



**Civil Engineering Infrastructure
Report for Planning**

Project:

**Kilwoghan Woods, Crodaun,
Celbridge, Co. Kildare**

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1. INTRODUCTION

The subject site is located south of the M4 motorway and north of Celbridge along the Maynooth Road (R405) at Crodaun, Co. Kildare. The location of the site is shown in Figure 1.1 below.



Figure 1.1: Location of Site

Planning has been granted previously for the site for 467 residential units (planning ref. 20307100) consisting of 228 units in Phase 1 and 239 units in Phase 2. Phase 1 is currently under construction. This report relates to a proposed amendment to the Phase 2 area. See Figure 1.2 below.



Figure 1.2: Project Phasing (JFA Architects)

1.1 PROPOSED DEVELOPMENT

Seattle Construction Limited intend to apply to Kildare County Council for permission to amend a previously permitted Strategic Housing Development (SHD) (ABP 307100-20) by way of a planning application for a Large-Scale Residential Development (LRD) on an overall site of approx. 12.93ha located on lands at Kilwoghan Woods in the townland of Crodaun, Celbridge, Co. Kildare. The proposed amendments relate to phase 2 (c.3.94ha) of the overall permitted development and will include amending 239 no. residential units (The overall total number of permitted 467 no. units in phase 1 and 2 remain unchanged).

The proposed amendments comprise a re-design of phase 2 only to include:

- a) The construction of 2 no. 4-storey apartment blocks at the north of the site (81 no. units in total) to include a retail unit (153 sqm) and creche (212sqm – 47 children) with outdoor play area at ground floor:
 - i. Block A – 40 no. units consisting of 18 no. 1 bed and 22 no. 2 bed units
 - ii. Block B – 41 no. units consisting of 19 no. 1 bed and 22 no. 2 bed units
- b) 5 no. 3-storey apartment and duplex units to be located on the eastern boundary of the site;
 - i. Duplex C – 08 no. units consisting of 4 no. 2 beds and 4 no. 3 beds
 - ii. Duplex D – 18 no. units consisting of 4 no. 1 beds, 8 no. 2 beds, and 6 no. 3 beds
 - iii. Duplex E – 18 no. units consisting of 4 no. 1 beds, 8 no. 2 beds, and 6 no. 3 beds
 - iv. Duplex F – 20 no. units consisting of 10 no. 2 beds, and 10 no. 3 beds
 - v. Duplex G – 18 no. units consisting of 4 no. 1 beds, 8 no. 2 beds, and 6 no. 3 beds
- c) 76 no. terraced houses consisting of;
 - i. 48 no. 2 bed mid terrace units;
 - ii. 12 no. 3 bed end terrace units;
 - iii. 16 no. 3 bed end terrace dual frontage units
- d) 252 no. of car parking spaces which includes 2 no. car sharing spaces, 14 no. motorcycle spaces and 538 no. bicycle parking spaces will be provided for in phase 2.

- e) Amendments to the previously permitted open spaces in phase 2 to now provide 5,357sqm Public Open Space, 1,165sqm Communal Open Space, and 3,313 Amenity Space. Each of the units are afforded their own private open space in the form of private gardens, balconies, or terraces.
- f) Amendments to internal residential access roads and cyclist/pedestrian paths to allow for the 4 arm entrance junction and a new shared pedestrian/cycle path through the site running north to south.
- g) All associated site development works, services provision, infrastructural and drainage works, internal access roads, home zones, cycle and pedestrian infrastructure, bin stores, car and bicycle parking, public lighting, communal open spaces, private open space in the form of gardens, terraces and/or balconies, landscaping and boundary treatment works.
- h) All application documentation and information is available for public viewing at the following website (www.kilwoghandrivephase2lrd.ie).

1.2 SCOPE OF THIS REPORT

This report describes the proposed civil engineering infrastructure for the development and how it connects to the public infrastructure serving the area. In particular, access and road layout, foul and surface water drainage and water supply are considered.

This report should be read in conjunction with the following drawings submitted with the planning application.

KWW-BMD-00-XX-DR-C-10000	Civil General Notes
KWW-BMD-00-XX-DR-C-11360	Road Junction Detail Drawing
KWW-BMD-00-XX-DR-C-11361	Road Junction Section Drawing
KWW-BMD-00-XX-DR-C-13210	Drainage and Watermain Layout Main Plan
KWW-BMD-00-XX-DR-C-13213	Drainage and Watermain Layout Tile 1 of 2
KWW-BMD-00-XX-DR-C-13214	Drainage and Watermain Layout Tile 2 of 2
KWW-BMD-00-XX-DR-C-13220	Longitudinal Drainage Section Sheet 5 of 6 (Phase 2)
KWW-BMD-00-XX-DR-C-13221	Longitudinal Drainage Section Sheet 6 of 6 (Phase 2)
KWW-BMD-00-XX-DR-C-13230	Proposed Foul Pumping Station Plan
KWW-BMD-00-XX-DR-C-13231	Proposed Foul Pumping Station Sections
KWW-BMD-00-XX-DR-C-13232	Proposed Foul Manhole Outfall Sections
KWW-BMD-00-XX-DR-C-13300	Roads and Surface Layout Plan
KWW-BMD-00-XX-DR-C-13301	Road and Surface Tile 1 of 2
KWW-BMD-00-XX-DR-C-13302	Road and Surface Tile 2 of 2
KWW-BMD-00-XX-DR-C-13305	SuDS Strategy
KWW-BMD-00-XX-DR-C-13310	SuDS Details Permeable Paving and Green Roof
KWW-BMD-00-XX-DR-C-13320	SuDS Details Bio Retention, Tree Pits & Hydrobrake
KWW-BMD-00-XX-DR-C-13350	Road Width & Radii, Kerb Detail, & Road Signage Drawing
KWW-BMD-00-XX-DR-C-13370	Junction Key Plan
KWW-BMD-00-XX-DR-C-13371	Roads and Surface Layout Plan – Detail for Junctions 1 & 2
KWW-BMD-00-XX-DR-C-13372	Roads and Surface Layout Plan – Detail for Junction 3
KWW-BMD-00-XX-DR-C-13400	Roads Standard Details - Sheet 1
KWW-BMD-00-XX-DR-C-13401	Roads Standard Details - Sheet 2
KWW-BMD-00-XX-DR-C-13410	Footpath Standard Details - Sheet 1

KWW-BMD-00-XX-DR-C-13411	Footpath Standard Details - Sheet 2
KWW-BMD-00-XX-DR-C-13510	Fire Tender Auto Tracking Analysis Four Arm Junction / Access Point
KWW-BMD-00-XX-DR-C-13520	Private Car Auto Tracking Analysis
KWW-BMD-00-XX-DR-C-13600	Visibility Splays and Sightlines
KWW-BMD-00-XX-DR-C-13610	Visibility Splays and Sightlines – Sheet 1
KWW-BMD-00-XX-DR-C-13620	Visibility Splays and Sightlines – Sheet 2

In addition to this report, the following additional engineering reports have been submitted with this planning submission.

DOCUMENTS

KWW-BMCE-ZZ-ZZ-RP-C-02	Site Specific Flood Risk Assessment
KWW-BMCE-ZZ-ZZ-RP-C-03	Outline Construction & Environmental Management Plan
KWW-BMCE-ZZ-ZZ-RP-C-04	Traffic Assessment of Critical 4-Arm Signalised Access Junction
2765R01	Stage 1 Road Safety Audit

1.3 SITE INVESTIGATION

A Site Investigation was carried out by Ground Investigations Ireland in February 2024 (Report no. 13272-10-23). The sequence of strata encountered were consistent across the site and generally comprised;

- Topsoil
- Cohesive Deposits
- Weathered Bedrock
- Bedrock

TOPSOIL: Topsoil was encountered in all the exploratory holes and was present to a maximum depth of 0.50m BGL. Rare red brick fragments were encountered at BH-08 which indicates this layer may be partially reworked.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Made Ground and were described typically as brown slightly sandy gravelly CLAY with low cobble content overlying a grey slightly sandy gravelly CLAY with low cobble and boulder content.

WEATHERED BEDROCK: In the majority of exploratory holes presumed weathered rock was encountered which was digable with the large excavator to a depth of up 0.60m below the top of the stratum. The trial pits were terminated upon encountering the more competent bedrock, in which further excavation became more difficult. This material was recovered typically as angular gravel and cobbles of Limestone and Mudstone, however there was some variability in the fracture spacing and the ease at which the excavator could progress. Some clay and sand were also present within the rock mass either from weathering or as infilling to fractures which were opened upon excavation.

BEDROCK: The rotary core boreholes recovered interbedded medium strong to very strong thinly laminated to thinly bedded dark grey fine grained argillaceous LIMESTONE and very weak to medium strong black calcareous MUDSTONE. This is typical of the Lucan Formation, which is noted on the Geological Survey Ireland's (GSI) geological mapping of the site. The degree of weathering ranged from

fresh to highly weathered. Calcite veins and rare visible pyrite lenses were noted during logging which are typically present within the Lucan Formation.

Groundwater was encountered at depths of 1.4m BGL to 2.20m BGL.

See Appendix 5 for further details.

2. PROPOSED ACCESS AND ROAD LAYOUT

2.1 BACKGROUND & PRE-PLANNING DISCUSSIONS WITH KILDARE COUNTY COUNCIL (KCC)

- Condition 3 of the previous application requests agreement on the access and junction arrangement.
- Through discussion and dialogue with Kildare County Council (KCC) Roads Department, our team has been in the process of agreeing the arrangement under that condition.
- Initial discussions were held with Senior Engineers in the Roads Department, Mr George Willoghby, Ronan Linane and Anthony Horgan throughout November 2024.
- KCC requested for the design to include a single access point rather than two separate entrances as indicated in the original application. They also requested that the single access and egress point be signalised.
- Through exploring different design options, it was agreed that combining the Ardrath Estate entrance as a single 4-arm junction was most appropriate.
- The proposal was submitted to the roads department for initial review. The matter had been headed by Ms Annette Keaveney, since April 2025, by way of an initial on-site meeting (7th April, attended by Christina Fox of BMCE). A second round of discussions were held as an online design session (12th May 2025). These discussions also included other members of KCC Roads, Transportation & Public Safety Department, Joe Keane, Jonathan M Walsh, Carthac de Brí and Ronan Linnane.
- Ms Keaveney requested junction design modelling and a forecast on the queuing lengths, etc. which BMCE have carried out.
- On foot of the initial submission, KCC agreed that the 4-arm signalised junction was appropriate and requested BMCE to advance with detailed design of the junction.

2.2 PROPOSED ACCESS/EGRESS

- BMCE have produced an engineering design drawing of the 4-arm junction that addresses KCC requests such as maintaining the 2-way cycle path to the west side of the Maynooth Road and tying in with the surrounding infrastructure.
- BMCE have also proposed interconnection of the toucan crossing to the south and a zebra crossing to the north where there is presently an uncontrolled crossing close to the roundabout.
- This design has been submitted to KCC Roads Department as part of advancement of the compliance agreement.
- The current design assumes adoption of this junction design and has been taken into consideration and incorporated in the layout included in this amendment application also.

2.3 PROPOSED INTERNAL ROADS LAYOUT

- The internal road network includes some relatively minor design changes, compared to the previous application. These are mainly related to working with the reconfigured house types, i.e. houses compared to previous apartments, etc.
- The internal road network follows the standards set out in the Design Manual for Urban Roads and Streets (DMURS).
- Roads are of sufficient width to allow for fire tender access.
- Autotracking (swept path analysis) of the new road entrance and internal roads has been carried out. Please refer to drawings KWW-BMD-00-XX-DR-C-13510 and KWW-BMD-00-XX-DR-C-13520.
- Internal road network includes enhanced cycle path routes that were imposed under condition in the previous application.

- The total unit numbers remain the same as the original application and through discussion with KCC Roads Department, it has been agreed that since permission was already granted for the same number of units and this application is an adjustment in the layout of those units, there is no requirement for a revised traffic impact assessment study.
- A detailed assessment of the junction design has been prepared as part of this. Please refer to report KWW-BMCE-ZZ-ZZ-RP-C-04.

3. SURFACE WATER DRAINAGE

3.1 EXISTING SURFACE WATER DRAINAGE

The existing site is a green field site. Kilwoghan stream traverses the southern boundary of the site and provides a suitable discharge source for the proposed development.

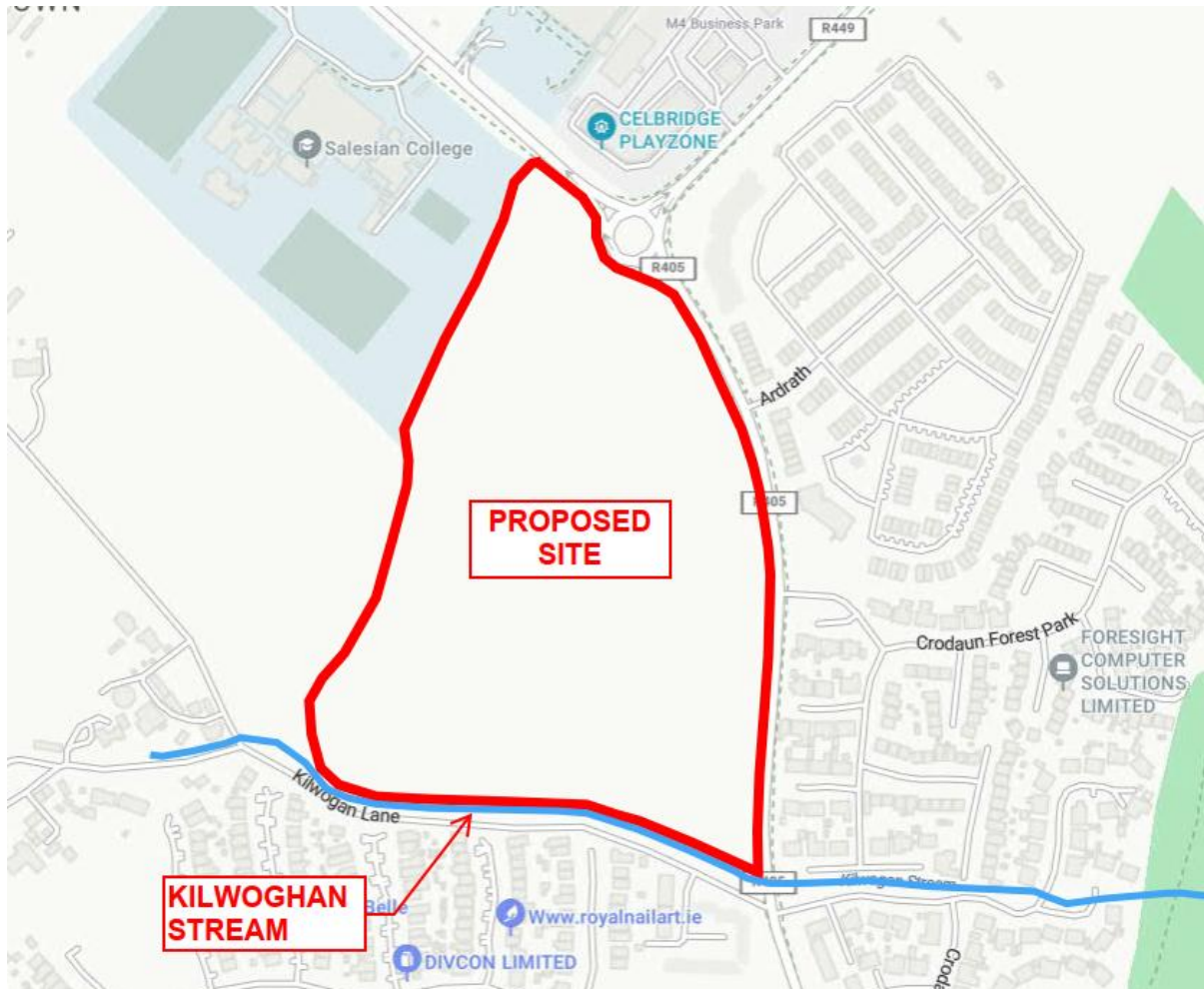


Fig 3.1: Existing stream at southern boundary of the site

3.2 PROPOSED SURFACE WATER DRAINAGE SYSTEM – OUTLINE STRATEGY

3.2.1 Existing Approved Strategy

The previous planning application provided two modular underground attenuation systems working in series before discharging to Kilwoghan Stream at the southern boundary of the site. The rate of discharge from the site is limited to the QBAR rate of 26.7 l/s. See Figure 3.2 below.

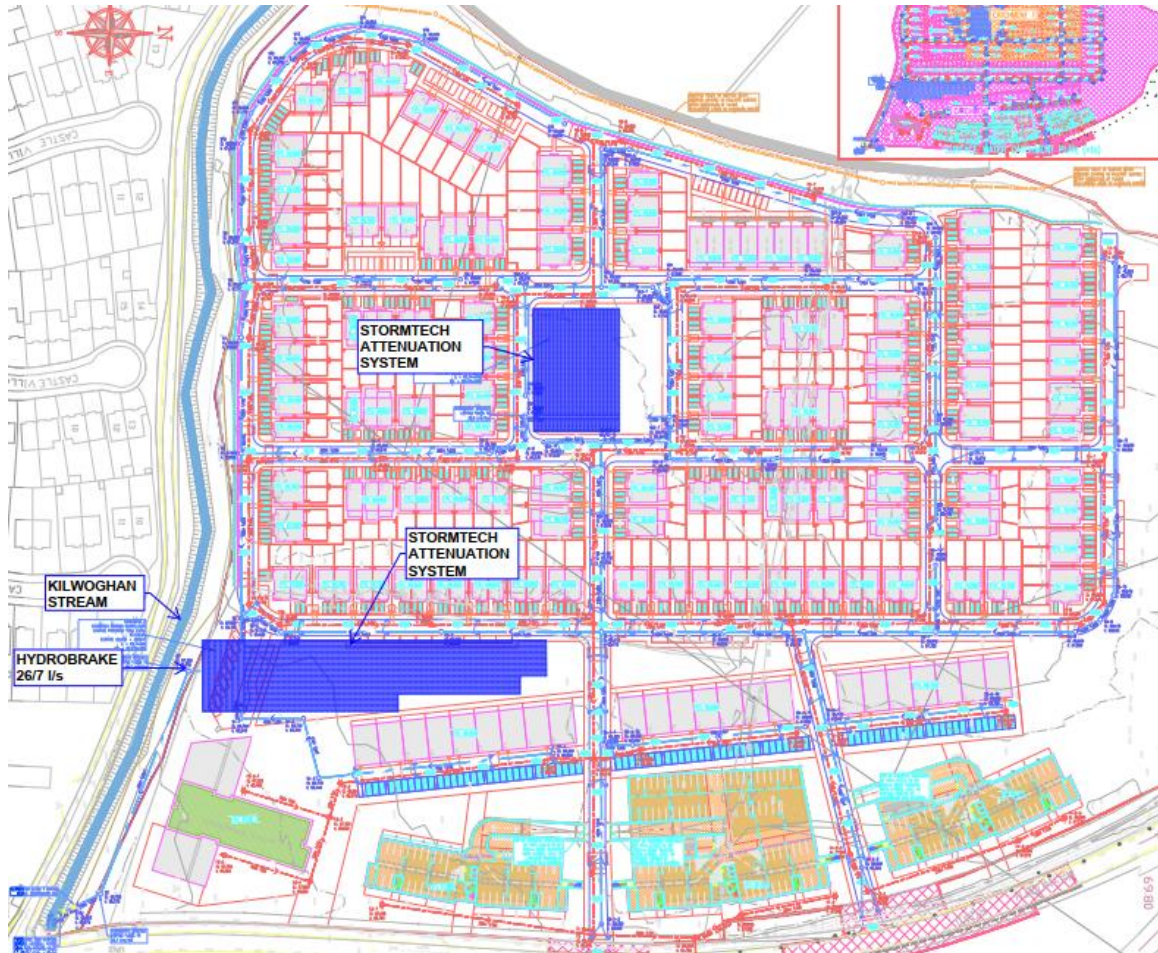


Fig 3.2: Previously approved stormwater drainage scheme (Planning Ref. 20307100)

Percolation tests have indicated that infiltration on the site is very poor. Therefore, storm water for the 1 in 100-year event must be accommodated within the attenuation systems.

3.2.2 Proposed Surface Water Drainage

The stormwater strategy for the development, as outlined in the previously approved planning permission, is proposed to remain largely unchanged. However, efforts have been made throughout the development to implement additional SuDS measures where possible. The soil characteristics from the ground investigation carried out stated that the soil within the site was classified as **CLAY**. During infiltration testing, the dropping of water levels was too gradual and slow to calculate the infiltration rate, thus leading to the conclusion that no soil infiltration would be possible. Attenuation storage has therefore, been provided to accommodate the 1 in 100-year storm event including an allowance of 20% for climate change and 10% for urban creep in accordance with the previously granted planning permission. Runoff from the site will discharge to the Kilwoghan Stream along the southern boundary of the site and will be limited to the pre-development greenfield runoff rate, QBar using a hydrobrake flow control device.

This strategy involves the construction of underground modular attenuation systems operating in series. However, to accommodate the new layout for Phase 2 and in an effort to introduce more SuDS measures, it is proposed to divide the larger attenuation system into three smaller systems within Phase 2. Where possible, enhanced SuDS measures in the form of two detention basins have been provided. Please refer to Figure 3.3 below.



