribution 110/38kV/MV substation at a site in Belmayne, Clonsaugh, Dublin 17, which is accessed off the R139 road.

This Engineering Services Report (ESR) provides details on the proposed foul and surface water drainage as well the water supply proposals for the new development described below.

1.2 Project Background

The proposed development is at a preliminary design stage and design elements of it are likely to change but the general technical requirements for the project will remain unchanged.

The proposed development will consist of the construction of a 110 kV/38 MV electrical substation and will include the following elements:

1. Construction of 1 no. substation compound (c. 5,650 sqm) securely enclosed with 2.6 m high palisade fencing and gates, containing:
 - i. 1 no. 110 kV Gas Insulated Switchgear (GIS) building (c. 707sqm; c. 12 m in height).
 - ii. 1 no. 38 kV Gas Insulated Switchgear (GIS) building (c. 232sqm; c. 7 m in height).
 - iii. no. Bunded 110 kV/38 kV Transformers (c. 5 m in height) with associated electrical equipment.
 - iv. no. Bunded 38 kV/MV Transformers (c. 5 m in height) with associated electrical equipment.
 - v. 2 no. fire walls (c. 5.5 m in height by c. 5 m length) separating the 110 kV/38 kV Transformers and 38 kV/MV Transformers.
 - vi. no. bunded Arc Suppression Coils (c. 4 m in height) with associated electrical equipment.
 - vii. 2 no. Neutral Earth Resistor (c. 2 m in height) and Neutral Earth Switch (c. 3.9 m in height).
 - viii. Perimeter RC wall with Stone Facing on West, North and South Elevations (2.6 m high).
2. Removal and reinstatement of 2 No. Gate Piers at existing entrance and provision of vehicular gate (5 m wide x 2.6 m in height);
3. All associated site development works including provision of new site entrance, internal access, lighting poles (c. 5.75 m in height), 3 no. lightning monopoles (c. 15 m in

Belmayne 110 kV Substation – Engineering Services Report

height), 1 no. Emergency, stand-by Diesel Generator, telecommunications, landscaping, site services including drainage, trenching and ducting and all other ancillary works.

The proposed site layout is illustrated on drawing PE492-D327-006-002 (latest revision).

1.3 Site of Proposed Development

1.3.1 Site Location

The proposed development is located at a site in Belmayne, Clonsaugh, Dublin 17. The boundary is depicted by the red line in the Figure 1-1 and Figure 1-2 below. The site is located on and accessed from the R139.

The site is bounded by:

- The R139 road to the south;
- Bewley’s Production Facility to the east;
- the Mayne River to the north; and
- Greenfield lands to the west with a paved private roadway.



Figure 1-1: General Site Location



Figure 1-2: Site Boundary

1.3.2 Site Topography

The topography of the site is generally flat, with a gentle slope at the northern boundary towards the River Mayne. Levels at the site range from 27.5 mAOD in the north to 31.0 mAOD in the south-west of the site which can be seen on the Existing Site Layout Drawing No. PE492-D327-006-002 (latest revision). These levels relate to ordnance datum Malin Head.

2 Surface Water

2.1 Existing Surface Water Drainage

The site is currently greenfield with no surface water connection/discharge to the local surface water infrastructure.

Dublin City Council records indicate that there are 2 no. 300 mm concrete surface water sewers running west-south in the R139, south of the proposed development, as shown in Figure 2-1 and Appendix A.

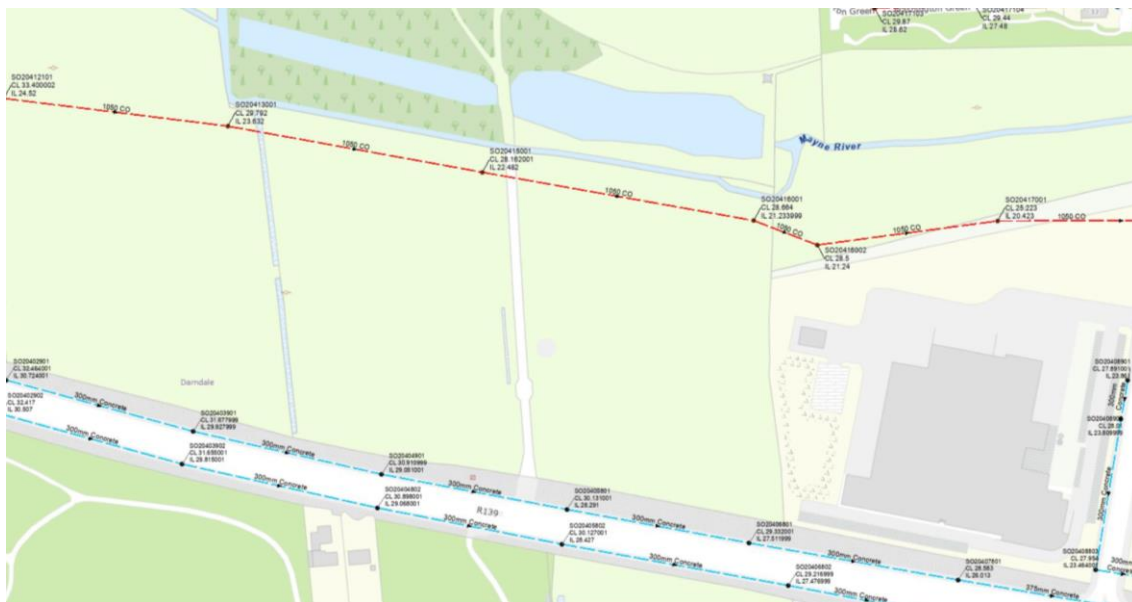


Figure 2-1: Existing Surface Water infrastructure

From a review of the available site investigation information for an adjacent site (Belcamp 220 kV Substation), infiltration testing failed, and soils encountered were predominantly clay. An extract from the site investigation is included in Appendix B.

2.2 Proposed Surface Water Drainage

2.2.1 General

The proposed surface water drainage system has been designed using Causeway FlowPlus software with reference to the following documents:

- Greater Dublin Strategic Drainage Study (GDSDS);
- Dublin City Development Plan 2022 – 2028;
- Dublin City Council Sustainable Drainage Design & Evaluation Guide 2021; and
- Dublin City Development Plan 2022 – 2028: Strategic Flood Risk Assessment.

A new surface water network is proposed to collect run-off from all hardstanding areas and discharge it to the existing public surface water sewer, south of the site (see Section 2.1 for details).

The internal roads will be macadam with gullies to collect run-off. Gullies will discharge the collected surface water to underground pipes, which will convey the collected water to an underground attenuation before discharging. Non-trafficked areas will be compound stone, allowing a portion of rainfall to infiltrate into the ground, mimicking the undeveloped sites natural water cycle.

The surface water drainage layout is illustrated on drawing PE492-D327-006-007 (latest revision).

2.2.2 Design Criteria

Rainfall design data such as rainfall return period were sourced from Met Eireann (see Appendix C). QBAR was estimated using the UK SuDS website and cross-referenced in the guidance provided by the GDSDS, see Appendix C for details.

Table 2-1: Drainage Design Criteria

Description	Value
Site Area	2.05 ha
Climate Change	30 %
M5-60	15.5
Ratio-R	0.274
SAAR	742 mm
SOIL	Soil Type 4 (previous SI from adjacent site)
Discharge Restriction	$Q_{BAR} = 10.6 \text{ l/s (5.2 l/s/ha)}$
Design Criteria	Pipe design: 1 in 5-year +CC Network design: 1 in 30-year + CC Check for flooding: 1 in 100-year + CC

2.2.3 SuDS Proposals

The surface water drainage proposals for this development have been developed with the intention of mimicking the natural drainage patterns of the site and in accordance with Sustainable Drainage Systems (SuDS). The surface water proposals replicate greenfield drainage conditions where possible. It is noted that infiltration options were not considered as site investigations for adjacent sites indicate that the ground is predominantly clay, and BRE365 infiltration testing failed.

Tree Pits

The access road outside the station compound will be drainage by a series of gullies which discharge to tree pits located along west side of the site.

The tree pit systems will incorporate drainage stone/subsoil and will provide a level of additional attenuation within the tree system. The base and sides of the tree root system will be lined and a high-level overflow to the drainage network within the build-up will accommodate distribution of surface water run-off.

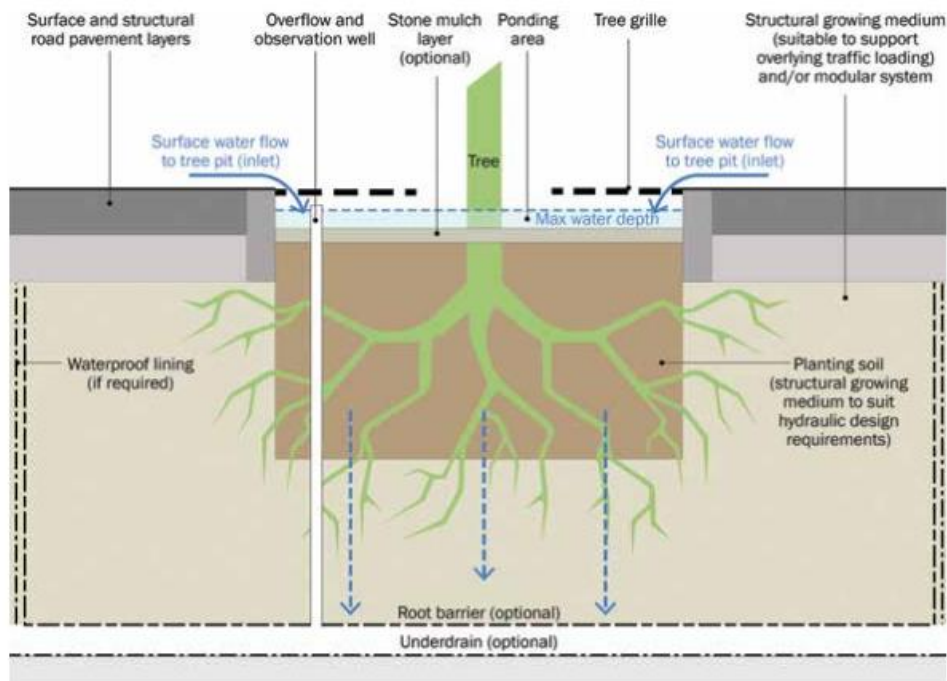


Figure 2-2: Typical Tree Pit Detail (extract from CIRIA Report R753: The SuDS Manual)

Compound Build-up

The areas within the substation fence will be made up of a 150 mm layer of 50 mm crushed stone over 300 mm of 6F2 material separated by a geotextile. The very nature of this build-up allows for water infiltration through the stone layers, before entering the drainage network. The geotextile provides a filter medium and traps sedimentation from washing to the drainage network. This stone build-up provides interception storage.

