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Infrastructure Report & Flood Risk Assessment

LDA Wilton
Sarsfield Road LRD

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1.0 INTRODUCTION

1.1 SCOPE OF THIS REPORT

The Land Development Agency (LDA) intends to apply to Cork City Council for permission for a Large Residential Development with a total application site area of c. 2.61ha, on lands adjoining the ESB Networks DAC Office, at Farrandahadore More, Sarsfield Road, Wilton, Cork City. The development will provide 348 no. residential units and a 156 sqm childcare facility, revised access arrangements to Sarsfield Road and all associated development above and below ground.

Barrett Mahony Consulting Engineers, acting as Civil & Structural Engineering Consultants for The Land Development Agency, have prepared the following report, which describes the development's main civil engineering infrastructural elements and how these connect to the existing public infrastructure in the area.

In particular, surface water and foul drainage, water supply and roads engineering aspects are addressed. This report should be read in conjunction with the drawings prepared by Barrett Mahony Consulting Engineers.

1.2 EXISTING SITE

The site boundary of the development extends to approximately 2.61ha and is currently in the ownership of ESB Networks.

The site is bounded to the north by the Society of African Missions (SMA) lands and Wilton Shopping Centre (further north). The site is bounded to the south by the existing ESB Networks facility, to the west by Cardinal Court residential estate, and to the east by the R641 regional road (Sarsfield Road). Refer to Figure 1.1 below.

Figure 1.1 – Site Location Map showing 2.61ha subject site outlined in red.

The majority of the existing site is currently vacant, in greenfield condition with several mature trees in-situ, while the southeastern corner of the site includes the ESB Networks facility access road & approach to an existing signalised junction with Sarsfield Road.

Access to the site is currently available via an existing gated access at Sarsfield Road, and also from the ESB Networks facility via an existing signalised junction with Sarsfield Road.

A detailed topographical survey of the existing site has been undertaken, showing substantial variation in ground levels across the site. In broad terms the site sloped in southerly direction, from the northern boundary with the Society of African Missions (SMA) lands. Figure 1.2 shows typical spot levels across the site.

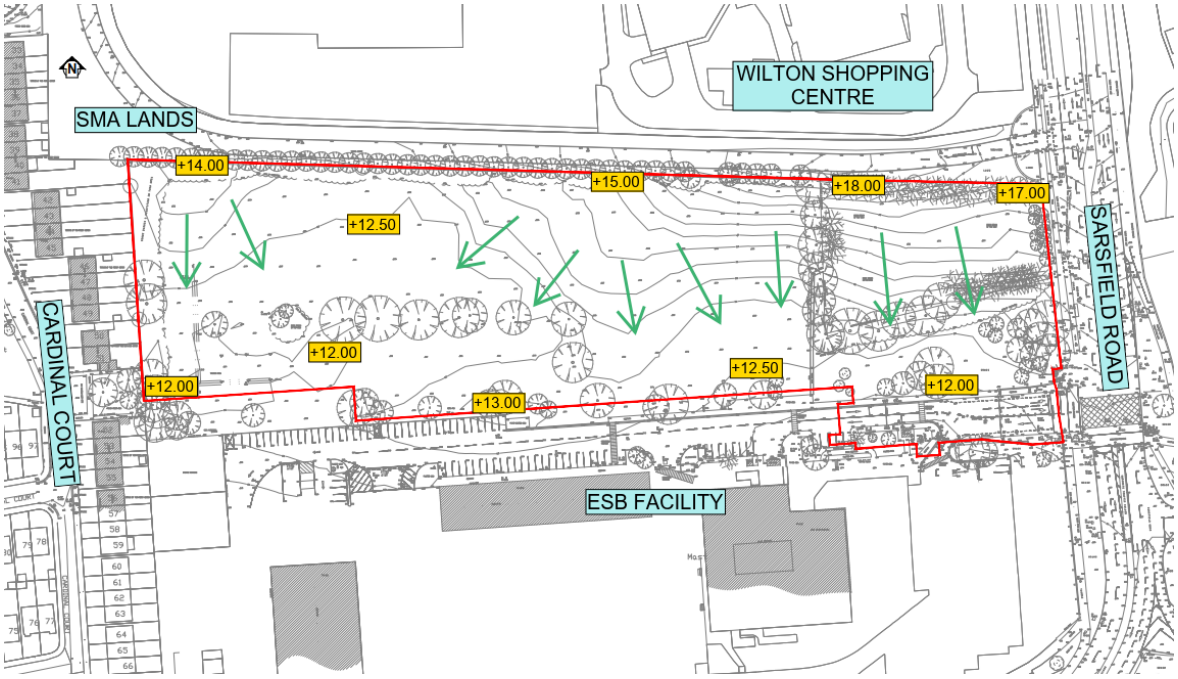


Figure 1.2 – Summary of the Existing Site Topography (All levels to Ordnance Datum levels).

1.3 PROPOSED DEVELOPMENT

The development will provide 348 no. residential units and a 156 sqm childcare facility. The residential element will consist of 16 no. townhouses, and 332 no. apartment units arranged in 3 no. apartment blocks.

Provision is made for potential future pedestrian connections that would facilitate permeability through the site to adjoining developments to the western and northern boundaries, subject to agreement with those parties and/or Cork City Council, as appropriate.

The proposed vehicular, cycle and pedestrian access into the development is via a reconfigured shared access with the ESB facility to the southeast, via a controlled junction on Sarsfield Road; the existing vehicular entrance to the site from Sarsfield Road on the eastern site boundary will be reconfigured to provide cycle and pedestrian only access. In addition, the proposed development includes 148 no. car parking spaces and 503 no. bicycle parking spaces.

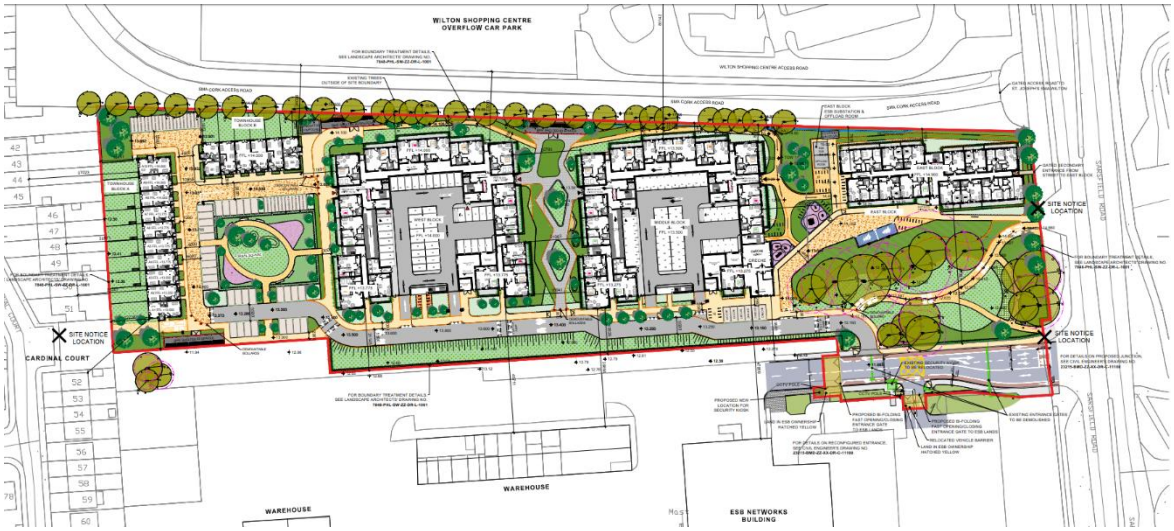


Figure 1.3 – Architect's Site Layout (by Reddy Architecture & Urbanism)

2.0 SURFACE WATER DRAINAGE SYSTEM

2.1 EXISTING SURFACE WATER INFRASTRUCTURE

Following a desktop review of the available drainage records, along with an underground utility survey completed by Murphy Geospatial and a visual site inspection, it is noted there is no formal surface water drainage serving the site. There are a number of existing road gullies within the site boundary on the existing ESB Networks facility access road to the southeast which appear to connect to a stormwater network which leads southwards towards the ESB networks campus. This has been verified by the underground utility survey undertaken indicating the ESB access road drains to a separate piped network within the ESB Networks facility.

Beyond the site boundary to the east, there is an existing 600mm diameter surface water pipe located below Sarsfield Road, which flows in a southerly direction, ultimately discharging to the Glasheen Stream. To the west, there is an existing 600mm diameter surface water pipe at Cardinal Court, which also flows in a southerly direction to a separate outfall to the Glasheen Stream.

Refer to existing drainage records included in Appendix I.

2.2 PROPOSED SURFACE WATER INFRASTRUCTURE

The proposed surface water drainage strategy has been established with reference to the following technical design documents:

- Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Technical Document – Volume 2, New Developments, 2005
- Greater Dublin Regional Code of Practice for Drainage Works, V6.0, 2005
- The SuDS Manual (CIRIA publication C753), 2015

2.2.1 Site Characteristics

The site area bounded by the redline planning boundary is 2.61ha. For the purposes of establishing the greenfield run-off rate, the positively drained area considered is **2.1569ha**.

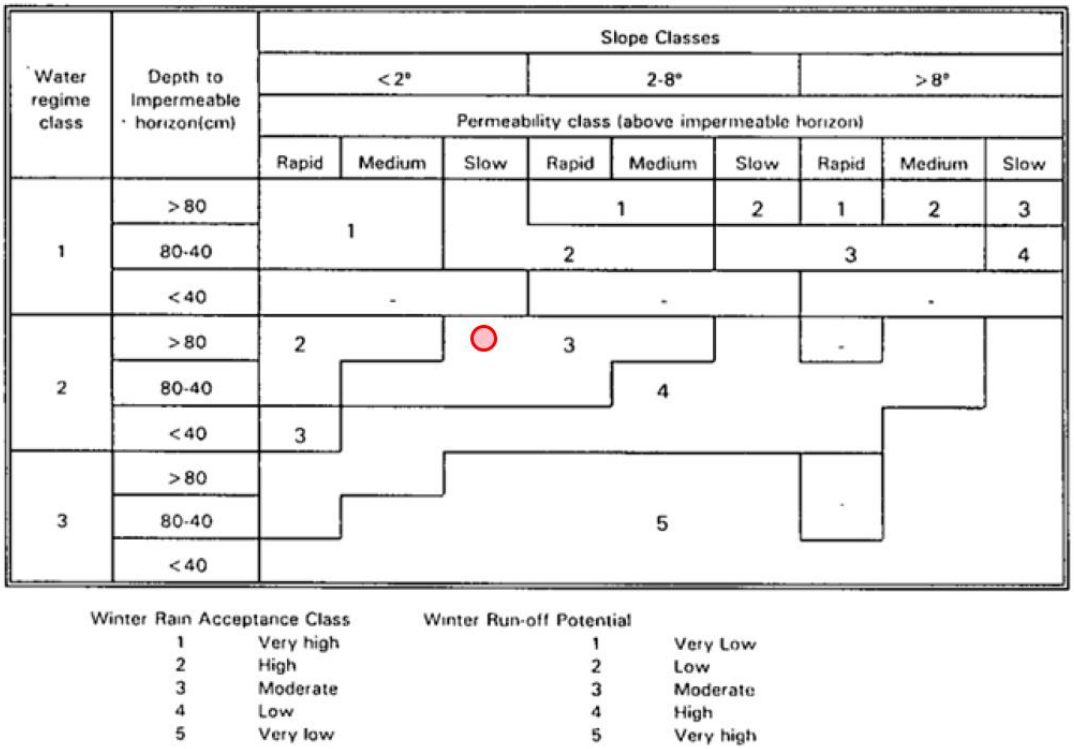
The Standard Average Annual Rainfall (SAAR) figure for the site has been gleaned from Met Eireann's "1991-2020 Annual Average Rainfall Grid", and is noted as **1126.3mm**. Refer to Appendix II.

A rainfall return period table has been obtained from Met Eireann in order to establish the M5-60 and M5-2D rainfall figures for the site. Refer to Appendix II. These Met Eireann figures correspond with the results of "Mateus, C., and Coonan, B. 2023. Estimation of point rainfall frequencies in Ireland. Technical Note No. 68.".

- **M5-60 = 16.7mm**
- M5-2D = 65.4mm
- **Ratio r = 0.255**

With reference to the WRAP table, Table 2.1 from IH126 (Institute of Hydrology Report No. 126), a SOIL type 3 is deemed appropriate for the site. Refer to Figure 2.1. With reference to the GDSDS Regional Drainage Policies – Volume 2, Table 6.7, this corresponds with a standard percentage runoff value (SPR) value of 0.37.

- **SOIL value = 0.37**



Water regime class	Depth to impermeable horizon(cm)	Slope Classes								
		<2°			2-8°			>8°		
		Permeability class (above impermeable horizon)								
		Rapid	Medium	Slow	Rapid	Medium	Slow	Rapid	Medium	Slow
1	>80	1			1		2	1	2	3
	80-40				2		3			4
	<40	-			-			-		
2	>80	2			3			-		
	80-40					4				
	<40	3								
3	>80							-		
	80-40				5					
	<40									

Winter Rain Acceptance Class		Winter Run-off Potential	
1	Very high	1	Very Low
2	High	2	Low
3	Moderate	3	Moderate
4	Low	4	High
5	Very low	5	Very high

Figure 2.1 – Extract from IH126 (Institute of Hydrology Report No. 126) showing estimation of SOIL value 3 for the site.

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

Figure 2.2 – Extract from the GDSDS Regional Drainage Policies – Volume 2, showing Table 6.7.

2.2.2 Estimation of Greenfield Run-off Rate

In accordance with the IH124 method, the greenfield runoff for existing undeveloped sites measuring less than 50ha can be estimated using the following formula:

$$Qbar_{rural} \text{ (in } m^3/s) = 0.00108 \times (0.01 \times AREA)^{0.89} \times SAAR^{1.17} \times SPR^{2.17}$$

where:

- $Qbar_{rural}$ is the mean annual flood flow from a catchment
- AREA is the area of the catchment in ha.
- SAAR is the standard average annual rainfall for the period 1981-2010 Annual Average Rainfall Grid produced by Met Éireann.
- SPR is Standard Percentage Runoff coefficient for the SOIL category.

Based on the Site Characteristics outlined in Section 2.2.1 of this report, $Qbar_{rural}$ for a 50ha site has been calculated as follows:

$Qbar_{rural}$ (for a 50ha site) $= 0.00108 \times (0.01 \times 50)^{0.89} \times 1126.3^{1.17} \times 0.37^{2.17}$
$= 0.2506\ m^3/s$
$= 250.6\ l/s$

Interpolating linearly, this corresponds with a Qbar figure for a site area of 2.1569ha equates to:

Qbar = 10.81l/s

Qbar is equivalent to approximately the 2.3yr return period greenfield run-off rate. Further to discussions with Cork City Council Drainage Section, it has been requested that the discharge limit be set to the 1yr return period. Applying a FSR growth curve factor of 0.85 in accordance with guidance contained within the GDSDS, this equates to a discharge limit of 0.85 x Qbar = 9.19l/s.

Acknowledging the comments from Cork City Council Drainage Section, the design for the development has been undertaken with a more conservative discharge rate limit for the total site of **9.0l/s**.

2.2.3 Catchment & Attenuation Strategy

The surface water catchment strategy for the development is based on a proposed surface water outfall to the existing 600mm diameter sewer at Sarsfield Road to the southeast of the development.

A detailed breakdown of the drained areas contributing to each pipe is provided in a 'Drained Area Summary' included in Appendix V. The strategy is to attenuate locally within individual subcatchments. The area around the townhouses to the west of the development will be attenuated in a buried concrete attenuation tank (Tank A). The western block and middle block apartments will be attenuated via a buried concrete attenuation structure below car parking level. The open space between these apartment blocks will be attenuated by utilising the void space below extensive permeable paving in this area. The remainder of the development will drain towards a final buried concrete attenuation tank (Tank B) located to the southeastern corner of the development. Restricted flows from the subcatchments, will ultimately drain towards Tank B also, and discharge finally at a rate limited to 9.0l/s, to the existing 600mm diameter surface water network at Sarsfield Road.

The above strategy has been arrived at, on the basis of the limited available open space available for one central attenuation facility. Due to various constraints, such as existing mature tree root protection zones and the need to avoid placing tanks below roads to be taken in charge in future, the above strategy allows for localised attenuation, with smaller structures, within each subcatchment.

The run-off coefficients proposed for the project are as follows:

- Roads, Paths & Hardstanding = 0.90
- Permeable Block Paving = 0.80
- Standard Impermeable Roofs = 0.95
- Green Roofs – Intensive/Extensive = 0.80
- Soft Landscaping & Other Porous Finishes = 0.30

Application of these runoff coefficients to the relevant areas within each subcatchment results in a total effective impermeable area of approximately 1.4558ha.

An attenuation requirement for the effective development impermeable area of 1.4558ha on the basis of 9.0l/s discharge rate limit, has been modelled and assessed using Causeway Flow software for the critical storm duration, for the 1, 30 and 100yr return periods including an allowance of 20% climate change. Appendix V of this report includes the calculation output arising from this modelling.

Table 2.2 shows the proposed attenuation provision within each subcatchment.

Table 2.2: Attenuation Provision per Subcatchment

Sub-catchment	Discharge Rate At Flow Control Device	Flow Control Type	Volume (cu.m)	Primary Storage System Proposed
Tank A	2.2l/s	HydroBrake	286	Concrete Tank (to be TIC)
Western Block	1.3l/s	HydroBrake	216	Concrete Tank below West Block Car Park (Private)
Gravel Bed to Perm Paving	2.0l/s	Orifice	55	Utilise Subbase of Permeable Paving (Private)
Middle Block	1.3l/s	HydroBrake	216	Concrete Tank below Middle Block Car Park (Private)
Tank B	9.0l/s	HydroBrake	360	Concrete Tank (to be TIC)
TOTAL	**9.0l/s**		**1133**	

2.3 COMPLIANCE WITH THE GDSDS

The proposed development is designed in accordance with the principles of Sustainable Drainage Systems (SuDS) as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS). The GDSDS addresses the issue of sustainability by requiring designs to comply with a set of drainage criteria which aim to minimize the impact of urbanization by replicating the run-off characteristics of the greenfield site. These drainage design criteria are as follows:

GDSDS Criteria	Aims
Criterion 1 – River Water Quality Protection	• to prevent pollution • to maintain base flows in streams • to recharge groundwater.
Criterion 2 – River Regime Protection	• to prevent river scour due to flash flooding.
Criterion 3 – Site Flood Risk Mitigation	• to prevent site flooding for 30 year storm and manage overland flows if site flooding occurs for 100 year storm.
Criterion 4 – River Flood Protection	• to prevent river flooding

It is noted that the proposed surface water drainage network will comply fully with these drainage design criteria.

2.3.1 Criterion 1 – River Quality Protection

Run-off from natural greenfield areas contributes very little pollution and sediment to rivers and for most rainfall events direct run-off from greenfield sites to rivers does not take place with rainfall percolating into the ground.

By contrast urban run-off, when drained by pipe systems, results in run-off from virtually every rainfall event with high levels of pollution, particularly in the first phase of run-off, with little of the rainfall percolating to the ground.

To prevent this happening Criterion 1 requires that interception storage is provided so that the first 5-10mm of rainfall from the developed site is intercepted and retained on site to prevent pollution, recharge groundwater and maintain base flows in streams thereby replicating the run-off characteristics of the pre-development greenfield site.

In the context of the subject site:

- Roofs – Standard Runoff = 3,242sqm
- Roofs – Green Roof (Extensive/Intensive) = 5,380sqm
- Roads & Impermeable Footpaths = 4,081sqm
- Concrete Block Permeable Paving = 1,682sqm
- Landscape & Porous Finishes = 7,184sqm
- TOTAL = 21,569sqm

Inteception storage is achieved on green roofs (extensive and intensive) and is prevented from entering the positively drained system at a rate of 12litres/m². For an area of 5380sqm this equates to 65.56cu.m of interception storage.

