MHL & ASSOCIATES LTD.

For: **Clockstrike Ltd.**

Proposed Residential Development - Phase 2,
Ringwood, Blarney.



Drainage Impact Assessment
SUDS Statement

December 2025

MHL & Associates Ltd.
Consulting Engineers

MHL & ASSOCIATES LTD.

Document Control Sheet

Client	Clockstrike Ltd.
Project Title	Proposed Residential Development- Phase 2
Project Location	Ringwood, Blarney, Cork
Document Title	Drainage Impact Assessment
Document No.	BLR-2-02-SW-ZZZ-RP-MHL-CE-009 Rev B DIA

Rev	Status	Author	Reviewed By	Approved By	Date
--	Internal Draft	D. Murphy	--	--	24th – Aug – '25
A	External Draft	D. Murphy	B. Murphy	B. Murphy	24th – Nov – '25
B	Client Issue	D. Murphy	B. Murphy	B. Murphy	09th – Dec – '25

M.H.L. & Associates Ltd.

Consulting Engineers

Unit 1b,
The Atrium,
Blackpool,
Cork.

Tel 021-4840214 *Fax:* 021-4840215

E-Mail: info@mhl.ie

Table of Contents

1 Introduction 3
1.1 Site Location 3
1.2 Site Description 4
1.3 Existing Site Hydrology 6
2 Proposed Development Surface Water Management System 8
2.1 Principle Design Considerations 8
2.2 Storm Water Drainage System Overview 8
2.2.1 Predevelopment Conditions 8
2.3 Greenfield Runoff 8
2.3.1 Post Development Conditions 9
3 Layout of Storm Network 11
3.1.1 Catchment Plan 12
3.2 Attenuation Tank 13
3.2.1 Volume of Attenuation 13
3.2.2 Hydrocarbon Treatment 13
3.2.3 Silt Control 14
3.3 Interception Storage 16
3.4 Flow Control 17
4 Sustainable Urban Drainage Systems (SUDs) 19
4.1 SUDs Objectives 19
4.1.1 Quantity Control Processes – Outline 19
4.1.2 Quality Control Processes 20
4.1.3 Amenity & Biodiversity Processes 20
4.2 SUDs Techniques 20
5 Operation and Maintenance 24
5.1 Oil/Petrol Interceptor 24
5.2 Rainwater Harvest Butt 24
5.3 Infiltration Basin / Tank 25
6 Flooding 26
7 Amenity and Biodiversity 27
7.1 Summary of Ecological Importance 27
7.2 Sensitive Receptors 27
8 SUDS Statement 28
9 Appendix 30
10 Appendix A: SUDS Details- Typical 31
10.1 Water Butts 31
10.2 Rainwater Harvesting 31
10.3 Permeable Paving 32
10.4 Soakaways 32
10.4.1 Swales 33
10.4.2 Modified Planters 34
10.4.3 Detention Basins 34
11 Appendix B: Greenfield Rates 36
12 Appendix C: Hydraulic Modelling 37
13 Appendix D: Permitted Phase 1 LRD Data 38

Table of Figures

Figure 1.1: Subject's Site Location 3
Figure 1.2: Site Location & Surrounding Area 4
Figure 1.3: Development Site Layout Phase 2 (c: CSR/CCK Architects) 5
Figure 1.4: Topographical Grading Assessment 6
Figure 1.5: Site Location 6
Figure 2.1:Site Values 9
Figure 3.1: Contributing Catchment Areas 12
Figure 3.2: Catchment Attenuation 13
Figure 3.3: Bypass Interceptor details. 14
Figure 3.4: Bypass Interceptor details. 14
Figure 3.5: Attenuation RC tanks -typical installation (Carlow tanks) 14
Figure 3.6: Attenuation RC tanks -cross section detail (Carlow tanks) 15
Figure 3.7: Proposed headwall location. 15
Figure 3.8: Interception Volume 16
Figure 3.9 Catchment drainage proposals. 17
Figure 3.10: Flow control locations. 18
Figure 4.1: SuDS Techniques for Source, Site & Regional Control 21
Figure 4.2: SUDS Stormwater Management (Preferred Management Train) 22
Figure 4.3 Typical Swale and Bioretention site layout incorporation. 22
Figure 4.4: Suds / surface water conveyance channel in greenspace areas. 23
Figure 6.1: Proposed site's proximity to nearby watercourse/ stream. 26
Figure 7.1: Sensitive Receptors/ Potential Impact 27
Figure 10.1: Domestic Water Butt (Susdrain.org) 31
Figure 10.2: Rainwater Harvesting Schematic (CIRIA 753) 31
Figure 10.3: Typical Permeable Paving Detail (c: Roadstone) 32
Figure 10.4: Typical Schematic of a Soakaway (c: SuDS Manual) 32
Figure 10.5: Typical Swale details. 33
Figure 10.6: Tree pit schematic. 34
Figure 10.7: Example Detention Basin (c: Suds Wales) 35
Figure 10.8: Example Detention Basin (c: Phys.org) 35
Figure 13.1: Development Site Layout Permitted Phase 1 (c: CSR/CCK Architects) 38
Figure 13.2: Development Site Sub catchments -Permitted Phase 1 38
Figure 13.3: Phase 1 flow control locations. 38

1 INTRODUCTION

This Drainage Impact Assessment (DIA), prepared by MHL& Associates Ltd. on behalf of Clockstrike Ltd., evaluates the proposed Phase 2 Large Scale Residential Development (LRD) on zoned lands in Ringwood, Blarney, Cork.

Prepared in accordance with the Cork City Development Plan 2022, the report focuses on sustainable surface water management. It assesses existing site hydrology, stormwater drainage design, site investigation results, and flood risk, while detailing proposed sustainable urban drainage systems (SUDs) and associated infrastructure.

The assessment considers pre- and post-development conditions, flow control, attenuation, water quality, amenity, and biodiversity, with guidance on operational and maintenance requirements.