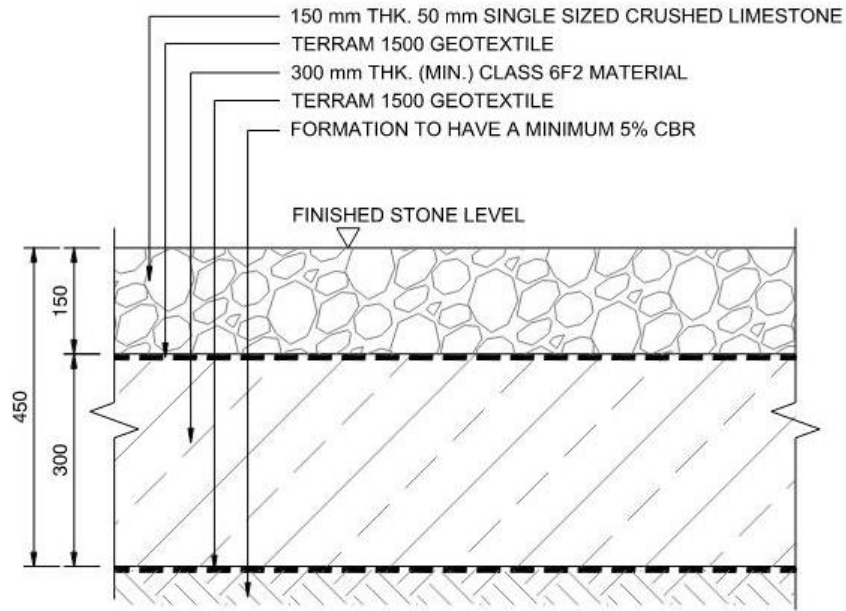


Figure 2-3: Compound Stone Detail

Filter Drains

Run-off from the compound road will be collected via a series of filter drains running parallel to the internal road network. The filter drains can:

- encouraging infiltration to groundwater where suitable;
- reducing peak runoff; and
- improving water quality through filtration of sediments.

Catch-pits will be located along filter drains to control sediment in the drainage network.

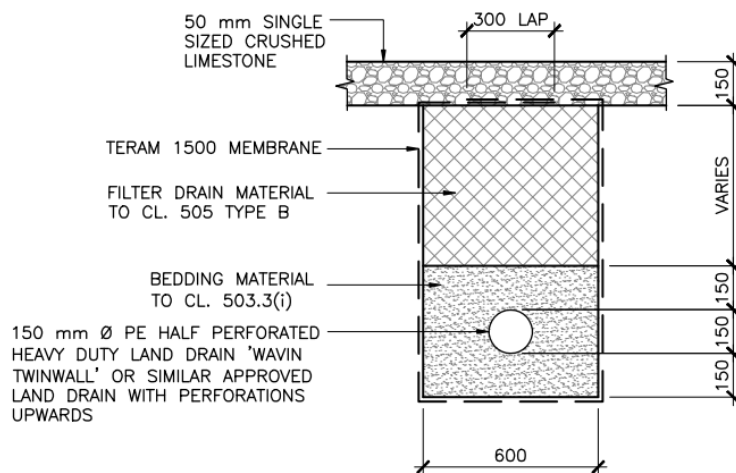


Figure 2-4: Typical filter drain detail

Fuel Separators

Runoff will be treated to remove sediments and pollutants prior to discharge from site. The proposed surface water drainage network along the new access road will incorporate catchpit manholes, which will capture silt and sediment, before surface water is conveyed to the attenuation tank and discharged to the existing surface water network to the south.

The proposed electrical transformers are oil filled equipment and as such are placed within impermeable bunds, in accordance with The Greater Dublin Regional Code of Practice (GDSDS) V6. In order to provide treatment of surface water generated in the transformer bunds, it is proposed to install an Entexol SCS001 (or equivalent approved) oil sensitive bund dewatering system. A 1.0 l/s low shear vortex pump with oil separation detection will be fitted within each bund containing oil-filled equipment in accordance with the GDSDS.

The bunds will also include an Entexol SCS002 Integrated Class 1 Full Retention Oil Separator (or equal and approved) which will provide treatment in accordance with IS EN 858. This system will ensure only non-contaminated water enters the drainage network.

The bund dewatering systems will be fitted with a high oil level alarm and will be connected back to the control building which is connected to a manned control centre via the plant's Supervisory Control and Data Acquisition (SCADA) telecom relay system.

It should be noted that an oil leak from an electrical transformer is an extremely rare occurrence. Such a leak will result in an electrical fault which will be notified to the transmission system operator and attended to on site by trained operatives immediately.

Limiting Discharge

When determining the greenfield runoff rate for the development, the entire site area was considered in the calculations. This represents the max allowable discharge for the entire site. The Q_{BAR} greenfield runoff rate for the site was determined as 10.7 l/s based on the total site area of 2.05 ha as shown by the calculations in Appendix C.

Attenuation Tanks

The proposed attenuation tank has been designed to store the excess surface water run-off, created from the sites limited flow of 10.7 l/s (Q_{BAR}) for the 1% AEP (1 in 100-year storm return period) storm, with an additional 30% allowance for climate change in accordance with the GDSDS. The proposed attenuation tank will provide 53.2 m³ of storage in the open space on the site.

2.3 Water Quality

The quality of the surface water discharge from the site was considered during the development of the drainage proposals.

The Greater Dublin Regional Code of Practice V6, under the General Requirements for Bunding of Storage Tanks (Section 17.1.4) states that, “Rainwater may only be removed from a bund by means of manual removal or a non-automatic pumping arrangement”. The proposed electrical transformers and oil tanks are oil filled equipment and as such are placed within impermeable bunds. In order to provide for treatment of surface water generated in the transformer bunds, it is proposed to install an Entexol SCS001 (or equal and approved) oil sensitive bund dewatering system. A 1.0 l/s low shear vortex pump with oil separation detection will be fitted within each bund containing oil-filled equipment in accordance with the Greater Dublin Regional Code of Practice V6. This system will ensure only non-contaminated water enters the site drainage network.

The bund dewatering system will be fitted with a high oil level alarm and will be connected back to the station control panel which is connected to a manned control centre via the station’s SCADA telecom relay system.

3 Foul Water

3.1 Existing Foul Water Drainage

The existing site is currently greenfield with no wastewater connection/discharge to the local wastewater infrastructure.

Uisce Éireann records indicate that there is a 1050 mm concrete sewer running west-east adjacent to the River Mayne, to the north of the proposed development, as shown in Figure 3-1 and Appendix A. Uisce Éireann have confirmed that the “required clearance distance to the 1050 mm sewer is 10 m”.

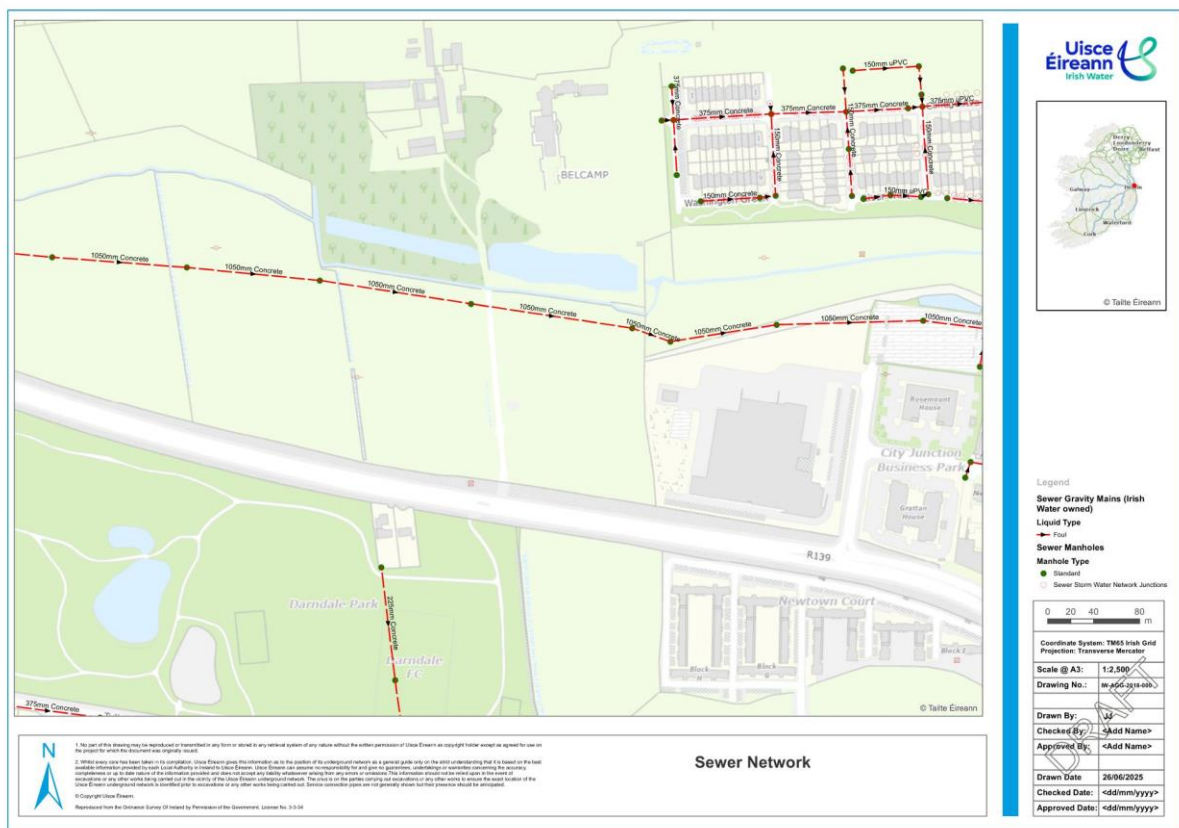


Figure 3-1: Existing wastewater infrastructure (source: Uisce Éireann)

3.2 Proposed Foul Water Drainage

It is proposed to separate the wastewater and surface water drainage networks, which will serve the proposed development, and provide independent connections to the local public foul and surface water sewers respectively.

The proposed wastewater network is to be designed and constructed in accordance with Uisce Éireann's Code of Practice for Wastewater Infrastructure. Wastewater generated on site will be discharged to the existing wastewater manhole to the north.

The foul water drainage layout is illustrated on drawing PE492-D327-006-007 (latest revision).

3.3 Foul Water Design Calculations

The foul water drainage proposals must cater for the wastewater generated in the welfare facilities of the proposed development. These welfare facilities include one toilet and two wash hand basins (one within WC and one within mess room) in the GIS building associated with the development.

The proposed development will generate small quantities of foul waste as the facility will typically be unmanned. As such, the quantities of foul waste generated will therefore be low.

There will be visits to the site for scheduled and unscheduled inspections, maintenance and repairs as necessary. A two-person crew visiting site for three days a week would be the most that would be expected on the site.

It is common for much lower usage of the facilities on unmanned facilities and therefore a much lower foul loading is likely.

A common problem on such unmanned stations is odours in the toilet areas due to the water trap in the toilet drying out through evaporation from the lack of use. For this reason, it is proposed to use self-flushing toilets in the station, which would flush automatically twice per week. The station will include one 6 litre flush WC.

Table 3-1: Foul Water Loading Calculations

Category	Quantity	Flow Rate (l/person/day)	Daily Flow +10% infiltration (l/day)	Peaking Factor	Design Flow (l/s)
Industrial – Part Time Staff	2	45	99	4.5	0.0124
WC	1	6 (per use)	2.64	4.5	0.0001
Total			101.64		0.0125

The foul water calculations are included in Appendix D.

3.4 Consultation

A Pre-Connection Enquiry Form was submitted to Uisce Éireann for the development (UÉ Ref No. CDS25007090), and the Confirmation of Feasibility is included in Appendix E. The connection was confirmed as feasible without any infrastructure updates required.

Following consultation with Uisce Éireann on receipt of the service records, Uisce Éireann have confirmed that the “*required clearance distance to the 1050 mm sewer is 10 m*”.

4 Water Supply

4.1 Existing Water Supply

There is an existing 600 mm ductile iron watermain located within the southern boundary of the site, with a cap identified on the Uisce Éireann records. Uisce Éireann have confirmed that the “required clearance distance from the 600 mm watermain is 5 m, assuming the depth is less than 3 m”.

There is an existing 300 mm ductile iron watermain in the footpath to the south also. This existing watermain can be seen in Figure 4-1 and Appendix A.