Fig 3.3: Proposed stormwater drainage scheme

Stormwater from attenuation systems 1 and detention basins 1 & 2 will be directed into underground modular attenuation system 2 prior to outfall. The outfall from the site will be regulated by a flow control device to the greenfield runoff rate (QBAR) of 26.7 l/s, as calculated in the previously approved planning application (ABP Case Reference 307100-20).

SuDS measures are proposed throughout the development to collect runoff generated through storm events. These measures will provide an improvement over the original approved scheme. Refer to BMCE civil drawing for routes and locations of manholes. These include:

- The pipe network from S11.0 within the Phase 1D area will flow down into detention basin 1. The permeable parking reservoirs will also flow into detention basin 1. Detention basin 1 has been designed to store surface water falling during and up to the 30-year storm event (+20% Climate Change and +10% Urban Creep) within an underground Stormtech SC-800 attenuation tank. Extreme rainfall events above the 30-year storm event and up to the 100-year storm event (+20% Climate Change and +10% Urban Creep) will be stored within the detention basin directly above the Stormtech tank. Runoff generated during serious storm events will slowly infiltrate

into the Stormtech tank before entering the surface water network. A flow control device will be positioned on the outflow point of the tank to retain surface water within the detention basin and ensure a reduced outflow of 15l/s into the pipe network.

- The pipe network S13.0 and both apartment blocks will flow into detention basin 2 that has been designed similarly to detention basin 1 with an underground Stormtech SC-800 tank to hold up to the 1 in 30-year storm event and a detention basin above to store water up to the 1 in 100-year storm event. A flow control device located on the outflow manhole of detention basin 2 will reduce the outflow to 5l/s.
- Both detention basins have been designed to attenuate storm events above the 30-year storm event up to the 100-year storm event and will hold all storm water to maximum depth of 0.3m. Each basin will have a freeboard of 0.5m to the 100-year storm event level to ensure that there is a minimal chance of flooding. The detention basins will have side slopes no greater than 1 in 4 and will mostly remain dry apart from during extreme storm events.
- Rainwater falling at roof level on apartment blocks A and B will be stored through green/blue roof systems to retain and restrict the flow of water entering the surface water network system. Flat roof areas that are unable hold green roofs will be laid with blue roofs featuring underlying drainage boards for interception and attenuation storage. Where PV panels or other roof plant equipment preclude the use of green roof substrate, a gravel ballast will be provided over the drainage board so that storage will still be provided. Refer to drawing KWW-BMD-00-XX-DR-C-13310 for details.
- All rainwater falling onto pitched roofs within phase 2 will flow through diffuser boxes into permeable paving to act as a method of treatment and slow down the flow of water entering the surface water network. Refer to drawing KWW-BMD-00-XX-DR-C-13310 for details.
- Ground level soft landscaped areas throughout the development will provide direct infiltration of run-off into the underlying soils.
- All car parking spaces will be constructed using permeable paving which will intercept runoff and provide a treatment medium. The permeable paving reservoirs will retain and reduce surface water outflows into the surface water network system, thus reducing the pipe sizes required beneath roads. The permeable paving reservoirs have been designed to be a depth of 350mm, in order to ensure adequate retention of surface water is achieved and a reduced discharge into the surface water network is maintained. Refer to drawing KWW-BMD-00-XX-DR-C-13310 for details.
- Surface water falling onto hardstanding footpaths and roads will be directed towards permeable paving reservoirs situated underneath parking spaces and private driveways, all surface water will flow through permeable paving into the surface water pipe network. Roads with central cambers will contain road gullies connected directly to permeable paving reservoirs opposite the road at all locations. Impermeable hard surfaces that are unable to be within the catchment areas of the sections of permeable paving will either discharge surface water directly into the surface water network (roads) or into tree pits, filter trenches, and soft landscaping (footpaths and cycle tracks). Refer to drawings KWW-BMD-00-XX-DR-C-13320 for details.
- A swale is proposed adjacent to the circulation road along the south and western boundaries of the development. Runoff from the impermeable road surface will be directed to the swale prior to discharging to the stormwater system. The swale will help to slow and store runoff from the road while also providing a natural filtration process improving the quality of water that enters the surface water network. Refer to drawing KWW-BMD-00-XX-DR-C-13400 for details.

As can be seen from the above proposed SuDS measures, all available options to implement SuDS within the development have been fully explored and incorporated. The proposed scheme maximises the use of sustainable drainage techniques, ensuring that almost all surface water generated on-site will pass through at least one SuDS measure before entering the surface water network.

These measures provide multiple benefits by significantly slowing the rate of surface water runoff, reducing the risk of downstream flooding, and delivering an additional level of treatment to improve the quality of water being discharged. Through the enhanced integration of SuDS throughout the development the revised proposals represent a significant improvement when compared to the original approved scheme.

3.3 SUDS STRATEGY

3.3.1.1 Compliance with the principles of Sustainable Drainage Systems

In order to both reduce and attenuate the flow; the development will be designed in accordance with the principles of Sustainable Drainage Systems (SUDS) as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GSDSDS). The GSDSDS 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. The criteria provide a consistent approach to addressing the increase in both rate and volume of run-off as well as ensuring the environment is protected from pollution that is washed off roads and buildings. These drainage design criteria and are as follows:

Table 3.1: GSDSDS Criteria

GSDSDS Criteria	Aims
Criterion 1 - River Water Quality Protection - Provide Interception & treatment Storage	• To prevent pollution • To maintain base flows in streams • To recharge groundwater.
Criterion 2 - River Regime Protection - Provide Attenuation Storage	• To prevent river scour due to flash flooding.
Criterion 3 - Site Flood Risk Mitigation - Provide adequate pipe network & check overland flows	• 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 - Provide Long Term Storage or Extended Attenuation Storage	• To prevent river flooding

The overarching principle of SUDS design is that surface water runoff should be managed for maximum benefit. The types of benefits that can be achieved by SUDS will be dependent on the site but fit broadly into four categories – The Four Pillars of SUDS – and are as follows: water quantity, water quality, amenity, and biodiversity.

Table 3.2 Benefits of SUDS Design

SuDS Category	Benefit
Water Quantity	• Maintain & protect the natural water cycle • Support the management of Flood Risk
Water Quality	• Manage the quality of the runoff to prevent pollution
Biodiversity	• Create & sustain better places for Nature
Amenity	• Create & sustain better places for people

Compliance with Criteria 1 to 4 will require a SUDS strategy that employs at source and site wide SUDS control measures to control water quantity and quality whilst creating biodiversity and amenity for the benefit of nature and people. Reference was also made to the SUDS Manual - CIRIA 753 - in relation to the assessment of the potential SUDS measures that could be incorporated within the site and the final strategy was agreed with the Landscape Architect and the other members of the Design Team.

The SUDS measures employed on the subject site are listed in Table 3.3 below. The SUDS approach is also shown on drawing KWW-BMD-00-XX-DR-C-13305- SUDS Layout and associated SUDS details on drawings KWW-BMD-00-XX-DR-C-13310 & KWW-BMD-00-XX-DR-C-13320 and KWW-BMD-00-XX-DR-C-13400.

All surface water will pass through at least one SuDS measure with some travelling through a train of SuDS measures before reaching the outfall point in order to clean, retain, and slow the flow of water through the site. Roof storage, permeable paving, underground attenuation tanks, and detention basins will be used throughout Phase 2 of the design. These SuDS measures will be distributed throughout the site in order to ensure that the underground modular attenuation system 2 does not become inundated with an overabundance of water. The discharge of surface water into the nearby Kilwoghan stream will remain at the permitted flow rate of 26.7l/s.

Reference should also be made to the Causeway Flow Software output for attenuation & network simulation calculations given in Appendix 2.

Table 3.3 List of Suds Measures Employed, with volumes and performance rating

SuDS Measures	Measures to be used on this site (Y/N)	Rationale for selecting / not selecting measure	Area of Feature (m²)	Relevant GSDSDS Criterion	GSDSDS Storage Volume Classification (see note 1)	Storage volume size (m³)	Performance (See Note 2)			
							Quantity	Quality	Biodiversity	Amenity
Source Control										
Swales	N	Provided to intercept and treat surface water.	-	1 & 2	Int, Tre & Att	-				
Tree Pits	Y	Provided where possible throughout the site to intercept and treat surface water.	Varies	1 & 2	Int, Tre & Att	Varies				
Downpipe Planters	N	Other measures preferred.	-	1	Int					
Rainwater harvesting	N	Other measures preferred.	-	1	Int					
Soakaways	N	Poor infiltration rates on site.	-	1 & 2	Int, Tre & Att					
Infiltration Trenches	N	Poor infiltration rates on site.	-	1 & 2	Int, Tre & Att					
Permeable pavement	Y	Provided in parking areas and some paved areas.	5418	1 & 2	Int, Tre & Att	568.89				
Green Roofs	Y	Provided over flat roofs areas.	2010	1 & 2	Int, Tre & Att	20.1				
Green Wall	N	Other measures preferred.	-							
Filter strips	N	Permeable paving preferred.	-	1 & 2	Int, Tre & Att					
Raingardens/ Bio-retention system	N	Other methods preferred	-	1 & 2	Int, Tre & Att					
Blue Roofs	Y	Provided underneath the green roofs at roof level to attenuate flows and treat surface water before it enters the drainage system.	2010	2	Att	180.9				
Filter Drain	N	Permeable paving preferred	-	1 & 2	Int, Tre & Att					
Site Control										
Detention Basins	Y	Provided above underground attenuation tanks for 100-year storm event.	320.3	1	Int & Att & LT	92.2				
Bio Retention Systems	N	Considered unsuitable for development. Other measures used.	-	1 & 4	Int & LT					
Ponds & Wetlands	N	Considered unsuitable for development. Other measures used.	-	1 & 2	Int, Tre & Att					
Petrol/Oil interceptor	Y	Provided prior to outflow into Kilwoghan stream	-	1	Tre					
Attenuation Systems	Y	Stormtech attenuation system provided beneath Detention Basins 1 & 2 to accommodate flows for up to and during the 1 in 30 year storm event with an additional allowance of 10% for Urban creep	Varies	2	Att & Int	Varies				

		and an increase of 20% for climate change. Underground modular attenuation systems provided to attenuate runoff from the development in accordance with the permitted planning permission.								
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Note 1: Int = Interception storage (can be counted as both treatment & attenuation storage), Tre = Treatment Storage, Att = Attenuation Storage, LT= long term storage.

Note 2: green = good performance, orange = moderate performance, red = poor performance.

3.3.2 Criterion 1 GSDS: River Quality Protection - Interception or Treatment Storage

3.3.2.1 Calculation of Interception Volume

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, the catchment areas for the new surface water network are as follows:

Table 3.4 Area Summary for Phase 2

Impermeable Roof =	8,509m ²
Green/Blue Roof =	2,010m ²
Permeable Paving =	5,418m ²
Impermeable Hardstanding =	10,493.4m ²
Soft Landscaping =	9,253.6m ²
Total Catchment Area =	35,684m²

The total site area is 3.96 hectares. The total drained catchment area for the new proposed surface water network is 3.57ha. This is due to:

- A portion of the site remaining as green open space to the north of the development outside of the predicted catchment zone,
- A portion of green area to the south of the site accounted for within the Phase 1 catchment,
- As well as a section of existing road remaining within the catchment of an existing surface water network.

These areas lead to 0.39 hectares of the subject site not entering the new network. With the relevant coefficients applied, the area that forms part of the drainage system (reduced drained area) is 2.62ha. See Appendix 1 for further detail.

Interception Storage required @ 5mm across site = 26,246m² x 5mm = 131.23m³

Sections 3.3.2.1.1 and 3.3.2.1.2 below list the various types of SuDS measures that provide interception / treatment storage.

3.3.2.1.1 Permeable paving

Parking spaces, footpaths and a section of road will be provided with permeable paving. A linear collection drain will be provided within the permeable paving to ensure that surface water flows into the surface water drainage network. The permeable paving will be part of the overall management train used.

Refer to drawing KWW-BMD-00-XX-DR-C-13310 for details.

Permeable Paving Interception Storage

Permeable paving area = 5418m²

$$= 5418\text{m}^2 \times 100\text{mm}/1000 \times 0.3 = 162.54\text{m}^3$$

By providing a raised drainage outlet above the base of the coarse graded gravel bed it is possible to achieve interception storage. Raising the invert of the drainage pipe to 100mm above the gravel bed gives interception storage @ 30% voids in the gravel.

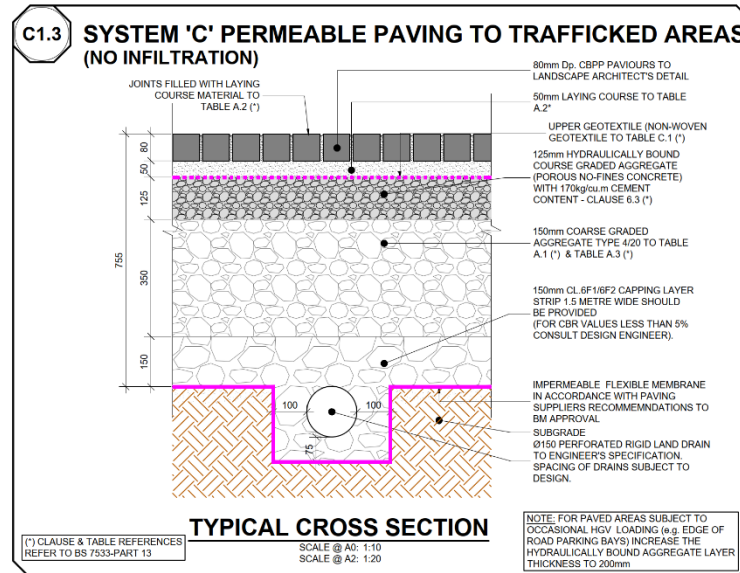


Figure 3.4: Permeable Paving

3.3.2.1.2 Green/Blue Roofs

Blue roof storage will be incorporated into the SuDS design for the proposed site and will be laid underneath extensive green roof or permeable paving to provide attenuation storage to the site. The proposed solution is to provide attenuation in the form of a blue roof with 1 layer of "Retention Spacer RSX 100" and a layer of 10 l/m² depression mat as interception storage on top of the attenuation layer. See Figure 3.5 below. When the interception storage mat is full, the water will overflow into the attenuation layer below.

Extensive green roofs with low substrate depths are proposed. They will be lightweight with simple planting and low maintenance requirements. 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 total 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 surface water network. 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 intercept and retain over 30 litres/m² 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, the more conservative estimate of 10 l/m² interception storage will be assumed. Refer to BMCE drawings KWW-BMD-00-XX-DR-C-13305, KWW-BMD-00-XX-DR-C-13310, and KWW-BMD-00-XX-DR-C-13320 for the SuDS strategy and standard details.

Green/Blue Roof Interception Storage

$$\begin{aligned} \text{Total Green Roof area} &= 2010\text{m}^2 \\ &= 2010\text{m}^2 \times 10/1000 = 20.1\text{m}^3 \end{aligned}$$

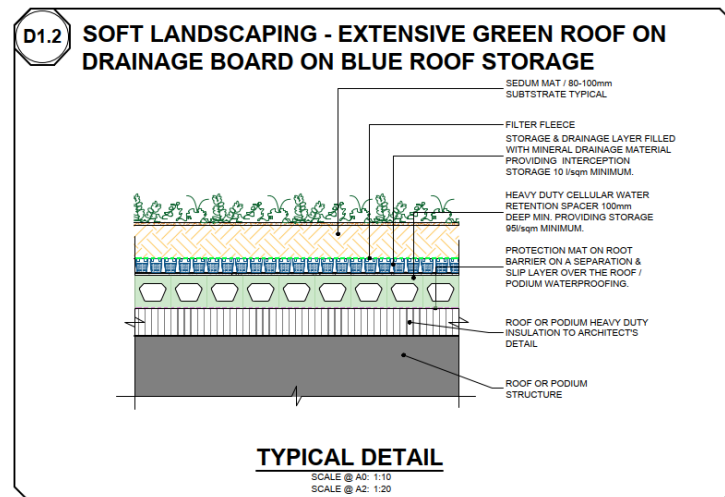


Figure 3.5: Extensive Green Roof on Blue Roof Storage

3.3.2.2 Total Interception Storage Required vs Provided

The total interception storage volume required for the site is 131.23m^3 whilst the provided interception storage within the development design is $162.54\text{m}^3 + 20.1\text{m}^3$ equalling a total storage provided of 182.64m^3 . The provided interception storage therefore exceeds required interception storage.

3.3.3 Criterion 2 GDSDS – River Regime Protection – Attenuation Storage

3.3.3.1.1 Calculation of QBAR

The Qbar calculated in the previous planning application (Ref. 20307100) for both Phase 1 and Phase 2 was 26.7l/s . This has not been altered for the design of the new surface water network within this planning application. The total site area of both phase 1 and phase 2 has not been impacted therefore the outflow into Kilwoghan Stream will remain as previously approved.

3.3.3.1.2 Calculation of Attenuation Volume

The runoff generated from the site will be attenuated within a series of attenuation measures for the catchment area. All attenuation measures will be designed to cater for the 1:100-year storm event plus 20% climate change and 10% urban creep. The green/blue roofs will attenuate and restrict the flow of surface water falling onto the roof areas within a depth of 100mm. The permeable paving will bring all surface water falling on the ground into the surface water network and flow towards the attenuation measures. Underground modular attenuation system 2 has been designed to hold all predicted storm water from both phase 1 and phase 2 of the development. A hydrobrake will be fitted downstream of underground modular attenuation system 2 in order to reduce the outflow to 26.7l/s .

The design parameters for Attenuation Volume estimation are given in the following table:

Table 3.6: Hydraulic Design parameters

Return period for Attenuation design	100 years
Time of entry	4 minutes
Discharge Limit	26.7 l/s
Pipe Friction (ks)	0.6mm
Minimum Velocity	0.75m/s
Standard Average Annual rainfall	804.1mm (Met Eireann)
M5-60	16.0 (Met Eireann)
R= (M5-60/M5-2D)	0.278 (Met Eireann)
Climate Change Allowance	20%
Urban Creep Allowance	10%

Appendix 2 gives Causeway Flow Hydraulic Modelling Output showing the critical storm durations, rainfall depths and corresponding storage volumes required for the 30- and 100-year event with the outflow rate being controlled by a hydrobrake restricting to a discharge rate of 26.7l/s. These events modelled take into consideration a climate change allowance of 20% and urban creep allowance of 10% as per Table 3.6 above. The Causeway Flow model contains calculations for the entire development of Phase 1 and Phase 2 in order to convey that the outflow of the site has been maintained at 26.7l/s.

3.3.3.1.3 SuDS Measures Providing Attenuation Storage Requirement

The GDSDS requires that flood waters be managed within the site for a 1 in 100-year flood.

All attenuation measures have been designed to be able to attenuate for the 1 in 100 year storm event with an allowance for climate change of 20% and urban creep of 10%. A flow control device will be fitted at the outflow point of the underground modular attenuation system 2 in order to control and limit the outflow of water to a discharge value of 26.7l/s. The green roofs and permeable paving will act as interception storage and reduce the velocity and flow of storm water in all potential storm events. The permeable paving has been designed to hold stormwater within a depth of 0.35m, thus leading to retention and gradual release of water into the attenuation system. Detention basin 1 has been designed to attenuate a volume of 281m³ within the Stormtech tank and basin, detention basin 2 is sized to hold 95m³ of storm water within the basin and Stormtech tank. Underground modular attenuation system 2 has been designed to hold surface water from storm events for both phase 1 and phase 2 of the development leading to an overall storage requirement of 4750m³.

The use of green/blue roofs and permeable paving will aid in improving the water quality of all surface water prior to discharge from the site. Removal of sediment and buoyant materials, as well as the reduction of nutrients, heavy metals, toxic materials and oxygen-demanding materials will occur and be of great benefit to the surface water network. A petrol interceptor will be fitted prior to discharge into the Kilwoghan stream to ensure that water quality is satisfactory.

The surface water system for the development has been hydraulically modelled in CAUSEWAY FLOW software. Please see Appendix 2 for full breakdown of calculations.

3.3.4 Criterion 3 GDSDS – site flood risk mitigation – Pipe Network Design

3.3.4.1.1 Network Design

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

No flooding of internal areas should occur during the 100-year storm 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 near internal floor levels and the flood waters should be contained within the site. In addition, the top water level in all attenuation tanks during the 100-year storm must be at least 500mm below near internal floor levels. Consideration should also be given to flooding of the receiving public system or watercourse outside the site during the 100-year event and all internal floor levels should be at least 500mm above the recorded levels for the receiving system for the 100-year event.

No flooding occurs within the surface water network and the maximum levels of water within the attenuation tanks will be 0.5m lower than the nearest lowest FFL. Refer to Causeway Flow calculations in Appendix 2. This leads to the conclusion that there is sufficient distance between the lowest internal floor level and surface water falling during a 1 in 100-year storm event.

3.3.5 Criterion 4 GDSDS – River Flood Protection– Long Term Storage or Extended Attenuation

3.3.5.1.1 Calculation of Long -Term Storage Volume

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 100-year storm to QBAR or a discharge of 2l/s 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 Computer Output given in Appendix 2 the rate of outflow from underground modular attenuation system 2 does not exceed 26.7l/s during the 100 year storm event which is less than the calculated QBAR for the total phase 1 and phase 2 areas.