Supported by detailed appendices, the report ensures that surface water management for the development is effective, environmentally sustainable, and aligned with wider ecological and community objectives.

1.1 Site Location

The applicant is seeking planning for the lands located South of the N20 and east of Station Road. For the purposes of this report, these lands are referred to as the Ringwood Phase 2 site.

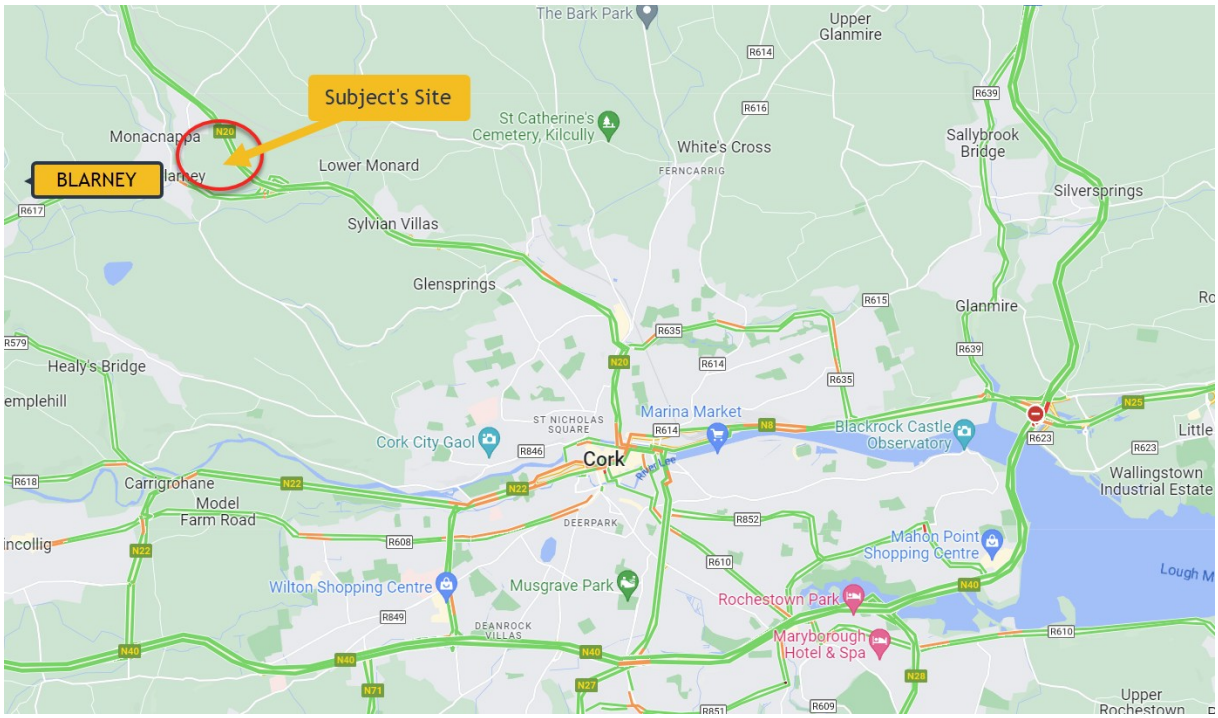


Figure 1.1: Subject's Site Location

The figure above shows the site location in relation to the Blarney Village environs and the wider regional road network. The site is 0.5-1.0 km east of the village centre.

The development of the Ringwood site is in keeping with Cork City Development Plan 2022-2028 which focuses on developing Blarney into an important population centre to the west of the city, fulfilling its role in urban city development.

The proposed site layout has been developed by CCK Architects. Please refer to the design team drawing pack submitted for further details.

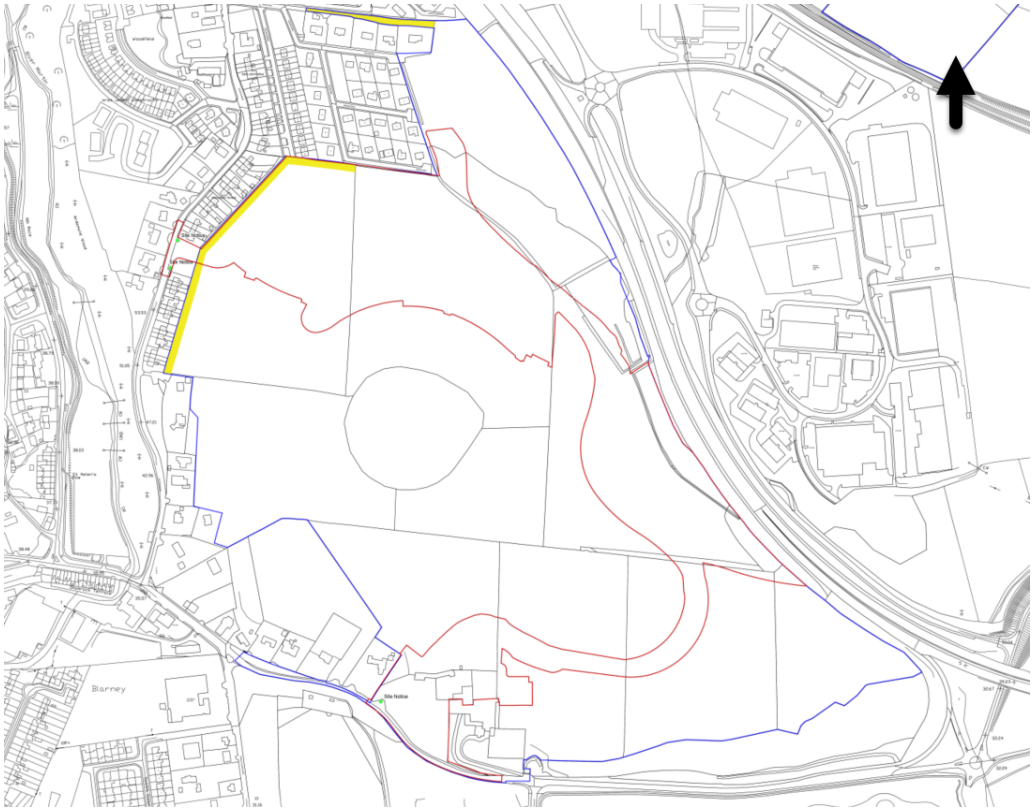


Figure 1.2: Site Location & Surrounding Area

1.2 Site Description

The LRD Phase 2 planning description states :