Interception storage is achieved in permeable paving subbase layers by providing a raised drainage outlet above the base of the coarse graded gravel bed. Where the outlet is raised 120mm above in the base of the gravel bed, and assuming a voids ratio of 40%, this ensures that circa 48mm of interception storage is achieved in the base of the permeable paving layer. For a plan area of 1682sqm this equates to 80.74cu.m of interception storage.

Landscape and Porous Finishes total 7184sqm and are deemed to achieve a minimum of 10mm/sqm of interception storage given their porous nature, which equates to 71.84cu.m of interception storage. By allowing for the above, any storage achieved in tree pits has been ignored conservatively for this calculation.

Interception storage required over the total unfactored drained area of 21569sqm:
5mm = 107.85cu.m
10mm = 215.69cu.m

Thus, in total, interception storage achieved = 64.56 + 80.74 + 71.84 = 217.14cu.m, which exceeds the minimum and preferred requirements outlined above. Therefore Criterion 1 is complied with.

2.3.2 Criterion 2 – River Regime Protection

Whatever the rainfall event, unchecked run-off from the developed site through traditional pipe networks will discharge into receiving waters at rates that are an order of magnitude greater than

that prior to development. This can cause flash flow in the outfall river / stream that can cause scour and erosion.

Attenuation storage is provided to prevent this occurring by limiting the rate of run-off to that which took place from the pre-development greenfield site. In practice the rate of run-off needs to be appropriately low for the majority of rainfall events and attenuation storage volumes should be provided for the 1 and 100year storm events and the rate of outflow from such storage should be controlled so that it does not exceed the greenfield flow.

As noted in section 2.2.3 of this report, attenuation requirements for the effective development impermeable area of 1.4558ha on the basis of a 9.0l/s discharge rate limit, has been modelled and assessed using Causeway Flow software for the critical storm duration, for the 1, 30 and 100yr return periods including an allowance of 20% climate change.

The flow rate of 9.0l/s is less than the calculated greenfield runoff rate for the development site of 10.81l/s and the Causeway Flow output shows sufficient attenuation storage volumes have been provided. Thus Criterion 2 has been complied with.

2.3.3 Criterion 3 – Site Flood Risk Mitigation

The GDSDS requires that no flooding should occur on site for storms up to and including the 30year event. The pipe network and the attenuation storage volumes should therefore, be checked for such storms to ensure that no site flooding occurs.

No flooding of internal areas should occur during the 100year event. The pipe network can therefore surcharge and cause site flooding during this event but the top water level due to any such flooding must be at least 500mm below any internal floor levels and the flood waters should be contained within the site.

Causeway Flow software for the critical storm duration, for the 1, 30 and 100yr return periods including an allowance of 20% climate change. The results show that for the critical storm durations for both the 30yr and the 100yr return periods, plus a 20% climate change allowance, that the pipe network is surcharged but no flooding occurs. Appendix V of this report includes the calculation output arising from this modelling.

Therefore Criterion 3 has been complied with.

2.3.4 Criterion 4 GDSDS – River Flood Protection

Criterion 4 is intended to prevent flooding of the receiving system/watercourse by either limiting the volume of run-off to the pre-development greenfield volume using “long term storage” (Option 1) or by limiting the rate of run-off for the 100year storm to QBAR without applying growth factors using “extended attenuation storage” (Option 2).

In the context of the subject site Criterion 4 has been satisfied using Option 2 by providing extended attenuation storage.

As can be seen in the Causeway Flow software output given in Appendix V the rate of outflow from the attenuation tank does not exceed QBAR during the 100year storm event.

Therefore Criterion 4 has been complied with.

2.4 INTEGRATED SUDS APPROACH

A range of SuDS measures are proposed across the site to maximise interception and treatment storage, in order to comply with both the requirements of the GDSDS and the CIRIA SuDS Manual.

2.4.1 Green Roof – Extensive:

Extensive roofs have low substrate depths and therefore low loadings on the building structure, they are lightweight and have a low cost to maintain. These systems cover the relevant roof area with hardy, slow growing, drought resistance, low maintenance plants and vegetation, such as sedums. The planting usually matures slowly, with the long-term biodiverse benefits being the sought-after results. These roofs are typically only accessed for maintenance and are usually comprised of between 20mm – 150mm overall depth.

Extensive green roofs have the effect of providing some initial storage of rainwater, while also reducing the rate at which rainwater from heavier rainfall events will discharge to the main attenuation tank. It can also help to filter the run-off, removing any pollutants and resulting in a higher quality of water discharging to the drainage system.

A typical extensive green roof system can retain over 30 litres/m² (i.e. 30 mm) in the substrate depending on the build-up. Since these roofs are exposed to the Irish climate, there is a high probability that the roof will not be completely dry, and the storage capacity will be compromised on any given rainfall event.

Thus, a more conservative estimate of 12 litres/m² (12mm) interception storage will be assumed through the use of a proprietary interception drainage mat below the extensive green roof substrate. It is proposed to finish the suitable upper roof levels of the apartment blocks (East Block, Middle Block & West Block) in an extensive green roof system with the exception of areas covered by plant equipment, PV arrays, parapets and balconies.

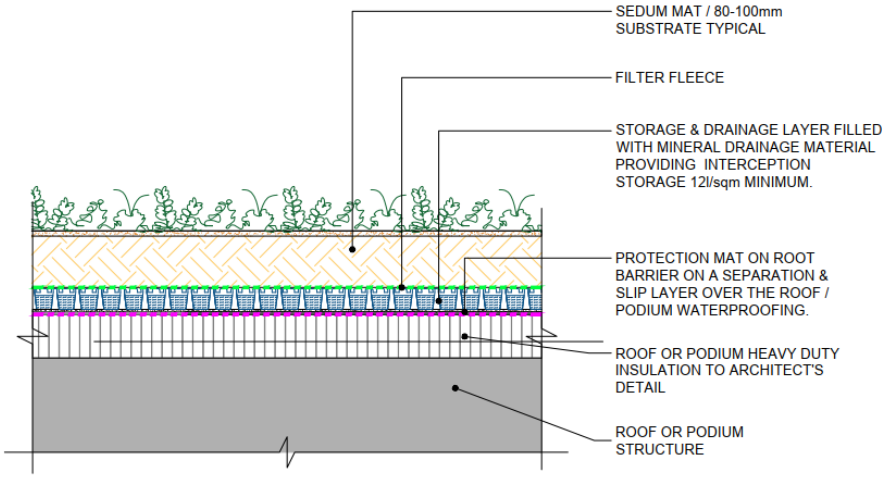


Figure 2.5 – Typical Extensive Green Roof Buildup

2.4.2 Green Roof – Intensive

Intensive green roofs are designed to sustain more complex landscaped environments that can provide high amenity and biodiverse benefits. They are planted with a range of plants, including

grasses, shrubs, trees and may also include water features, as well as hard landscape paved areas. They are designed to be accessible and normally require regular maintenance.

An intensive paved and soft landscaped green roof is proposed on the podium courtyard areas of the Middle Block and West Block. The use of intensive green roofs will also allow the planting of large shrubs, small trees, as well as permeable hardscaping finishes within the podium area which will improve the amenity value for the residents.

While the intensive substrate will act like a 'sponge' and inevitably provide storage of rainwater, conservatively (and similar to the approach taken with extensive green roofs in section 2.4.1), interception storage is only assumed within the interception drainage tray located below the substrate. The build-up for the Intensive Green Roof will include an interception tray to capture the first 12mm of rainfall falling on each roof, providing a minimum interception capacity of 12 litres/m² over the podium areas.

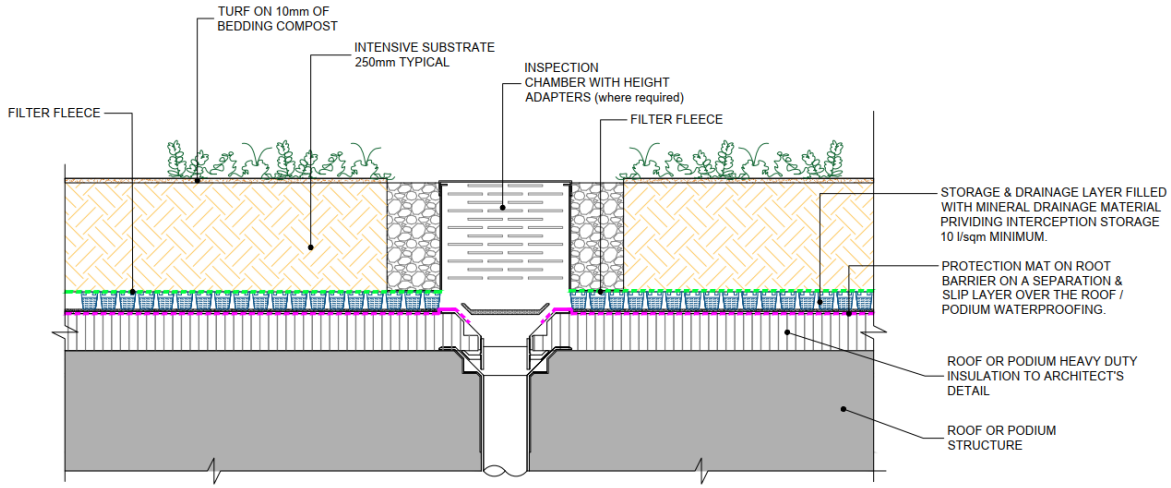


Figure 2.6 – Typical Intensive Green Roof Buildup

2.4.3 Hydrocarbon Interceptors

Contamination of surface water by oil, chemicals or suspended solids can cause these discharges to have a serious impact on receiving watercourses. Oil separators are installed on surface water drainage systems to protect receiving waters from pollution by oil, due to minor leaks from vehicles and plant.

Class 1 bypass separators are proposed immediately upstream of the final attenuation storage tank (Tank B) and are sized for the contributing area. These are effective containment systems which will capture any silts or hydrocarbons which may arise from run-off generated by the proposed development prior to final discharge at the proposed outfall to Sarsfield Road. Refer to BMCE drawing 23215-BMD-ZZ-XX-DR-C-11200 for locations of these interceptors.

2.4.4 Permeable Paving

Permeable paving provides a surface suitable for pedestrian and/or vehicular traffic, while also allowing rainwater to infiltrate through the surface and into the underlying structural layers. The water is temporarily stored beneath the overlying surface as it infiltrates back to ground at source.

Permeable paving systems are an effective way of managing surface water runoff close to its source and are an excellent means of providing treatment of run-off.

By providing a raised drainage outlet above the base of the coarse graded gravel bed it is possible to achieve interception storage.

The proposed surface-level car parking spaces, podium courtyard hardscaping, and specific paths (where not taken in charge) throughout the development will be constructed using permeable paving.

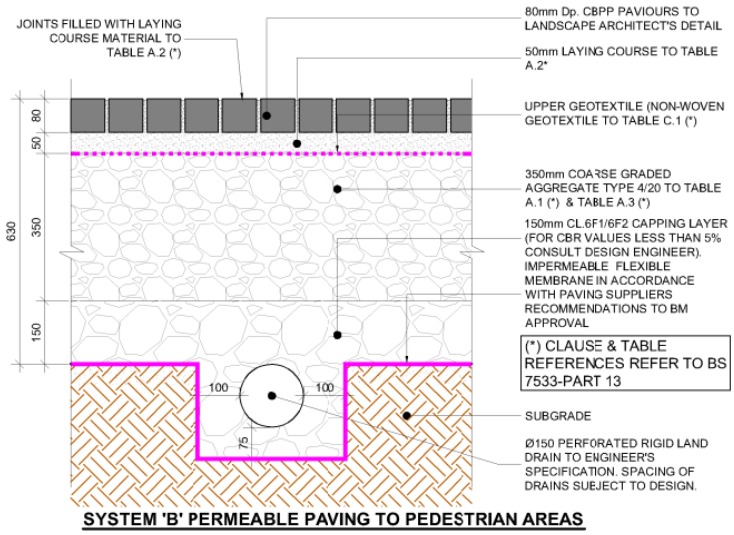


Figure 2.7 – Typical Permeable Paving Build-up

2.4.5 Bio-Retention and Tree Pits

Street tree pits are effective means of treating and intercepting runoff from adjacent impermeable surfaces. These systems permit infiltration to the ground either fully or partially, and can incorporate a slotted drainage pipe above the base which collects and re-directs excess runoff to the stormwater network.

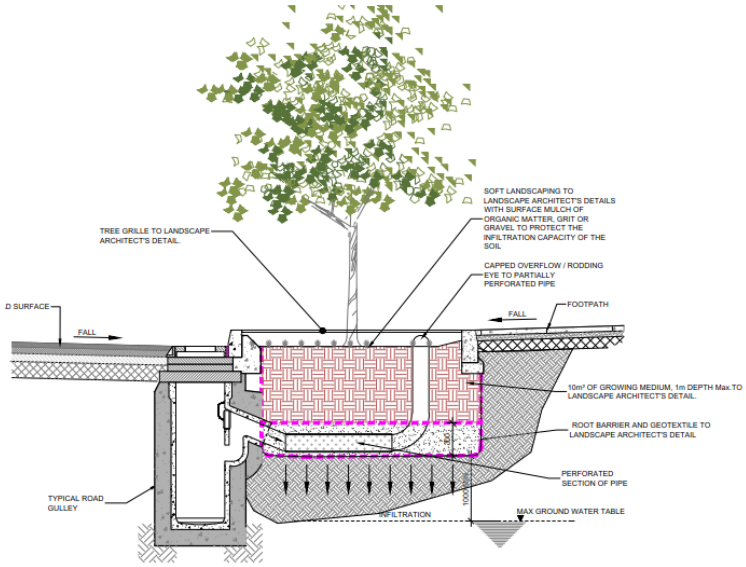


Figure 2.8 – Typical Bioretention Tree Pit Detail

2.5 COMPLIANCE WITH THE WATER FRAMEWORK DIRECTIVE

The Site is situated within the Lee, Cork Harbour and Youghal Bay Water Framework Directive ('WFD') Catchment [Catchment_ID: 19] and the Glasheen [Corkcity]_SC_010 subcatchment [Subcatchment_ID: 19_17].

As per EPA Maps, there is one watercourse, the Glasheen (Cork City) Stream of note, located ca. 75m to the south of the Site, at its closest point.

This stream drains in an eastern/northern direction and drains into the Glasheen (Cork City) River, ca. 2.3km downstream of the Site. The Glasheen (Cork City) river flows in an eastern direction into the Lee (Cork) Estuary Upper and Lower, which forms part of the Cork Harbour SPA.

Under the Water Framework Directive (WFD) 2000/60/EC, as amended, the EPA classifies the status, and the risk, of not achieving good water quality status, for all waterbodies in Ireland.

According to the WFD 2016-2021 monitoring events, the most up-to-date data at the time of writing this report, the water quality within the Glasheen (Cork City) stream/river are considered to be '*Poor*,' and the status of these features are considered '*At risk*'. The water quality status within the Lee (Cork) Estuary Upper and Lower are considered to be '*Moderate*' and these water features are considered to be '*At risk*'.

It is noted, the proposed development drainage strategy is designed in accordance with the principles of Sustainable Drainage Systems (SuDS) as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS).

In particular, Criterion 1, 3 and 4 of the GDSDS address the requirements around protection of rivers and watercourses. It has been demonstrated that the proposed drainage strategy is compliant with the requirements of these criterion, ensuring no adverse implications for the receiving Glasheen Stream or Glasheen River, under the EPA's Water Framework Directive classifications of water quality or risk status.

3.0 FLOOD RISK ASSESSMENT

3.1 INTRODUCTION

The flood risk assessment outlined below is carried out in accordance with the OPW publication "The Planning System and Flood Risk Assessment Guidelines for Planning Authorities".
The stages involved in the assessment of flood risk are listed in these publications as follows:

- Stage 1: Flood Risk Identification
- Stage 2: Initial Flood Risk Assessment
- Stage 3: Detailed Flood Risk Assessment

The OPW publication also outlines a Sequential Approach for determining whether a development is appropriate for a specified location in terms of flood risk. The categorization of the subject site in terms of the OPW's sequential approach is further outlined in section 3.2 below.

3.2 STAGE 1: FLOOD RISK IDENTIFICATION

Stage 1 identifies whether there are any flooding or surface water management issues related to the site, i.e., it identifies whether a flood risk assessment is required.

A desktop review of available flood mapping, notes that the site is not at risk of flooding. Refer to Appendix III for records of current flood mapping available from FloodMaps.ie. It is noted that the Glasheen Stream is approximately 80m to the south of the site but does not pose a risk.

3.2.1 Flood Zones

The sequential approach defines the flood zones as detailed below:

- *Flood Zone A* – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding).
- *Flood Zone B* – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and
- *Flood Zone C* – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

The site is located in Flood Zone C, where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

3.2.2 Vulnerability Class

The sequential approach describes the vulnerability classes as follows:

- *Highly vulnerable development* – hospitals, schools, houses, student halls of residence etc.
- *Less vulnerable development* – retail, commercial, industrial, agriculture etc.

  and
- *Water compatible development* – docks, marinas, amenity open space etc.

The development is a residential development which is classed as 'highly vulnerable'.

3.2.3 Development Classification

The matrix of vulnerability as per "The Planning System and Flood Risk Management – Guidelines for Planning Authorities" is reproduced in Table 3.1 below:

Table 3.1: Matrix of Vulnerability

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water compatible development	Appropriate	Appropriate	Appropriate

This development is therefore deemed appropriate. The site does not require a sequential justification test to be completed.

3.3 STAGE 2: INITIAL FLOOD RISK ASSESSMENT

The initial flood risk assessment should ensure that all relevant flood risk issues are assessed in relation to the decisions to be made and potential conflicts between flood risk and development are addressed. It should assess the adequacy of existing information and any flood defences.

3.3.1 Examination of potential flooding sources that can affect the site

The possible sources of flood water are assessed in the table below using the "**Source – Pathway – Receptor Model"**.

Table 3.2: The possible sources of flood water

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Tidal Note (Note 1)	Overtop Breach	People Property	Unlikely	High	Very Low
Fluvial Note	Overtop Breach	People Property	Unlikely	High	Very Low
Pluvial Surface water	Overflow / Blockage	People Property	Possible	Moderate	Moderate
Groundwater	Rising groundwater levels	People Property	Unlikely	Low	Low

3.3.2 Appraisal of the availability and adequacy of existing information and flood zone maps

3.3.3 Tidal/Fluvial

Reasonable data is available on possible flooding of the surrounding area to the site in the Preliminary Flood Risk Assessment (PFRA) extents mapping by the OPW which is a national screening exercise, based on available and readily derivable information, to identify areas where there may be a significant risk associated with flooding. CFRAM mapping is also available for the area but it is noted the site is not at risk of Tidal or Fluvial flooding from these records.

Further south of the development site, the Glasheen Stream is identified as being subject to flooding in the CFRAMS flood mapping. It is noted the proposed discharge of surface water from the development to the existing 600mm pipework, will ultimately discharge to the Glasheen Stream further south of the proposed connection point to the existing 600mm pipe network.

Cork City Council Drainage Section have requested the existing flooding at the Glasheen Stream be considered in Flood Risk Assessment for the development.

BMCE have reviewed and provide commentary as follows:

(i) The existing site forms part of the natural Glasheen Stream catchment currently, based on a review of the topography of the area. It is noted that the excess run-off from the site would flow overland to the ESB access road where existing gullies currently collect run-off from the road and transmit this via an internal surface water piped network within the ESB Networks compound, ultimately leading the Glasheen Stream. There is an existing SW outlet from the ESB Networks compound which has been identified at the Glasheen Stream, adjacent to the southwest corner of the ESB Networks compound. The outlet was heavily silted at time of inspection.

Fig 3.1 – existing SW outlet from the ESB Networks compound which has been identified at the Glasheen Stream, adjacent to the southwest corner of the ESB Networks compound

(ii) With regards to River Regime Protection, the GDSDS Regional Drainage Policies – Volume 2 document notes in section 6.3.1.2.2: "Rural runoff to rivers, when it occurs, is slow. To try and replicate this, urban runoff must be heavily constrained. Unrestrained runoff causes high velocities and erosion, affecting the morphology of the channel and the flora and fauna in the river." It also notes, the relevant design criterion to address this issue is to "Restrain the rate of discharge to the receiving water to that of greenfield runoff for the site."