4. FOUL DRAINAGE SYSTEM

4.1 PREVIOUS CORRESPONDENCE WITH UISCÉ ÉIREANN

Under the previously granted planning permission (ABP Case Reference 307100-20), it was proposed to discharge to the 225mm diameter foul sewer located within the Crodaun Forest Park housing development to the east of the proposed development.

A Statement of Design Acceptance (SODA) and a Confirmation of Feasibility (COF) were received from Uisce Éireann (UÉ) in March 2020 for a development of up to 491 residential units. However, the proposed scheme is for only 466 units which is less than the 491 figures confirmed feasible by UÉ.

A Self-Lay Connection Offer (Ref. CDS2000732301) for 192 units of Phase 1 of the development was received from UÉ on 12 August 2022. Listed in Appendix 3 Special Conditions – Part 1 of this connection offer, is a requirement to limit the discharge from the development to 5.94l/s in advance of Uisce Éireann Upgrade Works in the area (Crodaun Sewer Project).

A Confirmation of Feasibility (COF) was received from Uisce Éireann (UÉ) on 11th July 2025 for Phase 2 of the development of up to 240 residential units. See Appendix 4. The COF noted the requirement for upgrade works to the local network to be complete prior to a connection. Uisce Éireann is currently in the process of planning a project which will provide the necessary upgrade and capacity. However, the COF also notes that a “Connection to the network could be facilitated prior to completion of the upgrade project provided the Applicant installs a new WWPS to cater for the site with 24 hour storage and downstream flow control for any connection before the completion of the upgrade project”.

4.2 APPROVED OUTFALL LOCATION

As noted above, under the previously granted planning permission (ABP Case Reference 307100-20), it was proposed to discharge to the 225mm diameter foul sewer located within the Crodaun Forest Park housing development to the east of the proposed development.

The invert level of the existing manhole at the proposed connection point at Crodaun Forest Park is +64.830mOD. There is also an existing 375mm storm water sewer to the east of this foul line with an invert level of +64.830mOD.



Figure 4.1 – Extract from Uisce Éireann Maps

4.3 KEY POINTS

In order to achieve the minimum required clearance of 300mm over the storm water line and connect into the existing foul line, a backdrop manhole will need to be provided to allow the proposed foul line from the development to cross over the existing storm water line. The minimum invert level of the foul pipe at the cross over point will need to be +65.505mOD. This level is higher than the outfall level from the proposed development indicated at planning stage and on the drawing contained within the connection offer (Ref. CDS2000732301). Due to the levels on site, it is not possible to achieve a gravity connection to the foul line at the proposed outfall location while maintaining the minimum level of +65.505mOD at the storm water line cross over point.

An extensive review of the existing storm water sewer line and the foul water sewer line running along Maynooth Road (R405) and into the Crodaun Forest Park development has been undertaken to assess the viability of other connection points to the existing foul water sewer. However, due to the proximity and invert level of the existing storm water sewer which runs parallel to the existing foul water sewer, it is not possible to achieve a gravity connection from the proposed development to the existing foul line at an alternative location.

4.4 PROPOSED SOLUTION

It is therefore proposed, to provide a permanent pumping station in accordance with the Uisce Éireann Code of Practice for Wastewater Infrastructure within the development. This will allow foul flows from the development to be pumped to an appropriate level to an outfall manhole within the development. Foul flows will then discharge by gravity from the outfall manhole to a backdrop manhole and connect to the existing foul sewer line at the approved connection location at the junction to the Crodaun Forest Park development while achieving the minimum required clearance distance to the existing storm water line. See Figure 5.1 below.

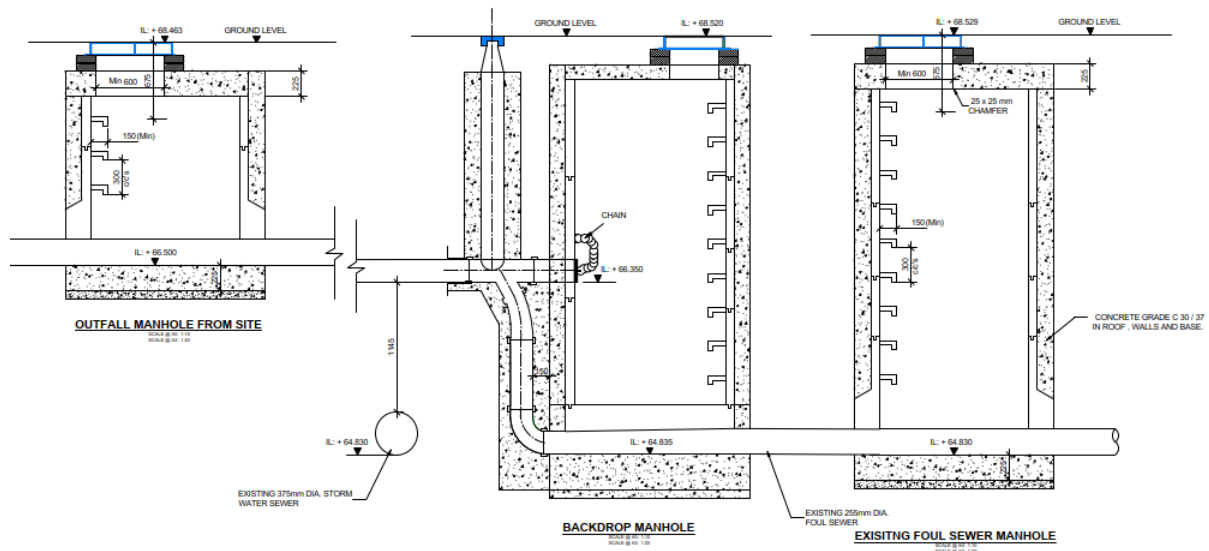


Figure 4.2: Proposed connection detail to the existing foul sewer

The pumping station will address the requirements listed in Appendix 3 Special Conditions – Part 1 of the Self-Lay Connection Offer (Ref. CDS2000732301) by limiting the discharge from the development to 5.94l/s. The proposed pumping station will also meet the requirements to facilitate a connection to the network for Phase 2 of the development prior to the completion of the upgrade works to the local network as outlined in the COF received for Phase 2 of the development (CDS25001161).

The storage tank has been designed to accommodate flows from the entire development (466 units) in accordance with the Uisce Éireann Code of Practice for Wastewater Infrastructure while limiting the discharge from the development to 5.94l/s. See Appendix 3 for calculations.

Please refer to attached drawings KWW-BMD-00-XX-DR-C-13230 and KWW-BMD-00-XX-DR-C-13231 for the proposed pumping station layout and details and drawing KWW-BMD-00-XX-DR-C-13232 for the outfall detail.

5. WATER SUPPLY

5.1 EXISTING WATER SUPPLY INFRASTRUCTURE

There is an existing 300mm diameter uPVC watermain running along the Maynooth Road (R405) along the eastern boundary of the proposed development.

5.2 PROPOSED WATER SUPPLY SYSTEM

In accordance with the previously granted planning permission (ref. 20307100), it is proposed to connect to the existing 300mm diameter uPVC watermain running along the Maynooth Road (R405) along the eastern boundary of the proposed development.

A Statement of Design Acceptance (SODA) and a Confirmation of Feasibility (COF) were received from Uisce Éireann (UÉ) in March 2020 for a development of up to 491 residential units. The proposed scheme, with the amended Phase 2 design, is for only 466 units which is less than the 491 figure confirmed feasible by UÉ.

The watermain design will be in accordance with the previously granted planning permission (ref. 20307100).

A Confirmation of Feasibility (COF) was also received from Uisce Éireann (UÉ) on 11th July 2025 for Phase 2 of the development of up to 240 residential units. See Appendix 4.

APPENDIX 1

DRAINED AREA SUMMARY

APPENDIX 2

SURFACE WATER “FLOW” DRAINAGE CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	16.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.278	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	0.055	4.00	69.539	1200	99.953	80.800	1.425
S1.1	0.013	4.00	69.363	1200	82.576	75.976	1.474
S1.2	0.005	4.00	69.363	1200	72.824	68.299	1.597
S1.3	0.015	4.00	68.997	1200	59.233	49.417	1.462
S1.4	0.083	4.00	68.890	1200	55.498	38.005	1.474
S1.5	0.029	4.00	68.600	1350	57.729	-13.661	2.270
S1.6	0.071	4.00	68.262	1350	55.550	-35.084	2.128
S1.7	0.075	4.00	68.600	1500	55.654	-78.969	3.141
S1.8	0.010	4.00	67.628	1800	56.484	-137.534	2.439
Tank (Big)	0.000		67.650	2100	44.816	-171.669	2.564
S1.9	0.000		67.000	1200	17.089	-198.385	1.991
S1.10	0.000		66.278	1200	-7.483	-255.497	1.447
OUT	0.000		66.472	1200	-15.952	-257.113	1.666
Greenway	0.532	4.00	67.600		40.340	-95.631	1.575
S2.0	0.216	4.00	69.002	1200	138.564	-13.678	1.500
S2.1	0.070	4.00	68.690	1200	98.158	-14.096	1.720
S3.0	0.152	4.00	69.070	1200	163.015	-16.164	1.425
S3.1	0.023	4.00	69.087	1200	162.928	-57.095	2.633
S3.2	0.029	4.00	68.883	1200	162.973	-75.205	2.520
S3.3	0.146	4.00	68.884	1350	152.521	-79.034	2.652
S3.4	0.093	4.00	68.409	1350	104.093	-78.944	2.419
S4.0	0.211	4.00	68.117	1500	142.267	-144.903	1.799
S4.1	0.023	4.00	67.701	1500	71.117	-146.001	1.739
S5.0	0.027	4.00	68.942	1200	169.895	-78.793	1.425
S5.1	0.186	4.00	69.127	1200	191.730	-78.669	1.903
S5.4	0.176	4.00	68.509	1500	191.151	-144.256	1.947
S6.0	0.109	4.00	69.413	1200	122.881	76.569	1.425
S6.1	0.195	4.00	69.557	1350	189.858	39.914	2.368
S6.2	0.009	4.00	69.257	1500	190.360	-18.705	2.541
S6.3	0.000		69.000	1500	191.088	-22.079	2.376
Tank (Lil)	0.072	4.00	69.000	1500	190.416	-48.515	2.450
S7.0	0.013	4.00	70.007	1200	295.228	10.000	1.457
S7.1	0.130	4.00	70.154	1200	246.585	23.209	2.062
S8.0	0.225	4.00	70.500	1350	385.724	-7.046	1.575
S8.1	0.065	4.00	69.935	1350	385.620	-80.349	1.575
S8.2	0.177	4.00	70.390	1350	317.323	-80.349	2.485
S8.3	0.080	4.00	69.894	1350	258.178	-80.006	2.360

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S8.4	0.150	4.00	69.417	1350	217.642	-79.396	2.086
S8.6	0.007	4.00	69.448	1350	217.490	-22.501	2.401
S8.7	0.015	4.00	69.397	1350	211.160	-15.789	2.396
S9.0	0.243	4.00	70.321	1200	316.137	-72.425	1.500
S9.1	0.067	4.00	69.957	1350	316.249	-14.904	1.815
S9.2	0.082	4.00	69.849	1350	267.478	-15.165	1.978
S10.0	0.100	4.00	69.893	1200	316.190	2.658	1.425
S11.0	0.124	4.00	69.851	1200	385.462	-93.261	1.500
S11.1	0.012	4.00	69.574	1200	385.690	-130.771	1.510
S11.2	0.012	4.00	69.621	1200	380.724	-141.488	1.635
S11.3	0.083	4.00	69.662	1200	370.948	-146.166	1.746
S11.4	0.061	4.00	69.750	1200	338.666	-146.530	2.040
S11.5	0.000	4.00	69.510	1200	338.908	-158.394	1.853
S11.6	0.000	4.00	69.023	1350	298.553	-187.894	1.743
S11.7	0.013	4.00	69.158	1350	298.583	-212.602	2.399
S11.8	0.000	4.00	69.233	1350	287.419	-219.882	2.541
S11.9	0.000	4.00	69.081	1350	242.184	-219.430	2.615
S11.10	0.005	4.00	69.059	1350	237.373	-215.810	2.623
S11.11	0.000	4.00	69.067	1500	238.320	-207.031	2.765
S11.12	0.000	4.00	68.514	1500	192.651	-206.566	2.395
S11.13	0.008	4.00	68.355	1500	129.930	-206.731	2.535
S11.14	0.000	4.00	68.373	1500	129.016	-219.362	2.598
S11.15	0.010	4.00	68.733	1500	68.385	-219.675	3.160
S11.16	0.000		68.692	1500	68.208	-200.624	3.183
S12.0	0.126	4.00	70.246	1200	316.085	-91.935	1.500
S12.1	0.124	4.00	69.670	1350	316.631	-146.208	1.677
S12.2	0.282	4.00	69.200	1350	268.191	-145.687	1.691
S13.0	0.048	4.00	68.760	1200	346.682	-206.658	1.425
S13.1	0.009	4.00	68.798	1200	334.422	-195.831	1.572
S14.0	0.009	4.00	69.164	1200	238.199	-188.990	1.389
S15.0	0.056	4.00	68.397	1200	192.428	-238.093	1.500
S16.0	0.010	4.00	68.195	1200	129.448	-189.707	1.483
S17.0	0.000	4.00	68.663	1200	67.952	-190.580	1.563
Detention Basin 1	0.315	4.00	69.550		317.222	-161.510	2.078
Detention Basin 2			69.450		315.458	-202.810	2.411
C1	0.027	10.00	69.670		319.273	-149.993	0.300
C2	0.017	10.00	69.510		334.357	-162.825	0.300
C3	0.018	10.00	69.400		328.858	-178.432	0.300
C4	0.019	10.00	69.447		312.517	-183.879	0.647
C5	0.025	10.00	69.510		345.513	-164.972	0.510
C6	0.025	10.00	69.400		339.228	-183.303	0.515
C7	0.021	10.00	69.340		313.564	-195.088	0.350

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
C8	0.016	10.00	69.970		302.251	-161.306	0.350
C9	0.019	10.00	69.960		302.379	-172.444	0.396
C10	0.088	10.00	69.441		287.953	-185.503	0.300
C11	0.038	10.00	69.380		302.703	-207.254	0.300
C12	0.099	10.00	69.207		245.477	-209.438	0.300
C13	0.120	10.00	69.137		244.534	-224.418	0.300
C14	0.090	10.00	68.500		200.696	-211.429	0.300
C15	0.096	10.00	68.600		201.901	-198.073	0.300
C16	0.098	10.00	69.400		227.460	-153.764	0.400
C17	0.099	10.00	69.500		243.517	-186.133	0.875
C18	0.167	10.00	68.230		149.510	-211.109	0.400
C19	0.125	10.00	68.140		136.162	-197.866	0.300
C20	0.125	10.00	68.300		135.088	-153.467	0.400
C21	0.092	10.00	68.140		121.745	-186.210	0.449
C22	0.188	10.00	69.000		75.966	-223.631	0.400
C23	0.106	10.00	69.000		78.343	-210.518	0.350
C24	0.085	10.00	68.980		76.273	-186.670	0.350
C25	0.201	10.00	69.000		63.640	-209.045	0.500
Apartment A	0.080	10.00	80.000		360.936	-176.174	1.350
Downpipe A			80.000	100	353.511	-165.732	10.600
Apartment B	0.081	10.00	80.000		316.146	-227.555	1.350
Downpipe B			80.000	100	322.645	-215.305	12.250

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)	Design Flow (l/s)
7.000	S1.0	S1.1	18.034	0.600	68.114	67.889	0.225	80.0	225	4.21	50.0	
7.001	S1.1	S1.2	12.411	0.600	67.889	67.766	0.123	100.6	225	4.36	50.0	
7.002	S1.2	S1.3	23.265	0.600	67.766	67.535	0.231	100.8	225	4.66	50.0	
7.003	S1.3	S1.4	12.008	0.600	67.535	67.416	0.119	100.7	225	4.82	50.0	
7.004	S1.4	S1.5	51.714	0.600	67.416	66.899	0.517	100.0	225	5.48	50.0	
7.005	S1.5	S1.6	21.534	0.600	66.330	66.134	0.196	110.0	375	5.68	50.0	
7.006	S1.6	S1.7	43.885	0.600	66.134	65.841	0.293	150.0	375	6.18	50.0	
1.014	S1.7	S1.8	58.571	0.600	65.459	65.264	0.195	300.0	675	11.07	42.9	
1.015	S1.8	Tank (Big)	36.074	0.600	65.189	65.086	0.103	350.0	750	11.47	42.2	
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)			
7.000	1.463	58.2	9.9	1.200	1.249	0.055	0.0	63	1.100			
7.001	1.303	51.8	12.3	1.249	1.372	0.068	0.0	74	1.071			
7.002	1.302	51.8	13.2	1.372	1.237	0.073	0.0	77	1.090			
7.003	1.303	51.8	15.9	1.237	1.249	0.088	0.0	86	1.151			
7.004	1.307	52.0	30.9	1.249	1.476	0.171	0.0	125	1.363			
7.005	1.727	190.7	87.8	1.895	1.753	0.486	0.0	178	1.691			
7.006	1.477	163.1	100.6	1.753	2.384	0.557	0.0	214	1.551			
1.014	1.508	539.5	436.7	2.466	1.689	2.814	0.0	463	1.669			
1.015	1.490	658.2	511.8	1.689	1.814	3.356	0.0	500	1.638			

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)	Design Flow (l/s)
1.016	Tank (Big)	S1.9	38.504	0.600	65.086	65.009	0.077	500.0	300	15.89	35.8	26.7
1.017	S1.9	S1.10	62.174	0.600	65.009	64.831	0.178	350.0	300	17.13	34.4	26.7
1.018	S1.10	OUT	8.622	0.600	64.831	64.806	0.025	350.0	300	17.30	34.2	26.7
9.000	Greenway	S1.8	44.905	0.600	66.025	65.800	0.225	200.0	375	4.59	50.0	
8.000	S2.0	S2.1	40.408	0.600	67.502	66.970	0.532	76.0	300	4.37	50.0	
8.001	S2.1	S1.5	40.431	0.600	66.970	66.392	0.578	70.0	300	4.73	50.0	
6.000	S3.0	S3.1	40.931	0.600	67.645	67.372	0.273	150.0	225	4.64	50.0	
1.010	S3.1	S3.2	18.110	0.600	66.454	66.363	0.091	200.0	300	8.97	47.4	20.0
1.011	S3.2	S3.3	11.131	0.600	66.363	66.307	0.056	200.0	300	9.14	47.0	25.0
1.012	S3.3	S3.4	48.428	0.600	66.232	65.990	0.242	200.0	375	9.77	45.5	90.0
1.013	S3.4	S1.7	48.439	0.600	65.990	65.759	0.231	210.0	375	10.42	44.2	107.0
35.004	S4.0	S4.1	71.158	0.600	66.318	65.962	0.356	200.0	525	7.00	50.0	
35.005	S4.1	Tank (Big)	36.750	0.600	65.962	65.778	0.184	200.0	525	7.39	50.0	
36.000	S5.0	S5.1	21.835	0.600	67.517	67.299	0.218	100.0	225	4.28	50.0	
36.001	S5.1	S5.4	65.590	0.600	67.224	66.787	0.437	150.0	300	5.13	50.0	
35.003	S5.4	S4.0	48.888	0.600	66.562	66.318	0.244	200.0	525	6.25	50.0	
5.000	S6.0	S6.1	76.351	0.600	67.988	67.606	0.382	200.0	225	5.38	50.0	
4.002	S6.1	S6.2	58.621	0.600	67.189	66.896	0.293	200.0	375	6.36	50.0	
1.007	S6.2	S6.3	3.452	0.600	66.716	66.699	0.017	200.0	525	7.76	50.0	
1.008	S6.3	Tank (Lil)	26.445	0.600	66.624	66.571	0.053	500.0	600	8.17	49.4	
4.000	S7.0	S7.1	50.405	0.600	68.550	68.092	0.458	110.0	225	4.67	50.0	
4.001	S7.1	S6.1	59.136	0.600	68.092	67.698	0.394	150.0	225	5.60	50.0	
1.000	S8.0	S8.1	73.303	0.600	68.925	68.360	0.565	129.7	375	4.77	50.0	
1.001	S8.1	S8.2	68.297	0.600	68.360	67.905	0.455	150.0	375	5.54	50.0	

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.016	0.696	49.2	26.7	2.264	1.691	7.451	0.0	157	0.710
1.017	0.834	59.0	26.7	1.691	1.147	7.451	0.0	142	0.814
1.018	0.834	59.0	26.7	1.147	1.366	7.451	0.0	142	0.814
9.000	1.277	141.1	96.1	1.200	1.453	0.532	0.0	227	1.370
8.000	1.805	127.6	39.0	1.200	1.420	0.216	0.0	113	1.591
8.001	1.881	133.0	51.7	1.420	1.908	0.286	0.0	130	1.768
6.000	1.065	42.3	27.5	1.200	1.490	0.152	0.0	132	1.132
1.010	1.108	78.3	20.0	2.333	2.220	1.914	0.0	103	0.930
1.011	1.108	78.3	25.0	2.220	2.277	1.943	0.0	116	0.988
1.012	1.277	141.1	90.0	2.277	2.044	2.089	0.0	218	1.351
1.013	1.246	137.6	107.0	2.044	2.466	2.182	0.0	249	1.372
35.004	1.580	342.0	204.6	1.274	1.214	1.132	0.0	293	1.647
35.005	1.580	342.0	208.7	1.214	1.347	1.155	0.0	297	1.654
36.000	1.307	52.0	4.9	1.200	1.603	0.027	0.0	46	0.824
36.001	1.281	90.6	38.5	1.603	1.422	0.213	0.0	136	1.230
35.003	1.580	342.0	166.4	1.422	1.274	0.921	0.0	258	1.569
5.000	0.921	36.6	19.7	1.200	1.726	0.109	0.0	117	0.936
4.002	1.277	141.1	80.8	1.993	1.986	0.447	0.0	203	1.318
1.007	1.580	342.0	301.2	2.016	1.776	1.667	0.0	385	1.772
1.008	1.082	305.9	297.5	1.776	1.829	1.667	0.0	481	1.224
4.000	1.246	49.5	2.3	1.232	1.837	0.013	0.0	33	0.640
4.001	1.065	42.3	25.8	1.837	1.634	0.143	0.0	127	1.116
1.000	1.589	175.5	40.7	1.200	1.200	0.225	0.0	122	1.300
1.001	1.477	163.1	52.4	1.200	2.110	0.290	0.0	145	1.319