Clockstrike Ltd., intend to apply for permission for a Large-Scale Residential Development (LRD), at this site at Ringwood, Shean Upper and Shean Lower, Blarney, Cork. The proposed development will consist of a large-scale residential development (LRD), representing Phase 2 of development in the Blarney East / Ringwood Expansion Area, and comprising the construction of (i) 323 no. residential dwellings comprising of 157 no. terraced, end-of-terrace, and detached houses (including 129no. 3-bed and 28no. 4-bed units); 52 no. duplexes provided in 5 no. 3-storey buildings (including 26 no. 2-bed and 26 no. 3-bed units) and 114 no. apartments provided in 2 no. 5-storey buildings (including 54 no. 1-bed and 60 no. 2-bed units); (ii) a primary care centre, over 2 stories and 1,724sqm in area, incorporating GP services (iii) the refurbishment and redevelopment of existing farm outbuildings for conversion to a retail/pharmacy use, 80sqm in area, and café/restaurant use, 380sqm in area; (iv) a new access roadway into the site from the R617 with associated pedestrian and cyclist infrastructure, which will form the 1st phase of the proposed Stoneview Access Link Road, (v) a new signalised junction on the R617 road which will provide a single lane approach to the west and a two lane approach to the east, comprising one lane for through traffic on the R617 and a right turn lane for traffic turning into the site, and associated footpath improvements and cycle lane provision (vi) a new signalised junction at the R617 and Killard Road junction which will provide a two lane approach from the west, one lane for through traffic heading eastbound on the R617

and a right turn lane onto the Killard Road, with associated footpath improvements and pedestrian and cyclist infrastructure; (vii) a new signalised junction on Station Road that reflects the junction permitted under the Phase 1 LRD scheme (Reg. Ref. 2443031) (viii) private, communal, and public open spaces and hard and soft landscaping, boundary treatments and amenity areas, including a new wetland public amenity area, (ix) drainage works and nature-based SuDS measures (x) foul sewer infrastructure, including 1no. pump station, the diversion of existing foul and water sewers and other new network works, (xi) car parking, including EV charging points, bicycle parking, and motorcycle parking bays (xii) 2no. substations, all associated ancillary site, drainage and development works. The planning application is accompanied by an Environmental Impact Assessment Report (EIAR).

The application may be inspected online at the following website: www.ringwoodphase2lrd.ie



Figure 1.3: Development Site Layout Phase 2 (c: CSR/CCK Architects)

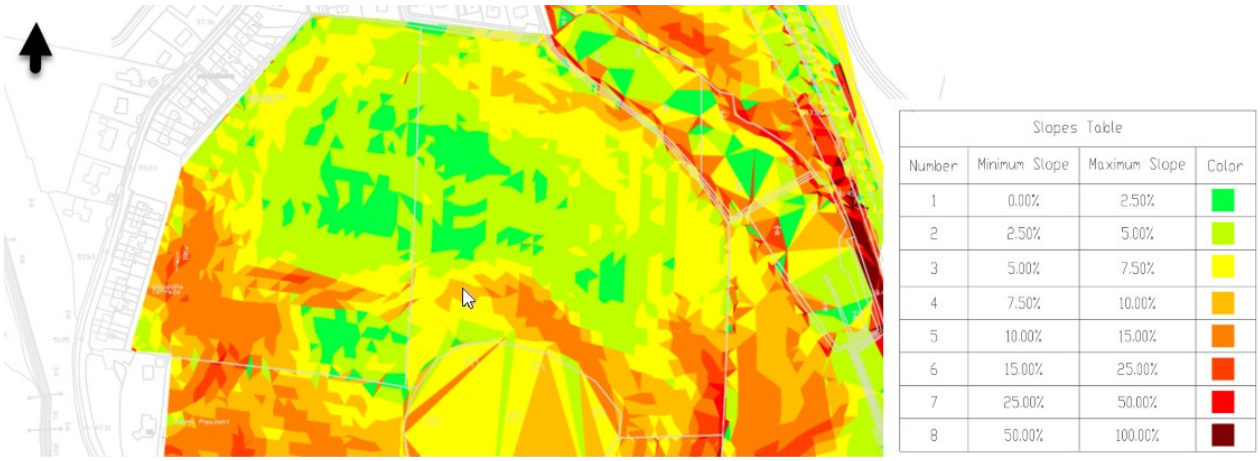
The development proposes to connect onto Station Road and the R617 with two proposed new development junctions. Extensive traffic analysis for this junction and surrounding road networks has been carried out by Systra Ltd. Please refer to their submitted

documentation for further details. This junction arrangement has been arrived at following discussions with Cork City Council.

1.3 Existing Site Hydrology

Local hydrology is intrinsically connected to the hydrogeological setting within the greater development area. According to the EPA (2021) on-line mapping, the proposed development site lies within the Manin_SC_010 sub catchment.

The site's existing slope profiles are severe in locations, as noted by the gradient heat mapping below.



Slopes Table

Number	Minimum Slope	Maximum Slope	Color
1	0.00%	2.50%	
2	2.50%	5.00%	
3	5.00%	7.50%	
4	7.50%	10.00%	
5	10.00%	15.00%	
6	15.00%	25.00%	
7	25.00%	50.00%	
8	50.00%	100.00%	

Figure 1.4: Topographical Grading Assessment

The River Martin is the closest surface water body to the proposed development.