(iii) With regards to River Flooding Protection, the GDSDS Regional Drainage Policies – Volume 2 document notes in section 6.3.1.3: "Flooding in rivers is exacerbated by urban runoff, particularly in catchments with a high degree of urbanisation." Section 6.3.1.4 goes onto state "If all catchments are developed on the basis of reflecting the rural behaviour prior to development, both in terms of rate of runoff and volume of runoff, it is likely that the river will be protected effectively." Where 'long-term' storage on site is not achievable, which is the case on this particular development, due to the space constraints arising from the need to protect existing mature trees, and the need to provide sufficient density of the development, the GDSDS notes : "It is possible that "long term" storage cannot be provided at certain sites. In these situations it is recommended that QBAR is used as the attenuation storage control requirement to ensure sufficient runoff is retained on site for extreme events. This will tend to be a less economic solution, but is the only way to ensure that urban runoff does not exacerbate flooding in a river."

(iv) The stormwater network design for the proposed development has estimated QBAR for the site at 10.81l/s. To further limit the risk of exacerbating flooding at the Glasheen

Stream, the stormwater network discharge rate has been limited to less than 0.85 x Qbar (i.e. a flow restriction of 9.0l/s has been designed for). Thus the design team have complied with the recommendations of the GDSDS and are satisfied the development will not exacerbate existing flooding issues at the Glasheen Stream.

4.0 FOUL DRAINAGE SYSTEM

4.1 EXISTING FOUL DRAINAGE SYSTEM

Following a desktop review of the available drainage records, along with a visual site inspection, it is noted there is no formal foul water drainage network serving the site at present.

There are two existing large diameter combined sewers which cross the southwestern corner of the site – a 525mm diameter combined sewer and a 750mm diameter combined sewer – and these flow in an easterly direction from Cardinal Court, through to Sarsfield Road and beyond.

There is an existing 225mm diameter foul sewer in Sarsfield Road, flowing in a southerly direction and appears to connect to the existing 525mm diameter combined sewer at the junction of the ESB Networks facility access road and Sarsfield Road.

Refer to existing drainage records included in Appendix I.

4.2 PROPOSED FOUL DRAINAGE SYSTEM

The proposed foul drainage system will be designed to take discharges from the new residential units. There is a small amount of commercial space on site, namely the proposed creche facility within the Middle Block.

The foul network will be designed in accordance with Uisce Eireann's current Code of Practice for Wastewater Infrastructure. The foul network will comprise of 150mm, 225mm and 300mm diameter SN8 pipework, and will be designed for a minimum velocity of 0.75m/s (self-cleansing) and maximum peak velocity of 2.5m/s.

It is proposed to connect to the existing Irish Water network at an existing manhole on the 750mm combined sewer at Sarsfield Road.

4.3 PROPOSED FOUL DEMAND CALCULATIONS

4.3.1 Residential Flow – 348 no. units

Dry Weather Flow (Daily) = (Population)(Consumption/Capita) + (Infiltration)

Number of Residential Units	= 348
Population Estimate	= 348 x 2.7 = 940 persons
Consumption/Capita	= 150 litres / person / day
Infiltration	= 10% (as per App C Section 1.2.4 of CoP for WW Infrastructure)
Average Flow (DWF)	= (940 x 150 x 1.1) = 155,100 litres / day = 1.795 litres/second
Peak Flow	= (Average Flow) × (4.5) = 1.795 x 4.5 = 8.078 litres/second

4.3.2 Commercial Flow – Creche

A 156 sqm creche facility will be provided in the Middle Block near the entrance to the development. It is assumed conservatively, that 52no. children will be catered for. A staff:child ratio of 1:5 on average (based on Schedule 6 Part 1 of Child Care Act 1991 (Early Years Services) Regulations 2016.) has been assumed, giving 11no. staff.

Thus, assume total of 11no. staff + 52no. children = 63no. persons.

As per Irish Water CoP for WW Infrastructure Appendix D, assume flow rate for "Schools - non-residential without a canteen" = 50litres/person/day.

Daily Flow = 63 x 50 x 10% infiltration = 3,465 l/day

Average Flow = 0.040 l/s

Peak Flow = 0.040 x 4.5 = 0.180 l/s

Thus, in summary:

- Total Average Flow (Residential + Creche) = 1.795 + 0.040 = 1.835l/s
- Total Peak Flow (Residential + Creche) = 8.078 + 0.180 = 8.258l/s

4.3.3 Uisce Eireann Pre-Connection Enquiry

A Pre-connection Enquiry application was submitted to Irish Water to confirm capacity in the receiving network on the basis of 391 units, and a Confirmation of Feasibility letter was obtained on the 8th December 2023.

A revised Confirmation of Feasibility letter, for the number of units now proposed (i.e. 348no. units + creche) was obtained on the 23rd January 2025.

The Confirmation of Feasibility letter, noted the development was feasible, subject to upgrades. Specifically, Uisce Eireann noted: “In order to accommodate the proposed discharge from the Development, upgrades to the existing Wilton WWPS are required to provide additional network storage capacity. It will also be necessary to provide real time telemetry controls at Wilton WWPS to manage the discharge of flow to the downstream network and prevent detriment to the existing network”. The applicant will engage further with Uisce Eireann to ensure completion of the required upgrades is achieved prior to full occupation. A copy of the revised confirmation of feasibility is included in Appendix IV.

4.3.4 Uisce Eireann Statement of Design Acceptance

A full design submission for the proposed water and wastewater arrangements was issued to Uisce Eireann and a Statement of Design Acceptance for the proposed development, dated 8th January 2025 has been obtained. Please see Appendix IV for the Statement of Design Acceptance received.

5.0 WATER SUPPLY

5.1 EXISTING WATERMAIN INFRASTRUCTURE

There is an existing 200mm diameter cast iron (1981) watermain within the site boundary, and this runs along the northern footpath of the existing ESB Networks facility access road. This appears from records to be fed via a large 600mm diameter D.I. (2012) watermain, located at Sarsfield Road, and is the main supply to the ESB Networks facility.

Refer to Appendix I for details of the existing watermain records for the area.

5.2 PROPOSED WATERMAINS

Is proposed to connect to the existing 200mm diameter cast iron watermain close to the proposed T-junction with the existing ESB Networks facility access road. The proposed watermains will include a 225mmOD PE100 SDR17 HDPE spine watermain, with further loops off this spine to serve Block E (160mm OD PE100 SDR17 HDPE) and the Townhouses (110mm OD PE100 SDR17 HDPE), all designed in accordance with Uisce Eireann's current Code of Practice for Water Infrastructure.

Individual service connections to each townhouse will be via 25mm OD MDPE pipework, complete with Uisce Eireann compliant boundary boxes. Each apartment block will have its own metered connection along with a bulk meter in accordance with Uisce Eireann requirements.

Buildings are to be a maximum of 46m from a hydrant in accordance with the Department of the Environment's Building Regulations "Technical Guidance Document Part B Fire Safety". Hydrants are to be installed in accordance with Uisce Eireann's Code of Practice and Standard Details. Final positions of hydrants will be agreed as part of the Fire Safety Certificate requirements.

Sluice valves will be provided at all junctions and at appropriate locations to facilitate isolation/purging of the system. Air valves will be located high points adjacent to the north west and north east corners of the development and scour valves at low points will be provided where necessary. The townhouses will accommodate a minimum of 24-hour water storage and include provision of water conservation measures such as dual flush water cisterns and low flow taps. Apartments will also incorporate 24-hour storage, either in a communal basement storage tank or individually within each apartment.

5.3 PROPOSED WATER DEMAND CALCULATIONS

5.3.1 Residential Demand – 348 no. units

The water demand for the proposed development has been calculated using the guidelines given in the Irish Water Code of Practice for Water Infrastructure assuming a per-capita consumption of 150 l/head/day and using the Irish Water assumed average occupancy of 2.7 persons/unit. The average day/peak week demand is taken as 1.25 times the average daily domestic demand. The peak demand factor is taken as 5 times the average day/peak week demand.

Average Daily Demand	= (Population)(Consumption/Capita)
Number of Residential Units	= 348
Population Estimate	= 348 x 2.7 = 940 persons
Consumption/Capita	= 150 litres / person / day

Average Daily Demand	= 940 x 150
	= 141,000 litres/day
Average Day/Peak Week Demand	= (Average Daily Demand) x 1.25
	= 176,250 litres/day
	= 2.04 litres/second
Peak Demand	= (Average Day/Peak Week Demand) x 5
	= 10.20 litres/second

5.3.2 Commercial Flow – Creche

A 156 sqm creche facility will be provided in the Middle Block near the entrance to the development. It is assumed conservatively, that 52no. children will be catered for. A staff:child ratio of 1:5 on average (based on Schedule 6 Part 1 of Child Care Act 1991 (Early Years Services) Regulations 2016.) has been assumed, giving 11no. staff.

Thus, assume total of 11no. staff + 52no. children = 63no. persons.

As per Irish Water CoP for WW Infrastructure Appendix D, assume flow rate for "Schools - non-residential without a canteen" = 50litres/person/day.

Average Daily Demand	= 63 x 50
	= 3,150 litres/day
Average Day/Peak Week Demand	= (Average Daily Demand) x 1.25
	= 3,937.5 litres/day
	= 0.046 litres/second
Peak Demand	= (Average Day/Peak Week Demand) x 5
	= 0.230 litres/second

Thus, in summary:

- Total Average Day/Peak Week Demand (Residential + Creche) = 2.04 + 0.046 = 2.086l/s
- Total Peak Demand (Residential + Creche) = 10.20 + 0.230 = 10.430l/s

5.3.3 Uisce Eireann Pre-Connection Enquiry

A Pre-connection Enquiry application was submitted to Irish Water to confirm capacity in the receiving network on the basis of 391 units, and a Confirmation of Feasibility letter was obtained on the 8th December 2023. The Confirmation of Feasibility letter, noted the development was feasible without infrastructure upgrades.

A revised Confirmation of Feasibility letter, for the number of units now proposed (i.e. 348no. units + creche) was obtained on the 23rd January 2025. A copy of the revised confirmation of feasibility is included in Appendix IV.

5.3.4 Uisce Eireann Statement of Design Acceptance

A full design submission for the proposed water and wastewater arrangements was issued to Uisce Eireann and a Statement of Design Acceptance for the proposed development, dated 8th January 2025 has been obtained. Please see Appendix IV for the Statement of Design Acceptance received.

6.0 TRANSPORT INFRASTRUCTURE

6.1 TRAFFIC IMPACT AND MOBILITY MANAGEMENT

Please refer to the separate reports on these items prepared by ILTP Traffic & Transport Consultants.

6.2 EXISTING ROAD ACCESS

Access to the site is currently available via an existing gated access at Sarsfield Road, and also from the ESB Networks facility via an existing signalised junction with Sarsfield Road. Refer to Figure 6.1 & Figure 6.2.

Figure 6.1 - Existing ESB Networks facility access road off the Sarsfield Road – looking west

Figure 6.2 - Existing gated access road off the Sarsfield Road – looking northwest

6.3 PROPOSED ROAD ACCESS TO THE DEVELOPMENT

Vehicular access to the development will be formed via a new priority T-junction with the existing access road to the ESB Networks facility to the south east. The existing access road is served via an existing signalised junction at Sarsfield Road.

It is proposed to retain the existing signalised junction arrangement at Sarsfield Road, and upgrade a section of the existing ESB access road, to rationalise traffic movements between the proposed development and the existing ESB networks facility.

The works will involve relocation of an existing ESB security hut, security gates and automated barriers to accommodate the new development T-junction, along with reconfiguration of the existing car park entrance junction. Refer to Figure 6.3 showing proposed access road upgrade arrangements including proposed junction to the new internal road network of the proposed development.

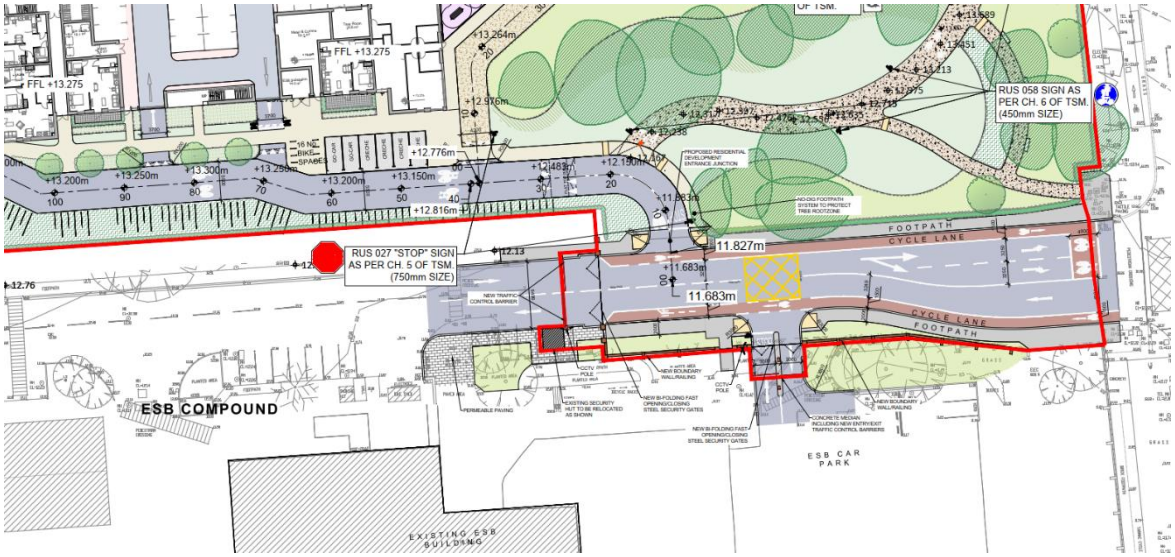


Figure 6.3 – Proposed upgrade works to existing ESB Networks facility access road

Additionally, pedestrian and cyclist access is proposed via separate entrances onto Sarsfield Road, in order to segregate vulnerable road users from vehicular traffic, and to provide direct linkages to the existing pedestrian and cycle network on Sarsfield Road.

It is noted that Cork City Council's Active Travel Unit is planning to implement a new cycle route between Sarsfield Road and MTU (Munster Technological University). It is likely that this active travel scheme will be delivered in advance or in tandem with the proposed LRD scheme. The applicant will coordinate with Cork City Council to ensure that detailed design of the proposed LRD access arrangements off Sarsfield Road are appropriately integrated with the planned active travel scheme.

In total 148 no. car parking spaces, along with 503no. bicycle parking spaces at surface level and undercroft level are proposed. The Middle and West Blocks are "u-shaped" buildings with a podium deck over car parking, with additional surface level car parking distributed throughout the development.

6.4 DMURS Compliance

A DMURS Compatibility Statement has been prepared by ILTP Traffic & Transport Consultants and submitted under separate cover with this planning application.

6.5 Quality Audit

A Quality Audit has been undertaken by MHL & Associates Ltd. Consulting Engineers and is submitted under separate cover with this application. The recommendations of the Quality Audit have all been considered and the actions/adjustments have been addressed in the drawings submitted with this application.

6.6 Road Safety Audit

A Stage 1/2 Road Safety Audit was undertaken on the proposed development design drawings by MHL & Associates Ltd. Consulting Engineers and is submitted under separate cover with this application.

The recommendations of the audit have been accepted and implemented and are reflected in the design drawings now submitted with this planning application.

Appendix I

Existing Services Records

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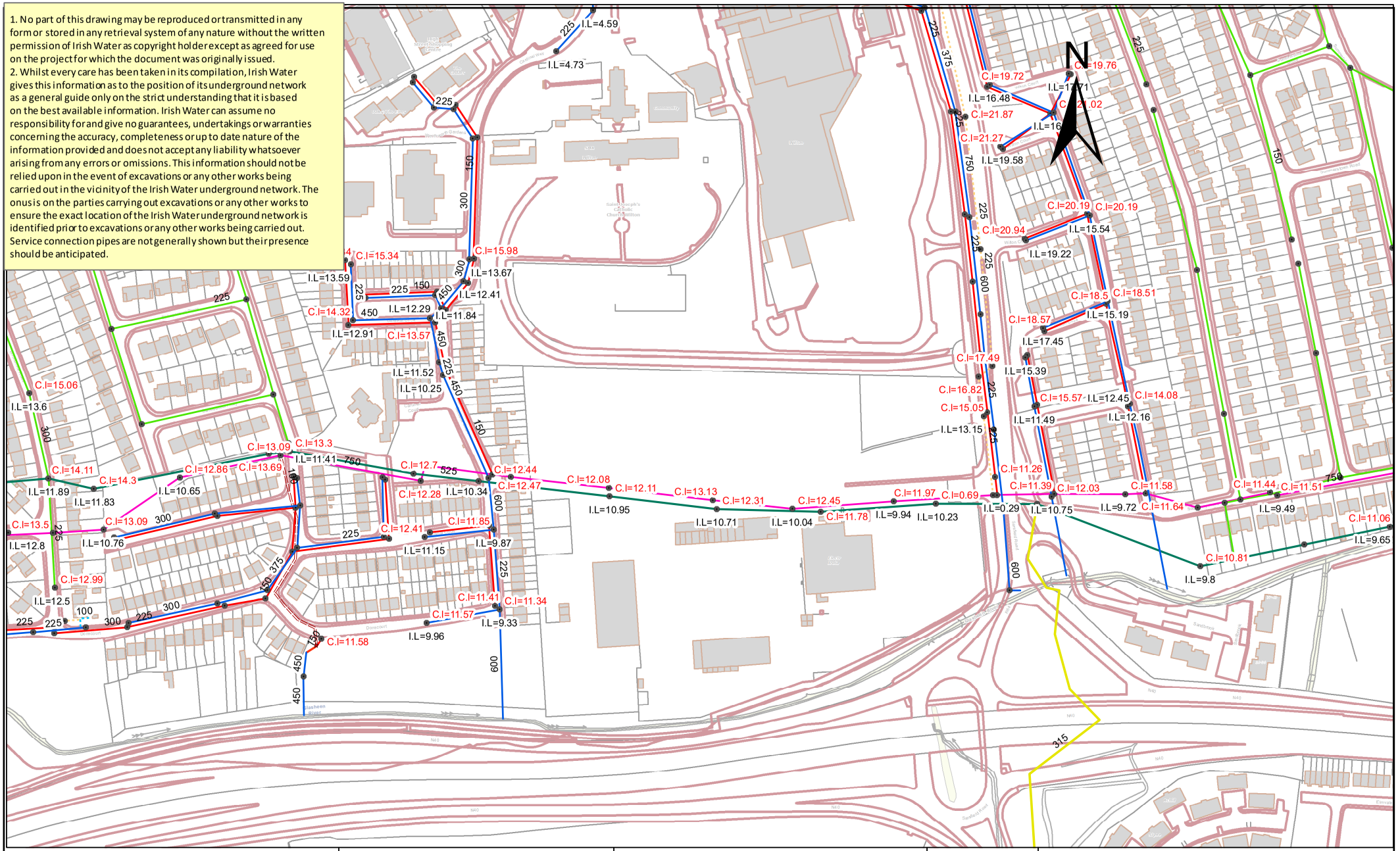


Drainage Records

Legend

- LOCAL STORM
- PRIVATE STORM
- Manhole
- LOCAL COMBINED
- LOCAL FOUL
- INTERCEPTOR
- RISING MAIN
- SWS
- CoCo Rising Main
- PRIVATE FOUL
- PUMP OVERFLOW
- Manhole
- Pumphouse
- OldCorkCityBoundaryIG

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.