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)	Design Flow (l/s)
10.003	S11.3	S11.4	32.284	0.600	67.916	67.710	0.206	156.7	300	5.18	50.0	
10.004	S11.4	S11.5	11.866	0.600	67.710	67.657	0.053	225.0	300	5.37	50.0	
10.005	S11.5	Detention Basin 1	21.909	0.600	67.657	67.547	0.110	200.0	300	5.70	50.0	
17.003	C6	S13.1	13.418	0.600	68.885	68.214	0.671	20.0	225	10.67	43.7	
10.007	S11.6	S11.7	24.708	0.600	67.280	67.115	0.165	150.0	375	10.89	43.3	
10.008	S11.7	S11.8	13.328	0.600	66.759	66.692	0.067	200.0	450	11.42	42.3	
10.009	S11.8	S11.9	45.237	0.600	66.692	66.466	0.226	200.0	450	11.95	41.4	
10.010	S11.9	S11.10	6.021	0.600	66.466	66.436	0.030	200.0	450	12.02	41.2	
10.011	S11.10	S11.11	8.830	0.600	66.436	66.377	0.059	150.0	450	12.11	41.1	
10.012	S11.11	S11.12	45.671	0.600	66.302	66.119	0.183	250.0	525	12.65	40.2	
10.013	S11.12	S11.13	62.721	0.600	66.119	65.895	0.224	280.0	525	13.43	39.0	
10.014	S11.13	S11.14	12.664	0.600	65.820	65.775	0.045	280.0	600	13.58	38.8	
10.015	S11.14	S11.15	60.632	0.600	65.775	65.573	0.202	300.0	600	14.30	37.8	
10.016	S11.15	S11.16	19.052	0.600	65.573	65.509	0.064	300.0	600	14.53	37.5	
10.017	S11.16	Tank (Big)	37.223	0.600	65.509	65.385	0.124	300.0	600	14.97	36.9	
14.000	C1	Detention Basin 1	11.698	0.600	69.370	68.785	0.585	20.0	225	10.07	44.9	
13.000	C2	Detention Basin 1	17.185	0.600	69.210	68.351	0.859	20.0	225	10.10	44.8	
12.000	C3	Detention Basin 1	20.537	0.600	69.100	68.073	1.027	20.0	225	10.12	44.8	
11.000	C4	Detention Basin 1	22.858	0.600	68.800	68.400	0.400	57.1	225	10.22	44.6	
15.000	C8	C9	11.139	0.600	69.620	69.564	0.056	200.0	225	10.20	44.6	
15.001	C9	S11.6	15.917	0.600	69.564	68.503	1.061	15.0	225	10.28	44.5	
16.000	C10	S11.6	10.866	0.600	69.141	68.598	0.543	20.0	225	10.06	44.9	
17.002	C5	C6	19.379	0.600	69.000	68.885	0.115	168.5	225	10.59	43.8	

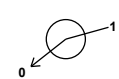
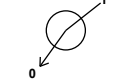
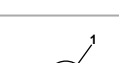
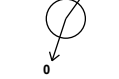
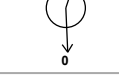
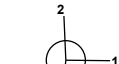
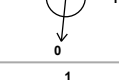
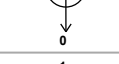
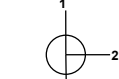
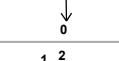
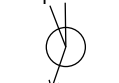
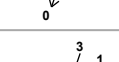
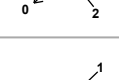
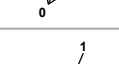
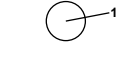
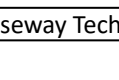
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
10.003	1.253	88.6	41.7	1.446	1.740	0.231	0.0	145	1.236
10.004	1.044	73.8	52.8	1.740	1.553	0.292	0.0	188	1.131
10.005	1.108	78.3	52.8	1.553	1.703	0.292	0.0	181	1.186
17.003	2.939	116.8	20.5	0.290	0.359	0.130	0.0	64	2.229
10.007	1.477	163.1	126.8	1.368	1.668	0.811	0.0	249	1.625
10.008	1.434	228.0	175.9	1.949	2.091	1.151	0.0	298	1.575
10.009	1.434	228.0	172.1	2.091	2.165	1.151	0.0	293	1.569
10.010	1.434	228.0	189.5	2.165	2.173	1.271	0.0	315	1.595
10.011	1.657	263.6	189.5	2.173	2.240	1.276	0.0	283	1.797
10.012	1.412	305.6	229.8	2.240	1.870	1.581	0.0	341	1.543
10.013	1.333	288.6	257.1	1.870	1.935	1.823	0.0	388	1.498
10.014	1.450	410.0	329.7	1.935	1.998	2.350	0.0	409	1.604
10.015	1.400	396.0	321.1	1.998	2.560	2.350	0.0	412	1.551
10.016	1.400	396.0	345.4	2.560	2.583	2.548	0.0	436	1.568
10.017	1.400	396.0	392.4	2.583	1.665	2.940	0.0	491	1.584
14.000	2.939	116.8	4.4	0.075	0.540	0.027	0.0	29	1.415
13.000	2.939	116.8	2.8	0.075	0.974	0.017	0.0	23	1.220
12.000	2.939	116.8	2.9	0.075	1.252	0.018	0.0	24	1.249
11.000	1.733	68.9	3.1	0.422	0.925	0.019	0.0	32	0.878
15.000	0.921	36.6	2.6	0.125	0.171	0.016	0.0	40	0.531
15.001	3.395	135.0	5.6	0.171	0.295	0.035	0.0	31	1.696
16.000	2.939	116.8	14.3	0.075	0.200	0.088	0.0	53	2.016
17.002	1.004	39.9	16.6	0.285	0.290	0.105	0.0	102	0.961

Links

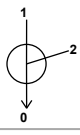
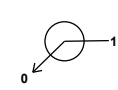
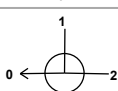
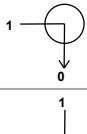
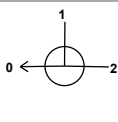
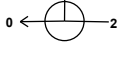
Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)	Design Flow (l/s)
20.000	C7	Detention Basin 2	7.951	0.600	68.990	68.592	0.398	20.0	225	10.05	45.0	
21.000	C11	S11.7	6.751	0.600	69.080	68.742	0.338	20.0	225	10.04	45.0	
22.000	C13	S11.9	5.514	0.600	68.837	68.561	0.276	20.0	150	10.04	45.0	
24.000	C12	S11.11	7.551	0.600	68.907	68.529	0.378	20.0	150	10.06	44.9	
23.001	C17	S14.0	6.037	0.600	68.625	68.589	0.036	167.7	225	10.76	43.5	
23.000	C16	C17	36.133	0.600	69.000	68.700	0.300	120.4	150	10.66	43.7	
26.000	C15	S11.12	12.558	0.600	68.300	68.175	0.125	100.5	225	10.16	44.7	
27.000	C14	S11.12	9.401	0.600	68.200	68.106	0.094	100.0	225	10.12	44.8	
29.000	C18	S11.13	20.063	0.600	67.830	67.629	0.201	100.0	225	10.26	44.5	
30.000	C19	S11.13	10.836	0.600	67.840	67.775	0.065	166.7	225	10.18	44.7	
28.000	C20	C21	35.357	0.600	67.900	67.691	0.209	169.2	225	10.59	43.9	
28.001	C21	S16.0	8.460	0.600	67.691	67.606	0.085	100.0	225	10.70	43.6	
34.000	C25	S11.16	9.580	0.600	68.500	68.260	0.240	40.0	225	10.08	44.9	
31.000	C22	S11.15	8.551	0.600	68.600	68.315	0.285	30.0	150	10.08	44.9	
33.000	C23	S11.16	14.164	0.600	68.650	68.178	0.472	30.0	150	10.13	44.8	
32.000	C24	S17.0	9.194	0.600	68.630	68.170	0.460	20.0	225	10.05	44.9	
19.000	Apartment B	Downpipe B	13.867	0.600	78.650	78.512	0.138	100.5	150	10.23	44.6	
19.001	Downpipe B	Detention Basin 2	14.415	0.600	67.750	67.654	0.096	150.0	150	10.52	44.0	
17.000	Apartment A	Downpipe A	12.813	0.600	78.650	78.512	0.138	92.8	150	10.20	44.6	
17.001	Downpipe A	C5	8.034	0.600	69.400	69.075	0.325	24.7	150	10.27	44.5	

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)
20.000	2.939	116.8	3.4	0.125	0.633	0.021	0.0	26	1.306
21.000	2.939	116.8	6.2	0.075	0.191	0.038	0.0	35	1.567
22.000	2.262	40.0	19.5	0.150	0.370	0.120	0.0	74	2.251
24.000	2.262	40.0	16.1	0.150	0.388	0.099	0.0	66	2.138
23.001	1.007	40.0	31.0	0.650	0.350	0.197	0.0	149	1.108
23.000	0.914	16.2	15.5	0.250	0.650	0.098	0.0	118	1.038
26.000	1.304	51.9	15.5	0.075	0.114	0.096	0.0	84	1.141
27.000	1.307	52.0	14.6	0.075	0.183	0.090	0.0	81	1.125
29.000	1.307	52.0	26.9	0.175	0.501	0.167	0.0	115	1.317
30.000	1.010	40.1	20.2	0.075	0.355	0.125	0.0	113	1.011
28.000	1.002	39.8	19.8	0.175	0.224	0.125	0.0	112	1.001
28.001	1.307	52.0	34.2	0.224	0.364	0.217	0.0	133	1.392
34.000	2.074	82.5	32.6	0.275	0.207	0.201	0.0	98	1.954
31.000	1.845	32.6	30.5	0.250	0.268	0.188	0.0	116	2.090
33.000	1.845	32.6	17.2	0.200	0.364	0.106	0.0	77	1.865
32.000	2.939	116.8	13.8	0.125	0.268	0.085	0.0	52	1.997
19.000	1.002	17.7	13.0	1.200	1.338	0.081	0.0	96	1.094
19.001	0.818	14.5	12.9	12.100	1.646	0.081	0.0	110	0.922
17.000	1.043	18.4	12.9	1.200	1.338	0.080	0.0	92	1.126
17.001	2.033	35.9	12.9	10.450	0.285	0.080	0.0	62	1.865

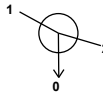
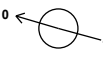
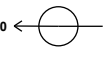
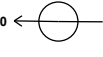
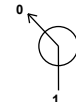
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S1.0	99.953	80.800	69.539	1.425	1200		0	7.000	68.114	225
S1.1	82.576	75.976	69.363	1.474	1200		1	7.000	67.889	225
							0	7.001	67.889	225
S1.2	72.824	68.299	69.363	1.597	1200		1	7.001	67.766	225
							0	7.002	67.766	225
S1.3	59.233	49.417	68.997	1.462	1200		1	7.002	67.535	225
							0	7.003	67.535	225
S1.4	55.498	38.005	68.890	1.474	1200		1	7.003	67.416	225
							0	7.004	67.416	225
S1.5	57.729	-13.661	68.600	2.270	1350		1	8.001	66.392	300
							2	7.004	66.899	225
							0	7.005	66.330	375
S1.6	55.550	-35.084	68.262	2.128	1350		1	7.005	66.134	375
							0	7.006	66.134	375
S1.7	55.654	-78.969	68.600	3.141	1500		1	7.006	65.841	375
							2	1.013	65.759	375
							0	1.014	65.459	675
S1.8	56.484	-137.534	67.628	2.439	1800		1	9.000	65.800	375
							2	1.014	65.264	675
							0	1.015	65.189	750
Tank (Big)	44.816	-171.669	67.650	2.564	2100		1	35.005	65.778	525
							2	10.017	65.385	600
							3	1.015	65.086	750
							0	1.016	65.086	300
S1.9	17.089	-198.385	67.000	1.991	1200		1	1.016	65.009	300
							0	1.017	65.009	300
S1.10	-7.483	-255.497	66.278	1.447	1200		1	1.017	64.831	300
							0	1.018	64.831	300
OUT	-15.952	-257.113	66.472	1.666	1200		1	1.018	64.806	300

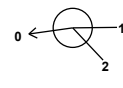
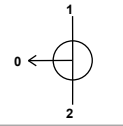
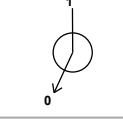
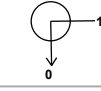
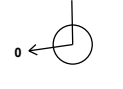
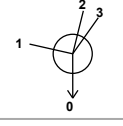
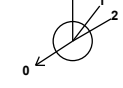
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
Greenway	40.340	-95.631	67.600	1.575			0	9.000	66.025	375
S2.0	138.564	-13.678	69.002	1.500	1200		0	8.000	67.502	300
S2.1	98.158	-14.096	68.690	1.720	1200		1	8.000	66.970	300
							0	8.001	66.970	300
S3.0	163.015	-16.164	69.070	1.425	1200		0	6.000	67.645	225
S3.1	162.928	-57.095	69.087	2.633	1200		1	6.000	67.372	225
							2	1.009	66.454	300
							0	1.010	66.454	300
S3.2	162.973	-75.205	68.883	2.520	1200		1	1.010	66.363	300
							0	1.011	66.363	300
S3.3	152.521	-79.034	68.884	2.652	1350		1	1.011	66.307	300
							0	1.012	66.232	375
S3.4	104.093	-78.944	68.409	2.419	1350		1	1.012	65.990	375
							0	1.013	65.990	375
S4.0	142.267	-144.903	68.117	1.799	1500		1	35.003	66.318	525
							0	35.004	66.318	525
S4.1	71.117	-146.001	67.701	1.739	1500		1	35.004	65.962	525
							0	35.005	65.962	525
S5.0	169.895	-78.793	68.942	1.425	1200		0	36.000	67.517	225
S5.1	191.730	-78.669	69.127	1.903	1200		1	36.000	67.299	225
							0	36.001	67.224	300
S5.4	191.151	-144.256	68.509	1.947	1500		1	36.001	66.787	300
							2	35.002	66.867	375
							0	35.003	66.562	525

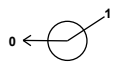
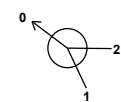
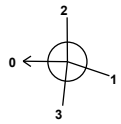
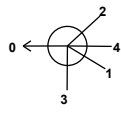
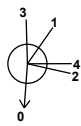
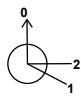
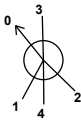
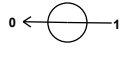
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S6.0	122.881	76.569	69.413	1.425	1200		0	5.000	67.988	225
S6.1	189.858	39.914	69.557	2.368	1350		1	5.000	67.606	225
							2	4.001	67.698	225
							0	4.002	67.189	375
S6.2	190.360	-18.705	69.257	2.541	1500		1	4.002	66.896	375
							2	1.006	66.791	450
							0	1.007	66.716	525
S6.3	191.088	-22.079	69.000	2.376	1500		1	1.007	66.699	525
							0	1.008	66.624	600
Tank (Lil)	190.416	-48.515	69.000	2.450	1500		1	1.008	66.571	600
							0	1.009	66.550	300
S7.0	295.228	10.000	70.007	1.457	1200		0	4.000	68.550	225
S7.1	246.585	23.209	70.154	2.062	1200		1	4.000	68.092	225
							0	4.001	68.092	225
S8.0	385.724	-7.046	70.500	1.575	1350		0	1.000	68.925	375
S8.1	385.620	-80.349	69.935	1.575	1350		1	1.000	68.360	375
							0	1.001	68.360	375
S8.2	317.323	-80.349	70.390	2.485	1350		1	1.001	67.905	375
							0	1.002	67.905	375
S8.3	258.178	-80.006	69.894	2.360	1350		1	1.002	67.609	375
							0	1.003	67.534	450
S8.4	217.642	-79.396	69.417	2.086	1350		1	1.003	67.331	450
							0	1.004	67.331	450
S8.6	217.490	-22.501	69.448	2.401	1350		1	1.004	67.047	450
							0	1.005	67.047	450

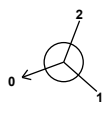
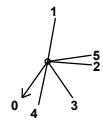
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S8.7	211.160	-15.789	69.397	2.396	1350		1	2.002	67.589	375
						2	1.005	67.001	450	
						0	1.006	67.001	450	
S9.0	316.137	-72.425	70.321	1.500	1200		0	2.000	68.821	300
S9.1	316.249	-14.904	69.957	1.815	1350		1	3.000	68.292	225
						2	2.000	68.246	300	
						0	2.001	68.142	375	
S9.2	267.478	-15.165	69.849	1.978	1350		1	2.001	67.871	375
						0	2.002	67.871	375	
S10.0	316.190	2.658	69.893	1.425	1200		0	3.000	68.468	225
S11.0	385.462	-93.261	69.851	1.500	1200		0	10.000	68.351	300
S11.1	385.690	-130.771	69.574	1.510	1200		1	10.000	68.064	300
						0	10.001	68.064	300	
S11.2	380.724	-141.488	69.621	1.635	1200		1	10.001	67.986	300
						0	10.002	67.986	300	
S11.3	370.948	-146.166	69.662	1.746	1200		1	10.002	67.916	300
						0	10.003	67.916	300	
S11.4	338.666	-146.530	69.750	2.040	1200		1	10.003	67.710	300
						0	10.004	67.710	300	
S11.5	338.908	-158.394	69.510	1.853	1200		1	10.004	67.657	300
						0	10.005	67.657	300	
S11.6	298.553	-187.894	69.023	1.743	1350		1	16.000	68.598	225
						2	15.001	68.503	225	
						3	10.006	67.280	375	
						0	10.007	67.280	375	
S11.7	298.583	-212.602	69.158	2.399	1350		1	21.000	68.742	225
						2	17.005	66.909	300	
						3	10.007	67.115	375	
						0	10.008	66.759	450	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S11.8	287.419	-219.882	69.233	2.541	1350	 1	10.008	66.692	450
						0	10.009	66.692	450
S11.9	242.184	-219.430	69.081	2.615	1350	 1	22.000	68.561	150
						2	10.009	66.466	450
						0	10.010	66.466	450
S11.10	237.373	-215.810	69.059	2.623	1350	 1	10.010	66.436	450
						0	10.011	66.436	450
S11.11	238.320	-207.031	69.067	2.765	1500	 1	24.000	68.529	150
						2	23.002	67.665	225
						3	10.011	66.377	450
						0	10.012	66.302	525
S11.12	192.651	-206.566	68.514	2.395	1500	 1	27.000	68.106	225
						2	26.000	68.175	225
						3	25.000	66.582	300
						4	10.012	66.119	525
						0	10.013	66.119	525
S11.13	129.930	-206.731	68.355	2.535	1500	 1	30.000	67.775	225
						2	29.000	67.629	225
						3	28.002	66.499	225
						4	10.013	65.895	525
						0	10.014	65.820	600
S11.14	129.016	-219.362	68.373	2.598	1500	 1	10.014	65.775	600
						0	10.015	65.775	600
S11.15	68.385	-219.675	68.733	3.160	1500	 1	31.000	68.315	150
						2	10.015	65.573	600
						0	10.016	65.573	600
S11.16	68.208	-200.624	68.692	3.183	1500	 1	34.000	68.260	225
						2	33.000	68.178	150
						3	32.001	66.899	225
						4	10.016	65.509	600
						0	10.017	65.509	600
S12.0	316.085	-91.935	70.246	1.500	1200	 0	35.000	68.746	300
S12.1	316.631	-146.208	69.670	1.677	1350	 1	35.000	68.068	300
						0	35.001	67.993	375
S12.2	268.191	-145.687	69.200	1.691	1350	 1	35.001	67.509	375
						0	35.002	67.509	375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S13.0	346.682	-206.658	68.760	1.425	1200		0	18.000	67.335	225
S13.1	334.422	-195.831	68.798	1.572	1200		1 2 0	18.000 17.003 17.004	67.226 68.214 67.226	225 225 225
S14.0	238.199	-188.990	69.164	1.389	1200		1 0	23.001 23.002	68.589 67.775	225 225
S15.0	192.428	-238.093	68.397	1.500	1200		0	25.000	66.897	300
S16.0	129.448	-189.707	68.195	1.483	1200		1 0	28.001 28.002	67.606 66.712	225 225
S17.0	67.952	-190.580	68.663	1.563	1200		1 0	32.000 32.001	68.170 67.100	225 225
Detention Basin 1	317.222	-161.510	69.550	2.078			1 2 3 4 5 0	14.000 13.000 12.000 11.000 10.005 10.006	68.785 68.351 68.073 68.400 67.547 67.472	225 225 225 225 300 375
Detention Basin 2	315.458	-202.810	69.450	2.411			1 2 3 0	20.000 19.001 17.004 17.005	68.592 67.654 67.114 67.039	225 150 225 300
C1	319.273	-149.993	69.670	0.300			0	14.000	69.370	225
C2	334.357	-162.825	69.510	0.300			0	13.000	69.210	225
C3	328.858	-178.432	69.400	0.300			0	12.000	69.100	225
C4	312.517	-183.879	69.447	0.647			0	11.000	68.800	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
C5	345.513	-164.972	69.510	0.510			17.001	69.075	150
C6	339.228	-183.303	69.400	0.515			17.002	68.885	225
C7	313.564	-195.088	69.340	0.350			20.000	68.990	225
C8	302.251	-161.306	69.970	0.350			15.000	69.620	225
C9	302.379	-172.444	69.960	0.396			15.000	69.564	225
C10	287.953	-185.503	69.441	0.300			16.000	69.141	225
C11	302.703	-207.254	69.380	0.300			21.000	69.080	225
C12	245.477	-209.438	69.207	0.300			24.000	68.907	150
C13	244.534	-224.418	69.137	0.300			22.000	68.837	150
C14	200.696	-211.429	68.500	0.300			27.000	68.200	225
C15	201.901	-198.073	68.600	0.300			26.000	68.300	225
C16	227.460	-153.764	69.400	0.400			23.000	69.000	150
C17	243.517	-186.133	69.500	0.875			23.000	68.700	150
							23.001	68.625	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
C18	149.510	-211.109	68.230	0.400			0	29.000	67.830	225
C19	136.162	-197.866	68.140	0.300			0	30.000	67.840	225
C20	135.088	-153.467	68.300	0.400			0	28.000	67.900	225
C21	121.745	-186.210	68.140	0.449			1	28.000	67.691	225
						0	28.001	67.691	225	
C22	75.966	-223.631	69.000	0.400						
						0	31.000	68.600	150	
C23	78.343	-210.518	69.000	0.350						
						0	33.000	68.650	150	
C24	76.273	-186.670	68.980	0.350						
						0	32.000	68.630	225	
C25	63.640	-209.045	69.000	0.500						
						0	34.000	68.500	225	
Apartment A	360.936	-176.174	80.000	1.350						
						0	17.000	78.650	150	
Downpipe A	353.511	-165.732	80.000	10.600	100		1	17.000	78.512	150
						0	17.001	69.400	150	
Apartment B	316.146	-227.555	80.000	1.350						
						0	19.000	78.650	150	
Downpipe B	322.645	-215.305	80.000	12.250	100		1	19.000	78.512	150
						0	19.001	67.750	150	