Figure 1.5: Site Location

Surface water drainage comprises the River Martin which runs to the west of the development, and which generally flows in a SW direction. A small tributary of the River Blarney is approx. 130m east of the proposed development and flows into the Blarney [River] 1km downstream of its closest point to the site. This stream flows through

agricultural fields and adjacent to the N20 before flowing underneath the R617 and an N20 slip road and then enters the River Blarney. This stream is also known as the Shean Upper Stream.

2 PROPOSED DEVELOPMENT SURFACE WATER MANAGEMENT SYSTEM

The proposed surface water management system is designed, as much as is feasible, in accordance with the principles of Sustainable Drainage Systems (SuDS) as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS).

The GDSDS addresses the issue of sustainability by requiring designs to comply with a set of drainage criteria which aim to minimise the impact of urbanisation by replicating the runoff characteristics of a greenfield site. The criteria provide a consistent approach to addressing both rate and volume of runoff as well as ensuring the environment is protected from pollution that is washed off roads and buildings.

These drainage design criteria are as follows:
- Criterion 1 - River Water Quality Protection
- Criterion 2 - River Regime Protection
- Criterion 3 - Flood Risk Assessment
- Criterion 4 - River Flood Protection

2.1 Principle Design Considerations

During the design of the storm water drainage for the proposed site, including Suds, the following key documents / standards were taken into consideration.
- Cork City Development Plan 2022-2028
- Greater Dublin Strategic Drainage Study (GDSDS)
- CIRIA report C753 The Suds Manual-v6
- Greater Dublin Regional Code of Practice for Drainage (GDRCoP)

2.2 Storm Water Drainage System Overview

2.2.1 Predevelopment Conditions

For this development, the permissible outflow is calculated using the estimation method contained in the Institute of Hydrology Report No.124: Flood estimation for small catchments:

$$QBAR = 0.00108 \times (AREA)^{0.89} \times (SAAR)^{1.17} \times (SOIL)^{2.17}$$

- QBAR is the Mean Annual Peak Flow (Permissible outflow in m3/sec)
- AREA is the Catchment site area in km2.
- SAAR is the Standard Annual Average Rainfall
- SOIL is the soil index.

Given that the development is smaller than 50 hectares, the analysis for determining the permissible outflow employs 50 hectares in the formula. It then linearly interpolates the flow rate values based on the ratio of the development size to 50 hectares. Design summary sheets for the QBAR value can be found in the appendix of this report, outlining the Mean Annual Flow (permissible outflow) specifically calculated for the designated development areas. The allowable runoff estimates method utilises IH124 and the Soil Index value taken from UKSUDS as 0.3.

2.3 Greenfield Runoff

The estimated greenfield runoff is calculated from the applicant's site area; however, this includes areas that are not positively drained to the development surface water drainage system. These areas are excluded from the calculation of Qbar. The greenfield runoff rate calculated for Phase 2 of the development is as per Figure 3.1. Details of this calculation are attached in the appendix of this report. A summary of the design values output by the HR Wallingford Greenfield runoff estimation online tool is shown below.

Soil Type	2
SPR	0.3
SAAR	1176
Hydrological Region	13
M5-60	17
R	0.3

Figure 2.1:Site Values

2.3.1 Post Development Conditions

The stormwater management plan for this particular development incorporates a range of measures, including both soft and hard solutions. The use of Sustainable Drainage Systems (SUDS) and tank systems has been proposed where applicable.

All surface water runoff from the paved development will be directed away from the site. The attenuation tank is specifically designed to handle a 100-year storm event. Moreover, the maximum discharge from the attenuation tank will be restricted to the calculated permissible runoff (QBAR) for the site.

Given the proposed changes in the development design, there will be alterations to the land surface. Consequently, this anticipated modification will result in a corresponding increase in the peak rate of surface runoff from the site during periods of heavy rainfall.

Collection

Surface water will be collected on the building roofs which will discharge via down pipes and underground pipes. Surface water runoff from paved surfaces will be collected separately by drainage channels, road gullies and underground pipes. The surface water drainage system for the proposed development will be separate to the foul water system.

Treatment

Surface water from the roof areas would be drained by gravity directly to the attenuation system. The runoff from paved surfaces will also be drained via a bypass interceptor or similar approved.

Discharge

It is proposed to discharge the attenuated surface water flow by gravity to the existing storm sewer into the nearby watercourse. Details of the outfall/ long sections are shown on the submitted drawings.

Pipe Design

Pipes carrying surface water within the site are suitably sized to cater for a rainfall intensity of 50mm per hour applied to all external impermeable areas and roofs. Surface water runoff from impermeable areas is calculated using the Modified Rational Method.

Design Details

It is proposed to attenuate to. tanks, providing sufficient capacity (m3) which is greater than the storage requirement for the 100-year return period. Regarding limiting outflow from the storm network, hydro-brakes (or similar approved) flow control devices are to be fitted at their outlets.

The design of the drainage network was assessed using events with a range of different durations to determine the critical event for each period analysed as follows:

- 1 in 2-year return period events were used to ensure that the system did not surcharge.
- 1 in 100-year return period events were used to ensure that flooding did not occur.

The layout of the proposed storm water network is shown in the Proposed Stormwater Sewer layout plans.

As per section 16 of the GDRCoP and in particular the criteria as set out in section 16.3, compliance with all 4 Criteria is summarised as follows:

Criterion 1 (River Water Quality Protection):

Interception provided by way of:

- Permeable paving in driveways and parking bays
- Surface water runoff to infiltration chambers in parts of the development. These will be equipped with silt chambers and hydrocarbon interceptors.
-

Criterion 2 (Stream Regime Protection):

Discharge rate restricted to QBAR for all storm events up to and including the 1 in 100-year storm event.