1:2,500

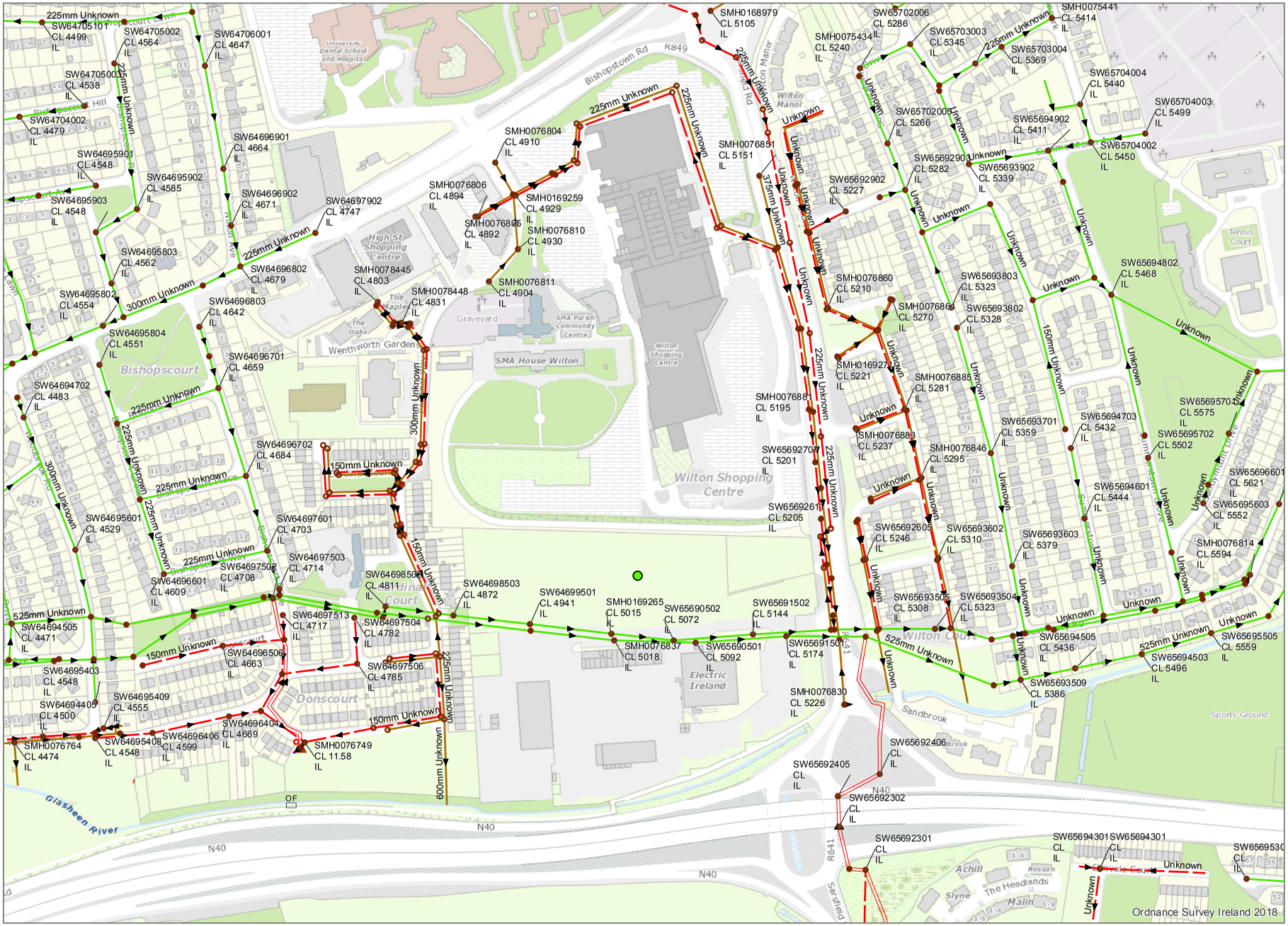
N

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

Drawn By: T.Quinn

Checked by:

Date: 18/08/2023



Legend

Sewer Manholes
- Standard
- Other; Unknown

Sewer Discharge Points
- Overflow

Sewer Fittings
- Other; Unknown

Sewer Mains (Irish Water)
- Gravity - Combined
- Gravity - Foul
- Gravity - Overflow
- Gravity - Unknown
- Pumping - Foul

Pump Station
- Pump Station

0 25 50 100 m

Coordinate System: TM65 Irish Grid
Projection: Transverse Mercator

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Approved By:	<Add Name>
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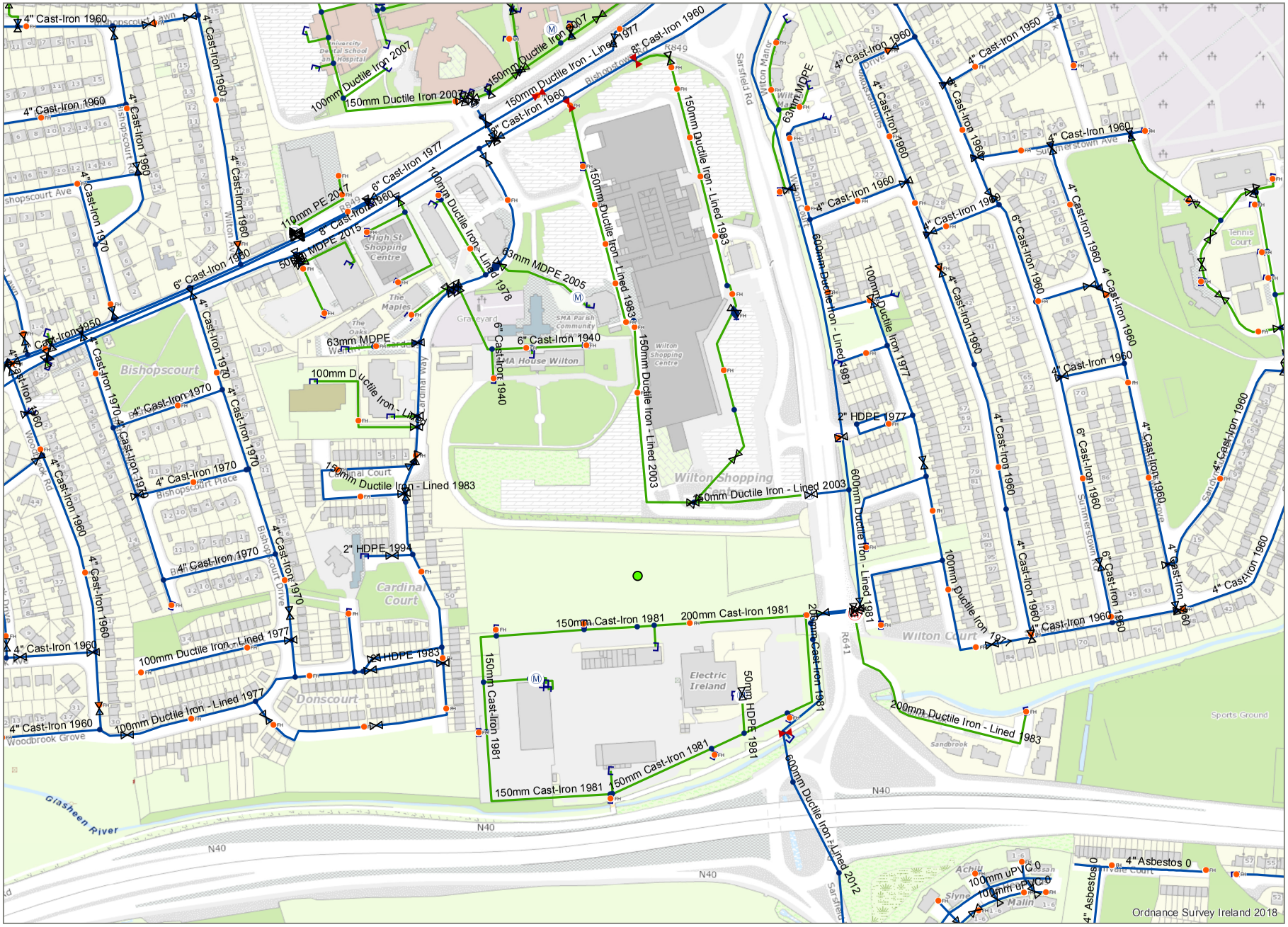
Sewer Network
Wilton, Co. Cork



Legend

Boundary Valves
- Closed

Non Boundary Valves
- Open
- Closed

Air Control Valves
- Air Control Valves

Non Boundary Meter
- Meter

Boundary Meter
- District (Boundary Meter)

Water Hydrants
- Fire Hydrant

Water Fittings
- Cap
- Other Fitting

Water Mains(Irish Water Owned)
- Potable Water

Water Mains(Non Irish Water Owned)
- Potable Water

0 25 50 100 m

Coordinate System: TM65 Irish Grid
Projection: Transverse Mercator

Scale @ A3:	1:3,430
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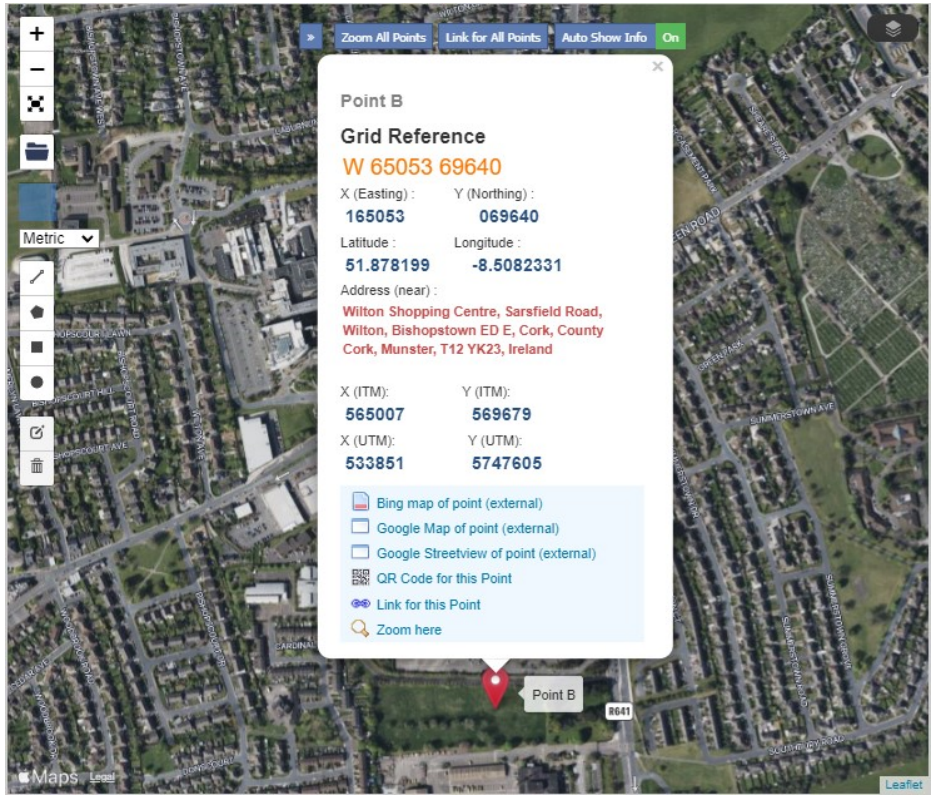
Water Distribution
Wilton, Co. Cork

Appendix 2

Met Eireann Data

Wilton Cork - SAAR Value = 1126.3mm



	A	B	O
1	east	north	ANN
2	165000	66000	1224.2
3	165000	67000	1211.2
4	165000	68000	1163.3
5	165000	69000	1126.3
6	165000	70000	1107.6
7	165000	71000	1084.9
8	165000	72000	1099.8
9	165000	73000	1121.2
10	165000	74000	1102.4
11	165000	75000	1130.3
12	165000	76000	1161.2
13	165000	77000	1191.7
14	165000	78000	1214.1

Wilton Cork

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 165053, Northing: 69640,

BM BARRETT MAHONY

	Interval		Years									
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	120,
5 mins	3.2,	4.0,	4.4,	5.0,	5.3,	5.6,	6.5,	7.4,	7.9,	8.7,	9.4,	9.9,	10.2,
10 mins	4.4,	5.6,	6.1,	6.9,	7.4,	7.8,	9.0,	10.3,	11.1,	12.1,	13.1,	13.7,	14.2,
15 mins	5.2,	6.5,	7.2,	8.1,	8.7,	9.2,	10.6,	12.1,	13.0,	14.3,	15.4,	16.2,	16.7,
30 mins	7.0,	8.8,	9.7,	10.9,	11.8,	12.4,	14.3,	16.3,	17.5,	19.2,	20.7,	21.8,	22.5,
1 hours	9.4,	11.9,	13.1,	14.7,	15.8,	16.7,	19.2,	21.9,	23.6,	25.9,	27.9,	29.3,	30.3,
2 hours	12.7,	16.0,	17.6,	19.9,	21.3,	22.5,	25.9,	29.5,	31.8,	34.9,	37.5,	39.5,	40.8,
3 hours	15.2,	19.0,	20.9,	23.7,	25.4,	26.7,	30.8,	35.2,	37.9,	41.6,	44.7,	47.1,	48.6,
4 hours	17.2,	21.5,	23.7,	26.8,	28.8,	30.2,	34.9,	39.8,	42.9,	47.0,	50.6,	53.2,	55.0,
6 hours	20.4,	25.6,	28.2,	31.9,	34.2,	36.0,	41.5,	47.4,	51.1,	56.0,	60.2,	63.4,	65.5,
9 hours	24.3,	30.5,	33.6,	37.9,	40.7,	42.9,	49.5,	56.4,	60.8,	66.7,	71.7,	75.5,	78.0,
12 hours	27.5,	34.5,	38.0,	42.9,	46.1,	48.5,	56.0,	63.8,	68.8,	75.4,	81.1,	85.4,	88.2,
18 hours	32.7,	41.1,	45.2,	51.1,	54.9,	57.8,	66.6,	76.0,	81.9,	89.8,	96.6,	101.7,	105.0,
24 hours	37.1,	46.5,	51.2,	57.8,	62.1,	65.4,	75.4,	86.0,	92.7,	101.6,	109.3,	115.1,	118.8,
2 days	48.1,	59.1,	64.5,	72.0,	76.8,	80.4,	91.5,	103.1,	110.3,	119.9,	128.1,	134.2,	138.2,
3 days	57.4,	69.6,	75.5,	83.8,	89.0,	93.0,	105.0,	117.4,	125.0,	135.3,	143.9,	150.3,	154.5,
4 days	65.8,	79.0,	85.4,	94.3,	99.9,	104.1,	116.9,	130.0,	138.1,	148.9,	157.9,	164.6,	168.9,
6 days	80.8,	95.9,	103.1,	113.0,	119.3,	123.9,	138.0,	152.4,	161.3,	172.9,	182.6,	189.8,	194.6,
8 days	94.5,	111.1,	119.0,	129.9,	136.7,	141.7,	157.0,	172.5,	181.9,	194.3,	204.7,	212.3,	217.3,
10 days	107.3,	125.4,	133.9,	145.5,	152.8,	158.2,	174.5,	190.9,	200.9,	214.0,	224.9,	233.0,	238.2,
12 days	119.6,	138.9,	147.9,	160.3,	168.1,	173.8,	191.0,	208.3,	218.8,	232.5,	243.9,	252.3,	257.7,
16 days	142.8,	164.4,	174.5,	188.2,	196.7,	203.0,	221.8,	240.6,	252.0,	266.8,	279.1,	288.1,	294.0,
20 days	164.9,	188.5,	199.4,	214.3,	223.5,	230.3,	250.5,	270.7,	282.9,	298.7,	311.8,	321.4,	327.6,
25 days	191.4,	217.2,	229.2,	245.4,	255.4,	262.7,	284.5,	306.2,	319.3,	336.2,	350.1,	360.3,	366.9,

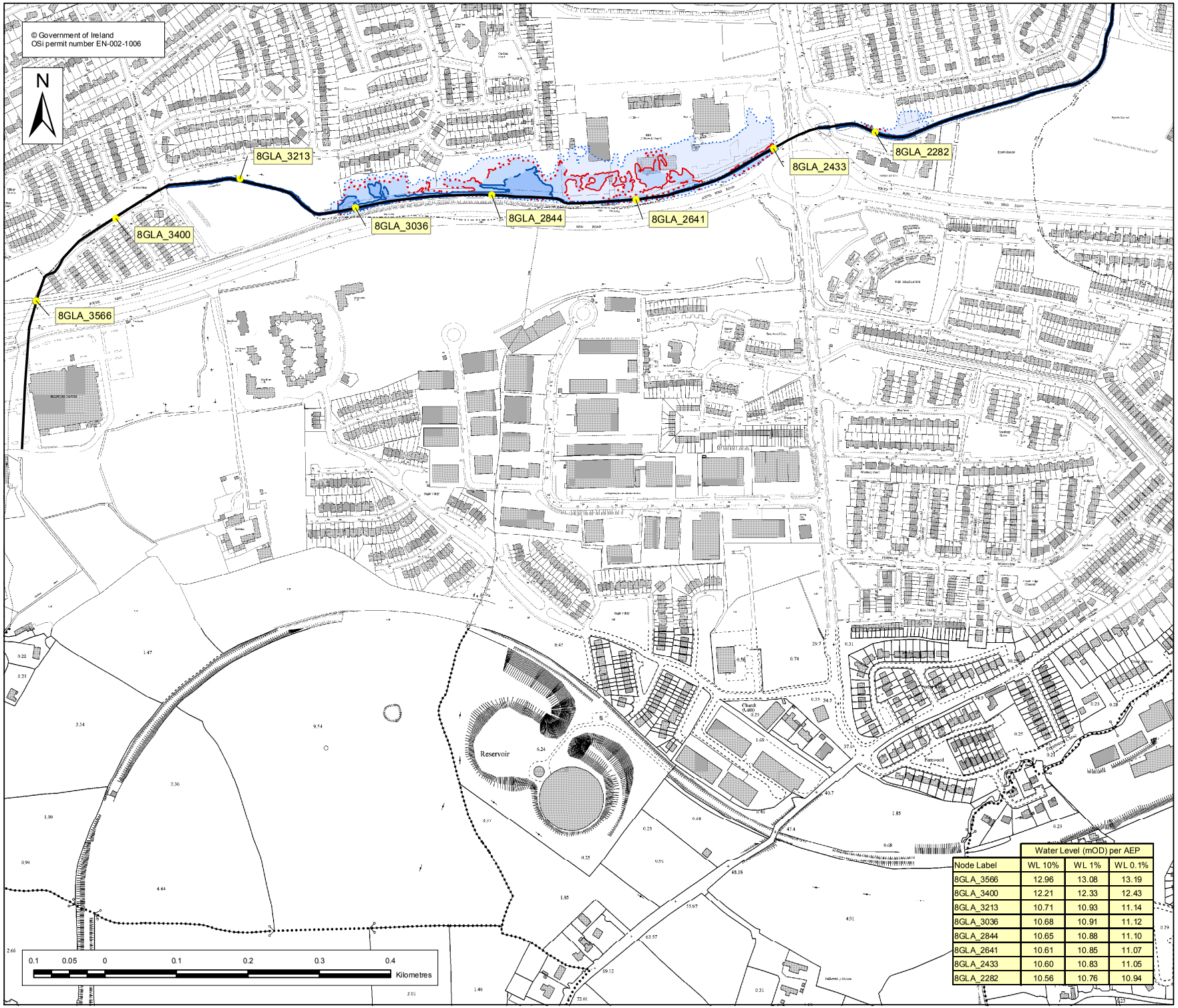
NOTES:
These values are derived from a Depth Duration Frequency (DDF) Model update 2023
For details refer to:
'Mateus C., and Coonan, B. 2023. Estimation of point rainfall frequencies in Ireland. Technical Note No. 68. Met Eireann',
Available for download at:
http://hdl.handle.net/2262/102417

M5-60 = 16.7
M5-2D = 65.4
ratio r = 0.255

100yr 6hrs = 63.4
100yr 12hrs = 85.4

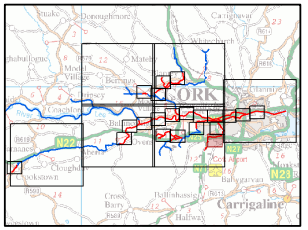
Appendix 3

Flood Mapping Records



Node Label	Water Level (mOD) per AEP		
	WL 10%	WL 1%	WL 0.1%
8GLA_3566	12.96	13.08	13.19
8GLA_3400	12.21	12.33	12.43
8GLA_3213	10.71	10.93	11.14
8GLA_3036	10.68	10.91	11.12
8GLA_2844	10.65	10.88	11.10
8GLA_2641	10.61	10.85	11.07
8GLA_2433	10.60	10.83	11.05
8GLA_2282	10.56	10.76	10.94

Location Plan :



EXTENT MAP

Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Defended area
- High Confidence (<20m) (10% AEP)
- Medium Confidence (<40m) (10% AEP)
- Low Confidence (>40m) (10% and 0.1% AEP)
- High Confidence (<20m) (1% AEP)
- Medium Confidence (<40m) (1% AEP)
- Low Confidence (>40m) (1% AEP)
- River Centreline
- Node Point
- 8OWG_376 Node Label (refer to table)

USER NOTE :

USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF A BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.