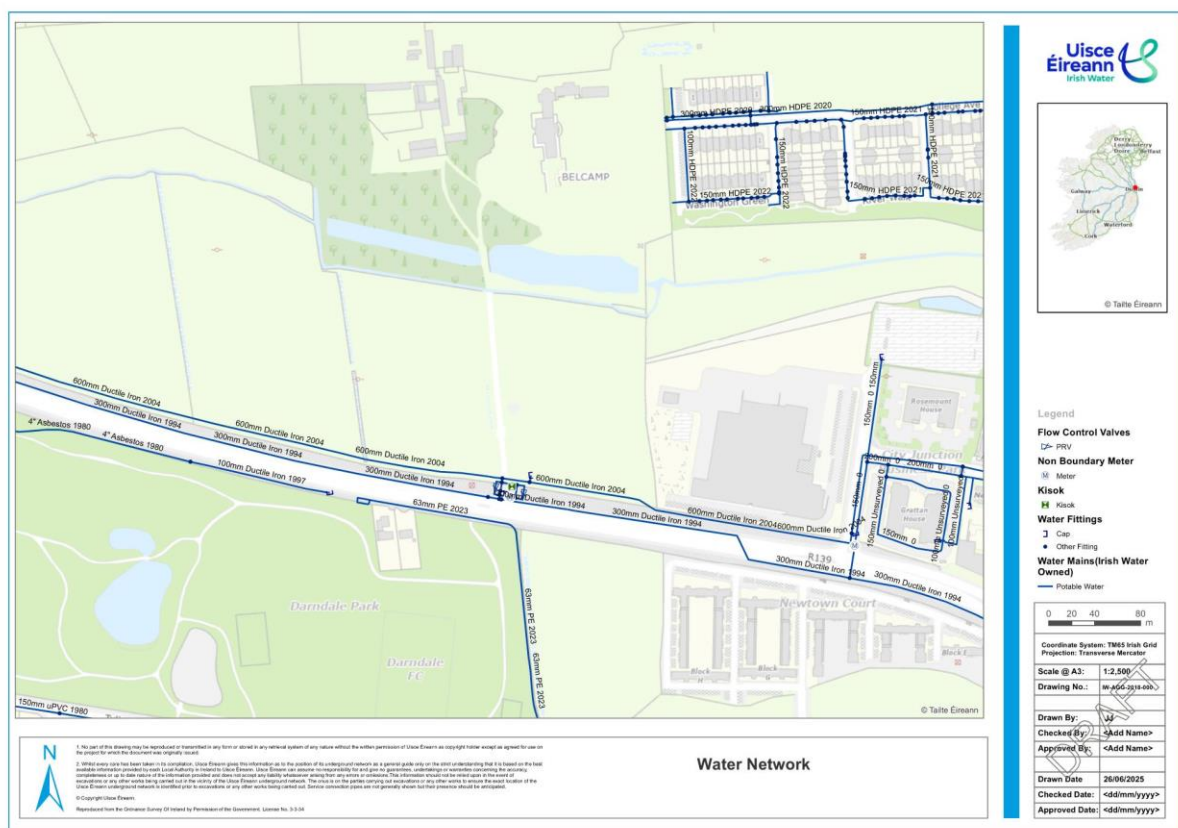


Figure 4-1: Existing water infrastructure (source: Uisce Éireann)

4.2 Water Supply Proposals

A 25 mm HDPE watermain is proposed to connect to the 600 mm existing watermain in the R139 which will provide the water supply for the new toilet and WHBs associated with the development. Full details of the proposed connection location will be agreed with Uisce Éireann at Connection Application Stage.

The proposed connection is to be carried out in accordance with the Uisce Éireann Code of Practice for Water Infrastructure.

The water supply proposals are illustrated on drawing PE492-D327-006-008 (latest revision).

4.3 Water Network Design Calculations

The total peak demand for this proposed development has been calculated in accordance with Uisce Éireann Code of Practice for Water Infrastructure and Wastewater Infrastructure.

Table 4-1: Water Demand

Category	Quantity	Demand (l/day)	Daily (l/day)	Average Day/Peak Week (l/s)	Peak Demand (l/s)
Industrial – Part Time Staff	2	45	90	0.0031	0.0156
WC – 2 flushes/week	1	6 (per use)	0.035	05.0E-07	2.5E-06
Total					0.0156

4.4 Water Meters

A water meter is to be provided at the connection to the public water main, at the development entrance. All metering is to be provided in accordance with Uisce Éireann requirements.

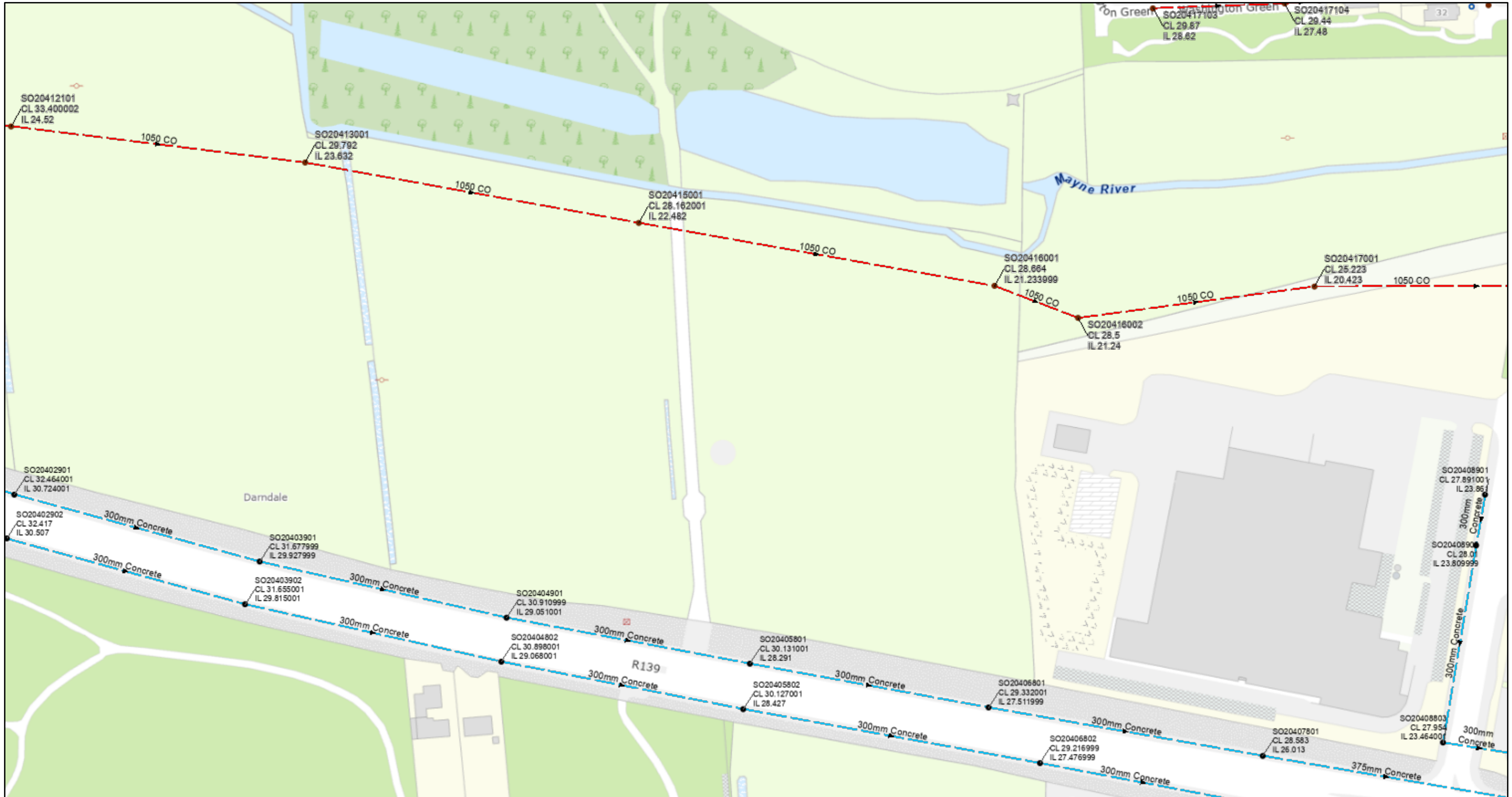
4.5 Consultation

A Pre-Connection Enquiry Form was submitted to Uisce Éireann for the development (UÉ Ref No. CDS25007090), and the Confirmation of Feasibility is included in Appendix E. The connection was confirmed as feasible without any infrastructure updates required.

Following consultation with Uisce Éireann on receipt of the service records, Uisce Éireann have confirmed that the “*required clearance distance from the 600 mm watermain is 5 m, assuming the depth is less than 3 m*”.

Appendix A Existing Record Information

BelMayne



9/22/2025

1:2,472

Storm Manholes

Sewer Manholes

Sewer Inlets

0 0.02 0.04 0.07 mi

• Standard

• Standard

• Other; Unknown

0 0.03 0.06 0.11 km

Surface Water Mains

Sewer Mains

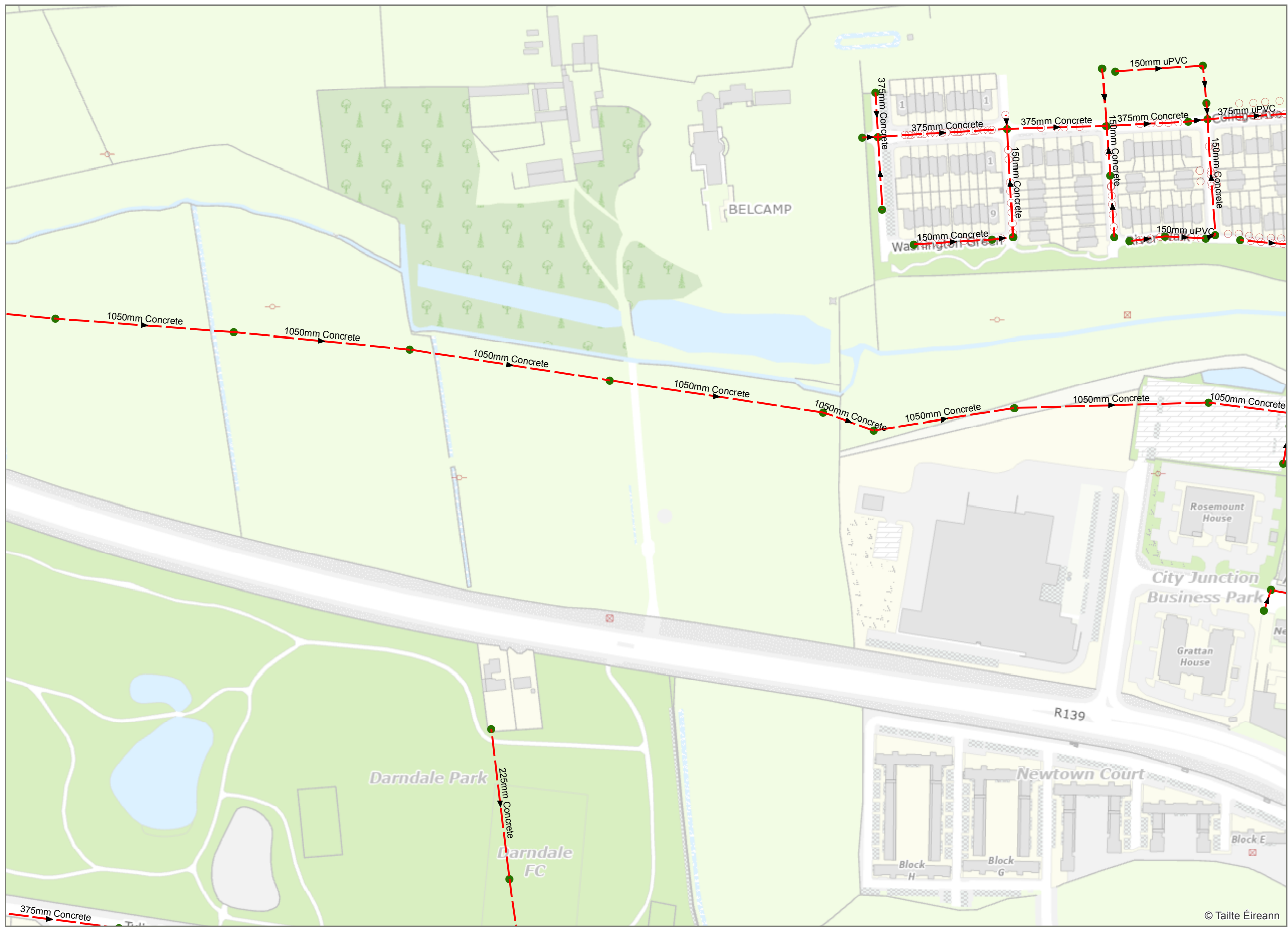
© Taitte Éireann

— Surface Gravity Mains

— Gravity - Foul



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Legend

Sewer Gravity Mains (Irish Water owned)