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	Scotland and Ireland	Additional Storage (m ³ /ha)	20.0
M5-60 (mm)	16.000	Starting Level (m)	
Ratio-R	0.278	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	

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

Node Tank (Lil) Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	66.550	Product Number	CTL-SHE-0092-4000-1200-4000
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	4.0	Min Node Diameter (mm)	1200

Node Tank (Big) Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	65.086	Product Number	CTL-SHE-0211-2670-2000-2670
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	26.7	Min Node Diameter (mm)	2100

Node Detention Basin 1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	67.472	Product Number	CTL-SHE-0168-1500-1500-1500
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	15.0	Min Node Diameter (mm)	1500

Node Apartment A Online Orifice Control

Flap Valve	x	Design Depth (m)	0.400	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	2.0		
Invert Level (m)	78.650	Diameter (m)	0.039		

Node Apartment B Online Orifice Control

Flap Valve	x	Design Depth (m)	0.400	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	3.0		
Invert Level (m)	78.650	Diameter (m)	0.048		

Node Detention Basin 2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	67.039	Product Number	CTL-SHE-0098-5000-1500-5000
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node Tank (Lil) Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	66.550
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.61	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	2423.0	0.0	1.500	2423.0	0.0	1.501	0.0	0.0

Node Tank (Big) Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	65.086
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	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	2500.0	0.0	2.000	2500.0	0.0	2.001	0.0	0.0

Node Detention Basin 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	67.512
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	204

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	440.0	0.0	1.600	440.0	0.0	1.601	0.0	0.0

Node Greenway Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	66.025	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	720	Depth (m)	0.700
Safety Factor	2.0	Width (m)	3.000	Inf Depth (m)	
Porosity	0.30	Length (m)	530.000		

Node Detention Basin 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	67.039
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	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	198.0	198.0	1.200	198.0	257.9	1.201	0.0	257.9

Node C1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	69.370	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	24.000		

Node C2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	69.210	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	14.000		

Node C3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	69.100	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	12.000		

Node C4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	69.147	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	13.000		

Node C5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	69.255	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	20.000		

Node C6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	69.050	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	16.200		

Node C7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	68.990	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	6	Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	13.000		

Node C8 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	69.620	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	11	Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	12.500		

Node C9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	69.660	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	12.500		

Node C10 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	69.141	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	6.000	Inf Depth (m)	
Porosity	0.40	Length (m)	38.000		

Node C11 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	69.080	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.500	Inf Depth (m)	
Porosity	0.40	Length (m)	15.000		

Node C12 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	68.907	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	49.400		

Node C13 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	68.837	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	45.000		

Node C14 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	68.200	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	37.500		

Node C15 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	68.300	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	6.000	Inf Depth (m)	
Porosity	0.40	Length (m)	37.700		

Node C16 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	69.000	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	18	Depth (m)	0.350
Safety Factor	2.0	Width (m)	6.000	Inf Depth (m)	
Porosity	0.40	Length (m)	38.000		

Node C17 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	68.900	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.500
Safety Factor	2.0	Width (m)	6.000	Inf Depth (m)	
Porosity	0.40	Length (m)	38.000		

Node C18 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	67.830	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	14	Depth (m)	0.400
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	50.000		

Node C19 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	67.840	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	6.000	Inf Depth (m)	
Porosity	0.40	Length (m)	52.000		

Node C20 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	67.900	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	16	Depth (m)	0.350
Safety Factor	2.0	Width (m)	6.000	Inf Depth (m)	
Porosity	0.40	Length (m)	52.600		

Node C21 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	67.840	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	6.000	Inf Depth (m)	
Porosity	0.40	Length (m)	38.000		

Node C22 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	68.600	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	17	Depth (m)	0.400
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	55.000		

Node C23 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	68.650	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	17	Depth (m)	0.350
Safety Factor	2.0	Width (m)	6.000	Inf Depth (m)	
Porosity	0.40	Length (m)	47.500		

Node C24 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	68.630	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	12	Depth (m)	0.350
Safety Factor	2.0	Width (m)	6.000	Inf Depth (m)	
Porosity	0.40	Length (m)	38.000		

Node C25 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	68.500	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	5	Depth (m)	0.500
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.40	Length (m)	72.000		

Node Apartment A Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	78.999
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	1003.0	1003.0	1.000	1003.0	1115.3	1.001	0.0	1115.3

Node Apartment B Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	78.999
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	1007.0	1007.0	1.000	1007.0	1119.5	1.001	0.0	1119.5

Results for 1 year +30% CC Critical Storm Duration. Lowest mass balance: 99.95%

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	68.182	0.068	11.2	0.1286	0.0000	OK
15 minute summer	S1.1	10	67.973	0.084	13.8	0.1099	0.0000	OK
15 minute summer	S1.2	10	67.850	0.084	14.8	0.1002	0.0000	OK
15 minute summer	S1.3	10	67.633	0.098	17.8	0.1305	0.0000	OK
15 minute summer	S1.4	11	67.548	0.132	34.3	0.2984	0.0000	OK
15 minute summer	S1.5	10	66.539	0.209	96.4	0.3530	0.0000	OK
15 minute summer	S1.6	11	66.368	0.234	108.2	0.4913	0.0000	OK
15 minute summer	S1.7	11	66.090	0.631	207.9	1.4170	0.0000	OK
15 minute summer	S1.8	11	66.008	0.819	347.3	2.1516	0.0000	SURCHARGED
2880 minute summer	Tank (Big)	1860	65.812	0.726	76.5	1726.6170	0.0000	SURCHARGED
2880 minute summer	S1.9	1860	65.152	0.143	26.7	0.1614	0.0000	OK
2880 minute summer	S1.10	1860	64.977	0.146	26.7	0.1653	0.0000	OK
2880 minute summer	OUT	1860	64.931	0.125	26.7	0.0000	0.0000	OK
15 minute summer	Greenway	11	66.245	0.220	107.9	8.6908	0.0000	OK
15 minute summer	S2.0	10	67.624	0.122	43.8	0.4891	0.0000	OK
15 minute summer	S2.1	10	67.114	0.144	58.1	0.2792	0.0000	OK
15 minute summer	S3.0	10	67.791	0.146	30.8	0.4751	0.0000	OK
15 minute summer	S3.1	11	66.602	0.148	34.9	0.1936	0.0000	OK
15 minute summer	S3.2	11	66.525	0.162	38.3	0.2203	0.0000	OK
15 minute summer	S3.3	10	66.417	0.185	66.1	0.4680	0.0000	OK
15 minute summer	S3.4	11	66.202	0.212	83.6	0.4662	0.0000	OK
15 minute summer	S4.0	11	66.632	0.314	213.0	1.2912	0.0000	OK
15 minute summer	S4.1	11	66.280	0.318	218.9	0.6467	0.0000	OK
15 minute summer	S5.0	10	67.566	0.049	5.5	0.0742	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1.0	7.000	S1.1	11.2	0.954	0.193	0.2122	
15 minute summer	S1.1	7.001	S1.2	13.8	1.024	0.267	0.1676	
15 minute summer	S1.2	7.002	S1.3	14.8	0.987	0.286	0.3489	
15 minute summer	S1.3	7.003	S1.4	17.5	0.860	0.338	0.2444	
15 minute summer	S1.4	7.004	S1.5	32.8	1.377	0.631	1.2327	
15 minute summer	S1.5	7.005	S1.6	94.2	1.416	0.494	1.4499	
15 minute summer	S1.6	7.006	S1.7	108.2	1.537	0.664	3.2932	
15 minute summer	S1.7	1.014	S1.8	261.5	1.133	0.485	20.6202	
15 minute summer	S1.8	1.015	Tank (Big)	466.6	2.798	0.709	8.0180	
2880 minute summer	Tank (Big)	1.016	S1.9	26.7	0.743	0.542	1.3836	
2880 minute summer	S1.9	1.017	S1.10	26.7	0.796	0.453	2.0852	
2880 minute summer	S1.10	1.018	OUT	26.7	0.865	0.453	0.2663	3069.2
15 minute summer	Greenway	9.000	S1.8	89.5	1.361	0.635	2.9536	
15 minute summer	S2.0	8.000	S2.1	43.9	1.470	0.344	1.2152	
15 minute summer	S2.1	8.001	S1.5	58.6	1.732	0.440	1.3679	
15 minute summer	S3.0	6.000	S3.1	30.2	1.143	0.713	1.0819	
15 minute summer	S3.1	1.010	S3.2	33.4	0.910	0.427	0.6650	
15 minute summer	S3.2	1.011	S3.3	38.8	1.063	0.496	0.4066	
15 minute summer	S3.3	1.012	S3.4	65.1	1.117	0.462	2.8343	
15 minute summer	S3.4	1.013	S1.7	87.0	1.238	0.632	4.0502	
15 minute summer	S4.0	35.004	S4.1	215.0	1.583	0.629	9.6636	
15 minute summer	S4.1	35.005	Tank (Big)	213.0	1.641	0.623	4.7691	
15 minute summer	S5.0	36.000	S5.1	5.5	0.735	0.106	0.1859	

Results for 1 year +30% CC Critical Storm Duration. Lowest mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S5.1	10	67.370	0.146	43.2	0.4493	0.0000	OK
15 minute summer	S5.4	10	66.845	0.283	174.9	1.0102	0.0000	OK
15 minute summer	S6.0	11	68.108	0.120	22.1	0.3189	0.0000	OK
15 minute summer	S6.1	10	67.400	0.211	85.1	0.6492	0.0000	OK
15 minute summer	S6.2	12	67.160	0.444	297.1	0.8160	0.0000	OK
15 minute summer	S6.3	12	67.065	0.441	291.2	0.7799	0.0000	OK
5760 minute summer	Tank (Lil)	3720	67.001	0.451	15.1	668.2830	0.0000	SURCHARGED
15 minute summer	S7.0	10	68.584	0.034	2.6	0.0449	0.0000	OK
15 minute summer	S7.1	10	68.223	0.131	28.9	0.3136	0.0000	OK
15 minute summer	S8.0	10	69.055	0.130	45.7	0.5570	0.0000	OK
15 minute summer	S8.1	10	68.510	0.150	59.3	0.3384	0.0000	OK
15 minute summer	S8.2	11	68.124	0.219	92.4	0.6244	0.0000	OK
15 minute summer	S8.3	11	67.755	0.221	99.7	0.4651	0.0000	OK
15 minute summer	S8.4	11	67.572	0.241	124.7	0.6905	0.0000	OK
15 minute summer	S8.6	12	67.371	0.324	124.8	0.4826	0.0000	OK
15 minute summer	S8.7	12	67.328	0.327	214.4	0.5087	0.0000	OK
15 minute summer	S9.0	10	68.963	0.142	49.3	0.6221	0.0000	OK
15 minute summer	S9.1	10	68.349	0.207	82.5	0.4502	0.0000	OK
15 minute summer	S9.2	11	68.104	0.233	98.6	0.5269	0.0000	OK
15 minute summer	S10.0	10	68.571	0.103	20.3	0.2609	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S5.1	36.001	S5.4	41.2	1.255	0.455	2.1706	
15 minute summer	S5.4	35.003	S4.0	175.8	1.391	0.514	6.1771	
15 minute summer	S6.0	5.000	S6.1	20.2	0.951	0.553	1.6248	
15 minute summer	S6.1	4.002	S6.2	84.5	1.280	0.599	4.1814	
15 minute summer	S6.2	1.007	S6.3	291.2	1.635	0.851	0.6139	
15 minute summer	S6.3	1.008	Tank (Lil)	295.1	1.487	0.965	5.2300	
5760 minute summer	Tank (Lil)	1.009	S3.1	4.0	0.526	0.063	0.2356	
15 minute summer	S7.0	4.000	S7.1	2.5	0.193	0.051	0.7008	
15 minute summer	S7.1	4.001	S6.1	26.6	1.126	0.629	1.3980	
15 minute summer	S8.0	1.000	S8.1	46.1	1.231	0.263	2.7465	
15 minute summer	S8.1	1.001	S8.2	56.5	1.095	0.346	3.6634	
15 minute summer	S8.2	1.002	S8.3	86.2	1.335	0.611	3.8231	
15 minute summer	S8.3	1.003	S8.4	99.5	1.232	0.436	3.3131	
15 minute summer	S8.4	1.004	S8.6	123.6	1.200	0.542	5.8416	
15 minute summer	S8.6	1.005	S8.7	125.1	1.069	0.548	1.1322	
15 minute summer	S8.7	1.006	S6.2	216.6	1.664	0.670	2.7553	
15 minute summer	S9.0	2.000	S9.1	48.6	1.511	0.437	1.8495	
15 minute summer	S9.1	2.001	S9.2	82.0	1.252	0.551	3.1946	
15 minute summer	S9.2	2.002	S8.7	95.1	1.364	0.674	3.9270	
15 minute summer	S10.0	3.000	S9.1	20.3	1.194	0.391	0.2987	

Results for 1 year +30% CC Critical Storm Duration. Lowest mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S11.0	10	68.456	0.105	25.2	0.2925	0.0000	OK
15 minute summer	S11.1	10	68.191	0.127	27.7	0.1640	0.0000	OK
15 minute summer	S11.2	10	68.123	0.137	29.8	0.1750	0.0000	OK
15 minute summer	S11.3	10	68.072	0.156	46.3	0.3239	0.0000	OK
15 minute summer	S11.4	11	67.927	0.217	58.0	0.3756	0.0000	OK
180 minute summer	S11.5	120	67.924	0.267	21.5	0.3016	0.0000	OK
30 minute summer	S11.6	23	67.389	0.109	28.2	0.1564	0.0000	OK
30 minute summer	S11.7	23	66.889	0.130	36.8	0.2003	0.0000	OK
30 minute summer	S11.8	23	66.812	0.120	36.8	0.1718	0.0000	OK
30 minute summer	S11.9	24	66.628	0.162	50.2	0.2321	0.0000	OK
30 minute summer	S11.10	24	66.583	0.147	50.3	0.2164	0.0000	OK
30 minute summer	S11.11	23	66.491	0.189	81.2	0.3348	0.0000	OK
30 minute summer	S11.12	23	66.340	0.221	102.9	0.3912	0.0000	OK
30 minute summer	S11.13	24	66.110	0.290	153.1	0.5309	0.0000	OK
30 minute summer	S11.14	24	66.041	0.266	153.1	0.4706	0.0000	OK
30 minute summer	S11.15	25	65.903	0.330	173.0	0.6031	0.0000	OK
30 minute summer	S11.16	25	65.842	0.333	214.9	0.5876	0.0000	OK
15 minute summer	S12.0	10	68.839	0.093	25.6	0.2616	0.0000	OK
15 minute summer	S12.1	10	68.119	0.126	50.4	0.3667	0.0000	OK
15 minute summer	S12.2	10	67.712	0.203	107.2	0.9671	0.0000	OK
360 minute summer	S13.0	248	67.414	0.079	2.4	0.1434	0.0000	OK
360 minute summer	S13.1	248	67.414	0.188	7.1	0.2346	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S11.0	10.000	S11.1	25.3	1.009	0.261	0.9448	
15 minute summer	S11.1	10.001	S11.2	27.4	0.919	0.304	0.3526	
15 minute summer	S11.2	10.002	S11.3	29.5	0.885	0.331	0.3696	
15 minute summer	S11.3	10.003	S11.4	45.6	1.001	0.515	1.4637	
15 minute summer	S11.4	10.004	S11.5	56.3	1.107	0.763	0.6110	
180 minute summer	S11.5	10.005	Detention Basin 1	20.3	0.610	0.259	1.4962	
30 minute summer	S11.6	10.007	S11.7	28.2	1.095	0.173	0.6365	
30 minute summer	S11.7	10.008	S11.8	36.8	1.025	0.161	0.4785	
30 minute summer	S11.8	10.009	S11.9	36.7	0.865	0.161	1.9294	
30 minute summer	S11.9	10.010	S11.10	50.1	1.039	0.220	0.2904	
30 minute summer	S11.10	10.011	S11.11	50.4	1.210	0.191	0.3678	
30 minute summer	S11.11	10.012	S11.12	81.1	1.037	0.265	3.5766	
30 minute summer	S11.12	10.013	S11.13	102.7	1.214	0.356	5.3202	
30 minute summer	S11.13	10.014	S11.14	153.1	1.198	0.374	1.6190	
30 minute summer	S11.14	10.015	S11.15	152.8	1.096	0.386	8.4537	
30 minute summer	S11.15	10.016	S11.16	172.9	1.087	0.437	3.0368	
30 minute summer	S11.16	10.017	Tank (Big)	215.0	1.427	0.543	5.6094	
15 minute summer	S12.0	35.000	S12.1	25.2	1.380	0.203	0.9927	
15 minute summer	S12.1	35.001	S12.2	50.0	1.092	0.250	2.2598	
15 minute summer	S12.2	35.002	S5.4	101.4	1.703	0.555	4.5875	
360 minute summer	S13.0	18.000	S13.1	2.4	0.362	0.056	0.3930	
360 minute summer	S13.1	17.004	Detention Basin 2	7.0	0.578	0.182	0.7608	

Results for 1 year +30% CC Critical Storm Duration. Lowest mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S14.0	22	67.893	0.118	20.1	0.1485	0.0000	OK
15 minute summer	S15.0	10	66.963	0.066	11.4	0.1235	0.0000	OK
30 minute summer	S16.0	22	66.814	0.102	22.2	0.1292	0.0000	OK
30 minute summer	S17.0	22	67.159	0.059	9.9	0.0666	0.0000	OK
180 minute summer	Detention Basin 1	120	67.923	0.451	50.2	73.8280	0.0000	SURCHARGED
360 minute summer	Detention Basin 2	248	67.414	0.375	10.6	29.6893	0.0000	SURCHARGED
30 minute summer	C1	22	69.396	0.026	3.4	0.3784	0.0000	OK
30 minute summer	C2	22	69.231	0.021	2.1	0.2371	0.0000	OK
30 minute summer	C3	22	69.121	0.021	2.3	0.2502	0.0000	OK
30 minute summer	C4	21	68.829	0.029	2.4	0.0168	0.0000	OK
30 minute summer	C5	21	69.054	0.054	4.9	0.0528	0.0000	OK
30 minute summer	C6	21	68.925	0.040	8.0	0.0393	0.0000	OK
30 minute summer	C7	22	69.013	0.023	2.6	0.2901	0.0000	OK
30 minute summer	C8	24	69.653	0.033	2.0	0.5316	0.0000	OK
30 minute summer	C9	22	69.590	0.026	3.9	0.0253	0.0000	OK
30 minute summer	C10	22	69.187	0.046	11.0	1.5469	0.0000	OK
30 minute summer	C11	22	69.111	0.031	4.8	0.6012	0.0000	OK
30 minute summer	C12	23	68.964	0.057	12.4	1.9897	0.0000	OK
30 minute summer	C13	23	68.901	0.064	15.0	2.5560	0.0000	OK
30 minute summer	C14	24	68.266	0.066	11.3	2.6134	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S14.0	23.002	S11.11	20.1	0.992	0.496	0.3652	
15 minute summer	S15.0	25.000	S11.12	11.3	1.011	0.102	0.3533	
30 minute summer	S16.0	28.002	S11.13	22.2	1.323	0.381	0.2857	
30 minute summer	S17.0	32.001	S11.16	9.9	1.252	0.134	0.0796	
180 minute summer	Detention Basin 1	10.006	S11.6	14.9	0.864	0.097	0.6325	
360 minute summer	Detention Basin 2	17.005	S11.7	4.8	0.687	0.053	0.1370	
30 minute summer	C1	14.000	Detention Basin 1	3.2	1.289	0.028	0.0292	
30 minute summer	C2	13.000	Detention Basin 1	2.0	1.121	0.017	0.0309	
30 minute summer	C3	12.000	Detention Basin 1	2.1	1.140	0.018	0.0384	
30 minute summer	C4	11.000	Detention Basin 1	2.4	0.819	0.035	0.0670	
30 minute summer	C5	17.002	C6	4.9	0.812	0.123	0.1174	
30 minute summer	C6	17.003	S13.1	8.0	1.675	0.068	0.0640	
30 minute summer	C7	20.000	Detention Basin 2	2.5	1.197	0.022	0.0167	
30 minute summer	C8	15.000	C9	1.6	0.559	0.045	0.0336	
30 minute summer	C9	15.001	S11.6	3.9	1.498	0.029	0.0410	
30 minute summer	C10	16.000	S11.6	10.3	1.797	0.088	0.0623	
30 minute summer	C11	21.000	S11.7	4.5	1.407	0.039	0.0216	
30 minute summer	C12	24.000	S11.11	11.3	1.899	0.283	0.0449	
30 minute summer	C13	22.000	S11.9	13.5	1.967	0.338	0.0379	
30 minute summer	C14	27.000	S11.12	9.4	0.979	0.180	0.0899	