Criterion 3 (Level of service (flooding) for the site) –:

A review of the Office of Public Works (OPW) Flood Hazard Mapping website indicates that there are no records of flooding incidents at the site of the proposed development.

- No Site Flooding.
- No internal property flooding.
- All FFLs are a minimum of 500mm above adjacent on-site attenuation/infiltration tanks.
- Flood routes have been mapped from each attenuated storage area showing overland routes away from dwellings.
- Run-off from green areas during high intensity storm events can be catered for in on-site attenuation tanks.

Criterion 4 (River Flood Protection):

Maximum discharge rate of QBAR for all attenuated storage is proposed which is considerably less than the 30-year and 100-year greenfield run-off rates. No reduction in terms of run-off has been allowed for in the sizing of attenuation tanks because of proposed Suds measures.

For the operational phase of the scheme the provision of Suds interception measures will ensure that the first 5mm of rainfall is prevented from discharging from the site. It is often the case that the initial run-off from roads and hard pavement areas has a concentration of pollutants. This first-flush is being addressed on site thus ensuring the quality of the receiving waters is not impacted.

The storm water management proposals for the site have been informed by the relevant standards and comply with best practice in terms of Suds (Sustainable Urban Drainage Design). By providing the measures as outlined, the impact of the proposed development on the Hydrological area has been minimised and results in a reduction in the existing greenfield runoff rate for the site.

3 LAYOUT OF STORM NETWORK

The proposed surface water network has been split into sub catchments, see Figure 3.2. The catchments will operate independently with the controlled discharges from each discharging via two outfalls to the adjoining watercourses.

The proposed surface water networks will include a storm drainage pipe network and SuDS features, including nature-based features, which will aid the reduction of runoff volumes by slowing surface water flows, both providing the opportunity for evapotranspiration and rainwater storage. Both the interception and attenuation storage requirements of GDSDS will be sufficiently met through the provision of these features.
An assessment of the potential SuDS measures that could be incorporated within the site was conducted using the SuDS Manual, CIRIA 753 as guidance.

The proposed surface water discharge rate from the development will be restricted to Qbar, as specified. Each catchment will have a hydrobrake flow-control device installed downstream to limit discharge to the pre-development greenfield discharge rate.

To facilitate the removal of grit from runoff before it enters the SuDS systems, grit-sump manholes will be positioned upstream of the detention basins and attenuation areas. Manholes will also be constructed at various points along pipe runs, including changes in sewer direction, changes in gradients, significant sewer connections, and at intervals not exceeding 90m along straight sections of pipework.

The SuDS strategy for the development involves a combination of measures such as swales, tree-pits, and basins. Together, these elements provide conveyance, interception storage, and attenuation storage for rainwater runoff.

To manage rainwater runoff from the houses, a specific approach is proposed. Runoff from the front roof will discharge to permeable paving located at the front of the house, while runoff from the back roof will discharge to soakaways. This strategy ensures effective management of rainwater runoff from the residential properties.

The proposed detention basins are located outside of the estimated flood extent area for this event.

- The proposed storm network has been designed for a 1in30year storm event, the attenuation tanks are designed for a 1 in 100year storm event, with a rainfall intensity of 50mm/hr.
- The minimum gradient in the proposed storm sewer network is 1/200.

Please refer to Proposed Surface Water Drainage layouts for the site in Planning Drawing Pack accompanying this planning application. As part of the design process the "Interim Code of Practice for Sustainable Drainage System" published in July 2004 by the National SUDS Working Group was consulted.

The construction of the storm sewer pipe network shall be in accordance with Section 3 of the Department of Environment and Local Government publication "Recommendations for Site Development Works for Housing Areas".

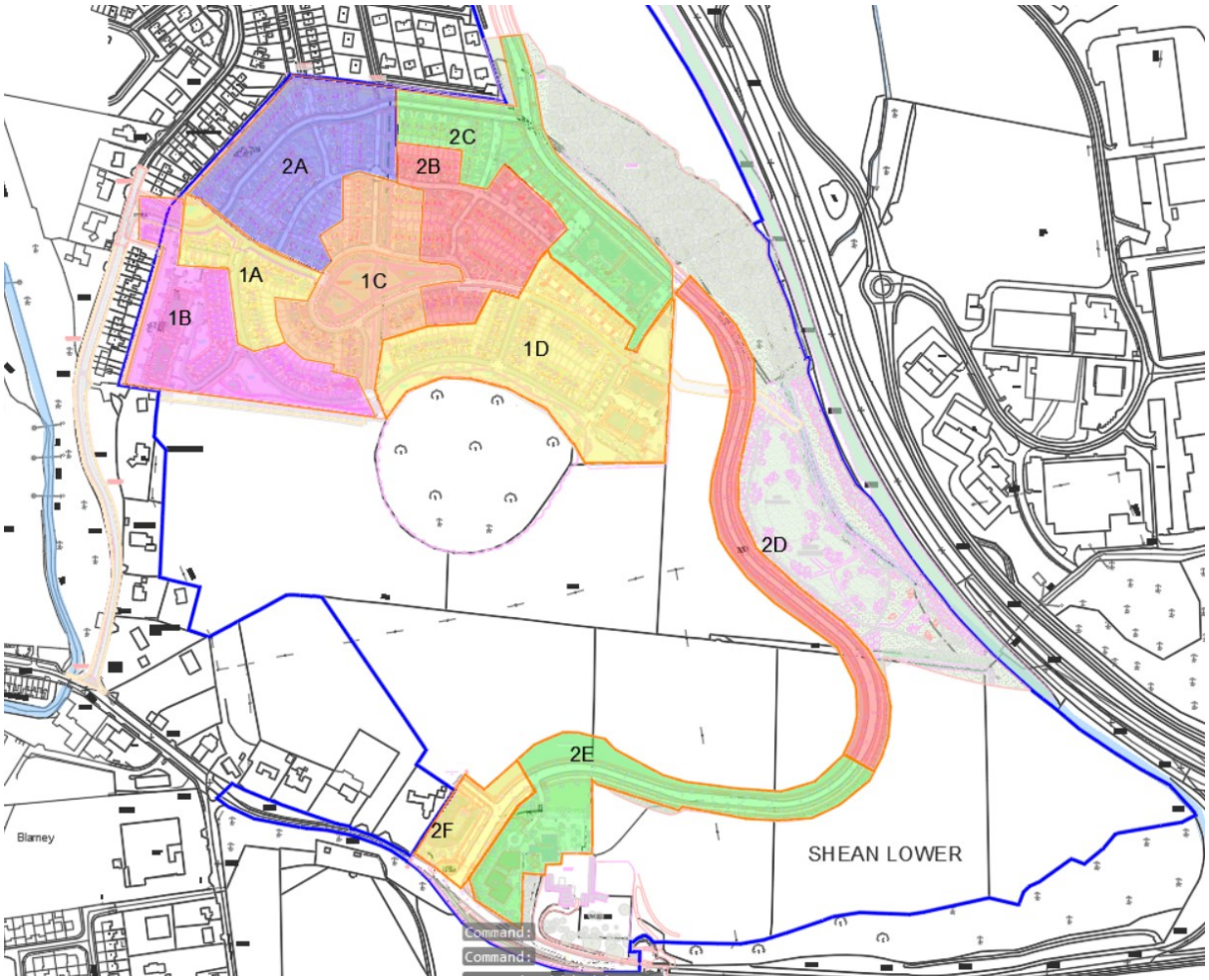
The storm system proposed will incorporate:

- Bypass Hydrocarbon Inceptors: Conder Bypass Separators or similar approved
- Hydro-brake flow control to be installed to control outflow rate l/s or similar approved.

- Attenuation tanks / Concrete tanks
- Sustainable systems as defined.

3.1.1 Catchment Plan

The LRD Phase 2 development has been split into 6No. sub catchment areas, as shown in Figure 3.1 below.



Contributing Area	(l/s) QBAR
Catchment Area 2a	7.7
Catchment Area 2b	5.6
Catchment Area 2c	7.7
Catchment Area 2d	5
Catchment Area 2e	7.1
Catchment Area 2f	2.3

Figure 3.1: Contributing Catchment Areas

The flood peak runoff rates from the post development grassy permeable area and the post development impervious area. It should be noted that comate change has been accounted in the design. The GDSDS a factor of 20% has been incorporated into the design.

3.2 Attenuation Tank

3.2.1 Volume of Attenuation

The proposed rate of surface water discharge from the development will be limited to Qbar, as described. Attenuation storage will be provided in the detention basins and the concreter attenuation tanks which will cater for the 1 in 100-year storm event with a 20% climate change allowance added. The proposed surface water network has been populated with various nature-based SuDS components being proposed as part of the development, which will provide some attenuation, reduce flow rates, and will disperse surface water runoff via evapotranspiration and infiltration.

The capacity of the attenuation tank is designed to cater for the capacity required for a 1 in 100-year ARI event. Details of the proposed attenuation tank can be seen in the submitted planning pack. The capacity is summarised as follows:

Tank No.	Attenuated volume Capacity (M3)	Restricted Outflow (l/s)
Catchment Area 2a	434	7.7
Catchment Area 2b	318	5.6
Catchment Area 2c	432	7.7
Catchment Area 2d	275	5
Catchment Area 2e	398	7.1
Catchment Area 2f	127	2.3

Figure 3.2: Catchment Attenuation.

3.2.2 Hydrocarbon Treatment

In construction, a petrol interceptor serves as a crucial trap designed to filter out hydrocarbon pollutants from rainwater runoff, preventing fuel contamination of streams that carry away the runoff.

The functioning principle of petrol interceptors relies on the fact that certain hydrocarbons, such as petroleum and diesel, tend to float on water. When rainwater runoff, potentially carrying contaminants, flows off roads or hardstanding areas, it enters the interceptor, typically deposited into the first tank.

The initial tank accumulates a layer of hydrocarbons and other scum. Typically, petrol interceptors consist of three separate tanks, each interconnected with a dip pipe. As more liquid enters the interceptor, water moves into the second tank, leaving the majority of hydrocarbons behind because they cannot enter the dip pipe. The dip pipe's opening into the second tank is positioned below the surface.

While some contaminants may inadvertently enter the second tank, it does not accumulate as much hydrocarbon on its surface. Similarly, as water continues to enter the second tank, it is then pushed into the third tank.

The third tank is designed to be clear of any floating hydrocarbons on its surface. As an additional precaution, the outlet pipe also functions as a dip pipe. When water exits the third tank through the outlet pipe, it should be free of contaminants.

In this project (Phase 2) there are 6no. different catchment areas that eventually discharge to the public stormwater network/existing watercourses from the development. Each local network will have a petrol interceptor incorporated into the system to reduce the risk of pollutants. A summary of the proposed interceptors is as per Figure 3.3 below.

Catchment	Area m2 (Proposed)	Interceptor type	Area m2 (Capacity)	Oil Storage Capacity (l)
Catchment Area 2a	14940	CNSB30S/21	16667	450
Catchment Area 2b	10583	CNSB20S/21	8333	300
Catchment Area 2c	14400	CNSB30S/21	16667	450
Catchment Area 2d	9194	CNSB20S/21	8333	300
Catchment Area 2e	13273	CNSB25S/21	8333	375
Catchment Area 2f	4241	CNSB8S/21	3333	120

Figure 3.3: Bypass Interceptor details.

3.2.3 Silt Control

The proposed bypass interceptors from Conder Environmental also include a silt storage capacity in addition to the oil storage capacity that allow silt to be collected in the interceptor prior to discharge to the proposed attenuation tanks. This silt build up can then be removed from the tanks. The amount of silt storage from the proposed bypass interceptor is outlined below.