Liquid Type

→ Foul

Sewer Manholes

Manhole Type

● Standard

○ Sewer Storm Water Network Junctions



Coordinate System: TM65 Irish Grid
Projection: Transverse Mercator

Scale @ A3: 1:2,500

Drawing No.: IW-AGG-2018-000

Drawn By: JJ

Checked By: <Add Name>

Approved By: <Add Name>

Drawn Date: 26/06/2025

Checked Date: <dd/mm/yyyy>

Approved Date: <dd/mm/yyyy>

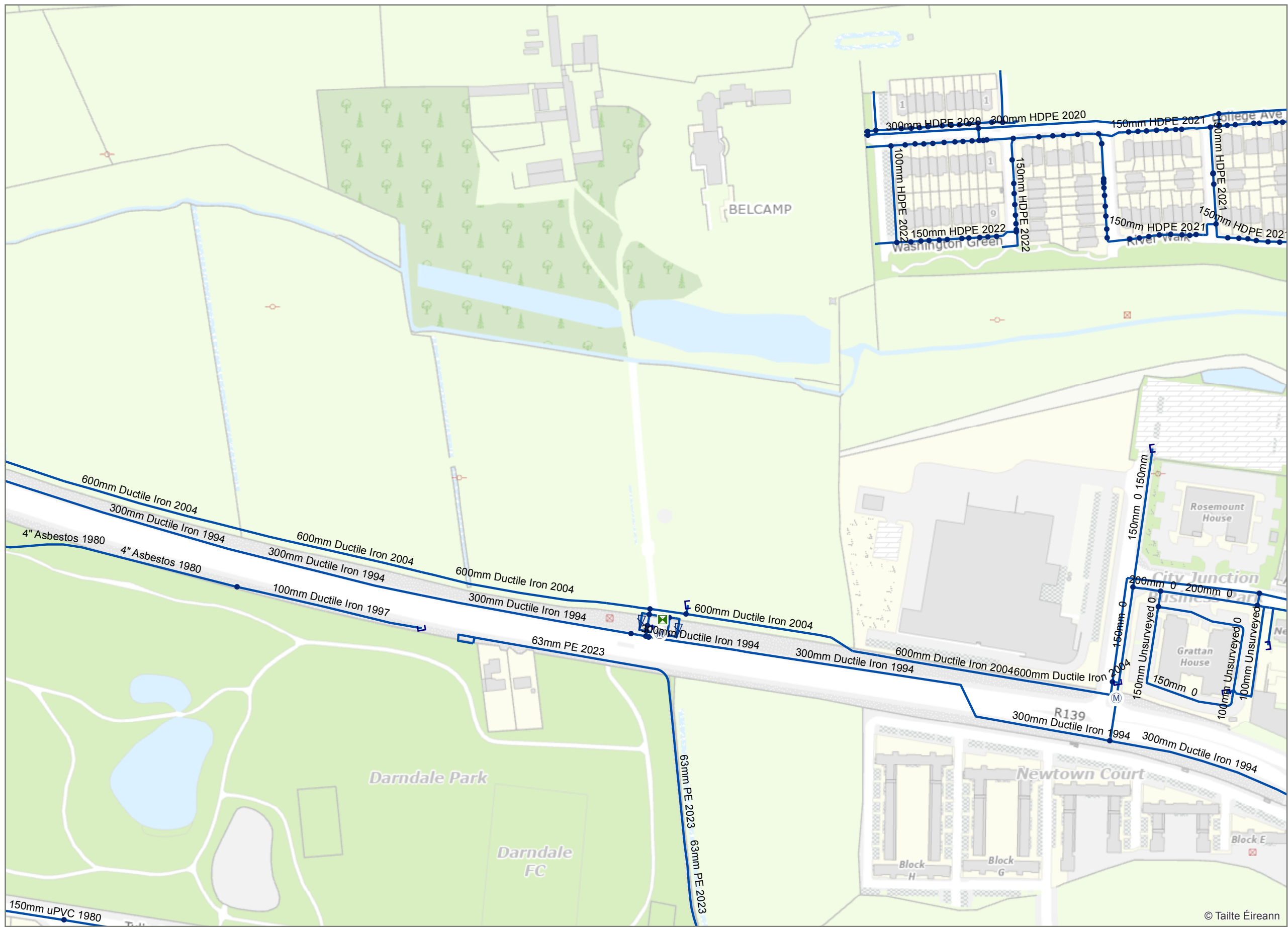


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Sewer Network



Legend

Flow Control Valves

PRV

Non Boundary Meter

Meter

Kisok

Kisok

Water Fittings

Cap

Other Fitting

Water Mains (Irish Water Owned)

Potable Water



Coordinate System: TM65 Irish Grid
Projection: Transverse Mercator

Scale @ A3: 1:2,500
Drawing No.: IW-AGG-2018-000

Drawn By:	JJ
Checked By:	<Add Name>
Approved By:	<Add Name>
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Water Network

Appendix B Previous Site Investigation

Soakaway Design f-value from field tests IGSL

Contract: Dublin North Fringe 220kV Reinforcement Contract No. 16016
 Test No. SW101
 Client ESBi
 Date: 12/10/11

Summary of ground conditions

from	to	Description	Ground water
0.00	0.30	TOPSOIL	No groundwater encountered
0.30	0.70	Firm brown sandy CLAY	
0.70	1.90	Firm becoming stiff grey brown slightly sandy gravelly CLAY with low cobble content	
1.90	2.10	Very stiff black slightly sandy gravelly CLAY with low cobble content	

Notes: E: 319537.09 N: 241427.71

Field Data

Field Test

Depth to Water (m)	Elapsed Time (min)
1.27	0.00
1.27	1.00
1.27	2.00
1.27	3.00
1.27	4.00
1.27	5.00
1.27	6.00
1.27	8.00
1.27	10.00
1.27	12.00
1.27	14.00
1.27	16.00
1.27	18.00
1.27	20.00
1.27	25.00
1.27	30.00
1.27	35.00
1.27	40.00
1.27	45.00
1.27	50.00
1.27	55.00
1.27	60.00

Depth of Pit (D) = 2.10 m
 Width of Pit (B) = 0.60 m
 Length of Pit (L) = 1.90 m

Initial depth to Water = 1.27 m
 Final depth to water = 1.27 m
 Elapsed time (mins) = 60.00

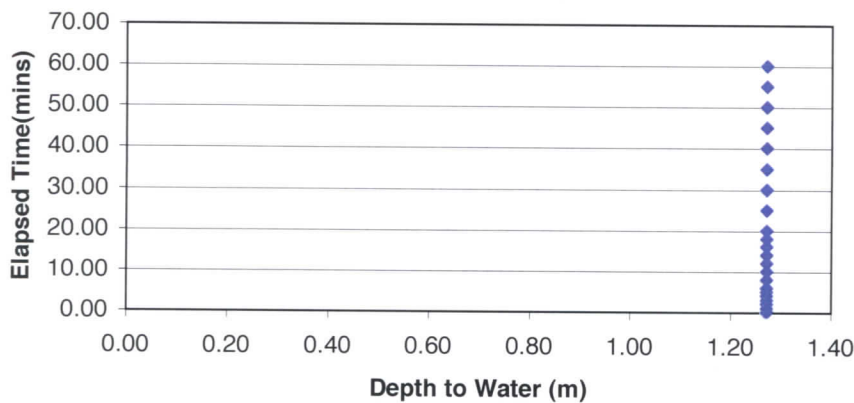
Top of permeable soil = 0.00 m
 Base of permeable soil = 2.10 m

Base area = 1.14 m²
 *Av. side area of permeable stratum over test pit = 4.15 m²
 Total Exposed area = 5.29 m²

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f = 0 m/min or 0 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f -value from field tests IGSL

Contract: Dublin North Fringe 220kV Reinforcement Contract No. 16016
 Test No. SW102
 Client ESBi
 Date: 12/10/11

Summary of ground conditions

from	to	Description	Ground water
0.00	0.30	TOPSOIL	No groundwater encountered
0.30	0.70	Firm brown sandy CLAY	
0.70	1.90	Firm becoming stiff grey brown slightly sandy gravelly CLAY with low cobble content	
1.90	2.10	Very stiff black slightly sandy gravelly CLAY with low cobble content	

Notes: E: 319537.40 N: 241415.34

Field Data

Field Test

Depth to Water (m)	Elapsed Time (min)
1.36	0.00
1.36	1.00
1.36	2.00
1.36	3.00
1.36	4.00
1.36	5.00
1.36	6.00
1.36	8.00
1.36	10.00
1.36	12.00
1.36	14.00
1.36	16.00
1.36	18.00
1.36	20.00
1.36	25.00
1.36	30.00
1.36	35.00
1.36	40.00
1.36	45.00
1.36	50.00
1.36	55.00
1.36	60.00

Depth of Pit (D) = 2.10 m
 Width of Pit (B) = 0.60 m
 Length of Pit (L) = 1.90 m

Initial depth to Water = 1.36 m
 Final depth to water = 1.36 m
 Elapsed time (mins) = 60.00

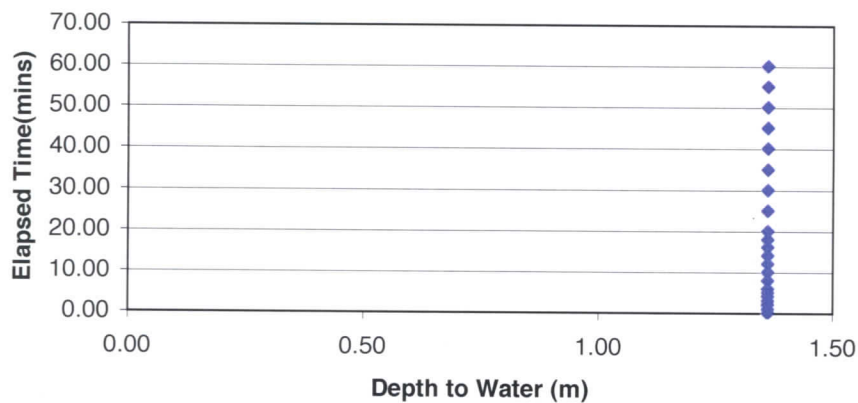
Top of permeable soil = 0.00 m
 Base of permeable soil = 2.10 m

Base area = 1.14 m²
 *Av. side area of permeable stratum over test pit = 3.7 m²
 Total Exposed area = 4.84 m²