Halcrow
www.halcrow.com
Halcrow Group Ireland
3A Eastgate Road
Eastgate
Little Island
Cork
Ireland

OPW
Office of Public Works
17-19 Lower Hatch Street
Dublin 2
Ireland

Project :
LEE CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

Map :
CORK CITY

Map Type :	FLOOD EXTENT		
Source :	FLUVIAL FLOODING		
Map area :	URBAN AREA		
Scenario :	CURRENT		
Figure By :	Valeria Medina	Date :	26 October 2012
Checked By :	Ricardo Santaella	Date :	26 October 2012
Approved By :	Clare Dewar	Date :	26 October 2012

Figure No. : M8/UA/EXT/CURS/016

Revision 1

Drawing Scale : 1:5,000

Plot Scale : 1:1 @ A3

Appendix 4

Uisce Eireann
Confirmation of Feasibility
& Statement of Design Acceptance

CONFIRMATION OF FEASIBILITY

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

John Cunningham

52-54 Sandwith Street Lower
Dublin
Co. Dublin
D02 WR26

23 January 2025

Our Ref: CDS23007638 Pre-Connection Enquiry
Sites at ESB Networks, Wilton, Cork, Co. Cork

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 Housing Development of 348no. units plus a creche at ESB Networks, Wilton, Cork, Co. 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 Uisce Éireann
- **Wastewater Connection** - Feasible Subject to upgrades:

  In order to accommodate the proposed discharge from the Development, upgrades to the existing Wilton WWPS are required to provide additional network storage capacity. It will also be necessary to provide real time telemetry controls at Wilton WWPS to manage the discharge of flow to the downstream network and prevent detriment to the existing network.

  Uisce Éireann does not currently have any plans to undertake these upgrade works, therefore the applicant will be required to fund these local network upgrades. The fee for these works will be calculated at a connection application stage.

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

Stiúrthóirí / Directors: Tony Keohane (Cathaoirleach / Chairman), Niall Gleeson (POF / CEO), Christopher Banks, Fred Barry, Gerard Britchfield, Liz Joyce, Patricia King, Eileen Maher, Cathy Mannion, 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 design activity company, limited by shares. Cláraithe in Éirinn Uimh.: 530363 / Registered in Ireland No.: 530363.

to our network(s) you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.

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 Delivery Manager

Section A - What is important to know?

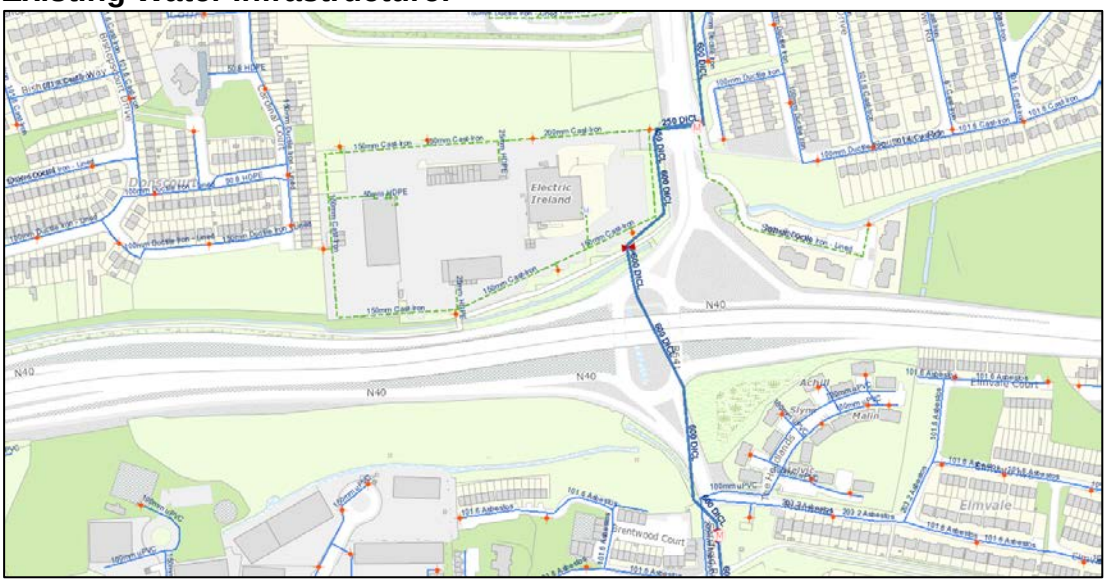
What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.
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?	• Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. *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 Uisce Éireann's network(s)?	• Requests for maps showing Uisce Éireann'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 Uisce Éireann 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)

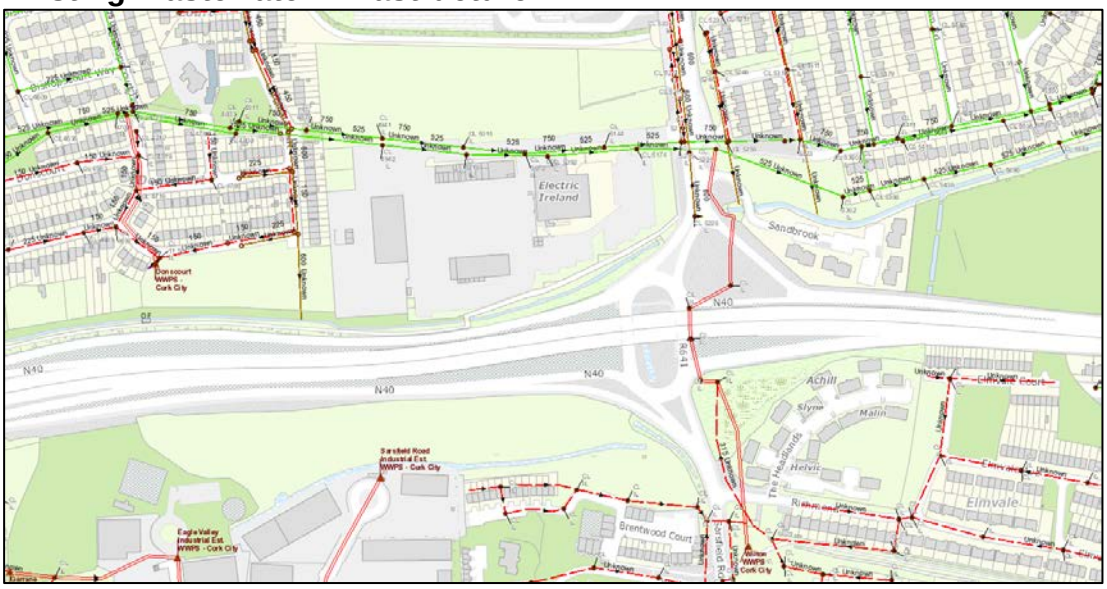
Section B – Details of Uisce Éireann's Network(s)

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

Existing Water Infrastructure:



Existing Wastewater Infrastructure:



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 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.

John Cunningham
Barrett Mahony
52/54 Sandwith Street Lower
Dublin 2
D02WR26

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

8 January 2025

Re: Design Submission for Sites at, ESB Networks, Wilton, Cork (the "Development") (the "Design Submission") / Connection Reference No: CDS23007638

Dear John Cunningham,

Many thanks for your recent Design Submission.

We have reviewed your proposal for the connection(s) at the Development. Based on the information provided, which included the documents outlined in Appendix A to this letter, Uisce Éireann has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before you can connect to our network you must sign a connection agreement with Uisce Éireann. This can be applied for by completing the connection application form at www.water.ie/connections. Uisce Éireann's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities (CRU)(https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/).

You the Customer (including any designers/contractors or other related parties appointed by you) is entirely responsible for the design and construction of all water and/or wastewater infrastructure within the Development which is necessary to facilitate connection(s) from the boundary of the Development to Uisce Éireann's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Uisce Éireann does not, in any way, render Uisce Éireann liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Uisce Éireann representative:
Name: Alicia Ros Bernal
Email: ailciarosbernal.bernal@water.ie

Yours sincerely,

Dermot Phelan
Connections Delivery Manager

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.

Appendix A

Document Title & Revision

- 23215-BMD-ZZ-XX-DR-C-11300
- 23215-BMD-ZZ-XX-DR-C-11200
- 23215-BMD-ZZ-XX-DR-C-11201
- 23215-BMD-ZZ-XX-DR-C-12210
- 23215-BMD-ZZ-XX-DR-C-12211

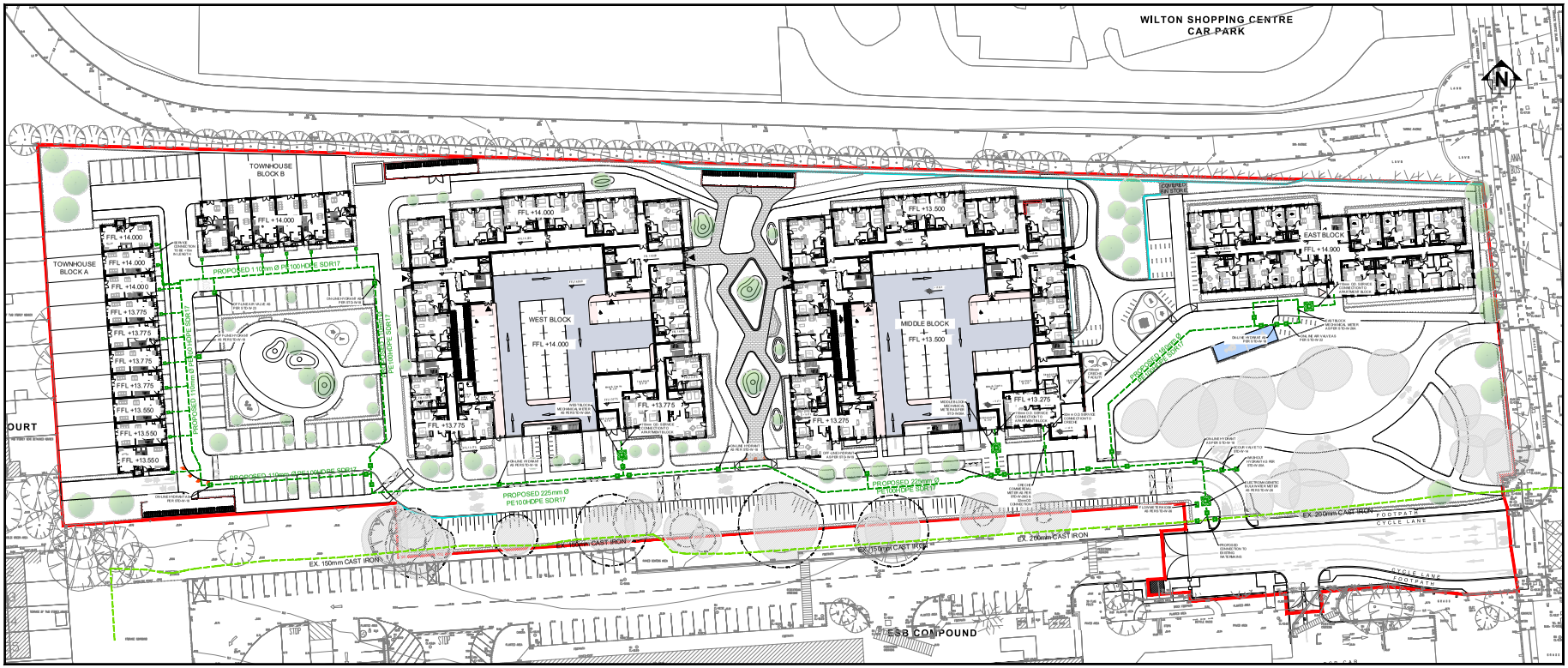
Additional Comments

The design submission will be subject to further technical review at connection application stage.

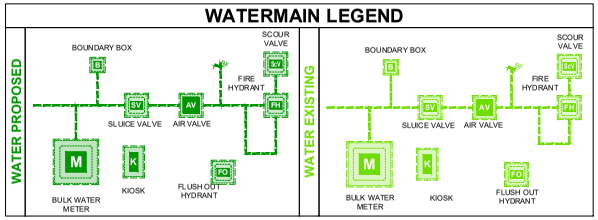
Uisce Éireann cannot guarantee that its Network in any location will have the capacity to deliver a particular flow rate and associated residual pressure to meet the requirements of the relevant Fire Authority, see Section 1.17 of Water Code of Practice.

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

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



WATERMAIN LEGEND



WATERMAIN PLAN LAYOUT

SCALE @ A1: 1:500
SCALE @ A3: 1:1000

ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH UISCE EIREANN CODE OF PRACTICE AND STANDARD DETAILS FOR WATER INFRASTRUCTURE.

THRUST BLOCKS ARE TO BE LOCATED AND INSTALLED IN ACCORDANCE WITH UISCE EIREANN STANDARD DETAILS FOR WATER INFRASTRUCTURE.

A FULL AIR-GAP SEPARATION FROM THE IRISH WATER NETWORK AND PRIVATE SUPPLY SHALL BE PROVIDED VIA BREAK TANKS IN THE EAST, MIDDLE AND WEST APARTMENT BLOCKS PRIOR TO CONNECTION TO THE PRIVATE PRESSURISED WATER DISTRIBUTION SYSTEM.

ROOT BARRIERS SHALL BE USED WHERE WATERMAINS ARE IN CLOSE PROXIMITY TO PROPOSED TREE PLANTING. A TRIPLE COATED, TWIN REINFORCED, IMPERMEABLE, POLYETHYLENE BARRIER MEMBRANE ROOT BARRIER SHALL BE INSTALLED IN THE PIPE TRENCH.

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEERS & ARCHITECTS DRAWINGS.FIGURED DIMENSIONS ONLY (NOT SCALING) TO BE USED. WHERE A CONFLICT OF INFORMATION EXISTS OR IF IN ANY DOUBT - ASK'
2. CONSULTANTS TO BE INFORMED IMMEDIATELY OF ANY DISCREPANCIES BEFORE WORK PROCEEDS.

ISSUE	DATE	DESCRIPTION	BY
PL3	11.12.24	ISSUED FOR SODA APPLICATION	POD
PL2	23.09.24	ISSUED FOR SODA APPLICATION	POD
PL1	28.08.24	ISSUED FOR PLANNING	POD

Project Engineer: Peter O'Dwyer | Project Director: Brian Mahony

BIM STAGE
PLANNING

BARRETT MAHONY
Dublin Office:
Sandwith House, 52-54 Lower Sandwith Street, Dublin 2, Ireland.
Tel: (01) 677 3200 Fax: (01) 677 3164
London Office:
5th Floor, Mill House, 8 Mill Street, London SE1 2BA, United Kingdom
Tel: (0044) 20 3750 3530
Consulting Engineers, Civil , Structural , Project Management. E-mail: bmce@bmce.ie Web: www.bmce.ie

CLIENT
LAND DEVELOPMENT AGENCY

PROJECT TITLE
LDA WILTON
SARSFIELD ROAD LRD

BM PROJECT No.
23.215

MODEL | REFERENCE | SUITABILITY | REVISION

DRAWING TITLE
WATERMAIN PLAN LAYOUT

DWG | DRAWING REFERENCE **23215-BMD-ZZ-XX-DR-C-11300** | STATUS | REVISION **PL3**

NOTES

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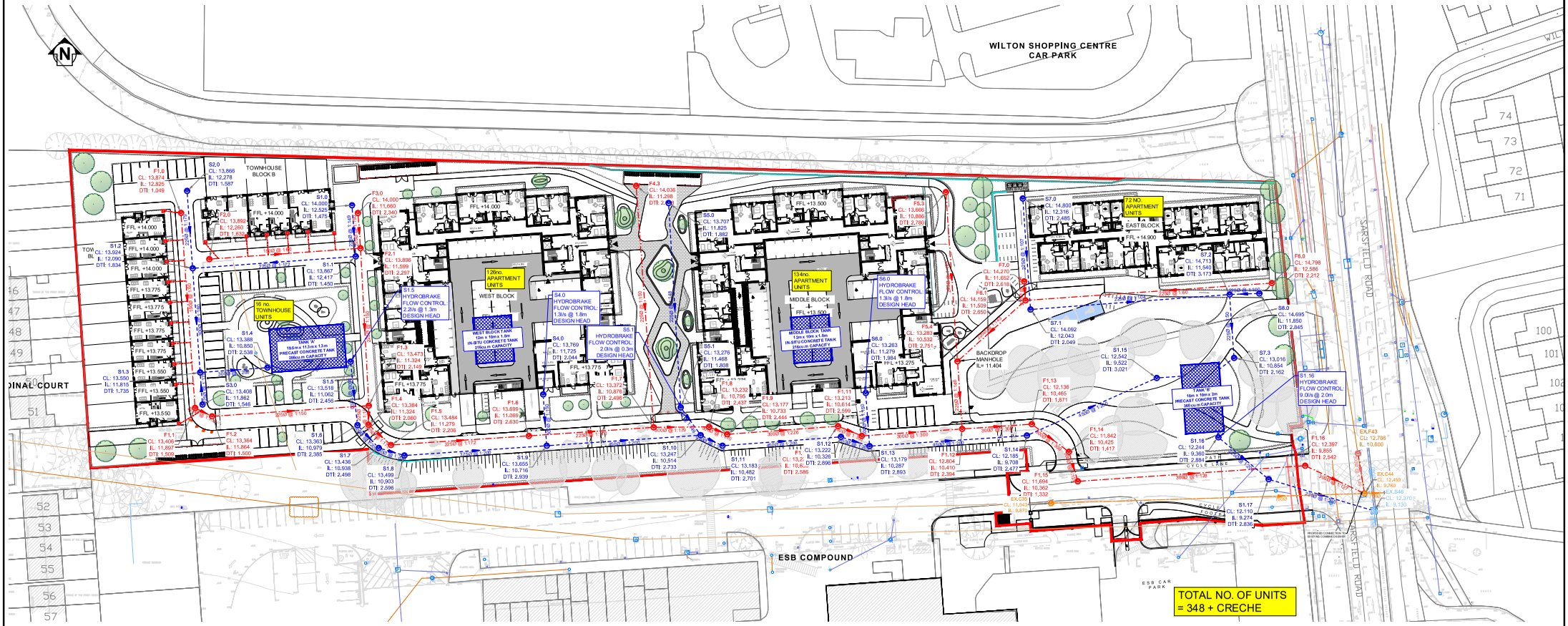
2. CONSULTANTS TO BE INFORMED IMMEDIATELY OF ANY DISCREPANCIES BEFORE WORK PROCEEDS.



BURIED DRAINAGE PLAN LAYOUT

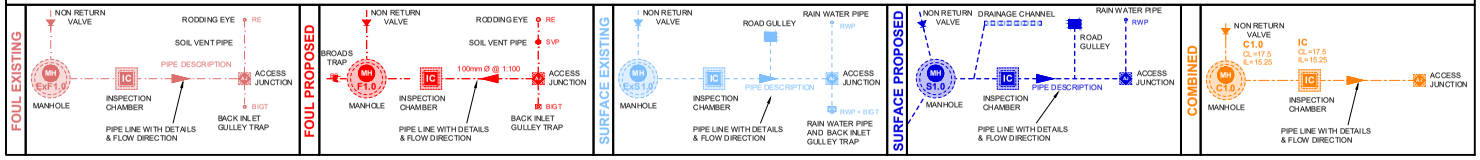
SCALE @ A1 : 1:500
SCALE @ A3 : 1:1000

ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH UISCE EIREANN CODE OF PRACTICE AND STANDARD DETAILS FOR WASTEWATER INFRASTRUCTURE.