Catchment	Interceptor type	Silt Storage Capacity (l)
Catchment Area 2a	CNSB30S/21	3000
Catchment Area 2b	CNSB20S/21	2000
Catchment Area 2c	CNSB30S/21	3000
Catchment Area 2d	CNSB20S/21	2000
Catchment Area 2e	CNSB25S/21	2500
Catchment Area 2f	CNSB8S/21	800

Figure 3.4: Bypass Interceptor details.

The design of individual soakaways and attenuation tank systems have too been considered. It is thought that the site would be served by providing attenuation basins/tanking to deal with the internal road impervious area surface runoff.

Each storm run will pass through a hydrocarbon bypass interceptor, an attenuation tank, and flow control manhole before out falling into the existing storm network/ watercourses.



Figure 3.5: Attenuation RC tanks -typical installation (Carlow tanks)

The site's layout and levels proposed dictate the positioning of the storm system. With these constraints, the proposed attenuation tank has been positioned under the proposed carriageways/ green spaces and suds basin features. This location is best suited for this site, providing easy access for maintenance.

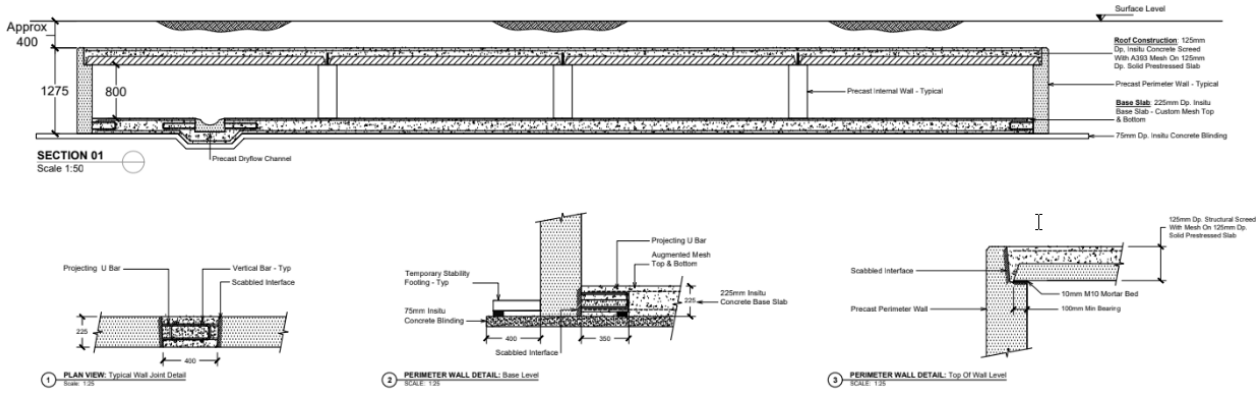


Figure 3.6: Attenuation RC tanks -cross section detail (Carlow tanks)

An existing storm sewer currently outfalls south of the proposed new development entrance, out falling into the nearby River Martin. The invert level and distance to the sewer allow for connection from the development site by gravity so all discharges of stormwater will be to the River Martin for a portion of the northwestern section of the site. It is proposed that the existing storm outfall will remain undisturbed with the development connection occurring on the road carriageway.

For eastward surface/storm flows, a new outfall to Shean Upper is proposed and is note in the figure above. A new headwall will be constructed, as per the details noted below.

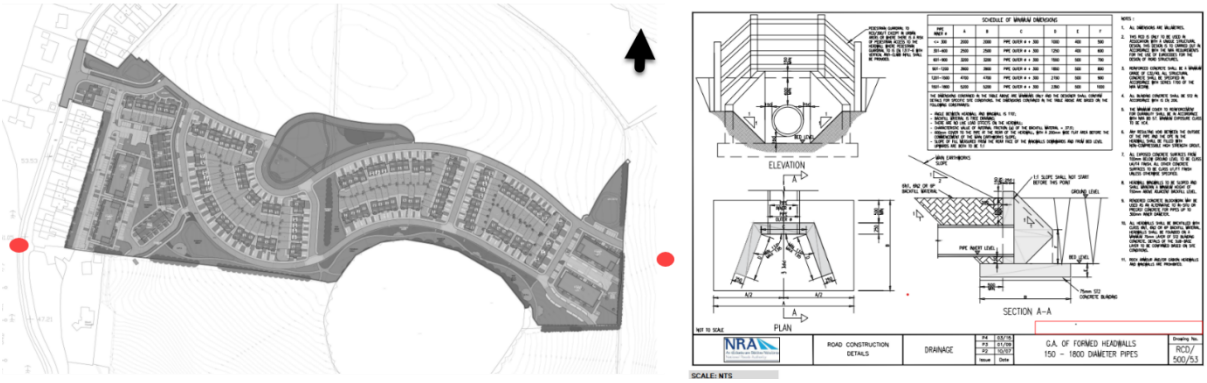


Figure 3.7: Proposed headwall location.

Flow southward towards the development junction with R617 are to be attenuated.

The surface water strategy also employs a series of nature based Sustainable Urban Drainage tools ensuring that the development will:

- Manage and control runoff volumes and flow rates from impermeable surfaces, reducing the impact of urbanisation on flooding.
- Provide opportunities harvesting rainwater run for use close to where it falls.
- Promote groundwater and aquifer body recharge.
- Protect natural flow regimes in watercourses.
- Encourage evapotranspiration from planted and other storage area.

The nature based Sustainable Urban Drainage tools employed as part of this scheme are to include:

- Tree Pits - capture rainwater and lower street and building temperatures by providing shade. They also add value to biodiversity and public amenity in development areas.
- Soakaways and Infiltration Systems - encourage infiltration as an effective means of managing water runoff and aiding groundwater recharge. Infiltration can be implemented via overground shallow locations or underground infiltration systems.