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f = 0 m/min or 0 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f-value from field tests IGSL

Contract: Dublin North Fringe 220kV Reinforcement Contract No. 16016
 Test No. SW103
 Client ESBi
 Date: 12/10/11

Summary of ground conditions

from	to	Description	Ground water
0.00	0.30	TOPSOIL	No groundwater encountered
0.30	0.70	Firm brown sandy CLAY	
0.70	1.90	Firm becoming stiff grey brown slightly sandy gravelly CLAY with low cobble content	
1.90	2.10	Very stiff black slightly sandy gravelly CLAY with low cobble content	

Notes: E: 319572.65 N: 241410.05

Field Data

Field Test

Depth to Water (m)	Elapsed Time (min)
1.25	0.00
1.25	1.00
1.25	2.00
1.25	3.00
1.25	4.00
1.25	5.00
1.25	6.00
1.25	8.00
1.25	10.00
1.25	12.00
1.25	14.00
1.25	16.00
1.25	18.00
1.25	20.00
1.25	25.00
1.25	30.00
1.25	35.00
1.25	40.00
1.25	45.00
1.25	50.00
1.25	55.00
1.25	60.00

Depth of Pit (D) = 2.10 m
 Width of Pit (B) = 0.60 m
 Length of Pit (L) = 2.00 m

Initial depth to water = 1.25 m
 Final depth to water = 1.25 m
 Elapsed time (mins) = 60.00

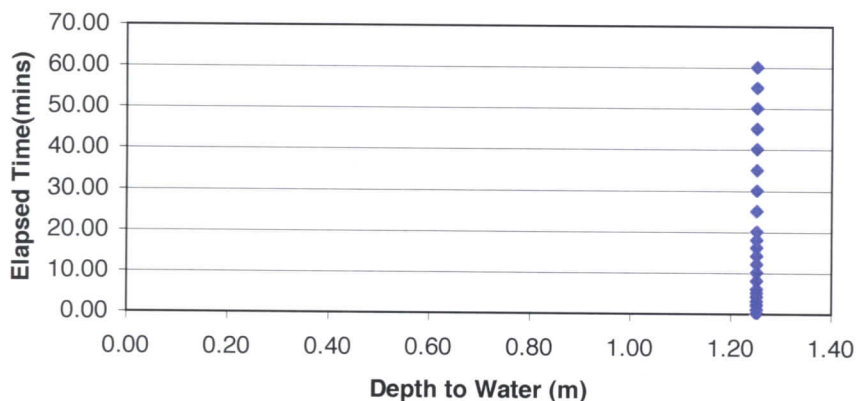
Top of permeable soil = 0.00 m
 Base of permeable soil = 2.10 m

Base area = 1.2 m²
 *Av. side area of permeable stratum over test pit = 4.42 m²
 Total Exposed area = 5.62 m²

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f = 0 m/min or 0 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f-value from field tests IGSL

Contract: Dublin North Fringe 220kV Reinforcement Contract No. 16016
 Test No. SW104
 Client ESBi
 Date: 12/10/11

Summary of ground conditions

from	to	Description	Ground water
0.00	0.40	TOPSOIL	No groundwater encountered
0.40	0.70	Firm brown sandy CLAY	
0.70	1.80	Firm becoming stiff grey brown slightly sandy gravelly CLAY with low cobble content	
1.80	2.10	Very stiff black slightly sandy gravelly CLAY with low cobble content	

Notes: E: 319597.21 N: 241389.02

Field Data

Field Test

Depth to Water (m)	Elapsed Time (min)
1.16	0.00
1.16	1.00
1.16	2.00
1.16	3.00
1.16	4.00
1.16	5.00
1.16	6.00
1.16	8.00
1.16	10.00
1.16	12.00
1.16	14.00
1.16	16.00
1.16	18.00
1.16	20.00
1.16	25.00
1.16	30.00
1.16	35.00
1.16	40.00
1.16	45.00
1.16	50.00
1.16	55.00
1.16	60.00

Depth of Pit (D) = 2.10 m
 Width of Pit (B) = 0.60 m
 Length of Pit (L) = 2.00 m

Initial depth to Water = 1.16 m
 Final depth to water = 1.16 m
 Elapsed time (mins) = 60.00

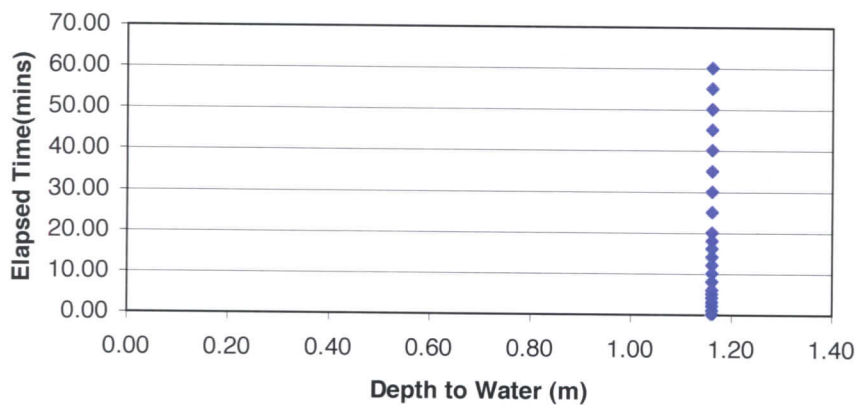
Top of permeable soil = 0.00 m
 Base of permeable soil = 2.10 m

Base area = 1.2 m²
 *Av. side area of permeable stratum over test pit = 4.888 m²
 Total Exposed area = 6.088 m²

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f = 0 m/min or 0 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f -value from field tests IGSL

Contract: Dublin North Fringe 220kV Reinforcement Contract No. 16016
 Test No. SW105
 Client ESBi
 Date: 12/10/11

Summary of ground conditions

from	to	Description	Ground water
0.00	0.30	TOPSOIL	No groundwater encountered
0.40	0.80	Firm brown sandy CLAY	
0.80	1.90	Firm becoming stiff grey brown slightly sandy gravelly CLAY with low cobble content	
1.90	2.10	Very stiff black slightly sandy gravelly CLAY with low cobble content	

Notes: E: 319603.97 N: 241413.93

Field Data

Field Test

Depth to Water (m)	Elapsed Time (min)
1.25	0.00
1.25	1.00
1.25	2.00
1.25	3.00
1.25	4.00
1.25	5.00
1.25	6.00
1.25	8.00
1.25	10.00
1.25	12.00
1.25	14.00
1.25	16.00
1.25	18.00
1.25	20.00
1.25	25.00
1.25	30.00
1.25	35.00
1.25	40.00
1.25	45.00
1.25	50.00
1.25	55.00
1.25	60.00

Depth of Pit (D) = 2.10 m
 Width of Pit (B) = 0.60 m
 Length of Pit (L) = 2.00 m

Initial depth to Water = 1.16 m
 Final depth to water = 1.16 m
 Elapsed time (mins) = 60.00

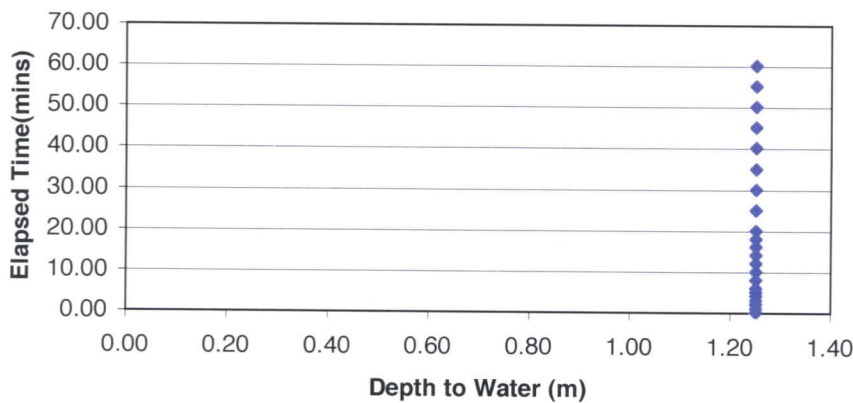
Top of permeable soil = 0.00 m
 Base of permeable soil = 2.10 m

Base area = 1.2 m²
 *Av. side area of permeable stratum over test pit = 4.888 m²
 Total Exposed area = 6.088 m²

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f = 0 m/min or 0 m/sec

Depth of water vs Elapsed Time (mins)



Appendix C Surface Water Calculations

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 320587, Northing: 240992,

DURATION	Interval		Years													
	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.5,	3.5,	4.0,	4.8,	5.4,	5.8,	7.2,	8.7,	9.8,	11.2,	12.5,	13.5,	15.0,	16.2,	17.2,	N/A ,
10 mins	3.5,	4.9,	5.6,	6.7,	7.5,	8.1,	10.0,	12.2,	13.6,	15.6,	17.4,	18.8,	21.0,	22.6,	24.0,	N/A ,
15 mins	4.1,	5.7,	6.6,	7.9,	8.8,	9.5,	11.8,	14.3,	16.0,	18.4,	20.5,	22.1,	24.7,	26.6,	28.2,	N/A ,
30 mins	5.4,	7.5,	8.6,	10.2,	11.3,	12.2,	14.9,	18.0,	20.1,	22.9,	25.4,	27.4,	30.4,	32.7,	34.6,	N/A ,
1 hours	7.1,	9.7,	11.1,	13.1,	14.5,	15.5,	18.9,	22.7,	25.1,	28.5,	31.5,	33.9,	37.4,	40.1,	42.4,	N/A ,
2 hours	9.4,	12.7,	14.4,	16.9,	18.6,	19.9,	24.0,	28.5,	31.5,	35.5,	39.1,	41.9,	46.0,	49.2,	51.9,	N/A ,
3 hours	11.1,	14.8,	16.7,	19.6,	21.5,	22.9,	27.5,	32.6,	35.9,	40.4,	44.4,	47.4,	52.0,	55.5,	58.4,	N/A ,
4 hours	12.4,	16.5,	18.7,	21.8,	23.8,	25.4,	30.4,	35.9,	39.4,	44.3,	48.5,	51.8,	56.7,	60.4,	63.5,	N/A ,
6 hours	14.6,	19.3,	21.7,	25.2,	27.5,	29.3,	34.9,	41.0,	44.9,	50.3,	55.0,	58.6,	64.0,	68.1,	71.5,	N/A ,
9 hours	17.2,	22.6,	25.3,	29.2,	31.8,	33.8,	40.1,	46.9,	51.3,	57.2,	62.4,	66.3,	72.3,	76.8,	80.5,	N/A ,
12 hours	19.3,	25.2,	28.2,	32.5,	35.3,	37.5,	44.2,	51.6,	56.3,	62.7,	68.2,	72.4,	78.8,	83.6,	87.6,	N/A ,
18 hours	22.7,	29.4,	32.8,	37.7,	40.8,	43.2,	50.8,	59.0,	64.2,	71.3,	77.4,	82.0,	89.0,	94.3,	98.6,	N/A ,
24 hours	25.5,	32.8,	36.5,	41.8,	45.3,	47.9,	56.1,	64.9,	70.5,	78.1,	84.6,	89.6,	97.0,	102.6,	107.2,	122.8,
2 days	31.6,	39.8,	43.9,	49.8,	53.5,	56.4,	65.2,	74.6,	80.4,	88.4,	95.2,	100.3,	107.9,	113.7,	118.4,	134.1,
3 days	36.5,	45.5,	49.9,	56.1,	60.2,	63.2,	72.6,	82.4,	88.6,	96.9,	103.9,	109.2,	117.1,	123.0,	127.8,	143.9,
4 days	40.7,	50.3,	55.0,	61.7,	65.9,	69.1,	78.9,	89.2,	95.6,	104.2,	111.5,	117.0,	125.1,	131.1,	136.1,	152.5,
6 days	48.2,	58.8,	64.0,	71.2,	75.8,	79.3,	89.9,	101.0,	107.8,	116.9,	124.6,	130.4,	138.9,	145.3,	150.4,	167.5,
8 days	54.7,	66.2,	71.8,	79.6,	84.5,	88.2,	99.5,	111.1,	118.3,	127.9,	136.0,	142.0,	150.9,	157.5,	162.8,	180.5,
10 days	60.6,	72.9,	78.9,	87.1,	92.3,	96.2,	108.1,	120.3,	127.8,	137.8,	146.2,	152.4,	161.7,	168.5,	174.0,	192.3,
12 days	66.2,	79.2,	85.4,	94.1,	99.6,	103.6,	116.0,	128.8,	136.6,	146.9,	155.6,	162.1,	171.6,	178.6,	184.3,	203.0,
16 days	76.4,	90.7,	97.5,	106.9,	112.8,	117.2,	130.5,	144.1,	152.5,	163.5,	172.7,	179.5,	189.5,	196.9,	202.9,	222.5,
20 days	85.8,	101.2,	108.5,	118.5,	124.8,	129.5,	143.7,	158.1,	166.9,	178.4,	188.1,	195.2,	205.7,	213.5,	219.7,	240.1,
25 days	96.8,	113.4,	121.2,	132.0,	138.8,	143.8,	158.8,	174.1,	183.4,	195.6,	205.7,	213.2,	224.2,	232.3,	238.8,	260.1,