ALL FOUL SEWER PIPES TO BE Sn8 uPVC IN ACCORDANCE WITH UISCE EIREANN WASTEWATER CODE OF PRACTICE.

ROOT BARRIERS SHALL BE USED WHERE FOUL PIPEWORK IS IN CLOSE PROXIMITY TO PROPOSED TREE PLANTING. A TRIPLE COATED, TWIN REINFORCED, IMPERMEABLE, POLYETHYLENE BARRIER MEMBRANE ROOT BARRIER SHALL BE INSTALLED IN THE PIPE TRENCH.

DRAINAGE LEGEND



ISSUE	DATE	DESCRIPTION	BY
PL4	07.01.25	ISSUED FOR SODA APPLICATION	AO
PL3	11.12.24	ISSUED FOR SODA APPLICATION	AO
PL2	23.09.24	ISSUED FOR SODA APPLICATION	POD
PL1	28.08.24	ISSUED FOR PLANNING	AO

Project Engineer: Peter O'Dwyer | Project Director: Brian Mahony

BM STAGE: **PLANNING**

BM BARRETT MAHONY
Dublin Office: Sandwith House, 52-54 Lower Sandwith Street, Dublin 2, Ireland. Tel: (01) 677 3200 Fax: (01) 677 3164
London Office: 12 Mill Street, London SE1 2AY, United Kingdom Tel: (0044) 084 5413 2722
Consulting Engineers, Civil , Structural , Project Management. E-mail: bmce@bmce.ie Web: www.bmce.ie

CLIENT: **LAND DEVELOPMENT AGENCY**

PROJECT TITLE: **LDA WILTON SARSFIELD ROAD LRD**

BM PROJECT No.: **23.215**

MODEL | REFERENCE | SUITABILITY | REVISION

DRAWING TITLE: **BURIED DRAINAGE PLAN LAYOUT**

DWG | DRAWING REFERENCE: **23215-BMD-ZZ-XX-DR-C-11200** | STATUS | REVISION: **PL4**

NOTES

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2. CONSULTANTS TO BE INFORMED IMMEDIATELY OF ANY DISCREPANCIES BEFORE WORK PROCEEDS.

NEW SURFACE WATER MANHOLE

MANHOLE	COVER LEVEL	INVERT LEVEL	X	Y	DTI
Ex.S46	+12.370	IN FROM (600mm⌀) : +9.130 IN FROM S1.17 (225mm⌀) : +9.130 OUT (600mm⌀) : +9.130	565180.197	569623.567	3.240
S1.0	+14.000	OUT (225mm⌀): +12.525	564912.675	569703.531	1.475
S1.1	+13.867	IN FROM S1.0 (225mm⌀) : +12.435 OUT (225mm⌀): +12.417	564913.651	569690.149	1.450
S1.2	+13.924	IN FROM S2.0 (225mm⌀) : +12.165 IN FROM S1.1 (225mm⌀) : +12.168 OUT (300mm⌀) : +12.090	564870.973	569687.036	1.834
S1.3	+13.550	IN FROM S1.2 (300mm⌀) : +11.938 IN FROM S3.0 (225mm⌀) : +11.815 OUT (300mm⌀): +11.938	564872.939	569659.780	1.735
S1.4	+13.388	IN FROM S1.3 (300mm⌀) : +11.850 OUT (300mm⌀): +11.350	564890.563	569661.051	2.538
S1.5	+13.518	IN FROM S1.4 (300mm⌀) : +11.241 OUT (300mm⌀): +11.062	564912.303	569662.620	2.456
S1.6	+13.363	IN FROM S1.5 (300mm⌀) : +10.979 OUT (300mm⌀): +10.979	564914.117	569646.016	2.385
S1.7	+13.436	IN FROM S1.6 (300mm⌀) : +10.938 OUT (300mm⌀): +10.938	564919.670	569640.033	2.498
S1.8	+13.499	IN FROM S1.7 (300mm⌀) : +10.903 OUT (375mm⌀): +10.903	564926.401	569638.060	2.596
S1.9	+13.655	IN FROM S1.8 (375mm⌀) : +10.716 IN FROM S4.0 (300mm⌀) : +11.635 OUT (450mm⌀): +10.716	564963.640	569640.616	2.939
S1.10	+13.247	IN FROM S5.1 (300mm⌀) : +11.408 IN FROM S1.9 (450mm⌀) : +10.514 OUT (450mm⌀): +10.514	565003.935	569643.381	2.733
S1.11	+13.183	IN FROM S1.10 (450mm⌀) : +10.482 OUT (450mm⌀): +10.482	565009.639	569640.616	2.701
S1.12	+13.222	IN FROM S1.11 (450mm⌀) : +10.326 OUT (450mm⌀): +10.326	565040.656	569642.929	2.896
S1.13	+13.179	IN FROM S1.12 (450mm⌀) : +10.287 IN FROM S6.0 (300mm⌀) : +11.186 OUT (450mm⌀): +10.287	565048.149	569640.506	2.893
S1.14	+12.185	IN FROM S1.13 (450mm⌀) : +10.081 OUT (450mm⌀): +9.708	565089.331	569643.275	2.477
S1.15	+12.542	IN FROM S1.14 (450mm⌀) : +9.522 OUT (450mm⌀): +9.522	565123.306	569658.355	3.021
S1.16	+12.244	IN FROM S1.15 (450mm⌀) : +9.410 IN FROM S7.3 (225mm⌀) : +10.431 OUT (225mm⌀): +9.360	565139.427	569642.830	2.884
S1.17	+12.110	IN FROM S1.16 (225mm⌀) : +9.274 OUT (225mm⌀): +9.274	565152.600	569631.839	2.836
S2.0	+13.866	OUT (225mm⌀): +12.278	564869.513	569707.270	1.587
S3.0	+13.408	OUT (225mm⌀): +11.862	564873.544	569651.404	1.546
S4.0	+13.769	OUT (300mm⌀): +11.725	564962.714	569654.058	2.044
S5.0	+13.707	OUT (225mm⌀): +11.825	564995.541	569704.105	1.882
S5.1	+13.276	IN FROM S5.0 (225mm⌀) : +11.468 OUT (300mm⌀): +11.468	564998.724	569650.646	1.808
S6.0	+13.263	OUT (300mm⌀): +11.279	565047.156	569654.413	1.984
S7.0	+14.800	OUT (225mm⌀): +12.316	565088.246	569705.316	2.485
S7.1	+14.092	IN FROM S7.0 (225mm⌀) : +12.043 OUT (225mm⌀): +12.043	565090.282	569676.262	2.049
S7.2	+14.713	IN FROM S7.1 (225mm⌀) : +11.540 IN FROM S8.0 (225mm⌀) : +11.772 OUT (225mm⌀): +11.540	565142.373	569680.192	3.173
S7.3	+13.016	IN FROM S7.2 (225mm⌀) : +11.207 OUT (225mm⌀): +10.854	565143.536	569663.596	2.162
S8.0	+14.695	OUT (225mm⌀): +11.850	565150.160	569680.468	2.845

NEW FOUL DRAINAGE MANHOLE

MANHOLE	COVER LEVEL	INVERT LEVEL	X	Y	DTI
Ex.C35	+11.543	OUT (750mm⌀): +9.870	565095.636	569625.604	1.673
Ex.C44	+12.459	IN FROM Ex.F43 (300mm⌀) : +10.529 IN FROM Ex.C35 (750mm⌀) : +9.760 IN FROM F1.16 (300mm⌀) : +9.760 OUT (750mm⌀): +9.760	565177.679	569628.122	2.699
Ex.F43	+12.786	OUT (300mm⌀): +10.600	565175.991	569638.593	2.186
F1.0	+13.874	OUT (150mm⌀): +12.825	564867.921	569701.547	1.049
F1.1	+13.406	IN FROM F1.0 (150mm⌀) : +11.972 OUT (225mm⌀): +11.897	564871.603	569650.521	1.509
F1.2	+13.364	IN FROM F1.1 (225mm⌀) : +11.864 OUT (225mm⌀): +11.864	564876.057	569648.301	1.500
F1.3	+13.473	IN FROM F1.2 (225mm⌀) : +11.590 IN FROM F2.1 (225mm⌀) : +11.324 OUT (225mm⌀): +11.357	564917.076	569651.107	2.149
F1.4	+13.384	IN FROM F1.3 (225mm⌀) : +11.324 OUT (225mm⌀): +11.324	564916.995	569646.083	2.060
F1.5	+13.484	IN FROM F1.4 (225mm⌀) : +11.279 OUT (225mm⌀): +11.279	564922.888	569640.806	2.206
F1.6	+13.699	IN FROM F1.5 (225mm⌀) : +11.069 OUT (225mm⌀): +11.069	564958.953	569643.194	2.630
F1.7	+13.372	IN FROM F4.3 (225mm⌀) : +10.876 IN FROM F1.6 (225mm⌀) : +10.876 OUT (300mm⌀): +10.876	564991.644	569645.442	2.496
F1.8	+13.232	IN FROM F1.7 (300mm⌀) : +10.795 OUT (300mm⌀): +10.795	565006.121	569645.548	2.437
F1.9	+13.177	IN FROM F1.8 (300mm⌀) : +10.765 OUT (300mm⌀): +10.765	565010.857	569643.611	2.444
F1.10	+13.222	IN FROM F1.9 (300mm⌀) : +10.636 OUT (300mm⌀): +10.636	565039.893	569645.726	2.586
F1.11	+13.213	IN FROM F1.10 (300mm⌀) : +10.614 OUT (300mm⌀): +10.614	565046.115	569643.188	2.599
F1.12	+12.804	IN FROM F5.4 (225mm⌀) : +10.410 IN FROM F1.11 (300mm⌀) : +10.526 OUT (300mm⌀): +10.526	565072.377	569645.007	2.394
F1.13	+12.136	IN FROM F1.12 (300mm⌀) : +10.465 OUT (300mm⌀): +10.465	565090.594	569646.266	1.671
F1.14	+11.842	IN FROM F1.13 (300mm⌀) : +10.425 OUT (300mm⌀): +10.425	565100.313	569639.034	1.417
F1.15	+11.694	IN FROM F1.14 (300mm⌀) : +10.362 OUT (300mm⌀): +10.362	565102.654	569631.297	1.332
F1.16	+12.397	IN FROM F1.15 (300mm⌀) : +9.895 OUT (300mm⌀): +9.895	565162.139	569635.389	2.542
F2.0	+13.892	OUT (150mm⌀): +12.260	564875.337	569689.445	1.632
F2.1	+13.896	IN FROM F2.0 (150mm⌀) : +11.599 IN FROM F3.0 (225mm⌀) : +11.599 OUT (225mm⌀): +11.599	564914.908	569692.300	2.297
F3.0	+14.000	OUT (225mm⌀): +11.660	564914.228	569701.500	2.340
F4.3	+14.036	OUT (225mm⌀): +11.298	564987.049	569708.609	2.738
F5.3	+13.666	OUT (225mm⌀): +10.886	565068.092	569706.969	2.780
F5.4	+13.283	IN FROM F6.1 (225mm⌀) : +11.342 IN FROM F5.3 (225mm⌀) : +10.532 OUT (225mm⌀): +10.532	565071.153	569662.710	2.751
F6.0	+14.798	OUT (225mm⌀): +12.586	565153.441	569683.167	2.212
F6.1	+14.159	IN FROM F7.0 (225mm⌀) : +11.569 IN FROM F6.0 (225mm⌀) : +11.509 OUT (225mm⌀): +11.509	565088.962	569678.648	2.650
F7.0	+14.270	OUT (225mm⌀): +11.652	565088.615	569683.622	2.618

ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH UISCE EIREANN CODE OF PRACTICE AND STANDARD DETAILS FOR WASTEWATER INFRASTRUCTURE

ISSUE	DATE	DESCRIPTION	BY
PL4	07.01.25	ISSUED FOR SODA APPLICATION	AO
PL3	11.12.24	ISSUED FOR SODA APPLICATION	POD
PL2	23.09.24	ISSUED FOR SODA APPLICATION	POD
PL1	28.08.24	ISSUED FOR PLANNING	AO

Project Engineer: Peter O'Dwyer | Project Director: Brian Mahony

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CLIENT
LAND DEVELOPMENT AGENCY

PROJECT TITLE
LDA WILTON SARSFIELD ROAD LRD

BM PROJECT No.
23.215

MODEL | REFERENCE | SUITABILITY | REVISION

DRAWING TITLE
EXTERNAL DRAINAGE SCHEDULES

DWG | DRAWING REFERENCE **23215-BMD-ZZ-XX-DR-C-11201** | STATUS | REVISION **PL4**

NOTES

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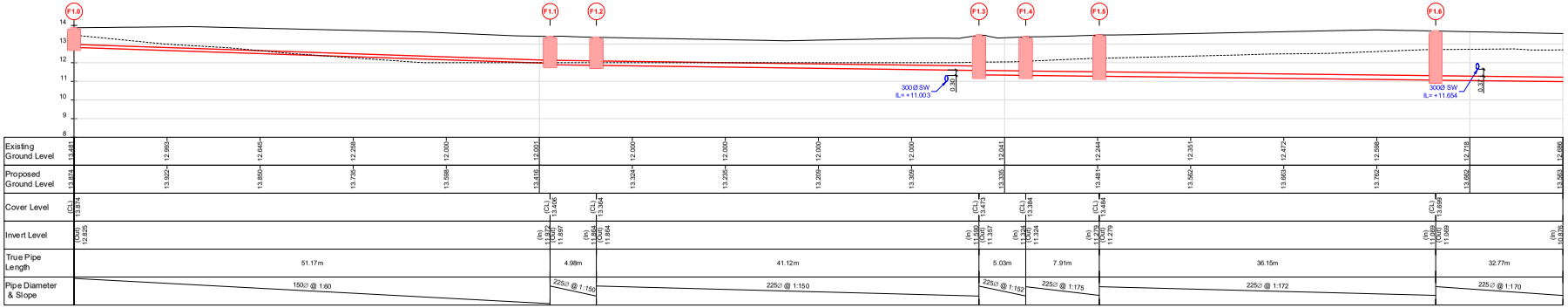

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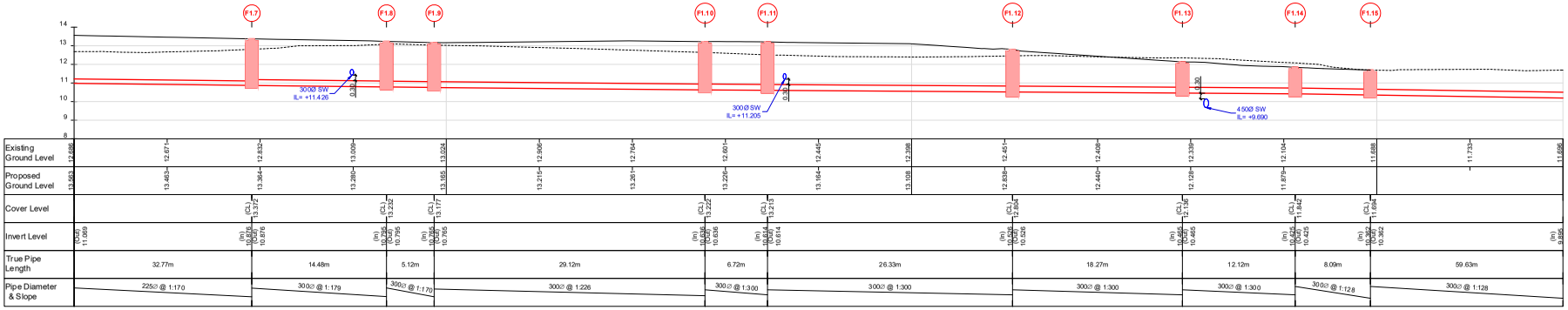

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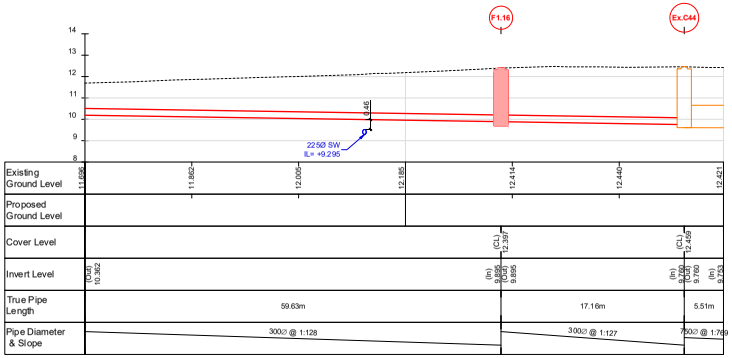

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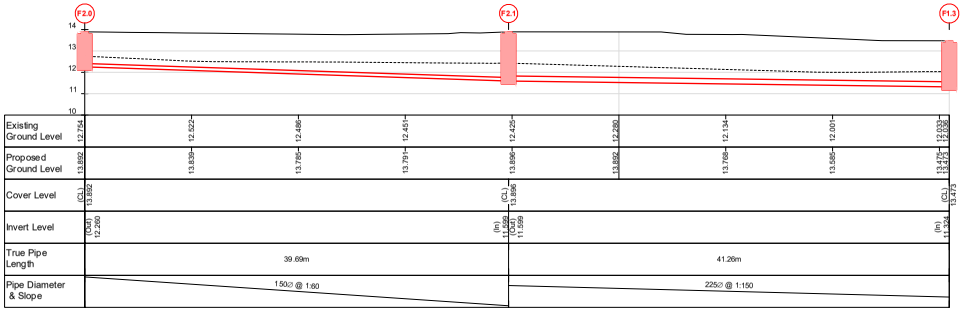

SECTION MH F2.0 TO MH F1.3

FOUL DRAINAGE LONGITUDINAL SECTIONS

SCALE @ A1: H= 1:250 ; V= 1:125
SCALE @ A3: H= 1:500 ; V= 1:250

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PL4	07.01.25	ISSUED FOR SODA APPLICATION	AO
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Project Engineer: Peter O'Dwyer | Project Director: Brian Mahony

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CLIENT
LAND DEVELOPMENT AGENCY

PROJECT TITLE
LDA WILTON SARSFIELD ROAD LRD

BM PROJECT No.
23.215

MODEL | REFERENCE | SUITABILITY | REVISION

DRAWING TITLE
FOUL DRAINAGE LONGITUDINAL SECTION SHEET 1 OF 2

DWG | DRAWING REFERENCE **23215-BMD-ZZ-XX-DR-C-12210** | STATUS | REVISION **PL4**

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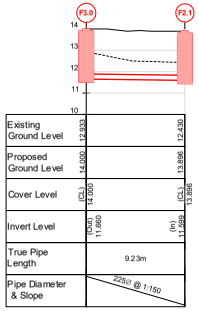

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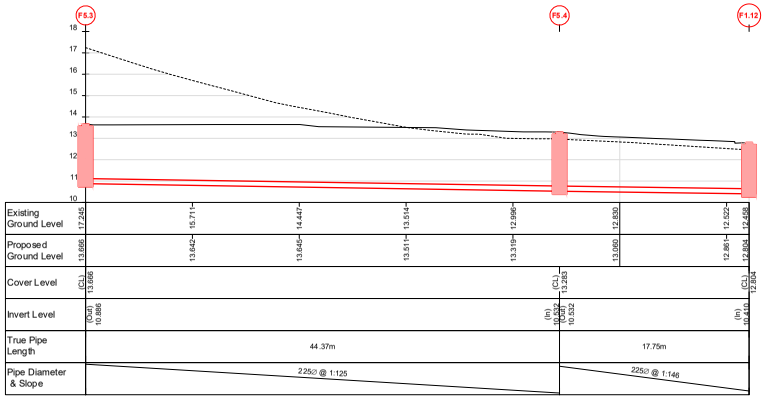