Results for 1 year +30% CC Critical Storm Duration. Lowest mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	C15	24	68.367	0.067	12.0	3.1269	0.0000	OK
30 minute summer	C16	25	69.076	0.076	12.3	3.8775	0.0000	OK
30 minute summer	C17	22	68.741	0.116	19.5	0.2635	0.0000	OK
30 minute summer	C18	24	67.921	0.091	20.9	4.8686	0.0000	OK
30 minute summer	C19	24	67.924	0.084	15.6	4.9130	0.0000	OK
30 minute summer	C20	24	67.982	0.082	15.6	4.5856	0.0000	OK
30 minute summer	C21	22	67.798	0.107	21.9	0.4365	0.0000	OK
30 minute summer	C22	23	68.690	0.090	23.5	4.8535	0.0000	OK
30 minute summer	C23	23	68.713	0.063	13.3	2.7388	0.0000	OK
30 minute summer	C24	22	68.675	0.045	10.6	1.4605	0.0000	OK
30 minute summer	C25	23	68.584	0.084	25.2	4.2354	0.0000	OK
120 minute summer	Apartment A	84	79.004	0.354	7.1	6.3700	0.0000	SURCHARGED
120 minute summer	Downpipe A	86	69.423	0.023	1.8	0.0002	0.0000	OK
60 minute summer	Apartment B	46	79.003	0.353	9.3	5.1728	0.0000	SURCHARGED
60 minute summer	Downpipe B	47	67.794	0.044	2.7	0.0004	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	C15	26.000	S11.12	9.6	0.990	0.185	0.1219	
30 minute summer	C16	23.000	C17	8.4	0.931	0.519	0.3256	
30 minute summer	C17	23.001	S14.0	19.5	0.977	0.487	0.1205	
30 minute summer	C18	29.000	S11.13	17.2	1.169	0.331	0.2949	
30 minute summer	C19	30.000	S11.13	11.3	0.860	0.281	0.1423	
30 minute summer	C20	28.000	C21	11.6	0.790	0.291	0.5549	
30 minute summer	C21	28.001	S16.0	21.7	1.220	0.418	0.1507	
30 minute summer	C22	31.000	S11.15	19.8	1.872	0.607	0.0905	
30 minute summer	C23	33.000	S11.16	11.3	1.657	0.348	0.0970	
30 minute summer	C24	32.000	S17.0	9.9	1.774	0.085	0.0515	
30 minute summer	C25	34.000	S11.16	22.7	1.730	0.275	0.1257	
120 minute summer	Apartment A	17.000	Downpipe A	1.8	0.662	0.098	0.0349	
120 minute summer	Downpipe A	17.001	C5	1.8	1.055	0.050	0.0137	
60 minute summer	Apartment B	19.000	Downpipe B	2.7	0.722	0.152	0.0517	
60 minute summer	Downpipe B	19.001	Detention Basin 2	2.7	0.626	0.186	0.0620	

Results for 30 year +30% CC Critical Storm Duration. Lowest mass balance: 99.83%

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	68.222	0.108	24.8	0.2052	0.0000	OK
15 minute summer	S1.1	11	68.049	0.160	30.7	0.2096	0.0000	OK
15 minute summer	S1.2	11	68.012	0.246	32.7	0.2939	0.0000	SURCHARGED
15 minute summer	S1.3	11	67.947	0.412	36.1	0.5508	0.0000	SURCHARGED
15 minute summer	S1.4	11	67.889	0.473	70.1	1.0669	0.0000	SURCHARGED
15 minute summer	S1.5	10	67.121	0.791	187.0	1.3336	0.0000	SURCHARGED
15 minute summer	S1.6	10	66.877	0.743	216.1	1.5586	0.0000	SURCHARGED
2880 minute summer	S1.7	2220	66.628	1.169	29.2	2.6237	0.0000	SURCHARGED
2880 minute summer	S1.8	2220	66.628	1.439	40.8	3.7794	0.0000	SURCHARGED
2880 minute summer	Tank (Big)	2220	66.628	1.542	128.8	3666.7150	0.0000	SURCHARGED
120 minute summer	S1.9	114	65.152	0.143	26.7	0.1614	0.0000	OK
120 minute summer	S1.10	114	64.977	0.146	26.7	0.1653	0.0000	OK
7200 minute summer	OUT	3540	64.931	0.125	26.7	0.0000	0.0000	OK
2880 minute summer	Greenway	2220	66.628	0.603	12.5	58.0870	0.0000	SURCHARGED
15 minute summer	S2.0	11	67.842	0.340	97.3	1.3644	0.0000	SURCHARGED
15 minute summer	S2.1	10	67.575	0.605	124.3	1.1774	0.0000	SURCHARGED
15 minute summer	S3.0	11	68.179	0.534	68.5	1.7422	0.0000	SURCHARGED
15 minute summer	S3.1	11	67.096	0.642	71.1	0.8383	0.0000	SURCHARGED
15 minute summer	S3.2	11	67.008	0.645	80.5	0.8777	0.0000	SURCHARGED
15 minute summer	S3.3	11	66.900	0.668	140.0	1.6923	0.0000	SURCHARGED
15 minute summer	S3.4	10	66.635	0.645	176.5	1.4180	0.0000	SURCHARGED
15 minute summer	S4.0	11	67.161	0.843	413.4	3.4672	0.0000	SURCHARGED
2880 minute summer	S4.1	2220	66.628	0.666	27.1	1.3526	0.0000	SURCHARGED
15 minute summer	S5.0	11	67.804	0.287	12.2	0.4334	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1.0	7.000	S1.1	24.8	1.119	0.426	0.4187	
15 minute summer	S1.1	7.001	S1.2	30.4	1.186	0.586	0.4347	
15 minute summer	S1.2	7.002	S1.3	29.4	1.106	0.568	0.9253	
15 minute summer	S1.3	7.003	S1.4	35.4	0.895	0.683	0.4776	
15 minute summer	S1.4	7.004	S1.5	63.0	1.586	1.213	2.0525	
15 minute summer	S1.5	7.005	S1.6	189.6	1.719	0.994	2.3751	
15 minute summer	S1.6	7.006	S1.7	220.3	2.000	1.351	4.8404	
2880 minute summer	S1.7	1.014	S1.8	28.1	0.548	0.052	20.9086	
2880 minute summer	S1.8	1.015	Tank (Big)	40.2	0.669	0.061	15.8769	
2880 minute summer	Tank (Big)	1.016	S1.9	26.6	0.743	0.541	1.3817	
120 minute summer	S1.9	1.017	S1.10	26.7	0.796	0.453	2.0854	
120 minute summer	S1.10	1.018	OUT	26.7	0.865	0.453	0.2663	480.1
2880 minute summer	Greenway	9.000	S1.8	12.5	0.759	0.089	4.9529	
15 minute summer	S2.0	8.000	S2.1	92.9	1.686	0.728	2.8455	
15 minute summer	S2.1	8.001	S1.5	117.0	1.798	0.880	2.8471	
15 minute summer	S3.0	6.000	S3.1	61.9	1.557	1.461	1.5830	
15 minute summer	S3.1	1.010	S3.2	69.7	1.019	0.890	1.2753	
15 minute summer	S3.2	1.011	S3.3	85.4	1.268	1.091	0.7838	
15 minute summer	S3.3	1.012	S3.4	141.7	1.285	1.005	5.3415	
15 minute summer	S3.4	1.013	S1.7	186.4	1.691	1.354	5.3427	
15 minute summer	S4.0	35.004	S4.1	406.2	1.880	1.188	15.3725	
2880 minute summer	S4.1	35.005	Tank (Big)	27.1	0.899	0.079	7.9392	
15 minute summer	S5.0	36.000	S5.1	17.9	0.749	0.345	0.8684	

Results for 30 year +30% CC Critical Storm Duration. Lowest mass balance: 99.83%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S5.1	11	67.772	0.548	96.0	1.6902	0.0000	SURCHARGED
15 minute summer	S5.4	11	67.439	0.877	336.8	3.1347	0.0000	SURCHARGED
15 minute summer	S6.0	11	68.504	0.516	49.1	1.3736	0.0000	SURCHARGED
15 minute summer	S6.1	11	68.007	0.818	172.1	2.5178	0.0000	SURCHARGED
15 minute summer	S6.2	11	67.564	0.848	554.8	1.5594	0.0000	SURCHARGED
5760 minute summer	S6.3	4140	67.501	0.877	24.9	1.5500	0.0000	SURCHARGED
5760 minute summer	Tank (Lil)	4380	67.497	0.947	25.9	1401.9330	0.0000	SURCHARGED
15 minute summer	S7.0	10	68.602	0.052	5.9	0.0678	0.0000	OK
15 minute summer	S7.1	11	68.598	0.506	64.4	1.2092	0.0000	SURCHARGED
15 minute summer	S8.0	10	69.132	0.207	101.3	0.8885	0.0000	OK
15 minute summer	S8.1	12	68.976	0.616	131.4	1.3896	0.0000	SURCHARGED
15 minute summer	S8.2	12	68.792	0.887	194.2	2.5346	0.0000	SURCHARGED
15 minute summer	S8.3	11	68.490	0.956	167.5	2.0163	0.0000	SURCHARGED
15 minute summer	S8.4	11	68.376	1.045	232.3	3.0005	0.0000	SURCHARGED
15 minute summer	S8.6	11	68.109	1.062	206.8	1.5817	0.0000	SURCHARGED
15 minute summer	S8.7	11	68.027	1.026	388.8	1.5980	0.0000	SURCHARGED
15 minute summer	S9.0	11	69.279	0.458	109.5	2.0007	0.0000	SURCHARGED
15 minute summer	S9.1	11	68.854	0.712	174.7	1.5458	0.0000	SURCHARGED
15 minute summer	S9.2	11	68.541	0.670	187.5	1.5148	0.0000	SURCHARGED
15 minute summer	S10.0	11	68.957	0.489	45.0	1.2390	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S5.1	36.001	S5.4	79.7	1.370	0.880	4.6188	
15 minute summer	S5.4	35.003	S4.0	323.0	1.513	0.945	10.5614	
15 minute summer	S6.0	5.000	S6.1	39.6	1.108	1.082	3.0366	
15 minute summer	S6.1	4.002	S6.2	161.9	1.468	1.148	6.4657	
15 minute summer	S6.2	1.007	S6.3	554.2	2.565	1.620	0.7457	
5760 minute summer	S6.3	1.008	Tank (Lil)	24.8	0.368	0.081	7.4490	
5760 minute summer	Tank (Lil)	1.009	S3.1	4.0	0.509	0.063	0.4334	
15 minute summer	S7.0	4.000	S7.1	5.8	0.215	0.118	1.1759	
15 minute summer	S7.1	4.001	S6.1	53.7	1.359	1.268	2.3519	
15 minute summer	S8.0	1.000	S8.1	102.1	1.477	0.582	6.0598	
15 minute summer	S8.1	1.001	S8.2	114.5	1.256	0.702	7.5330	
15 minute summer	S8.2	1.002	S8.3	142.2	1.421	1.008	6.5236	
15 minute summer	S8.3	1.003	S8.4	167.6	1.258	0.735	6.4235	
15 minute summer	S8.4	1.004	S8.6	204.2	1.315	0.895	9.0146	
15 minute summer	S8.6	1.005	S8.7	207.3	1.345	0.909	1.4618	
15 minute summer	S8.7	1.006	S6.2	389.6	2.459	1.205	3.3278	
15 minute summer	S9.0	2.000	S9.1	101.7	1.639	0.915	4.0506	
15 minute summer	S9.1	2.001	S9.2	150.6	1.397	1.012	5.3794	
15 minute summer	S9.2	2.002	S8.7	177.0	1.626	1.255	6.2120	
15 minute summer	S10.0	3.000	S9.1	42.8	1.305	0.824	0.6985	

Results for 30 year +30% CC Critical Storm Duration. Lowest mass balance: 99.83%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	S11.0	184	68.593	0.242	16.4	0.6739	0.0000	OK
240 minute summer	S11.1	184	68.593	0.529	18.0	0.6823	0.0000	SURCHARGED
240 minute summer	S11.2	184	68.593	0.607	19.4	0.7756	0.0000	SURCHARGED
240 minute summer	S11.3	184	68.593	0.677	28.3	1.4091	0.0000	SURCHARGED
240 minute summer	S11.4	184	68.592	0.882	33.1	1.5255	0.0000	SURCHARGED
240 minute summer	S11.5	184	68.592	0.935	31.8	1.0574	0.0000	SURCHARGED
30 minute summer	S11.6	22	67.424	0.144	46.5	0.2055	0.0000	OK
30 minute summer	S11.7	22	66.933	0.174	62.8	0.2686	0.0000	OK
30 minute summer	S11.8	22	66.850	0.158	62.8	0.2267	0.0000	OK
30 minute summer	S11.9	23	66.708	0.242	91.2	0.3458	0.0000	OK
30 minute summer	S11.10	23	66.657	0.221	91.7	0.3251	0.0000	OK
2880 minute summer	S11.11	2160	66.628	0.326	32.9	0.5762	0.0000	OK
2880 minute summer	S11.12	2160	66.628	0.509	38.6	0.8995	0.0000	OK
2880 minute summer	S11.13	2160	66.628	0.808	50.9	1.4785	0.0000	SURCHARGED
2880 minute summer	S11.14	2160	66.628	0.853	50.1	1.5071	0.0000	SURCHARGED
2880 minute summer	S11.15	2160	66.628	1.055	54.1	1.9303	0.0000	SURCHARGED
2880 minute summer	S11.16	2160	66.628	1.119	62.1	1.9768	0.0000	SURCHARGED
15 minute summer	S12.0	10	68.892	0.146	56.8	0.4102	0.0000	OK
15 minute summer	S12.1	11	68.266	0.273	112.5	0.7957	0.0000	OK
15 minute summer	S12.2	11	68.202	0.693	237.1	3.3048	0.0000	SURCHARGED
600 minute summer	S13.0	480	67.943	0.608	3.3	1.0973	0.0000	SURCHARGED
600 minute summer	S13.1	480	67.943	0.717	8.9	0.8926	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute summer	S11.0	10.000	S11.1	16.4	0.912	0.169	2.4631	
240 minute summer	S11.1	10.001	S11.2	17.8	0.821	0.197	0.8318	
240 minute summer	S11.2	10.002	S11.3	17.4	0.774	0.195	0.7632	
240 minute summer	S11.3	10.003	S11.4	25.6	0.747	0.289	2.2734	
240 minute summer	S11.4	10.004	S11.5	31.8	0.807	0.431	0.8356	
240 minute summer	S11.5	10.005	Detention Basin 1	31.3	0.600	0.400	1.5428	
30 minute summer	S11.6	10.007	S11.7	46.4	1.249	0.284	0.9183	
30 minute summer	S11.7	10.008	S11.8	62.8	1.180	0.276	0.7100	
30 minute summer	S11.8	10.009	S11.9	62.8	0.939	0.275	3.0844	
30 minute summer	S11.9	10.010	S11.10	91.2	1.126	0.400	0.4943	
30 minute summer	S11.10	10.011	S11.11	91.7	1.314	0.348	0.6701	
2880 minute summer	S11.11	10.012	S11.12	32.9	0.867	0.108	8.1076	
2880 minute summer	S11.12	10.013	S11.13	38.6	0.934	0.134	13.4901	
2880 minute summer	S11.13	10.014	S11.14	50.1	0.941	0.122	3.5672	
2880 minute summer	S11.14	10.015	S11.15	49.5	0.814	0.125	17.0787	
2880 minute summer	S11.15	10.016	S11.16	53.0	0.786	0.134	5.3665	
2880 minute summer	S11.16	10.017	Tank (Big)	61.5	0.831	0.155	10.4849	
15 minute summer	S12.0	35.000	S12.1	56.6	1.705	0.455	2.1458	
15 minute summer	S12.1	35.001	S12.2	110.1	1.269	0.550	4.7573	
15 minute summer	S12.2	35.002	S5.4	190.8	1.880	1.045	8.4987	
600 minute summer	S13.0	18.000	S13.1	3.1	0.311	0.073	0.6505	
600 minute summer	S13.1	17.004	Detention Basin 2	8.8	0.496	0.227	0.8037	

Results for 30 year +30% CC Critical Storm Duration. Lowest mass balance: 99.83%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S14.0	22	68.005	0.230	43.8	0.2906	0.0000	SURCHARGED
15 minute summer	S15.0	10	66.997	0.100	25.2	0.1878	0.0000	OK
30 minute summer	S16.0	24	66.881	0.169	47.3	0.2144	0.0000	OK
30 minute summer	S17.0	22	67.192	0.092	22.1	0.1040	0.0000	OK
240 minute summer	Detention Basin 1	184	68.591	1.119	82.0	193.4488	0.0000	SURCHARGED
600 minute summer	Detention Basin 2	480	67.942	0.903	12.9	71.5412	0.0000	SURCHARGED
30 minute summer	C1	22	69.408	0.038	7.5	0.7867	0.0000	OK
30 minute summer	C2	22	69.240	0.030	4.7	0.4920	0.0000	OK
30 minute summer	C3	22	69.131	0.031	5.0	0.5017	0.0000	OK
30 minute summer	C4	20	68.842	0.042	5.3	0.0246	0.0000	OK
30 minute summer	C5	20	69.072	0.072	8.8	0.0703	0.0000	OK
30 minute summer	C6	20	68.942	0.057	15.8	0.0554	0.0000	OK
30 minute summer	C7	22	69.024	0.034	5.8	0.5796	0.0000	OK
30 minute summer	C8	23	69.670	0.050	4.5	0.9716	0.0000	OK
30 minute summer	C9	22	69.604	0.040	9.0	0.0381	0.0000	OK
30 minute summer	C10	22	69.211	0.070	24.5	3.3332	0.0000	OK
30 minute summer	C11	22	69.127	0.047	10.6	1.1625	0.0000	OK
30 minute summer	C12	23	68.997	0.090	27.6	4.6866	0.0000	OK
30 minute summer	C13	23	68.941	0.104	33.4	6.1880	0.0000	OK
30 minute summer	C14	23	68.305	0.105	25.1	5.6654	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S14.0	23.002	S11.11	43.7	1.166	1.080	0.6575	
15 minute summer	S15.0	25.000	S11.12	25.2	1.260	0.227	0.6307	
30 minute summer	S16.0	28.002	S11.13	47.3	1.557	0.813	0.5166	
30 minute summer	S17.0	32.001	S11.16	22.0	1.537	0.299	0.1441	
240 minute summer	Detention Basin 1	10.006	S11.6	14.9	0.892	0.097	0.7089	
600 minute summer	Detention Basin 2	17.005	S11.7	4.9	0.690	0.054	0.1383	
30 minute summer	C1	14.000	Detention Basin 1	7.2	1.644	0.062	0.0514	
30 minute summer	C2	13.000	Detention Basin 1	4.5	1.433	0.039	0.0545	
30 minute summer	C3	12.000	Detention Basin 1	4.9	1.446	0.042	0.3850	
30 minute summer	C4	11.000	Detention Basin 1	5.3	1.034	0.076	0.1164	
30 minute summer	C5	17.002	C6	8.8	0.939	0.220	0.1819	
30 minute summer	C6	17.003	S13.1	15.7	2.031	0.135	0.1040	
30 minute summer	C7	20.000	Detention Basin 2	5.7	1.533	0.049	0.0295	
30 minute summer	C8	15.000	C9	4.0	0.726	0.108	0.0619	
30 minute summer	C9	15.001	S11.6	8.9	1.920	0.066	0.0741	
30 minute summer	C10	16.000	S11.6	22.8	2.238	0.195	0.1107	
30 minute summer	C11	21.000	S11.7	10.3	1.780	0.088	0.0390	
30 minute summer	C12	24.000	S11.11	24.3	2.280	0.608	0.0805	
30 minute summer	C13	22.000	S11.9	28.6	2.318	0.717	0.0681	
30 minute summer	C14	27.000	S11.12	21.2	1.213	0.407	0.1641	