NOTES:

N/A Data not available

These values are derived from a Depth Duration Frequency (DDF) Model

For details refer to:

'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

Mean Annual Flood Flow Rate Equation for Greenfield Catchments IH124

(Based on Institute of Hydrology report No. 124)

(Complete figures in **blue** only)

$$Q \text{ Bar} = 0.00108 \times \text{Area}^{0.89} \times \text{SAAR}^{1.17} \times \text{Soil}^{2.17}$$

Where		Units
Q Bar	= Mean Annual Peak Flow	m ³ /s
Area	= Catchment area	km ²
SARR	= Standard Annual Average Rainfall	mm
Soil	= Soil Index	-

Area description:

Soil characteristics: Soil type (See Table 1) **4** (Clayey, poorly drained)
=> Soil index = 0.47

Area = 0.5 km² (**20511.1** m²)

Where developments are smaller than 50 ha, the analysis for determining the peak greenfield discharge rate should use 50 ha in the formula and linearly interpolate the flow rate value based on the ratio of the development to 50 ha. (Ref: Interim Code of Practice for Sustainable Drainage Systems)

SAAR = **750** mm

$$Q \text{ Bar} = 0.2617 \text{ m}^3/\text{s}$$

= 261.69 l/s

or

= 127.58 l/s/ha

Linear Interpolation of Q Bar based on ratio of development to 50 ha

Peak greenfield discharge rate, Q_{Bar}	=	10.73	l/s
		5.23373	

Growth Curve

Region: Ireland East

Return Period Q_{t1} : 1 year

Growth Factor for Q_{t1} : 0.85

Allowable Discharge for 1 year return period:	9.12	l/s
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Return Period Q_{t2} : 5 year

Growth Factor for Q_{t2} : 1.21

Allowable Discharge for 5 year return period:	12.99	l/s
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Return Period Q_{t2} : 30 year

Growth Factor for Q_{t2} : 2.1

Allowable Discharge for 25 year return period:	22.54	l/s
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Return Period Q_{t3} : 100 year

Growth Factor for Q_{t3} : 1.9

Allowable Discharge for 100 year return period:	20.40	l/s
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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)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	15.500	Minimum Backdrop Height (m)	0.000
Ratio-R	0.270	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
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)
S1-0	0.067	5.00	30.500	1200	720504.216	741025.517	1.425
S1-1	0.046	5.00	30.500	1200	720548.765	741025.517	1.688
CP1.0	0.031	5.00	30.500	600	720511.911	741028.733	1.000
CP1-1			30.500	600	720571.043	741028.733	1.650
S2-0	0.018	5.00	30.500	600	720544.365	741044.117	0.700
S2-1			30.500	1200	720576.965	741044.117	1.300
S1-2			30.500	1200	720576.965	741025.517	1.854
S3-0	0.022	5.00	30.580	1200	720485.494	740997.183	1.234
CP4-0	0.009	5.00	30.500	600	720510.671	741020.678	0.700
CP4-1			30.500	600	720510.671	741002.183	1.350
CP5-0	0.009	5.00	30.500	600	720510.671	740973.688	1.000
CP5-1			30.500	600	720510.671	740992.183	1.650
S3-1	0.078	5.00	30.500	1200	720513.861	740997.087	1.436
CP6-0	0.032	5.00	30.500	600	720522.124	741000.682	1.000
CP6-1			30.500	600	720570.246	741000.682	1.650
CP2-0	0.025	5.00	30.500	600	720581.247	741043.403	1.000
CP3-0	0.013	5.00	30.500	600	720581.246	740974.218	1.000
CP2-1			30.500	600	720581.246	740997.183	2.300
S1-3	0.005	5.00	30.500	1200	720577.039	740997.183	2.213
S4-0	0.044	5.00	30.500	1200	720521.021	740974.276	1.350
S1-4			30.500	1200	720576.922	740974.276	2.307
S1-5			30.500	1200	720594.388	740948.670	2.734
STORAGE			30.500	1200	720594.836	740942.574	2.459
S1-7			30.500	1500	720595.284	740936.473	2.634
EX-S-MH			29.380	1200	720599.304	740908.273	1.554

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)	T of C (mins)	Rain (mm/hr)	Design Flow (l/s)
S1.000	S1-0	S1-1	44.549	0.600	29.075	28.812	0.263	169.4	225	5.74	50.0	
S1.001	S1-1	S1-2	28.200	0.600	28.812	28.646	0.166	169.9	225	6.21	50.0	
FD1.000	CP1.0	CP1-1	59.132	0.600	29.800	29.682	0.118	500.0	150	7.23	49.7	
FD1.001	CP1-1	S1-2	6.744	0.600	29.150	29.083	0.067	100.7	150	7.34	49.4	
S2.000	S2-0	S2-1	32.600	0.600	29.800	29.257	0.543	60.0	100	5.55	50.0	
S2.001	S2-1	S1-2	18.600	0.600	29.200	28.890	0.310	60.0	100	5.86	50.0	
S1.002	S1-2	S1-3	28.334	0.600	28.646	28.479	0.167	169.7	225	7.81	48.1	
S3.000	S3-0	S3-1	28.367	0.600	29.346	29.064	0.282	100.6	150	5.47	50.0	
FD4.000	CP4-0	CP4-1	18.495	0.600	29.800	29.763	0.037	500.0	150	5.70	50.0	
FD4.001	CP4-1	S3-1	6.012	0.600	29.150	29.070	0.080	75.0	150	5.78	50.0	

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)	T of C (mins)	Rain (mm/hr)	Design Flow (l/s)
FD5.000	CP5-0	CP5-1	18.495	0.600	29.800	29.763	0.037	500.0	150	5.70	50.0	
FD5.001	CP5-1	S3-1	5.850	0.600	29.150	29.072	0.078	75.0	150	5.78	50.0	
S3.001	S3-1	S1-3	63.178	0.600	29.064	28.437	0.627	100.8	150	6.83	50.0	
FD6.000	CP6-0	CP6-1	48.122	0.600	29.800	29.704	0.096	500.0	150	6.81	50.0	
FD6.001	CP6-1	S1-3	7.641	0.600	29.150	29.074	0.076	100.5	150	6.94	50.0	
FD2.000	CP2-0	CP2-1	46.220	0.600	29.800	29.708	0.092	500.0	150	6.74	50.0	
FD3.000	CP3-0	CP2-1	22.965	0.600	29.800	29.754	0.046	500.0	150	5.86	50.0	
FD2.001	CP2-1	S1-3	4.207	0.600	28.500	28.458	0.042	100.2	150	6.81	50.0	
S1.003	S1-3	S1-4	22.907	0.600	28.287	28.193	0.094	243.7	300	8.19	47.2	
S4.000	S4-0	S1-4	55.901	0.600	29.150	28.596	0.554	100.9	150	5.93	50.0	
S1.004	S1-4	S1-5	30.996	0.600	28.193	28.066	0.127	244.1	300	8.71	45.9	
S1.005	S1-5	STORAGE	6.112	0.600	28.066	28.041	0.025	244.5	300	8.81	45.7	
S1.006	STORAGE	S1-7	6.117	0.600	28.041	28.016	0.025	244.7	300	8.91	45.4	
S1.007	S1-7	EX-S-MH	28.485	0.600	28.016	27.826	0.190	149.9	225	9.36	44.4	10.7

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
S1.000	44.549	169.4	225	Circular	30.500	29.075	1.200	30.500	28.812	1.463
S1.001	28.200	169.9	225	Circular	30.500	28.812	1.463	30.500	28.646	1.629
FD1.000	59.132	500.0	150	Perforated	30.500	29.800	0.550	30.500	29.682	0.668
FD1.001	6.744	100.7	150	Circular	30.500	29.150	1.200	30.500	29.083	1.267
S2.000	32.600	60.0	100	Circular	30.500	29.800	0.600	30.500	29.257	1.143
S2.001	18.600	60.0	100	Circular	30.500	29.200	1.200	30.500	28.890	1.510
S1.002	28.334	169.7	225	Circular	30.500	28.646	1.629	30.500	28.479	1.796
S3.000	28.367	100.6	150	Circular	30.580	29.346	1.084	30.500	29.064	1.286
FD4.000	18.495	500.0	150	Perforated	30.500	29.800	0.550	30.500	29.763	0.587
FD4.001	6.012	75.0	150	Circular	30.500	29.150	1.200	30.500	29.070	1.280
FD5.000	18.495	500.0	150	Perforated	30.500	29.800	0.550	30.500	29.763	0.587
FD5.001	5.850	75.0	150	Circular	30.500	29.150	1.200	30.500	29.072	1.278
S3.001	63.178	100.8	150	Circular	30.500	29.064	1.286	30.500	28.437	1.913
FD6.000	48.122	500.0	150	Perforated	30.500	29.800	0.550	30.500	29.704	0.646
FD6.001	7.641	100.5	150	Circular	30.500	29.150	1.200	30.500	29.074	1.276