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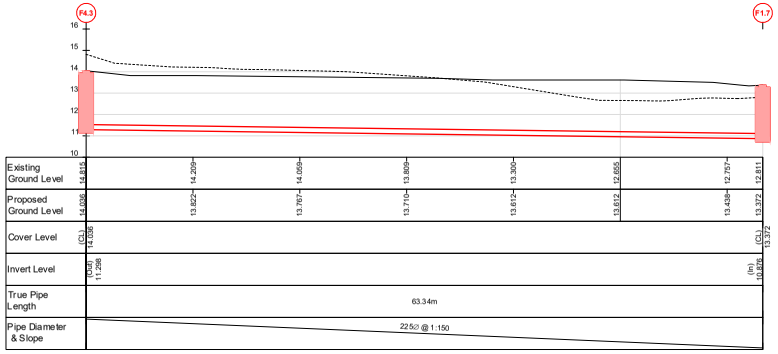

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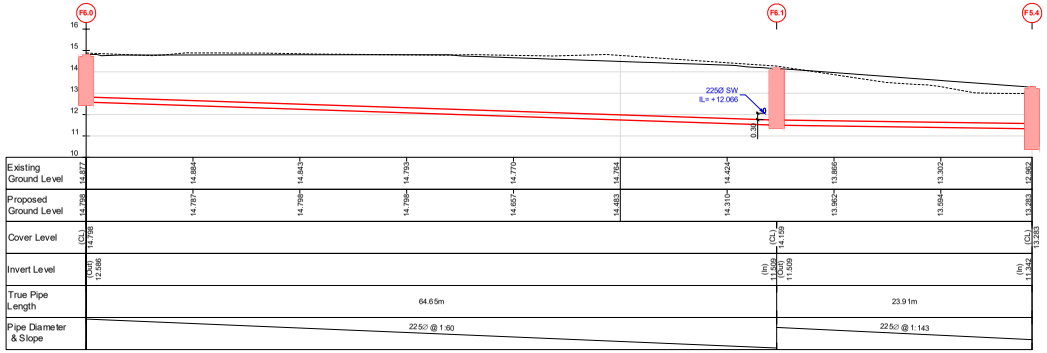

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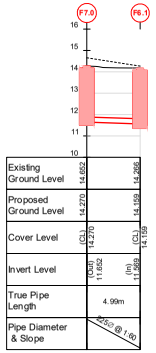

SECTION MH F7.0 TO MH F6.1

FOUL DRAINAGE LONGITUDINAL SECTIONS

SCALE @ A1: H= 1:250 ; V= 1:125
SCALE @ A3: H= 1:500 ; V= 1:250

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PL4	07.01.25	ISSUED FOR SODA APPLICATION	AO
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Project Engineer: Peter O'Dwyer | Project Director: Brian Mahony

BM STAGE: **PLANNING**

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CLIENT: **LAND DEVELOPMENT AGENCY**

PROJECT TITLE: **LDA WILTON SARSFIELD ROAD LRD**

BM PROJECT No.: **23.215**

MODEL | REFERENCE | SUITABILITY | REVISION

DRAWING TITLE: **FOUL DRAINAGE LONGITUDINAL SECTION SHEET 2 OF 2**

DWG | DRAWING REFERENCE: **23215-BMD-ZZ-XX-DR-C-12211** | STATUS | REVISION: **PL4**

Appendix 5

Surface Water Calculations

LDA Wilton, Sarsfield Road LRD - Qbar Calculation

BARRETT MAHONY

$Qbar_{rural} = 0.00108 \times (0.01 \times AREA)^{0.89} \times SAAR^{1.17} \times SPR^{2.17}$

Qbar (50ha) =	0.2506	m^3/s	=	250.6 l/s
Area =	50	ha		
SAAR =	1126.3	mm		
SPR =	0.37			

Drained Area 2.1569 ha

Return Period	Growth Curve Factor	Rate of Outflow
1yr	0.85	9.19 l/s
Qbar (2.3 yr)	1	10.81 l/s
10yr	1.7	18.38 l/s
30yr	2.1	22.70 l/s
100yr	2.6	28.10 l/s
200yr	2.9	31.35 l/s

As per discussions with Cork City Council Drainage Section, a conservative rate of outflow restriction, less than or equivalent to the 1yr return period run-off rate (i.e. Qbar x 0.85) will be applied to the development.
A conservative discharge rate, rounded down to 9.0l/s has been chosen for the development.

Proposed total development discharge rate restriction = 9.0 l/s

Proposed Flow Control Devices:

	Subcatchment Area:	Flow Control:
Tank A:	0.5225 ha	2.2 l/s
West Block:	0.3249 ha	1.3 l/s
Gravel Bed:	0.1849 ha	2.0 l/s
Middle Block:	0.3248 ha	1.3 l/s
Tank B:	2.1569 ha	**9.0 l/s**

23.215 - LDA Wilton Sarsfield Road LRD

Drained Area Summary

Catchment	Manhole Ref	Total unfactored areas m^2	Impermeable Roofs	CV Value 0.95	Green Roof (Extensive / Intensive)	CV Value 0.8	Roads + Impermeable Footpaths	CV Value 0.9	Concrete Block Permeable Paving	CV Value 0.8	Landscape & Porous Finishes	CV Value 0.3	Effective Impermeable Areas m^2
Tank A	S1.0	608	34.0	32.3	0.0	0.0	215.0	193.5	0.0	0.0	359.0	107.7	334
	S1.1	1471	354.0	336.3	0.0	0.0	348.0	313.2	117.0	93.6	652.0	195.6	939
	S2.0	850	129.0	122.6	0.0	0.0	311.0	279.9	130.0	104.0	280.0	84.0	590
	S1.2	715	282.0	267.9	0.0	0.0	206.0	185.4	118.0	94.4	109.0	32.7	580
	S3.0	538	180.0	171.0	0.0	0.0	298.0	268.2	52.0	41.6	8.0	2.4	483
	S1.3	389	0.0	0.0	0.0	0.0	145.0	130.5	52.0	41.6	192.0	57.6	230
	S1.4	654	0.0	0.0	0.0	0.0	86.0	77.4	40.0	32.0	528.0	158.4	268
Tank B	S1.5	230	0.0	0.0	0.0	0.0	158.0	142.2	0.0	0.0	72.0	21.6	164
	S1.6	233	0.0	0.0	0.0	0.0	53.0	47.7	138.0	110.4	42.0	12.6	171
	S1.7	71	0.0	0.0	0.0	0.0	51.0	45.9	0.0	0.0	20.0	6.0	52
	S1.8	759	0.0	0.0	0.0	0.0	413.0	371.7	91.0	72.8	255.0	76.5	521
West Block	S4.0	3249	882.0	837.9	2367.0	1893.6	0.0	0.0	0.0	0.0	0.0	0.0	2732
	S1.9	698	0.0	0.0	0.0	0.0	321.0	288.9	130.0	104.0	247.0	74.1	467
Gravel Bed	S5.0	1849	0.0	0.0	0.0	0.0	0.0	0.0	460.0	368.0	1389.0	416.7	785
	S5.1	40	0.0	0.0	0.0	0.0	33.0	29.7	0.0	0.0	7.0	2.1	32
Tank B	S1.10	97	0.0	0.0	0.0	0.0	46.0	41.4	0.0	0.0	51.0	15.3	57
	S1.11	584	0.0	0.0	0.0	0.0	286.0	257.4	117.0	93.6	181.0	54.3	405
	S1.12	172	0.0	0.0	0.0	0.0	118.0	106.2	0.0	0.0	54.0	16.2	122
Middle Block	S6.0	3248	894.0	849.3	2354.0	1883.2	0.0	0.0	0.0	0.0	0.0	0.0	2733
Tank B	S1.13	743	0.0	0.0	0.0	0.0	423.0	380.7	176.0	140.8	144.0	43.2	565
	S1.14	754	0.0	0.0	0.0	0.0	181.0	162.9	0.0	0.0	573.0	171.9	335
	S1.15	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Tank B	S7.0	1700	257.0	244.2	109.0	87.2	255.0	229.5	21.0	16.8	1058.0	317.4	895
	S7.1	1060	153.0	145.4	429.0	343.2	134.0	120.6	40.0	32.0	304.0	91.2	732
	S8.0	591	77.0	73.2	121.0	96.8	0.0	0.0	0.0	0.0	393.0	117.9	288
	S7.2	266	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	266.0	79.8	80
	S7.3	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Outlet	S1.16	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	S1.17	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	EX.S46	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
			3242.0	*3079.9*	*5380.0*	*4304.0*	*4081.0*	*3672.9*	*1682.0*	*1345.6*	*7184.0*	*2155.2*	
	TOTAL	21569											14558

Average CV value	0.67

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 Soffits
M5-60 (mm)	16.700	Minimum Backdrop Height (m)	0.200
Ratio-R	0.255	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1.0	0.033	4.00	14.000	1200	564912.675	569703.531	1.475
S1.1	0.094	4.00	13.867	1200	564913.651	569690.149	1.450
S2.0	0.059	4.00	13.866	1200	564869.513	569707.270	1.588
S1.2	0.058	4.00	13.924	1200	564870.973	569687.036	1.834
S3.0	0.048	4.00	13.408	1200	564873.544	569651.404	1.353
S1.3	0.023	4.00	13.550	1200	564872.939	569659.780	1.612
S1.4	0.027	4.00	13.388	1200	564890.563	569661.051	2.038
S1.5	0.016	4.00	13.518	1200	564912.303	569662.620	2.456
S1.6	0.017	4.00	13.363	1200	564914.117	569646.016	2.384
S1.7	0.005	4.00	13.436	1200	564919.670	569640.033	2.498
S1.8	0.052	4.00	13.499	1200	564926.401	569638.060	2.596
S4.0	0.273	4.00	13.769	1200	564962.714	569654.058	2.044
S1.9	0.047	4.00	13.655	1350	564963.640	569640.616	2.939
S5.0	0.078	4.00	13.707	1200	564995.541	569704.105	1.882
S5.1	0.003	4.00	13.276	1200	564998.724	569650.646	1.808
S1.10	0.006	4.00	13.247	1350	565003.935	569643.381	2.733
S1.11	0.041	4.00	13.183	1350	565009.639	569640.616	2.701
S1.12	0.012	4.00	13.222	1350	565040.656	569642.929	2.896
S6.0	0.273	4.00	13.263	1200	565047.156	569654.413	1.984
S1.13	0.056	4.00	13.179	1350	565048.149	569640.506	2.892
S1.14	0.033	4.00	12.185	1350	565089.331	569643.275	2.477
S1.15	0.000	4.00	12.542	1350	565123.306	569658.355	3.020
S7.0	0.089	4.00	14.800	1200	565088.246	569705.316	2.484
S7.1	0.073	4.00	14.092	1200	565090.282	569676.262	2.049
S8.0	0.029	4.00	14.695	1200	565150.160	569680.468	2.845
S7.2	0.008	4.00	14.713	1200	565142.373	569680.192	3.173
S7.3	0.000	4.00	13.016	1200	565143.536	569663.596	2.162
S1.16	0.000		12.244	1500	565139.427	569642.830	2.884
S1.17	0.000		12.110	1500	565152.600	569631.839	2.836
EX.S46	0.000		12.370	1500	565180.197	569623.567	3.240

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
S1.0	S1.0	S1.1	13.418	0.600	12.525	12.435	0.090	149.1	225	4.21	50.0
S1.1	S1.1	S1.2	42.791	0.600	12.417	12.168	0.249	171.9	225	4.93	50.0
S2.0	S2.0	S1.2	20.287	0.600	12.278	12.165	0.113	179.5	225	4.35	50.0
S1.2	S1.2	S1.3	27.327	0.600	12.090	11.938	0.152	180.0	300	5.32	50.0
S3.0	S3.0	S1.3	8.398	0.600	12.055	12.013	0.042	199.9	225	4.15	50.0
S1.3	S1.3	S1.4	17.670	0.600	11.938	11.850	0.088	200.8	300	5.58	50.0
S1.4	S1.4	S1.5	21.797	0.600	11.350	11.241	0.109	200.0	300	5.91	50.0
S1.5	S1.5	S1.6	16.703	0.600	11.062	10.979	0.083	201.2	300	6.16	50.0
S1.6	S1.6	S1.7	8.163	0.600	10.979	10.938	0.041	199.1	300	6.29	50.0
S1.7	S1.7	S1.8	7.014	0.600	10.938	10.903	0.035	200.4	300	6.39	50.0
S1.8	S1.8	S1.9	37.327	0.600	10.903	10.716	0.187	199.6	300	6.95	50.0
S4.0	S4.0	S1.9	13.474	0.600	11.725	11.635	0.090	149.7	300	4.18	50.0
S1.9	S1.9	S1.10	40.390	0.600	10.716	10.514	0.202	199.9	375	7.48	50.0
S5.0	S5.0	S5.1	53.554	0.600	11.825	11.468	0.357	150.0	225	4.84	50.0
S5.1	S5.1	S1.10	8.941	0.600	11.468	11.408	0.060	149.0	225	4.98	50.0
S1.10	S1.10	S1.11	6.339	0.600	10.514	10.482	0.032	198.1	450	7.55	50.0
S1.11	S1.11	S1.12	31.103	0.600	10.482	10.326	0.156	199.4	450	7.91	50.0
S1.12	S1.12	S1.13	7.875	0.600	10.326	10.287	0.039	201.9	450	8.01	50.0
S6.0	S6.0	S1.13	13.942	0.600	11.279	11.186	0.093	149.9	300	4.18	50.0
S1.13	S1.13	S1.14	41.275	0.600	10.287	10.081	0.206	200.4	450	8.49	48.8
S1.14	S1.14	S1.15	37.171	0.600	9.708	9.522	0.186	199.8	450	8.92	47.8
S1.15	S1.15	S1.16	22.381	0.600	9.522	9.410	0.112	199.8	450	9.18	47.2
S7.0	S7.0	S7.1	29.125	0.600	12.316	12.043	0.273	106.7	225	4.38	50.0
S7.1	S7.1	S7.2	52.239	0.600	12.043	11.540	0.503	103.9	225	5.06	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
S1.0	1.068	42.5	6.0	1.250	1.207	0.033	0.0	57	0.758
S1.1	0.994	39.5	22.9	1.225	1.531	0.127	0.0	123	1.031
S2.0	0.972	38.7	10.7	1.363	1.534	0.059	0.0	80	0.832
S1.2	1.168	82.6	44.1	1.534	1.312	0.244	0.0	156	1.187
S3.0	0.921	36.6	8.7	1.128	1.312	0.048	0.0	74	0.756
S1.3	1.106	78.2	56.9	1.312	1.238	0.315	0.0	191	1.203
S1.4	1.108	78.3	61.8	1.738	1.977	0.342	0.0	202	1.224
S1.5	1.104	78.1	64.7	2.156	2.084	0.358	0.0	209	1.229
S1.6	1.110	78.5	67.8	2.084	2.198	0.375	0.0	216	1.244
S1.7	1.107	78.2	68.7	2.198	2.296	0.380	0.0	219	1.243
S1.8	1.109	78.4	78.1	2.296	2.639	0.432	0.0	246	1.257
S4.0	1.282	90.6	49.3	1.744	1.720	0.273	0.0	158	1.309
S1.9	1.277	141.1	135.9	2.564	2.358	0.752	0.0	298	1.446
S5.0	1.065	42.3	14.1	1.657	1.583	0.078	0.0	89	0.960
S5.1	1.069	42.5	14.6	1.583	1.614	0.081	0.0	91	0.972
S1.10	1.441	229.1	151.6	2.283	2.251	0.839	0.0	268	1.535
S1.11	1.436	228.4	159.0	2.251	2.446	0.880	0.0	277	1.547
S1.12	1.427	226.9	161.2	2.446	2.442	0.892	0.0	281	1.543
S6.0	1.282	90.6	49.3	1.684	1.693	0.273	0.0	158	1.308
S1.13	1.432	227.8	215.5	2.442	1.654	1.221	0.0	351	1.619
S1.14	1.434	228.1	216.6	2.027	2.570	1.254	0.0	352	1.621
S1.15	1.434	228.1	213.9	2.570	2.384	1.254	0.0	348	1.620
S7.0	1.265	50.3	16.1	2.259	1.824	0.089	0.0	87	1.129
S7.1	1.282	51.0	29.3	1.824	2.948	0.162	0.0	123	1.327

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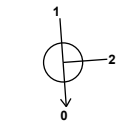
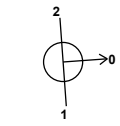
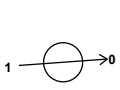
Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
S8.0	S8.0	S7.2	7.792	0.600	11.850	11.772	0.078	99.9	225	4.10	50.0
S7.2	S7.2	S7.3	16.637	0.600	11.540	11.207	0.333	50.0	225	5.21	50.0
S7.3	S7.3	S1.16	21.169	0.600	10.854	10.431	0.423	50.0	225	5.40	50.0
S1.16	S1.16	S1.17	17.156	0.600	9.360	9.274	0.086	199.5	525	9.36	46.8
S1.17	S1.17	EX.S46	28.810	0.600	9.274	9.130	0.144	200.1	525	9.66	46.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
S8.0	1.308	52.0	5.2	2.620	2.716	0.029	0.0	48	0.843
S7.2	1.855	73.7	36.0	2.948	1.584	0.199	0.0	111	1.846
S7.3	1.853	73.7	36.0	1.937	1.588	0.199	0.0	111	1.844
S1.16	1.582	342.5	245.8	2.359	2.311	1.453	0.0	330	1.714
S1.17	1.580	341.9	242.3	2.311	2.715	1.453	0.0	327	1.707

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1.0	564912.675	569703.531	14.000	1.475	1200	 0	S1.0	12.525	225
S1.1	564913.651	569690.149	13.867	1.450	1200	 1	S1.0	12.435	225
						0	S1.1	12.417	225
S2.0	564869.513	569707.270	13.866	1.588	1200	 0	S2.0	12.278	225
S1.2	564870.973	569687.036	13.924	1.834	1200	 1	S2.0	12.165	225
						2	S1.1	12.168	225
						0	S1.2	12.090	300
S3.0	564873.544	569651.404	13.408	1.353	1200	 0	S3.0	12.055	225
S1.3	564872.939	569659.780	13.550	1.612	1200	 1	S3.0	12.013	225
						2	S1.2	11.938	300
						0	S1.3	11.938	300
S1.4	564890.563	569661.051	13.388	2.038	1200	 1	S1.3	11.850	300
						0	S1.4	11.350	300
S1.5	564912.303	569662.620	13.518	2.456	1200	 1	S1.4	11.241	300
						0	S1.5	11.062	300

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1.6	564914.117	569646.016	13.363	2.384	1200	1	S1.5	10.979	300
						0	S1.6	10.979	300
S1.7	564919.670	569640.033	13.436	2.498	1200	1	S1.6	10.938	300
						0	S1.7	10.938	300
S1.8	564926.401	569638.060	13.499	2.596	1200	1	S1.7	10.903	300
						0	S1.8	10.903	300
S4.0	564962.714	569654.058	13.769	2.044	1200	0	S4.0	11.725	300
S1.9	564963.640	569640.616	13.655	2.939	1350	1	S4.0	11.635	300
						2	S1.8	10.716	300
						0	S1.9	10.716	375
S5.0	564995.541	569704.105	13.707	1.882	1200	0	S5.0	11.825	225
S5.1	564998.724	569650.646	13.276	1.808	1200	1	S5.0	11.468	225
						0	S5.1	11.468	225
S1.10	565003.935	569643.381	13.247	2.733	1350	1	S5.1	11.408	225
						2	S1.9	10.514	375
						0	S1.10	10.514	450
S1.11	565009.639	569640.616	13.183	2.701	1350	1	S1.10	10.482	450
						0	S1.11	10.482	450
S1.12	565040.656	569642.929	13.222	2.896	1350	1	S1.11	10.326	450
						0	S1.12	10.326	450
S6.0	565047.156	569654.413	13.263	1.984	1200	0	S6.0	11.279	300
S1.13	565048.149	569640.506	13.179	2.892	1350	1	S6.0	11.186	300
						2	S1.12	10.287	450
						0	S1.13	10.287	450
S1.14	565089.331	569643.275	12.185	2.477	1350	1	S1.13	10.081	450
						0	S1.14	9.708	450