Results for 30 year +30% CC Critical Storm Duration. Lowest mass balance: 99.83%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	C15	24	68.405	0.105	26.7	6.7629	0.0000	OK
30 minute summer	C16	25	69.132	0.132	27.3	9.2368	0.0000	OK
30 minute summer	C17	22	68.823	0.198	42.5	0.4489	0.0000	OK
30 minute summer	C18	24	67.977	0.147	46.5	10.9579	0.0000	OK
30 minute summer	C19	25	67.972	0.132	34.8	11.0756	0.0000	OK
30 minute summer	C20	24	68.028	0.128	34.8	10.3488	0.0000	OK
30 minute summer	C21	23	67.869	0.178	47.9	1.2262	0.0000	OK
30 minute summer	C22	25	68.774	0.174	52.3	14.7854	0.0000	FLOOD RISK
30 minute summer	C23	24	68.750	0.100	29.5	6.5502	0.0000	OK
30 minute summer	C24	22	68.699	0.069	23.7	3.1897	0.0000	OK
30 minute summer	C25	23	68.634	0.134	55.9	10.0286	0.0000	OK
180 minute summer	Apartment A	140	79.018	0.368	12.0	19.8521	0.0000	SURCHARGED
180 minute summer	Downpipe A	140	69.423	0.023	1.8	0.0002	0.0000	OK
120 minute summer	Apartment B	92	79.015	0.365	15.3	16.6503	0.0000	SURCHARGED
600 minute summer	Downpipe B	480	67.944	0.194	2.7	0.0016	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	C15	26.000	S11.12	21.7	1.227	0.418	0.2220	
30 minute summer	C16	23.000	C17	17.1	1.079	1.058	0.5713	
30 minute summer	C17	23.001	S14.0	42.5	1.213	1.061	0.2106	
30 minute summer	C18	29.000	S11.13	37.9	1.412	0.730	0.5389	
30 minute summer	C19	30.000	S11.13	24.5	1.045	0.611	0.2545	
30 minute summer	C20	28.000	C21	25.1	0.963	0.631	1.0073	
30 minute summer	C21	28.001	S16.0	46.4	1.437	0.892	0.2728	
30 minute summer	C22	31.000	S11.15	32.3	2.004	0.991	0.1505	
30 minute summer	C23	33.000	S11.16	23.9	1.971	0.733	0.1716	
30 minute summer	C24	32.000	S17.0	22.1	2.209	0.189	0.0918	
30 minute summer	C25	34.000	S11.16	48.7	2.078	0.590	0.2245	
180 minute summer	Apartment A	17.000	Downpipe A	1.8	0.666	0.100	0.0354	
180 minute summer	Downpipe A	17.001	C5	1.8	1.061	0.051	0.0139	
120 minute summer	Apartment B	19.000	Downpipe B	2.7	0.726	0.155	0.0524	
600 minute summer	Downpipe B	19.001	Detention Basin 2	2.7	0.627	0.188	0.2538	

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1.0	12	68.599	0.485	32.1	0.9229	0.0000	SURCHARGED
15 minute summer	S1.1	12	68.566	0.677	38.5	0.8854	0.0000	SURCHARGED
15 minute summer	S1.2	12	68.522	0.756	39.4	0.9023	0.0000	SURCHARGED
15 minute summer	S1.3	11	68.432	0.897	37.0	1.1990	0.0000	SURCHARGED
15 minute summer	S1.4	11	68.378	0.962	74.6	2.1714	0.0000	SURCHARGED
15 minute summer	S1.5	11	67.444	1.114	219.6	1.8785	0.0000	SURCHARGED
15 minute summer	S1.6	10	67.107	0.973	257.4	2.0423	0.0000	SURCHARGED
2880 minute summer	S1.7	2280	67.016	1.557	33.6	3.4959	0.0000	SURCHARGED
2880 minute summer	S1.8	2280	67.016	1.827	48.0	4.7999	0.0000	SURCHARGED
2880 minute summer	Tank (Big)	2280	67.016	1.930	150.5	4590.6920	0.0000	SURCHARGED
5760 minute summer	S1.9	2700	65.152	0.143	26.7	0.1614	0.0000	OK
10080 minute summer	S1.10	9960	64.977	0.146	26.7	0.1653	0.0000	OK
10080 minute summer	OUT	9960	64.931	0.125	26.7	0.0000	0.0000	OK
2880 minute summer	Greenway	2280	67.016	0.991	15.2	152.7283	0.0000	SURCHARGED
15 minute summer	S2.0	11	68.670	1.168	126.0	4.6828	0.0000	SURCHARGED
15 minute summer	S2.1	11	68.229	1.259	139.1	2.4495	0.0000	SURCHARGED
15 minute summer	S3.0	11	68.699	1.054	88.7	3.4404	0.0000	SURCHARGED
15 minute summer	S3.1	11	67.706	1.252	100.6	1.6348	0.0000	SURCHARGED
15 minute summer	S3.2	11	67.550	1.187	102.0	1.6159	0.0000	SURCHARGED
15 minute summer	S3.3	11	67.396	1.164	171.7	2.9476	0.0000	SURCHARGED
2880 minute summer	S3.4	2280	67.017	1.027	16.7	2.2584	0.0000	SURCHARGED
15 minute summer	S4.0	11	67.631	1.313	492.6	5.4013	0.0000	SURCHARGED
2880 minute summer	S4.1	2280	67.016	1.054	33.1	2.1420	0.0000	SURCHARGED
15 minute summer	S5.0	11	68.628	1.111	20.8	1.6777	0.0000	SURCHARGED
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1.0	7.000	S1.1	30.9	1.160	0.531	0.7172	
15 minute summer	S1.1	7.001	S1.2	36.5	1.188	0.704	0.4936	
15 minute summer	S1.2	7.002	S1.3	35.1	1.095	0.678	0.9253	
15 minute summer	S1.3	7.003	S1.4	43.3	1.090	0.837	0.4776	
15 minute summer	S1.4	7.004	S1.5	69.4	1.745	1.335	2.0567	
15 minute summer	S1.5	7.005	S1.6	223.0	2.022	1.169	2.3751	
15 minute summer	S1.6	7.006	S1.7	261.5	2.371	1.603	4.8404	
2880 minute summer	S1.7	1.014	S1.8	32.6	0.556	0.060	20.9086	
2880 minute summer	S1.8	1.015	Tank (Big)	47.5	0.705	0.072	15.8769	
2880 minute summer	Tank (Big)	1.016	S1.9	26.7	0.743	0.542	1.3818	
5760 minute summer	S1.9	1.017	S1.10	26.7	0.796	0.453	2.0855	
10080 minute summer	S1.10	1.018	OUT	26.7	0.865	0.453	0.2663	10924.9
2880 minute summer	Greenway	9.000	S1.8	15.1	0.761	0.107	4.9529	
15 minute summer	S2.0	8.000	S2.1	105.3	1.698	0.825	2.8455	
15 minute summer	S2.1	8.001	S1.5	140.5	1.996	1.057	2.8471	
15 minute summer	S3.0	6.000	S3.1	77.2	1.942	1.824	1.6279	
15 minute summer	S3.1	1.010	S3.2	93.5	1.327	1.194	1.2753	
15 minute summer	S3.2	1.011	S3.3	111.5	1.584	1.424	0.7838	
15 minute summer	S3.3	1.012	S3.4	177.8	1.612	1.260	5.3415	
2880 minute summer	S3.4	1.013	S1.7	15.7	0.788	0.114	5.3427	
15 minute summer	S4.0	35.004	S4.1	491.1	2.274	1.436	15.3725	
2880 minute summer	S4.1	35.005	Tank (Big)	32.0	0.905	0.094	7.9392	
15 minute summer	S5.0	36.000	S5.1	20.3	0.752	0.390	0.8684	

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S5.1	11	68.586	1.362	113.9	4.2020	0.0000	SURCHARGED
15 minute summer	S5.4	11	68.034	1.472	391.5	5.2624	0.0000	SURCHARGED
15 minute summer	S6.0	11	69.212	1.224	63.6	3.2563	0.0000	FLOOD RISK
15 minute summer	S6.1	11	68.444	1.255	203.6	3.8641	0.0000	SURCHARGED
8640 minute summer	S6.2	6600	67.799	1.083	28.4	1.9899	0.0000	SURCHARGED
4320 minute summer	S6.3	4020	67.769	1.145	35.9	2.0234	0.0000	SURCHARGED
4320 minute summer	Tank (Lil)	4080	67.766	1.216	37.4	1800.4690	0.0000	SURCHARGED
30 minute summer	S7.0	19	69.214	0.664	9.0	0.8690	0.0000	SURCHARGED
15 minute summer	S7.1	11	69.237	1.145	82.5	2.7389	0.0000	SURCHARGED
15 minute summer	S8.0	12	70.030	1.105	131.3	4.7388	0.0000	SURCHARGED
15 minute summer	S8.1	12	69.897	1.537	160.4	3.4686	0.0000	FLOOD RISK
15 minute summer	S8.2	12	69.668	1.763	232.0	5.0356	0.0000	SURCHARGED
15 minute summer	S8.3	12	69.178	1.644	204.8	3.4673	0.0000	SURCHARGED
15 minute summer	S8.4	12	68.982	1.651	251.5	4.7369	0.0000	SURCHARGED
15 minute summer	S8.6	12	68.571	1.524	254.1	2.2711	0.0000	SURCHARGED
15 minute summer	S8.7	11	68.447	1.446	466.4	2.2508	0.0000	SURCHARGED
15 minute summer	S9.0	11	70.223	1.402	141.8	6.1277	0.0000	FLOOD RISK
15 minute summer	S9.1	11	69.611	1.469	180.3	3.1886	0.0000	SURCHARGED
15 minute summer	S9.2	11	69.166	1.295	214.0	2.9289	0.0000	SURCHARGED
15 minute summer	S10.0	11	69.755	1.287	58.4	3.2625	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S5.1	36.001	S5.4	95.9	1.361	1.058	4.6188	
15 minute summer	S5.4	35.003	S4.0	390.4	1.808	1.142	10.5614	
15 minute summer	S6.0	5.000	S6.1	49.5	1.245	1.353	3.0366	
15 minute summer	S6.1	4.002	S6.2	195.5	1.773	1.386	6.4657	
8640 minute summer	S6.2	1.007	S6.3	23.4	0.619	0.068	0.7457	
4320 minute summer	S6.3	1.008	Tank (Lil)	35.8	0.420	0.117	7.4490	
4320 minute summer	Tank (Lil)	1.009	S3.1	4.0	0.476	0.063	2.0278	
30 minute summer	S7.0	4.000	S7.1	11.6	0.382	0.233	2.0047	
15 minute summer	S7.1	4.001	S6.1	59.7	1.500	1.409	2.3519	
15 minute summer	S8.0	1.000	S8.1	122.6	1.548	0.699	8.0851	
15 minute summer	S8.1	1.001	S8.2	129.1	1.232	0.792	7.5330	
15 minute summer	S8.2	1.002	S8.3	168.9	1.531	1.197	6.5236	
15 minute summer	S8.3	1.003	S8.4	199.2	1.257	0.874	6.4235	
15 minute summer	S8.4	1.004	S8.6	252.0	1.591	1.105	9.0146	
15 minute summer	S8.6	1.005	S8.7	257.2	1.624	1.128	1.4618	
15 minute summer	S8.7	1.006	S6.2	469.6	2.964	1.452	3.3278	
15 minute summer	S9.0	2.000	S9.1	106.7	1.663	0.960	4.0506	
15 minute summer	S9.1	2.001	S9.2	174.3	1.580	1.171	5.3794	
15 minute summer	S9.2	2.002	S8.7	208.2	1.888	1.476	6.2120	
15 minute summer	S10.0	3.000	S9.1	42.8	1.322	0.823	0.6985	

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S11.0	19	69.145	0.794	66.7	2.2108	0.0000	SURCHARGED
30 minute summer	S11.1	19	69.049	0.985	68.3	1.2710	0.0000	SURCHARGED
30 minute summer	S11.2	19	69.001	1.015	61.7	1.2972	0.0000	SURCHARGED
240 minute summer	S11.3	192	68.977	1.061	33.5	2.2097	0.0000	SURCHARGED
240 minute summer	S11.4	192	68.977	1.267	42.8	2.1900	0.0000	SURCHARGED
240 minute summer	S11.5	192	68.976	1.319	41.9	1.4918	0.0000	SURCHARGED
30 minute summer	S11.6	22	67.439	0.159	55.6	0.2277	0.0000	OK
2880 minute summer	S11.7	2280	67.017	0.258	24.7	0.3972	0.0000	OK
2880 minute summer	S11.8	2280	67.017	0.325	24.7	0.4649	0.0000	OK
2880 minute summer	S11.9	2280	67.017	0.551	28.1	0.7880	0.0000	SURCHARGED
2880 minute summer	S11.10	2280	67.016	0.580	28.2	0.8527	0.0000	SURCHARGED
2880 minute summer	S11.11	2280	67.017	0.715	36.9	1.2630	0.0000	SURCHARGED
2880 minute summer	S11.12	2280	67.017	0.898	43.9	1.5865	0.0000	SURCHARGED
2880 minute summer	S11.13	2280	67.017	1.197	57.9	2.1898	0.0000	SURCHARGED
2880 minute summer	S11.14	2280	67.017	1.242	56.8	2.1938	0.0000	SURCHARGED
2880 minute summer	S11.15	2280	67.016	1.443	61.5	2.6413	0.0000	SURCHARGED
2880 minute summer	S11.16	2280	67.016	1.507	72.5	2.6633	0.0000	SURCHARGED
15 minute summer	S12.0	11	69.254	0.508	73.5	1.4275	0.0000	SURCHARGED
15 minute summer	S12.1	11	69.126	1.133	138.9	3.2964	0.0000	SURCHARGED
15 minute summer	S12.2	11	69.011	1.502	278.0	7.1580	0.0000	FLOOD RISK
600 minute summer	S13.0	555	68.579	1.244	4.1	2.2452	0.0000	FLOOD RISK
600 minute summer	S13.1	555	68.579	1.353	10.7	1.6843	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S11.0	10.000	S11.1	62.3	1.147	0.641	2.6415	
30 minute summer	S11.1	10.001	S11.2	56.8	0.980	0.630	0.8318	
30 minute summer	S11.2	10.002	S11.3	61.5	0.873	0.690	0.7632	
240 minute summer	S11.3	10.003	S11.4	32.5	0.725	0.367	2.2734	
240 minute summer	S11.4	10.004	S11.5	41.9	0.756	0.568	0.8356	
240 minute summer	S11.5	10.005	Detention Basin 1	41.3	0.630	0.528	1.5428	
30 minute summer	S11.6	10.007	S11.7	55.5	1.306	0.340	1.0503	
2880 minute summer	S11.7	10.008	S11.8	24.7	0.912	0.108	1.4427	
2880 minute summer	S11.8	10.009	S11.9	24.7	0.841	0.108	6.3558	
2880 minute summer	S11.9	10.010	S11.10	28.1	0.907	0.123	0.9540	
2880 minute summer	S11.10	10.011	S11.11	28.2	1.038	0.107	1.3991	
2880 minute summer	S11.11	10.012	S11.12	36.9	0.885	0.121	9.8664	
2880 minute summer	S11.12	10.013	S11.13	43.0	0.937	0.149	13.5498	
2880 minute summer	S11.13	10.014	S11.14	56.8	0.903	0.139	3.5672	
2880 minute summer	S11.14	10.015	S11.15	55.8	0.810	0.141	17.0787	
2880 minute summer	S11.15	10.016	S11.16	61.3	0.784	0.155	5.3665	
2880 minute summer	S11.16	10.017	Tank (Big)	72.4	0.786	0.183	10.4849	
15 minute summer	S12.0	35.000	S12.1	66.8	1.742	0.537	3.8221	
15 minute summer	S12.1	35.001	S12.2	125.0	1.295	0.625	5.3431	
15 minute summer	S12.2	35.002	S5.4	221.0	2.004	1.211	8.4987	
600 minute summer	S13.0	18.000	S13.1	3.9	0.304	0.091	0.6505	
600 minute summer	S13.1	17.004	Detention Basin 2	10.5	0.514	0.273	0.8037	

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	S14.0	20	68.103	0.328	54.8	0.4139	0.0000	SURCHARGED
2880 minute summer	S15.0	2280	67.017	0.120	1.6	0.2246	0.0000	OK
2880 minute summer	S16.0	2280	67.016	0.304	6.5	0.3855	0.0000	SURCHARGED
30 minute summer	S17.0	22	67.208	0.108	28.7	0.1217	0.0000	OK
240 minute summer	Detention Basin 1	192	68.975	1.503	107.1	262.1770	0.0000	SURCHARGED
600 minute summer	Detention Basin 2	555	68.578	1.539	15.0	95.0796	0.0000	SURCHARGED
30 minute summer	C1	22	69.413	0.043	9.8	1.0113	0.0000	OK
30 minute summer	C2	22	69.245	0.035	6.2	0.6156	0.0000	OK
30 minute summer	C3	21	69.136	0.036	6.5	0.6108	0.0000	OK
240 minute summer	C4	196	68.975	0.175	3.1	0.1030	0.0000	OK
30 minute summer	C5	20	69.080	0.080	10.9	0.0783	0.0000	OK
30 minute summer	C6	20	68.950	0.065	20.0	0.0626	0.0000	OK
30 minute summer	C7	21	69.028	0.038	7.6	0.7076	0.0000	OK
30 minute summer	C8	23	69.677	0.057	5.8	1.1748	0.0000	OK
30 minute summer	C9	22	69.610	0.046	11.9	0.0439	0.0000	OK
30 minute summer	C10	22	69.222	0.081	32.0	4.3595	0.0000	OK
30 minute summer	C11	21	69.134	0.054	13.8	1.4145	0.0000	OK
30 minute summer	C12	23	69.015	0.108	36.0	6.4681	0.0000	OK
30 minute summer	C13	24	68.966	0.129	43.6	8.6008	0.0000	OK
30 minute summer	C14	23	68.324	0.124	32.7	7.2268	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	S14.0	23.002	S11.11	55.0	1.389	1.358	0.6866	
2880 minute summer	S15.0	25.000	S11.12	1.6	0.569	0.014	1.5228	
2880 minute summer	S16.0	28.002	S11.13	6.5	0.956	0.112	0.6773	
30 minute summer	S17.0	32.001	S11.16	28.7	1.637	0.389	0.1762	
240 minute summer	Detention Basin 1	10.006	S11.6	14.9	0.892	0.097	0.7321	
600 minute summer	Detention Basin 2	17.005	S11.7	5.0	0.694	0.055	0.1403	
30 minute summer	C1	14.000	Detention Basin 1	9.4	1.781	0.081	0.0621	
30 minute summer	C2	13.000	Detention Basin 1	6.0	1.556	0.051	0.2900	
30 minute summer	C3	12.000	Detention Basin 1	6.4	1.494	0.055	0.4496	
240 minute summer	C4	11.000	Detention Basin 1	3.1	0.882	0.045	0.8342	
30 minute summer	C5	17.002	C6	10.9	0.992	0.273	0.2132	
30 minute summer	C6	17.003	S13.1	20.0	2.170	0.171	0.1234	
30 minute summer	C7	20.000	Detention Basin 2	7.4	1.659	0.064	0.0356	
30 minute summer	C8	15.000	C9	5.3	0.790	0.145	0.0763	
30 minute summer	C9	15.001	S11.6	11.9	2.087	0.088	0.0908	
30 minute summer	C10	16.000	S11.6	29.7	2.400	0.254	0.1345	
30 minute summer	C11	21.000	S11.7	13.5	1.917	0.115	0.0474	
30 minute summer	C12	24.000	S11.11	30.8	2.382	0.770	0.0975	
30 minute summer	C13	22.000	S11.9	36.0	2.380	0.900	0.0830	
30 minute summer	C14	27.000	S11.12	28.0	1.297	0.538	0.2027	