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
S1.000	S1-0	1200	Manhole	Adoptable	S1-1	1200	Manhole	Adoptable
S1.001	S1-1	1200	Manhole	Adoptable	S1-2	1200	Manhole	Adoptable
FD1.000	CP1.0	600	Manhole	Adoptable	CP1-1	600	Manhole	Adoptable
FD1.001	CP1-1	600	Manhole	Adoptable	S1-2	1200	Manhole	Adoptable
S2.000	S2-0	600	Manhole	Adoptable	S2-1	1200	Manhole	Adoptable
S2.001	S2-1	1200	Manhole	Adoptable	S1-2	1200	Manhole	Adoptable
S1.002	S1-2	1200	Manhole	Adoptable	S1-3	1200	Manhole	Adoptable
S3.000	S3-0	1200	Manhole	Adoptable	S3-1	1200	Manhole	Adoptable
FD4.000	CP4-0	600	Manhole	Adoptable	CP4-1	600	Manhole	Adoptable
FD4.001	CP4-1	600	Manhole	Adoptable	S3-1	1200	Manhole	Adoptable
FD5.000	CP5-0	600	Manhole	Adoptable	CP5-1	600	Manhole	Adoptable
FD5.001	CP5-1	600	Manhole	Adoptable	S3-1	1200	Manhole	Adoptable
S3.001	S3-1	1200	Manhole	Adoptable	S1-3	1200	Manhole	Adoptable
FD6.000	CP6-0	600	Manhole	Adoptable	CP6-1	600	Manhole	Adoptable
FD6.001	CP6-1	600	Manhole	Adoptable	S1-3	1200	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
FD2.000	46.220	500.0	150	Perforated	30.500	29.800	0.550	30.500	29.708	0.642
FD3.000	22.965	500.0	150	Perforated	30.500	29.800	0.550	30.500	29.754	0.596
FD2.001	4.207	100.2	150	Circular	30.500	28.500	1.850	30.500	28.458	1.892
S1.003	22.907	243.7	300	Circular	30.500	28.287	1.913	30.500	28.193	2.007
S4.000	55.901	100.9	150	Circular	30.500	29.150	1.200	30.500	28.596	1.754
S1.004	30.996	244.1	300	Circular	30.500	28.193	2.007	30.500	28.066	2.134
S1.005	6.112	244.5	300	Circular	30.500	28.066	2.134	30.500	28.041	2.159
S1.006	6.117	244.7	300	Circular	30.500	28.041	2.159	30.500	28.016	2.184
S1.007	28.485	149.9	225	Circular	30.500	28.016	2.259	29.380	27.826	1.329

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
FD2.000	CP2-0	600	Manhole	Adoptable	CP2-1	600	Manhole	Adoptable
FD3.000	CP3-0	600	Manhole	Adoptable	CP2-1	600	Manhole	Adoptable
FD2.001	CP2-1	600	Manhole	Adoptable	S1-3	1200	Manhole	Adoptable
S1.003	S1-3	1200	Manhole	Adoptable	S1-4	1200	Manhole	Adoptable
S4.000	S4-0	1200	Manhole	Adoptable	S1-4	1200	Manhole	Adoptable
S1.004	S1-4	1200	Manhole	Adoptable	S1-5	1200	Manhole	Adoptable
S1.005	S1-5	1200	Manhole	Adoptable	STORAGE	1200	Manhole	Adoptable
S1.006	STORAGE	1200	Manhole	Adoptable	S1-7	1500	Manhole	Adoptable
S1.007	S1-7	1500	Manhole	Adoptable	EX-S-MH	1200	Manhole	Adoptable

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	Scotland and Ireland	Additional Storage (m ³ /ha)	20.0
M5-60 (mm)	15.500	Starting Level (m)	
Ratio-R	0.270	Check Discharge Rate(s)	✓
Summer CV	0.750	100 year (l/s)	10.7
Winter CV	0.840	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
5	20	0	0
30	20	0	0
100	30	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 S1-7 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	28.016	Product Number	CTL-SHE-0136-1070-2000-1070
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	10.7	Min Node Diameter (mm)	1500

Node STORAGE Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	5.0	Invert Level (m)	28.041
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	60

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	56.0	0.0	1.000	56.0	0.0	1.001	0.0	0.0

Node CP1-1 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	FD1.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	29.682	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	48	Diameter (mm)	600

Node CP2-1 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	FD3.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	29.754	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	44	Diameter (mm)	600

Node CP2-1 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	FD2.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	29.708	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	46	Diameter (mm)	600

Node CP6-1 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	FD6.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	29.704	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	48	Diameter (mm)	600

Node CP5-1 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	FD5.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	29.763	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	48	Diameter (mm)	600

Node CP4-1 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	FD4.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	29.763	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	48	Diameter (mm)	600

Results for 5 year +20% CC Critical Storm Duration. Lowest mass balance: 98.22%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	S1-0	10	29.161	0.086	12.9	0.1782	0.0000	OK
15 minute winter	S1-1	11	28.930	0.118	21.3	0.1982	0.0000	OK
15 minute winter	CP1.0	12	29.895	0.095	5.9	0.1103	0.0000	OK
15 minute winter	CP1-1	12	29.209	0.059	5.0	0.0166	0.0000	OK
15 minute winter	S2-0	10	29.847	0.047	3.5	0.0376	0.0000	OK
15 minute winter	S2-1	11	29.247	0.047	3.4	0.0534	0.0000	OK
15 minute winter	S1-2	12	28.795	0.148	29.5	0.1680	0.0000	OK
15 minute winter	S3-0	10	29.395	0.049	4.2	0.0729	0.0000	OK
15 minute winter	CP4-0	11	29.849	0.049	1.7	0.0258	0.0000	OK
15 minute winter	CP4-1	12	29.229	0.079	1.6	0.0224	0.0000	OK
15 minute winter	CP5-0	11	29.850	0.050	1.8	0.0275	0.0000	OK
15 minute winter	CP5-1	12	29.229	0.079	1.7	0.0224	0.0000	OK
15 minute winter	S3-1	12	29.225	0.161	22.5	0.3574	0.0000	SURCHARGED
15 minute winter	CP6-0	11	29.900	0.100	6.2	0.1196	0.0000	OK
15 minute winter	CP6-1	12	29.211	0.061	5.4	0.0172	0.0000	OK
15 minute winter	CP2-0	11	29.886	0.086	4.9	0.0869	0.0000	OK
15 minute winter	CP3-0	11	29.860	0.060	2.5	0.0392	0.0000	OK
60 minute winter	CP2-1	49	28.640	0.140	4.1	0.0397	0.0000	OK
60 minute winter	S1-3	49	28.640	0.353	38.3	0.4157	0.0000	SURCHARGED
15 minute winter	S4-0	11	29.222	0.072	8.5	0.1287	0.0000	OK
60 minute winter	S1-4	50	28.638	0.445	42.3	0.5030	0.0000	SURCHARGED
60 minute winter	S1-5	50	28.635	0.569	38.5	0.6431	0.0000	SURCHARGED
60 minute winter	STORAGE	50	28.633	0.592	37.2	32.1892	0.0000	SURCHARGED
60 minute winter	S1-7	51	28.632	0.616	11.2	1.0890	0.0000	SURCHARGED
60 minute winter	EX-S-MH	51	27.902	0.076	10.7	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 ³)	Discharge Vol (m ³)
15 minute winter	S1-0	S1.000	S1-1	12.5	0.718	0.315	0.7801	
15 minute winter	S1-1	S1.001	S1-2	21.3	0.882	0.535	0.6894	
15 minute winter	CP1.0	FD1.000	CP1-1	5.0	0.525	0.641	0.5635	
15 minute winter	CP1-1	FD1.001	S1-2	5.0	0.829	0.284	0.0410	
15 minute winter	S2-0	S2.000	S2-1	3.4	0.954	0.432	0.1155	
15 minute winter	S2-1	S2.001	S1-2	3.4	0.948	0.434	0.0666	
15 minute winter	S1-2	S1.002	S1-3	29.0	1.075	0.728	0.7638	
15 minute winter	S3-0	S3.000	S3-1	4.1	0.394	0.232	0.3200	
15 minute winter	CP4-0	FD4.000	CP4-1	1.6	0.398	0.207	0.0758	
15 minute winter	CP4-1	FD4.001	S3-1	1.7	0.161	0.084	0.0812	
15 minute winter	CP5-0	FD5.000	CP5-1	1.7	0.405	0.220	0.0791	
15 minute winter	CP5-1	FD5.001	S3-1	2.0	0.179	0.097	0.0791	
15 minute winter	S3-1	S3.001	S1-3	18.5	1.141	1.044	1.0516	
15 minute winter	CP6-0	FD6.000	CP6-1	5.4	0.541	0.694	0.4838	
15 minute winter	CP6-1	FD6.001	S1-3	5.5	0.851	0.308	0.0490	
15 minute winter	CP2-0	FD2.000	CP2-1	4.3	0.510	0.553	0.3940	
15 minute winter	CP3-0	FD3.000	CP2-1	2.4	0.443	0.307	0.1251	
60 minute winter	CP2-1	FD2.001	S1-3	4.1	0.775	0.232	0.0730	
60 minute winter	S1-3	S1.003	S1-4	37.6	0.900	0.530	1.6131	
15 minute winter	S4-0	S4.000	S1-4	8.1	0.978	0.459	0.4644	
60 minute winter	S1-4	S1.004	S1-5	38.5	0.800	0.544	2.1827	
60 minute winter	S1-5	S1.005	STORAGE	37.2	1.256	0.526	0.4304	
60 minute winter	STORAGE	S1.006	S1-7	11.2	0.423	0.158	0.4308	
60 minute winter	S1-7	S1.007	EX-S-MH	10.7	0.881	0.252	0.3449	63.9

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 98.22%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	S1-0	10	29.181	0.106	18.9	0.2206	0.0000	OK
120 minute winter	S1-1	94	29.049	0.237	11.8	0.3959	0.0000	SURCHARGED
15 minute winter	CP1.0	12	29.925	0.125	8.6	0.1449	0.0000	OK
15 minute winter	CP1-1	12	29.223	0.073	7.3	0.0206	0.0000	OK
15 minute winter	S2-0	10	29.859	0.059	5.2	0.0479	0.0000	OK
15 minute winter	S2-1	11	29.260	0.060	5.0	0.0684	0.0000	OK
120 minute winter	S1-2	94	29.048	0.402	16.8	0.4544	0.0000	SURCHARGED
15 minute winter	S3-0	13	29.626	0.280	6.8	0.4161	0.0000	SURCHARGED
15 minute winter	CP4-0	11	29.859	0.059	2.4	0.0309	0.0000	OK
15 minute winter	CP4-1	13	29.608	0.458	3.5	0.1296	0.0000	SURCHARGED
15 minute winter	CP5-0	11	29.861	0.061	2.6	0.0333	0.0000	OK
15 minute winter	CP5-1	13	29.608	0.458	3.6	0.1296	0.0000	SURCHARGED
15 minute winter	S3-1	13	29.607	0.543	28.3	1.2071	0.0000	SURCHARGED
15 minute winter	CP6-0	11	29.933	0.133	9.0	0.1593	0.0000	OK
15 minute winter	CP6-1	12	29.226	0.076	8.0	0.0215	0.0000	OK
15 minute winter	CP2-0	11	29.911	0.111	7.1	0.1117	0.0000	OK
15 minute winter	CP3-0	11	29.873	0.073	3.7	0.0478	0.0000	OK
120 minute winter	CP2-1	94	29.046	0.546	4.1	0.1545	0.0000	SURCHARGED
120 minute winter	S1-3	94	29.046	0.759	36.7	0.8936	0.0000	SURCHARGED
15 minute winter	S4-0	11	29.242	0.092	12.4	0.1632	0.0000	OK
120 minute winter	S1-4	94	29.044	0.851	39.3	0.9620	0.0000	SURCHARGED
120 minute winter	S1-5	96	29.041	0.975	37.1	1.1024	0.0000	SURCHARGED
120 minute winter	STORAGE	96	29.040	0.999	36.6	54.2610	0.0000	SURCHARGED
120 minute winter	S1-7	96	29.039	1.023	11.5	1.8070	0.0000	SURCHARGED
480 minute summer	EX-S-MH	272	27.902	0.076	10.7	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 ³)	Discharge Vol (m ³)
15 minute winter	S1-0	S1.000	S1-1	18.4	0.780	0.462	1.0507	
120 minute winter	S1-1	S1.001	S1-2	11.8	0.766	0.297	1.1215	
15 minute winter	CP1.0	FD1.000	CP1-1	7.3	0.573	0.934	0.7412	
15 minute winter	CP1-1	FD1.001	S1-2	7.3	0.911	0.415	0.0544	
15 minute winter	S2-0	S2.000	S2-1	5.0	1.049	0.642	0.1561	
15 minute winter	S2-1	S2.001	S1-2	5.0	1.041	0.646	0.0903	
120 minute winter	S1-2	S1.002	S1-3	16.8	0.924	0.423	1.1269	
15 minute winter	S3-0	S3.000	S3-1	6.1	0.427	0.343	0.4994	
15 minute winter	CP4-0	FD4.000	CP4-1	2.3	0.443	0.297	0.0976	
15 minute winter	CP4-1	FD4.001	S3-1	2.9	0.239	0.139	0.1058	
15 minute winter	CP5-0	FD5.000	CP5-1	2.5	0.453	0.323	0.1035	
15 minute winter	CP5-1	FD5.001	S3-1	2.9	0.243	0.140	0.1030	
15 minute winter	S3-1	S3.001	S1-3	19.4	1.113	1.098	1.1122	
15 minute winter	CP6-0	FD6.000	CP6-1	8.0	0.591	1.021	0.6354	
15 minute winter	CP6-1	FD6.001	S1-3	8.0	0.934	0.451	0.0653	
15 minute winter	CP2-0	FD2.000	CP2-1	6.4	0.562	0.814	0.5203	
15 minute winter	CP3-0	FD3.000	CP2-1	3.5	0.495	0.448	0.1630	
120 minute winter	CP2-1	FD2.001	S1-3	3.7	0.733	0.210	0.0741	
120 minute winter	S1-3	S1.003	S1-4	34.7	0.830	0.490	1.6131	
15 minute winter	S4-0	S4.000	S1-4	11.9	1.069	0.674	0.6223	
120 minute winter	S1-4	S1.004	S1-5	37.1	0.644	0.524	2.1827	
120 minute winter	S1-5	S1.005	STORAGE	36.6	1.110	0.517	0.4304	
120 minute winter	STORAGE	S1.006	S1-7	11.5	0.377	0.162	0.4308	
120 minute winter	S1-7	S1.007	EX-S-MH	10.7	0.882	0.252	0.3452	120.9