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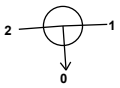
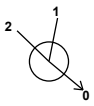
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1.15	565123.306	569658.355	12.542	3.020	1350	1	S1.14	9.522	450
									
						0	S1.15	9.522	450
S7.0	565088.246	569705.316	14.800	2.484	1200				
						0	S7.0	12.316	225
S7.1	565090.282	569676.262	14.092	2.049	1200	1	S7.0	12.043	225
									
						0	S7.1	12.043	225
S8.0	565150.160	569680.468	14.695	2.845	1200				
						0	S8.0	11.850	225
S7.2	565142.373	569680.192	14.713	3.173	1200	1	S8.0	11.772	225
						2	S7.1	11.540	225
									
						0	S7.2	11.540	225
S7.3	565143.536	569663.596	13.016	2.162	1200	1	S7.2	11.207	225
									
						0	S7.3	10.854	225
S1.16	565139.427	569642.830	12.244	2.884	1500	1	S7.3	10.431	225
						2	S1.15	9.410	450
									
						0	S1.16	9.360	525
S1.17	565152.600	569631.839	12.110	2.836	1500	1	S1.16	9.274	525
									
						0	S1.17	9.274	525
EX.S46	565180.197	569623.567	12.370	3.240	1500	1	S1.17	9.130	525
									

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	Scotland and Ireland	Additional Storage (m³/ha)	20.0
M5-60 (mm)	16.700	Starting Level (m)	
Ratio-R	0.255	Check Discharge Rate(s)	x
Summer CV	1.000	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	

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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	20	0	0
30	20	0	0
100	20	0	0

Node S1.5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	11.062
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	220.0	0.0	1.300	220.0	0.0	1.301	0.0	0.0

Node S4.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	11.725
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	120.0	0.0	1.800	120.0	0.0	1.801	0.0	0.0

Node S5.1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	11.468
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	128

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	460.0	0.0	0.300	460.0	0.0	0.301	0.0	0.0

Node S6.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	11.279
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	120.0	0.0	1.800	120.0	0.0	1.801	0.0	0.0

Node S1.16 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	9.360
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	180.0	0.0	2.000	180.0	0.0	2.001	0.0	0.0

Node S4.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	11.725
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	2367.0	0.0	0.012	2367.0	0.0	0.013	0.0	0.0

Node S6.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	11.279
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	2354.0	0.0	0.012	2354.0	0.0	0.013	0.0	0.0

Node S7.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	12.316
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	90

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	109.0	0.0	0.012	109.0	0.0	0.013	0.0	0.0

Node S7.1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	12.043
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	429.0	0.0	0.012	429.0	0.0	0.013	0.0	0.0

Node S8.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	11.850
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	104

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	121.0	0.0	0.012	121.0	0.0	0.013	0.0	0.0

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Results for 1 year +20% CC Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1.0	10	12.583	0.058	6.3	0.0917	0.0000	OK
15 minute summer	S1.1	10	12.545	0.128	24.2	0.3113	0.0000	OK
15 minute summer	S2.0	10	12.364	0.086	11.2	0.1608	0.0000	OK
15 minute summer	S1.2	10	12.257	0.167	45.5	0.2946	0.0000	OK
15 minute summer	S3.0	11	12.148	0.093	9.1	0.1720	0.0000	OK
15 minute summer	S1.3	11	12.143	0.205	57.8	0.2907	0.0000	OK
15 minute summer	S1.4	11	11.566	0.216	61.2	0.3017	0.0000	OK
1440 minute summer	S1.5	960	11.446	0.384	7.5	85.0465	0.0000	SURCHARGED
30 minute summer	S1.6	18	11.027	0.048	4.0	0.0612	0.0000	OK
30 minute summer	S1.7	18	10.993	0.055	4.8	0.0645	0.0000	OK
15 minute summer	S1.8	10	10.989	0.086	14.4	0.1322	0.0000	OK
4320 minute summer	S4.0	2820	12.374	0.649	3.0	109.9746	0.0000	SURCHARGED
15 minute summer	S1.9	10	10.819	0.103	23.2	0.1805	0.0000	OK
15 minute summer	S5.0	9	11.947	0.122	14.8	0.2400	0.0000	OK
480 minute summer	S5.1	288	11.537	0.069	3.4	12.7650	0.0000	OK
15 minute summer	S1.10	11	10.627	0.113	23.6	0.1671	0.0000	OK
15 minute summer	S1.11	11	10.596	0.114	30.3	0.1973	0.0000	OK
15 minute summer	S1.12	11	10.458	0.132	32.7	0.2001	0.0000	OK
4320 minute summer	S6.0	2820	11.928	0.649	3.0	109.8544	0.0000	SURCHARGED
15 minute summer	S1.13	11	10.419	0.132	41.3	0.2398	0.0000	OK
15 minute summer	S1.14	11	9.848	0.140	45.4	0.2379	0.0000	OK
720 minute summer	S1.15	480	9.808	0.286	13.5	0.4093	0.0000	OK
15 minute summer	S7.0	9	12.464	0.148	16.9	1.6369	0.0000	OK
30 minute summer	S7.1	18	12.168	0.125	31.1	5.5932	0.0000	OK
30 minute summer	S8.0	18	11.899	0.049	5.1	1.5774	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1.0	S1.0	S1.1	6.3	0.505	0.148	0.1840	
15 minute summer	S1.1	S1.1	S1.2	23.3	1.029	0.589	0.9739	
15 minute summer	S2.0	S2.0	S1.2	11.2	0.796	0.291	0.2958	
15 minute summer	S1.2	S1.2	S1.3	44.9	0.981	0.543	1.2478	
15 minute summer	S3.0	S3.0	S1.3	8.6	0.665	0.235	0.1654	
15 minute summer	S1.3	S1.3	S1.4	57.0	1.173	0.729	0.8588	
15 minute summer	S1.4	S1.4	S1.5	61.9	1.207	0.790	1.1171	
600 minute summer	S1.5	Hydro-Brake®	S1.6	1.9				
30 minute summer	S1.6	S1.6	S1.7	4.0	0.500	0.051	0.0658	
30 minute summer	S1.7	S1.7	S1.8	4.8	0.450	0.062	0.0876	
15 minute summer	S1.8	S1.8	S1.9	14.3	0.751	0.182	0.7122	
4320 minute summer	S4.0	Hydro-Brake®	S1.9	0.8				
15 minute summer	S1.9	S1.9	S1.10	22.4	0.872	0.159	1.0480	
15 minute summer	S5.0	S5.0	S5.1	15.6	1.555	0.369	0.6116	
480 minute summer	S5.1	Hydro-Brake®	S1.10	1.5				
15 minute summer	S1.10	S1.10	S1.11	23.9	0.767	0.104	0.1985	
15 minute summer	S1.11	S1.11	S1.12	30.8	0.878	0.135	1.0917	
15 minute summer	S1.12	S1.12	S1.13	32.4	0.838	0.143	0.3048	
4320 minute summer	S6.0	Hydro-Brake®	S1.13	0.8				
15 minute summer	S1.13	S1.13	S1.14	40.2	1.084	0.177	1.5442	
15 minute summer	S1.14	S1.14	S1.15	44.7	1.079	0.196	1.5475	
15 minute summer	S1.15	S1.15	S1.16	45.1	1.099	0.198	0.9184	
15 minute summer	S7.0	S7.0	S7.1	18.8	1.597	0.373	0.5087	
30 minute summer	S7.1	S7.1	S7.2	28.8	1.374	0.564	1.0937	
30 minute summer	S8.0	S8.0	S7.2	4.8	0.789	0.091	0.0470	

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Results for 1 year +20% CC Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S7.2	19	11.651	0.111	34.8	0.1311	0.0000	OK
30 minute summer	S7.3	19	10.966	0.112	32.4	0.1261	0.0000	OK
720 minute summer	S1.16	480	9.808	0.448	19.2	81.4235	0.0000	OK
720 minute summer	S1.17	480	9.332	0.058	8.6	0.1021	0.0000	OK
720 minute summer	EX.S46	480	9.187	0.057	8.6	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S7.2	S7.2	S7.3	32.4	1.735	0.440	0.3110	
30 minute summer	S7.3	S7.3	S1.16	33.3	1.759	0.452	0.4007	
720 minute summer	S1.16	Hydro-Brake®	S1.17	8.6				
720 minute summer	S1.17	S1.17	EX.S46	8.6	0.679	0.025	0.3635	316.6

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Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1.0	11	12.953	0.428	13.9	0.6760	0.0000	SURCHARGED
15 minute summer	S1.1	11	12.946	0.529	47.3	1.2839	0.0000	SURCHARGED
15 minute summer	S2.0	11	12.620	0.342	24.9	0.6409	0.0000	SURCHARGED
15 minute summer	S1.2	11	12.576	0.486	86.8	0.8570	0.0000	SURCHARGED
15 minute summer	S3.0	11	12.375	0.320	20.3	0.5883	0.0000	SURCHARGED
15 minute summer	S1.3	11	12.360	0.422	113.0	0.5982	0.0000	SURCHARGED
1440 minute summer	S1.4	1110	11.962	0.612	13.4	0.8540	0.0000	SURCHARGED
1440 minute summer	S1.5	1110	11.962	0.900	13.8	199.0610	0.0000	SURCHARGED
15 minute summer	S1.6	10	11.055	0.076	8.8	0.0963	0.0000	OK
15 minute summer	S1.7	10	11.044	0.106	10.8	0.1239	0.0000	OK
15 minute summer	S1.8	10	11.040	0.137	32.6	0.2095	0.0000	OK
4320 minute summer	S4.0	2880	13.122	1.397	5.2	202.5672	0.0000	SURCHARGED
15 minute summer	S1.9	10	10.878	0.162	52.3	0.2844	0.0000	OK
15 minute summer	S5.0	10	12.015	0.190	33.0	0.3727	0.0000	OK
360 minute summer	S5.1	240	11.608	0.140	8.2	25.9918	0.0000	OK
15 minute summer	S1.10	11	10.698	0.183	54.5	0.2707	0.0000	OK
15 minute summer	S1.11	11	10.662	0.180	69.6	0.3120	0.0000	OK
1440 minute summer	S1.12	1140	10.603	0.277	11.6	0.4186	0.0000	OK
4320 minute summer	S6.0	2880	12.676	1.397	5.2	202.4416	0.0000	SURCHARGED
1440 minute summer	S1.13	1140	10.602	0.315	14.6	0.5738	0.0000	OK
1440 minute summer	S1.14	1140	10.602	0.894	15.9	1.5186	0.0000	SURCHARGED
1440 minute summer	S1.15	1140	10.602	1.080	15.3	1.5457	0.0000	SURCHARGED
15 minute summer	S7.0	11	12.631	0.315	37.6	1.9444	0.0000	SURCHARGED
15 minute summer	S7.1	11	12.507	0.464	67.9	6.2184	0.0000	SURCHARGED
15 minute summer	S8.0	9	11.931	0.081	12.3	1.6204	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1.0	S1.0	S1.1	13.7	0.546	0.322	0.5336	
15 minute summer	S1.1	S1.1	S1.2	44.8	1.125	1.132	1.7018	
15 minute summer	S2.0	S2.0	S1.2	21.8	0.803	0.564	0.8068	
15 minute summer	S1.2	S1.2	S1.3	87.5	1.242	1.059	1.9243	
30 minute summer	S3.0	S3.0	S1.3	19.3	0.618	0.528	0.3340	
15 minute summer	S1.3	S1.3	S1.4	113.6	1.621	1.454	1.1930	
15 minute summer	S1.4	S1.4	S1.5	123.8	1.760	1.581	1.4892	
30 minute summer	S1.5	Hydro-Brake®	S1.6	1.9				
15 minute summer	S1.6	S1.6	S1.7	8.7	0.502	0.110	0.1473	
15 minute summer	S1.7	S1.7	S1.8	10.6	0.461	0.135	0.1874	
15 minute summer	S1.8	S1.8	S1.9	32.4	0.923	0.413	1.3097	
4320 minute summer	S4.0	Hydro-Brake®	S1.9	1.2				
15 minute summer	S1.9	S1.9	S1.10	51.5	1.043	0.365	1.9937	
15 minute summer	S5.0	S5.0	S5.1	34.1	1.735	0.806	1.0569	
120 minute summer	S5.1	Hydro-Brake®	S1.10	2.0				
15 minute summer	S1.10	S1.10	S1.11	54.4	0.913	0.238	0.3798	
15 minute summer	S1.11	S1.11	S1.12	70.2	1.039	0.307	2.1007	
15 minute summer	S1.12	S1.12	S1.13	74.9	1.004	0.330	0.5874	
4320 minute summer	S6.0	Hydro-Brake®	S1.13	1.2				
15 minute summer	S1.13	S1.13	S1.14	95.1	1.352	0.417	2.9025	
15 minute summer	S1.14	S1.14	S1.15	106.4	1.310	0.466	3.0174	
15 minute summer	S1.15	S1.15	S1.16	104.4	1.369	0.458	1.8261	
15 minute summer	S7.0	S7.0	S7.1	37.1	1.418	0.738	1.1583	
15 minute summer	S7.1	S7.1	S7.2	57.2	1.438	1.122	2.0776	
15 minute summer	S8.0	S8.0	S7.2	12.3	1.020	0.237	0.0940	

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Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S7.2	11	11.795	0.255	72.9	0.3015	0.0000	SURCHARGED
15 minute summer	S7.3	10	11.054	0.200	71.2	0.2265	0.0000	OK
1440 minute summer	S1.16	1140	10.602	1.242	22.7	225.7629	0.0000	SURCHARGED
240 minute summer	S1.17	128	9.332	0.058	8.6	0.1024	0.0000	OK
60 minute summer	EX.S46	45	9.187	0.057	8.6	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S7.2	S7.2	S7.3	71.2	1.978	0.965	0.6040	
30 minute summer	S7.3	S7.3	S1.16	70.0	2.006	0.950	0.7402	
60 minute summer	S1.16	Hydro-Brake®	S1.17	8.6				
60 minute summer	S1.17	S1.17	EX.S46	8.6	0.681	0.025	0.3652	140.7

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Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1.0	11	13.463	0.938	18.1	1.4797	0.0000	SURCHARGED
15 minute summer	S1.1	11	13.447	1.030	63.0	2.4997	0.0000	SURCHARGED
15 minute summer	S2.0	11	12.952	0.674	32.3	1.2628	0.0000	SURCHARGED
15 minute summer	S1.2	11	12.880	0.790	109.4	1.3923	0.0000	SURCHARGED
15 minute summer	S3.0	11	12.560	0.505	26.3	0.9292	0.0000	SURCHARGED
15 minute summer	S1.3	11	12.536	0.598	143.2	0.8468	0.0000	SURCHARGED
1440 minute summer	S1.4	1170	12.204	0.854	16.4	1.1923	0.0000	SURCHARGED
1440 minute summer	S1.5	1170	12.204	1.142	17.1	252.6873	0.0000	SURCHARGED
15 minute summer	S1.6	10	11.073	0.094	10.9	0.1193	0.0000	OK
15 minute summer	S1.7	10	11.067	0.129	13.6	0.1516	0.0000	OK
15 minute summer	S1.8	10	11.063	0.160	42.0	0.2451	0.0000	OK
4320 minute summer	S4.0	2940	13.481	1.756	6.2	246.9838	0.0000	FLOOD RISK
1440 minute summer	S1.9	1200	11.002	0.286	8.3	0.5012	0.0000	OK
15 minute summer	S5.0	10	12.126	0.301	42.7	0.5900	0.0000	SURCHARGED
360 minute summer	S5.1	256	11.656	0.188	10.4	34.8067	0.0000	OK
1440 minute summer	S1.10	1200	11.001	0.487	10.6	0.7188	0.0000	SURCHARGED
1440 minute summer	S1.11	1170	11.002	0.519	12.6	0.9013	0.0000	SURCHARGED
1440 minute summer	S1.12	1170	11.002	0.676	13.2	1.0235	0.0000	SURCHARGED
4320 minute summer	S6.0	2940	13.034	1.755	6.2	246.8628	0.0000	FLOOD RISK
1440 minute summer	S1.13	1200	11.002	0.715	16.9	1.3014	0.0000	SURCHARGED
1440 minute summer	S1.14	1200	11.002	1.294	18.5	2.1977	0.0000	SURCHARGED
1440 minute summer	S1.15	1200	11.002	1.480	17.5	2.1173	0.0000	SURCHARGED
15 minute summer	S7.0	11	13.320	1.004	48.7	3.2178	0.0000	SURCHARGED
15 minute summer	S7.1	11	13.120	1.077	77.9	7.3481	0.0000	SURCHARGED
15 minute summer	S8.0	11	12.008	0.158	15.9	1.7238	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1.0	S1.0	S1.1	17.2	0.531	0.405	0.5336	
15 minute summer	S1.1	S1.1	S1.2	55.7	1.400	1.408	1.7018	
15 minute summer	S2.0	S2.0	S1.2	27.8	0.804	0.718	0.8068	
15 minute summer	S1.2	S1.2	S1.3	110.3	1.567	1.335	1.9243	
15 minute summer	S3.0	S3.0	S1.3	23.4	0.634	0.640	0.3340	
15 minute summer	S1.3	S1.3	S1.4	143.7	2.041	1.839	1.2250	
15 minute summer	S1.4	S1.4	S1.5	156.6	2.224	1.999	1.5182	
1440 minute summer	S1.5	Hydro-Brake®	S1.6	2.1				
15 minute summer	S1.6	S1.6	S1.7	10.9	0.507	0.139	0.1952	
15 minute summer	S1.7	S1.7	S1.8	13.5	0.462	0.172	0.2360	
15 minute summer	S1.8	S1.8	S1.9	41.7	0.979	0.532	1.5884	
4320 minute summer	S4.0	Hydro-Brake®	S1.9	1.3				
15 minute summer	S1.9	S1.9	S1.10	66.7	1.099	0.473	2.4509	
15 minute summer	S5.0	S5.0	S5.1	41.2	1.698	0.974	1.2671	
30 minute summer	S5.1	Hydro-Brake®	S1.10	2.0				
15 minute summer	S1.10	S1.10	S1.11	70.5	0.955	0.308	0.4703	
15 minute summer	S1.11	S1.11	S1.12	90.8	1.088	0.398	2.5986	
15 minute summer	S1.12	S1.12	S1.13	97.1	1.055	0.428	0.7250	
4320 minute summer	S6.0	Hydro-Brake®	S1.13	1.3				
15 minute summer	S1.13	S1.13	S1.14	124.6	1.444	0.547	3.5618	
15 minute summer	S1.14	S1.14	S1.15	139.6	1.386	0.612	3.7456	
15 minute summer	S1.15	S1.15	S1.16	135.9	1.458	0.596	2.8458	
15 minute summer	S7.0	S7.0	S7.1	45.0	1.346	0.894	1.1583	
15 minute summer	S7.1	S7.1	S7.2	71.3	1.793	1.398	2.0776	
15 minute summer	S8.0	S8.0	S7.2	15.4	1.074	0.296	0.2712	

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Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S7.2	11	12.008	0.468	87.5	0.5526	0.0000	SURCHARGED
15 minute summer	S7.3	11	11.338	0.484	86.5	0.5475	0.0000	SURCHARGED
1440 minute summer	S1.16	1170	11.002	1.642	26.9	298.3731	0.0000	SURCHARGED
480 minute summer	S1.17	232	9.332	0.058	8.6	0.1024	0.0000	OK
30 minute summer	EX.S46	129	9.187	0.057	8.6	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S7.2	S7.2	S7.3	86.5	2.174	1.172	0.6550	
15 minute summer	S7.3	S7.3	S1.16	85.5	2.150	1.161	0.8334	
30 minute summer	S1.16	Hydro-Brake®	S1.17	8.6				
30 minute summer	S1.17	S1.17	EX.S46	8.6	0.681	0.025	0.3652	131.1

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