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	C15	24	68.425	0.125	34.9	8.6408	0.0000	OK
30 minute summer	C16	26	69.180	0.180	35.6	13.8184	0.0000	FLOOD RISK
30 minute summer	C17	20	68.871	0.246	52.1	0.5568	0.0000	SURCHARGED
30 minute summer	C18	24	68.010	0.180	60.7	14.4930	0.0000	OK
30 minute summer	C19	25	67.998	0.158	45.4	14.5379	0.0000	OK
30 minute summer	C20	24	68.053	0.153	45.4	13.5967	0.0000	OK
30 minute summer	C21	25	67.913	0.222	62.4	4.0912	0.0000	OK
30 minute summer	C22	26	68.846	0.246	68.3	23.2684	0.0000	FLOOD RISK
30 minute summer	C23	24	68.770	0.120	38.5	9.0534	0.0000	OK
30 minute summer	C24	22	68.710	0.080	30.9	4.1841	0.0000	OK
30 minute summer	C25	23	68.659	0.159	73.0	13.7586	0.0000	OK
180 minute summer	Apartment A	152	79.027	0.377	15.4	28.5325	0.0000	SURCHARGED
180 minute summer	Downpipe A	152	69.424	0.024	1.9	0.0002	0.0000	OK
120 minute summer	Apartment B	100	79.022	0.372	19.8	24.2293	0.0000	SURCHARGED
600 minute summer	Downpipe B	555	68.582	0.832	2.7	0.0067	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	C15	26.000	S11.12	28.7	1.313	0.553	0.2746	
30 minute summer	C16	23.000	C17	18.3	1.080	1.131	0.6361	
30 minute summer	C17	23.001	S14.0	52.1	1.324	1.302	0.2278	
30 minute summer	C18	29.000	S11.13	48.7	1.468	0.936	0.6645	
30 minute summer	C19	30.000	S11.13	31.8	1.102	0.792	0.3126	
30 minute summer	C20	28.000	C21	32.6	0.979	0.819	1.2073	
30 minute summer	C21	28.001	S16.0	54.2	1.454	1.043	0.3206	
30 minute summer	C22	31.000	S11.15	34.6	2.006	1.063	0.1505	
30 minute summer	C23	33.000	S11.16	29.9	2.035	0.919	0.2083	
30 minute summer	C24	32.000	S17.0	28.7	2.367	0.246	0.1115	
30 minute summer	C25	34.000	S11.16	61.8	2.178	0.749	0.2718	
180 minute summer	Apartment A	17.000	Downpipe A	1.9	0.669	0.101	0.0357	
180 minute summer	Downpipe A	17.001	C5	1.9	1.065	0.052	0.0141	
120 minute summer	Apartment B	19.000	Downpipe B	2.8	0.728	0.156	0.0528	
600 minute summer	Downpipe B	19.001	Detention Basin 2	2.7	0.627	0.189	0.2538	

APPENDIX 3
FOUL PUMPING STATION STORAGE
CALCULATIONS

PROJECT TITLE:	KILWOGHAN	PE:	CF
CALCULATION:	PUMPING STATION STORAGE VOLUME	PD:	CK
APPENDIX:	3	DATE:	08/08/2025

A: RESIDENTIAL (250 NO. UNITS)

The foul effluent from the proposed dwellings is calculated as per the Irish Water Code of Practice for Wastewater Infrastructure assuming dry weather flow of 150 l/head/day plus a 10% infiltration rate and using the Irish Water assumed average occupancy of 2.7 persons/unit.

$$\begin{aligned}
 \text{No. of Units} &= 250 \\
 \text{No. of Occupants} &= 250 \times 2.7 = 675.0 \\
 \\
 \text{Daily Flow} &= \text{No. of Occupants} \times \text{Dry Weather Flow} \\
 \text{Daily Flow} &= 675.0 \times 150 \times 1.1 = 111,375 \text{ l/day} \\
 \\
 \text{Average Flow} &= \frac{\text{Daily Flow}}{\text{Flow Duration}} = \frac{111,375 \text{ l/day}}{24 \times 60 \times 60} = 1.289 \text{ l/s} \\
 \\
 \text{Peak Flow} &= \text{Average Flow} \times 6 \\
 \text{Peak Flow} &= 1.289 \text{ l/s} \times 6 = 7.734 \text{ l/s}
 \end{aligned}$$

B: RESIDENTIAL (83 NO. UNITS)

The foul effluent from the proposed dwellings is calculated as per the Irish Water Code of Practice for Wastewater Infrastructure assuming dry weather flow of 150 l/head/day plus a 10% infiltration rate and using the Irish Water assumed average occupancy of 2.7 persons/unit.

$$\begin{aligned}
 \text{No. of Units} &= 83 \\
 \text{No. of Occupants} &= 83 \times 2.7 = 224.1 \\
 \\
 \text{Daily Flow} &= \text{No. of Occupants} \times \text{Dry Weather Flow} \\
 \text{Daily Flow} &= 224.1 \times 150 \times 1.1 = 36,977 \text{ l/day} \\
 \\
 \text{Average Flow} &= \frac{\text{Daily Flow}}{\text{Flow Duration}} = \frac{36,977 \text{ l/day}}{24 \times 60 \times 60} = 0.428 \text{ l/s} \\
 \\
 \text{Peak Flow} &= \text{Average Flow} \times 6 \\
 \text{Peak Flow} &= 0.428 \text{ l/s} \times 6 = 2.568 \text{ l/s}
 \end{aligned}$$

PROJECT TITLE:	KILWOGHAN	PE:	CF
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CALCULATION: PUMPING STATION STORAGE VOLUME
APPENDIX: 3

PD: CK
DATE: 08/08/2025

C: RESIDENTIAL (250 NO. UNITS)

The foul effluent from the proposed dwellings is calculated as per the Irish Water Code of Practice for Wastewater Infrastructure assuming dry weather flow of 150 l/head/day plus a 10% infiltration rate and using the Irish Water assumed average occupancy of 2.7 persons/unit.

$$\begin{aligned} \text{No. of Units} &= 133 \\ \text{No. of Occupants} &= 133 \times 2.7 = 359.1 \\ \text{Daily Flow} &= \text{No. of Occupants} \times \text{Dry Weather Flow} \\ \text{Daily Flow} &= 359.1 \times 150 \times 1.1 = 59,252 \text{ l/day} \\ \text{Average Flow} &= \frac{\text{Daily Flow}}{\text{Flow Duration}} = \frac{59,252 \text{ l/day}}{24 \times 60 \times 60} = 0.686 \text{ l/s} \\ \text{Peak Flow} &= \text{Average Flow} \times 6 \\ \text{Peak Flow} &= 0.686 \text{ l/s} \times 6 = 4.115 \text{ l/s} \end{aligned}$$

D: CRÈCHE

A creche facility is proposed ca. 212sqm GFA. Assume conservatively 50no. children catered for. Assume staff:child ratio of 1:5 on average (based on Schedule 6 Part 1 of Child Care Act 1991 (Early Years Services) Regulations 2016.). Thus assume total of 10no. staff + 50no. children = 60no. persons. As per Irish Water CoP for WW Infrastructure Appendix D, assume Demand rate for "Schools - non-residential without a canteen" = 50litres/person/day.

$$\begin{aligned} \text{No. of Children} &= 50 \\ \text{Staff:Child Ratio} &= 1:5 \\ \text{Total Population} &= 50 + 10 = 60 \\ \text{Daily Flow} &= \text{Population} \times \text{Dry Weather Flow} \\ \text{Daily Flow} &= 60 \times 50 \times 1.1 = 3,300 \text{ l/day} \\ \text{Average Flow} &= \frac{\text{Daily Flow}}{\text{Flow Duration}} = \frac{3,300 \text{ l/day}}{24 \times 60 \times 60} = 0.038 \text{ l/s} \\ \text{Peak Flow} &= \text{Average Flow} \times 4.5 \\ \text{Peak Flow} &= 0.038 \text{ l/s} \times 4.5 = 0.172 \text{ l/s} \end{aligned}$$

PROJECT TITLE: KILWOGHAN

PE: CF

CALCULATION: PUMPING STATION STORAGE VOLUME
APPENDIX: 3

PD: CK
DATE: 08/08/2025

E: RETAIL (153sqm GFA)

The water demand from the proposed commercial unit is calculated as per the Irish Water Code of Practice for Water Infrastructure assuming a water demand of 50 l/worker/day. Workers calculated: area in m² of area per FTE (Full time equivalent employee); as per Employment Densities Guide from OFFPAT. Type Retail A1 – High street with 1 FTE per 18m².

$$\begin{aligned} \text{Area sqm} &= 153 \text{ m}^2 \\ \text{No. of Staff} &= 153 / 18 = 8.5 \end{aligned}$$

$$\begin{aligned} \text{Daily Flow} &= \text{No. of Staff} \times \text{Dry Weather Flow} \\ \text{Daily Flow} &= 8.5 \times 50 \times 1.1 = 468 \text{ l/day} \end{aligned}$$

$$\text{Average Flow} = \frac{\text{Daily Flow}}{\text{Flow Duration}} = \frac{468 \text{ l/day}}{24 \times 60 \times 60} = 0.005 \text{ l/s}$$

$$\begin{aligned} \text{Peak Flow} &= \text{Average Flow} \times 5 \\ \text{Peak Flow} &= 0.005 \text{ l/s} \times 5 = 0.024 \text{ l/s} \end{aligned}$$

F: STORAGE REQUIRED

No. of Houses	Avg Flow (l/s)	Storage Req. (Hr)	Volume (m ³)
250	1.289 l/s	24	111.4
83	0.428 l/s	18	27.7
133	0.686 l/s	12	29.6
Creche	0.038 l/s	12	1.7
Retail	0.005 l/s	12	0.2
Total			170.6

Allow storage for 200m³

APPENDIX 4

UÉ INFORMATION

CONFIRMATION OF FEASIBILITY

Christina Fox

Sandwith House
52-54 Sandwith Street
Dublin
D02WR26

10 July 2025

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

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

**Our Ref: CDS25001161 Pre-Connection Enquiry
Crodaun, Celbridge, Kildare**

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 Multi/Mixed Use Development of 240 unit(s) at Crodaun, Celbridge, Kildare, (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
 - The Applicant shall note that predicted minimum development pressures are given at the site boundary at an elevation of 68.8mAOD. Based on the highest finished floor level of one of the blocks of flats in the submitted plans, an onsite booster pump station would likely to be required. This will be further assessed at Connection Application stage.
- **Wastewater Connection**
 - Feasible Subject to upgrades
 - In order to accommodate the proposed connection for this development, upgrade works are required to increase the capacity of the wastewater network in Celbridge. Uisce Éireann is currently in the process of planning a project which will provide the necessary upgrade and capacity. The

Stiúthóirí / 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.

- scheduling for this upgrade project is still to be confirmed and the proposed connection could be completed as soon as possibly practicable after this project is complete.
- Connection to the network could be facilitated prior to completion of the upgrade project provided the Applicant installs a new WWPS to cater for the site with 24 hour storage and downstream flow control for any connection before the completion of the upgrade project.

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

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

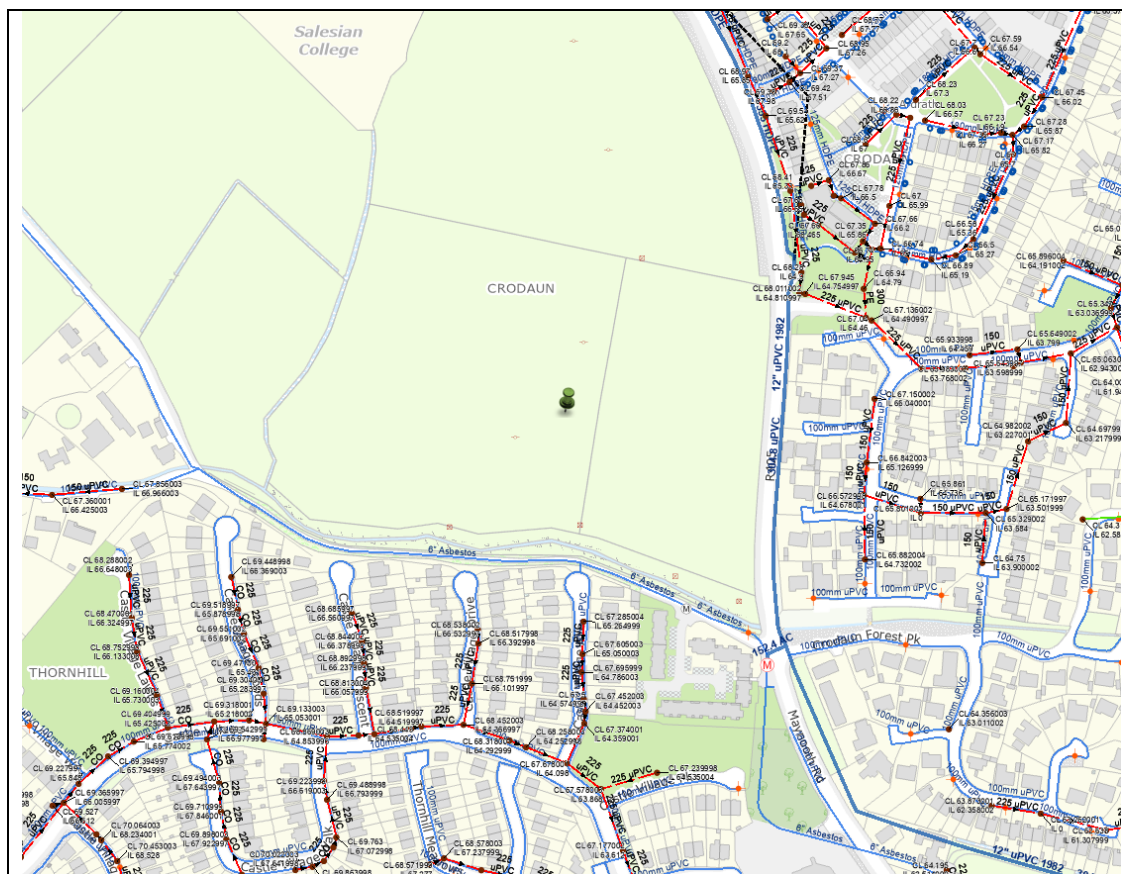
Section A - What is important to know?

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 <u>and be granted and sign</u> 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 <i>the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice</i>, 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



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

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

APPENDIX 5
EXTRACT FROM GROUND INVESTIGATIONS
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seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report.

3.9. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.

Environmental & Chemical testing as required by the specification, including the Rilta Suite, pH and sulphate testing was carried out by Element Materials Technology Laboratory in the United Kingdom (UK). The Rilta suite testing includes both Solid Waste and Leachate Waste Acceptance Criteria.

Geotechnical testing consisting of Moisture Content, Atterberg Limits and Particle Size Distribution (PSD) tests were carried by Professional Soils Laboratory (PSL) in the UK.

The results of the laboratory testing are included in Appendix 7 of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to in-situ and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and generally comprised;

- Topsoil
- Cohesive Deposits
- Weathered Bedrock
- Bedrock

TOPSOIL: Topsoil was encountered in all the exploratory holes and was present to a maximum depth of 0.50m BGL. Rare red brick fragments were encountered at BH-08 which indicates this layer may be partially reworked.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Made Ground and were described typically as *brown slightly sandy gravelly CLAY with low cobble content* overlying a *grey slightly sandy gravelly CLAY with low cobble and boulder content*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. These deposits had low (<5%), medium (5%-20%) or high (20%-50%) cobble and boulder content, where noted on the exploratory hole logs.

WEATHERED BEDROCK: In the majority of exploratory holes presumed weathered rock was encountered which was digable with the large excavator to a depth of up 0.60m below the top of the stratum. The trial pits were terminated upon encountering the more competent bedrock, in which further excavation became more difficult. This material was recovered typically as angular gravel and cobbles of Limestone and Mudstone, however there was some variability in the fracture spacing and the ease at which the excavator could progress. Some clay and sand were also present within the rock mass either from weathering or as infilling to fractures which were opened upon excavation.

BEDROCK: The rotary core boreholes recovered *interbedded medium strong to very strong thinly laminated to thinly bedded dark grey fine grained argillaceous LIMESTONE and very weak to medium strong black calcareous MUDSTONE*. This is typical of the Lucan Formation, which is noted on the Geological Survey Ireland's (GSI) geological mapping of the site. The degree of weathering ranged from fresh to highly weathered. Calcite veins and rare visible pyrite lenses were noted during logging which are typically present within the Lucan Formation.

The depth to rock varies from 1.60m BGL in RC-08 to a maximum of 2.80m BGL in RC-04. The total core recovery is good, typically 100% with some of the uppermost runs dropping to 80 or 90%. The SCR and RQD both are relatively poor in the upper weathered zone, often recovered as non-intact, however both indices show an increase with depth in most of the boreholes.

4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred and where possible drilling was suspended for twenty minutes to allow the subsequent rise in groundwater to be recorded. It should be noted that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the tide, time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in RC-01, RC-04, RC-07 and RC-08 to allow the equilibrium groundwater level to be determined. The groundwater monitoring is included in Appendix 8.

4.3. Laboratory Testing

4.3.1. Geotechnical Laboratory Testing

The geotechnical testing carried out on soil samples recovered generally confirm the descriptions on the logs with the primary constituent of the cohesive deposits found to be a CLAY of low plasticity. The Particle Size Distribution tests confirm that generally the cohesive deposits are well-graded with percentages of sands and gravels ranging between 28% and 45% generally with fines contents of 27% to 36%.

4.3.2. Chemical Laboratory Testing

The pH and sulphate testing carried out indicate that pH results are near neutral and that the water-soluble sulphate results is low when compared to the guideline values from BRE Special Digest 1:2005. The samples tested classify the soil as a Design Sulphate Level DS-1.

4.3.3. Environmental Laboratory Testing

A number of samples were analysed for a suite of parameters which allows for the assessment of the sampled material in terms of total pollutant content for classification of materials as *hazardous* or *non-hazardous*. The suite also allows for the assessment of the sampled material in terms of suitability for placement at licenced landfills (inert, stable non-reactive, hazardous etc.). The parameter list for the suite includes analysis of the solid samples for arsenic, barium, cadmium, chromium, copper, cyanide, lead, nickel, mercury, zinc, speciated aliphatic and aromatic petroleum hydrocarbons, pH, sulphate, sulphide, moisture content, soil organic matter and an asbestos screen.

The suite also includes those parameters specified in the EU Council Decision establishing criteria for the acceptance of waste at Landfills (Council Decision 2003/33/EC), which for the solid samples are total organic carbon (TOC), speciated aliphatic and aromatic petroleum hydrocarbons, BTEX, phenol, polychlorinated biphenyls (PCB) and PAH.

As part of the suite a leachate is generated from the solid sample, which is analysed for antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, chloride, fluoride, soluble sulphate, sulphide, phenols, dissolved organic carbon (DOC) and total dissolved solids (TDS).

While the laboratory report provides a comparison with the waste acceptance criteria limits it does not provide a waste classification of the material sampled nor does it comment on any potentially hazardous properties of the materials tested. The possibility for contamination, not revealed by the testing undertaken should be borne in mind particularly where Made Ground deposits are present, or the previous site use or location indicate a risk of environmental variation. A waste classification report is recommended to be carried out to provide an interpretation of the laboratory data should any material be required to be disposed of off-site.

The results from the completed laboratory testing are included in Appendix 7 of this report.

5.0 Recommendations & Conclusions

5.1. General

The recommendations given and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes. Limited information has been provided at the ground investigation stage and any designs based on the recommendations or conclusions should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory hole logs.

5.2. Foundations

At the location of the proposed houses, an allowable bearing capacity (ABC) of 100 kN/m² is recommended for conventional strip or pad foundations on the firm cohesive deposits at a depth of 1.00m BGL, except at BH/RC-06, where an ABC of 90kN/m² is recommended at 1.00m BGL. The possibility for variation in the depth of the made ground in the vicinity of these foundations should be considered and foundation inspections should be carried out. Any soft spots encountered at the proposed foundation depths should be excavated and replaced with lean mix concrete. Dynamic probes are recommended to be completed across the site to ensure the bearing stratum's recommended depth remains consistent and to help identify any anomalous zones, if present.

At the location of the proposed apartment blocks, where BH/RC-02, BH/RC-03 and BH/RC-04 were completed, an ABC of 200 kN/m² is recommended for pad foundations on the very stiff cohesive deposits at a depth of 1.50m BGL. If higher bearing capacity is required, an ABC of 750 kN/m² is recommended on competent bedrock at a depth of 2.10m to 2.80m BGL.

In any part of the site, should competent bedrock be present at foundation level, an ABC of 750 kN/m² is recommended for conventional strip or pad foundations. Should part of a foundation be on rock we would recommend that all the foundations of the unit in question be lowered to the competent rock stratum to avoid differential settlement.

A ground bearing floor slab is recommended to be based on the firm cohesive deposits, with an appropriate depth of compacted hardcore specified by the consulting engineer and in accordance with the limits and guidelines in SR21:2014 +A1:2016 and/or NRA SRW CL808 Type E granular stone fill. Where the depth of Made Ground or soft deposits exceeds 0.90m then suspended floor slabs should be considered.

The pH and sulphate testing completed on samples recovered from the exploratory holes indicates the pH results are near neutral and the sulphate results are low, when compared to the guideline values from BRE Special Digest 1:2005. No special precautions are required for concrete foundations to prevent sulphate attack. The samples tested were below the limits of DS1 in the BRE Special Digest 1:2005.

5.3. External Pavements

The proposed pavements are recommended to be designed in accordance with the CBR test results included in the Appendices of this Report. The low CBR test results indicate that a capping layer or a sufficient depth of crushed stone fill may be required. Plate bearing tests are recommended at the time of construction to verify the design assumptions for the proposed pavement make up and to verify adequate compaction has been achieved.

The use of a geogrid and separation membrane may improve the performance of the proposed pavement and enable a more economical pavement design to be achieved, a specialist supplier is recommended to advise of the required strength, depth and type of geotextile for the proposed design.

5.4. Excavations

Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry. Excavations in the Made Ground or soft Cohesive Deposits will require to be appropriately battered or the sides supported due to the low strength of these deposits. Excavations in the upper cohesive and weathered rock deposits are expected to be excavatable with conventional excavation equipment, with zones of more intact bedrock below this depth requiring rock breaking techniques. The groundwater and stability noted on the trial pit logs should be consulted when determining the most appropriate construction methods for excavations.

5.5. Soakaway Design

At all soakaway test locations, the water level dropped too slowly to allow calculation of 'f' the soil infiltration rate. These locations are therefore not recommended as suitable for soakaway design and construction.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

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