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 98.22%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
120 minute winter	S1-0	104	30.077	1.002	9.8	2.0762	0.0000	SURCHARGED
120 minute winter	S1-1	104	30.076	1.264	16.5	2.1154	0.0000	SURCHARGED
120 minute winter	CP1.0	104	30.077	0.277	4.5	0.3198	0.0000	SURCHARGED
120 minute winter	CP1-1	104	30.076	0.926	6.3	3.5097	0.0000	SURCHARGED
120 minute winter	S2-0	104	30.079	0.279	2.7	0.2251	0.0000	SURCHARGED
120 minute winter	S2-1	104	30.077	0.877	4.4	0.9917	0.0000	SURCHARGED
120 minute winter	S1-2	104	30.075	1.429	21.6	1.6166	0.0000	SURCHARGED
120 minute winter	S3-0	100	30.097	0.751	3.2	1.1147	0.0000	SURCHARGED
120 minute winter	CP4-0	100	30.097	0.297	1.7	0.1567	0.0000	SURCHARGED
120 minute winter	CP4-1	100	30.097	0.947	3.0	1.2189	0.0000	SURCHARGED
120 minute winter	CP5-0	98	30.097	0.297	1.7	0.1621	0.0000	SURCHARGED
120 minute winter	CP5-1	100	30.097	0.947	2.9	1.2189	0.0000	SURCHARGED
120 minute winter	S3-1	100	30.097	1.033	15.9	2.2968	0.0000	SURCHARGED
120 minute winter	CP6-0	102	30.075	0.275	4.7	0.3284	0.0000	SURCHARGED
120 minute winter	CP6-1	102	30.073	0.923	4.8	2.7885	0.0000	SURCHARGED
120 minute winter	CP2-0	104	30.074	0.274	3.7	0.2753	0.0000	SURCHARGED
120 minute winter	CP3-0	104	30.073	0.273	1.9	0.1781	0.0000	SURCHARGED
120 minute winter	CP2-1	104	30.073	1.573	6.9	3.9592	0.0000	SURCHARGED
120 minute winter	S1-3	102	30.073	1.786	43.3	2.1040	0.0000	SURCHARGED
120 minute winter	S4-0	102	30.074	0.924	8.8	1.6461	0.0000	SURCHARGED
120 minute winter	S1-4	106	30.071	1.878	48.6	2.1238	0.0000	SURCHARGED
120 minute winter	S1-5	102	30.068	2.002	46.7	2.2646	0.0000	SURCHARGED
120 minute winter	STORAGE	112	30.066	2.025	46.0	55.5168	0.0000	SURCHARGED
120 minute winter	S1-7	102	30.066	2.050	12.1	3.6215	0.0000	SURCHARGED
720 minute summer	EX-S-MH	525	27.902	0.076	10.7	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 ³)	Discharge Vol (m ³)
120 minute winter	S1-0	S1.000	S1-1	9.8	0.672	0.246	1.7718	
120 minute winter	S1-1	S1.001	S1-2	15.2	0.804	0.383	1.1215	
120 minute winter	CP1.0	FD1.000	CP1-1	4.5	0.509	0.569	1.0410	
120 minute winter	CP1-1	FD1.001	S1-2	4.5	0.803	0.252	0.1187	
120 minute winter	S2-0	S2.000	S2-1	2.7	0.899	0.345	0.2551	
120 minute winter	S2-1	S2.001	S1-2	2.7	0.881	0.345	0.1455	
120 minute winter	S1-2	S1.002	S1-3	19.9	0.943	0.500	1.1269	
120 minute winter	S3-0	S3.000	S3-1	3.2	0.330	0.180	0.4994	
120 minute winter	CP4-0	FD4.000	CP4-1	1.3	0.372	0.166	0.3256	
120 minute winter	CP4-1	FD4.001	S3-1	-2.2	0.160	-0.108	0.1058	
120 minute winter	CP5-0	FD5.000	CP5-1	1.4	0.380	0.178	0.3256	
120 minute winter	CP5-1	FD5.001	S3-1	-2.2	0.173	-0.109	0.1030	
120 minute winter	S3-1	S3.001	S1-3	15.0	1.056	0.848	1.1122	
120 minute winter	CP6-0	FD6.000	CP6-1	4.7	0.520	0.597	0.8472	
120 minute winter	CP6-1	FD6.001	S1-3	4.7	0.816	0.264	0.1345	
120 minute winter	CP2-0	FD2.000	CP2-1	3.7	0.487	0.470	0.8137	
120 minute winter	CP3-0	FD3.000	CP2-1	1.9	0.413	0.243	0.4043	
120 minute winter	CP2-1	FD2.001	S1-3	5.2	0.748	0.295	0.0741	
120 minute winter	S1-3	S1.003	S1-4	42.2	0.824	0.596	1.6131	
120 minute winter	S4-0	S4.000	S1-4	6.4	0.864	0.362	0.9841	
120 minute winter	S1-4	S1.004	S1-5	46.7	0.702	0.660	2.1827	
120 minute winter	S1-5	S1.005	STORAGE	46.0	1.152	0.650	0.4304	
120 minute winter	STORAGE	S1.006	S1-7	12.1	0.402	0.172	0.4308	
120 minute winter	S1-7	S1.007	EX-S-MH	10.7	0.882	0.252	0.3453	168.5

Appendix D Foul Water Calculations

Design Settings

Frequency of use (kDU)	0.50	Minimum Velocity (m/s)	0.75
Flow per dwelling per day (l/day)	446	Connection Type	Level Soffits
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	✓

Nodes

Name	Units	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
F1-0	2.1	30.500	450	720553.812	740992.120	0.550
F1-1		30.500	1200	720579.286	740992.120	1.300
F1-2		30.500	1200	720579.286	741043.214	2.578
EX-F-MH		28.660	1200	720588.966	741074.542	1.558

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)
1.000	F1-0	F1-1	25.474	1.500	29.950	29.200	0.750	34.0	100
1.001	F1-1	F1-2	51.094	1.500	29.200	27.922	1.278	40.0	100
1.002	F1-2	EX-F-MH	32.789	1.500	27.922	27.102	0.820	40.0	100

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	25.474	34.0	100	Circular	30.500	29.950	0.450	30.500	29.200	1.200
1.001	51.094	40.0	100	Circular	30.500	29.200	1.200	30.500	27.922	2.478
1.002	32.789	40.0	100	Circular	30.500	27.922	2.478	28.660	27.102	1.458

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	F1-0	450	Manhole	Adoptable	F1-1	1200	Manhole	Adoptable
1.001	F1-1	1200	Manhole	Adoptable	F1-2	1200	Manhole	Adoptable
1.002	F1-2	1200	Manhole	Adoptable	EX-F-MH	1200	Manhole	Adoptable

Appendix E Uisce Éireann Confirmation of Feasibility

CONFIRMATION OF FEASIBILITY

Deirdre Ryan
ESB EMP One Dublin Airport Central
Cloghran
Dublin
K67XF72
Ireland

30 January 2026

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

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

**Our Ref: CDS25007090 Pre-Connection Enquiry
Belmayne 110 KV Substation R139, Belcamp, Dublin**

Dear Applicant/Agent,

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

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Business Connection of 1 unit(s) at Belmayne 110 KV Substation R139, Belcamp, Dublin, (the **Development**).

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

- **Water Connection**
 - Feasible without infrastructure upgrade by Uisce Éireann
 - Approximately 15m of new 100mm ID pipe to be laid to connect the site development to the existing 300mm DI main
- **Wastewater Connection**
 - Feasible without infrastructure upgrade by Uisce Éireann
 -

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann 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 Uisce Éireann.

Stiúrthóirí / Directors: Niall Gleeson (POF / CEO), Jerry Grant (Cathaoirleach / Chairperson), Gerard Britchfield, Liz Joyce, Michael Nolan, Patricia King, Eileen Maher, Cathy Mannion, Paul Reid, Michael Walsh.

Oifig Chláraithe / Registered Office: Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86 / Colvill House, 24-26 Talbot Street, Dublin, Ireland D01NP86

Is cuideachta ghníomhaíochta ainmnithe atá faoi theorainn scaireanna é Uisce Éireann / Uisce Éireann is a designated activity company, limited by shares.

Cláraithe in Éirinn Uimh.: 530363 / Registered in Ireland No.: 530363.

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/

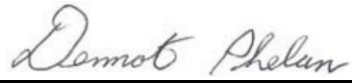
Where can you find more information?

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

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

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

Yours sincerely,



Dermot Phelan
Connections and Developer Services

Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	<ul style="list-style-type: none"> • 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 Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application <u>and be granted and sign</u> a connection agreement with Uisce Éireann.
When should I submit a Connection Application?	<ul style="list-style-type: none"> • A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	<ul style="list-style-type: none"> • Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	<ul style="list-style-type: none"> • All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. <p>*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</p>
Fire flow Requirements	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 Uisce Éireann's network(s)?	<ul style="list-style-type: none"> • Requests for maps showing Uisce Éireann's network(s) can be submitted to: datarequests@water.ie

<p>What are the design requirements for the connection(s)?</p>	<ul style="list-style-type: none"> The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with <i>the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice</i>, available at www.water.ie/connections
<p>Trade Effluent Licensing</p>	<ul style="list-style-type: none"> 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/ <p>**trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)</p>

Section B – Details of Uisce Éireann’s Network(s)

The map included below outlines the current Uisce Éireann infrastructure adjacent the Development: To access Uisce Éireann Maps email

datarequests@water.ie



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Note: The information provided on the included maps as to the position of Uisce Éireann’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 Uisce Éireann.

Whilst every care has been taken in respect of the information on Uisce Éireann’s network(s), Uisce Éireann 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 Uisce Éireann’s underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Uisce Éireann’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.