3.3 Interception Storage

On the proposed site, it is intended to prevent the first 5mm of rainfall generated from road/footpaths from reaching the public sewers. This is achieved by providing interception storage. It is proposed to provide this by using a stone filled infiltration under the attenuation tank. The interception storage volume calculated is as tabulated below:

Run off area	Area (m2)	Run off coefficient	Rainfall (mm)	Interception volume (m3)
Catchment Area 2a	14940	0.8	5	60
Catchment Area 2b	10583	0.8	5	42
Catchment Area 2c	14400	0.8	5	58
Catchment Area 2d	9194	0.8	5	37
Catchment Area 2e	13273	0.8	5	53
Catchment Area 2f	4241	0.8	5	17
Total				267

Figure 3.8: Interception Volume

In accordance with the requirements of GDSGS, at least 5mm, of interception storage should be provided on site, where runoff to the receiving water can be prevented. It has been assumed that where the rainfall falls on green areas there will be no runoff occurring for the first 5mm - 10mm.

Permeable paving is proposed for private parking spaces at dwellings, covering a total area of circa 9690m². The drainage pipe within the stone bed for these areas will be set 100mm above the bed formation giving (assumed 35% voids) an interception storage volume of approximately 340m³. It should be noted that this volume is discounted from the overall interception storage for the development as per Cork City Council recommendations (due to ongoing maintenance concerns).



Figure 3.9 Catchment drainage proposals.

Basins are proposed throughout the phase 2 application development and that of the permitted phase 1 development. The drainage pipe within the gravel bed for these areas will be set at 100mm above the bed formation providing (assumed 30% voids) an interception storage above the 267m3 as calculated in Figure 3.8.

Proposed Basin in the central green has circa 350m3 provided for phase 2.
Proposed Basin in the east of the site ha circa 5000m3.

Additional basins provide supplementary storage where noted in Figure 3.9.

Tree pits will provide infiltration with an overflow system to collect and convey runoff from extreme storm events to the pipework and detention basins. Tree pits will mostly be located adjacent to roads and will provide infiltration of rainwater runoff from these roads. The drainage pipe within the gravel bed for the tree pits will be set at 100mm above the bed formation providing (assumed 30% voids) an interception storage of approximately 7.5m³ will be achieved assuming a 5m2 area for each of the 50 tree pits.

The overall interception storage volume provided is therefore which is greater than the required minimum provision as detailed above. Please refer to the drainage layouts as submitted for further details.

3.4 Flow Control

Flow controls are proposed at certain drainage network locations for the phase 2 application (additional to the 4no. flow controls proposed for the LRD phase 1 permitted application). are providing a post development runoff per the defined sub catchment for Phase 2. Hydrobrake vortex control to provide control flow to match greenfield runoff rates per defined unit area and as noted in Figure 3.2.

Proposed flow controls are set at combined sub catchment greenfield rates listed in Figure 3.2 and those of Phase 1, where drainage routing is deemed applicable.

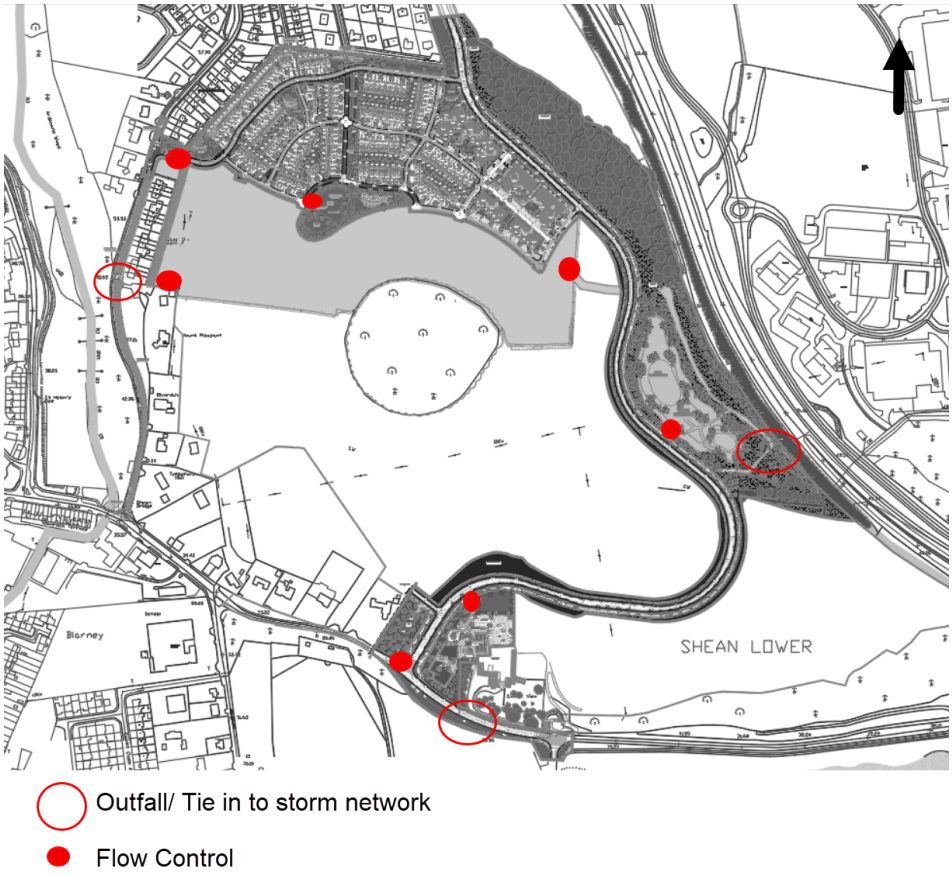


Figure 3.10: Flow control locations.

4 SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS)

The proposed surface water drainage network is to be designed in accordance with Sustainable Urban Drainage Systems (SUDS) principles. Surface water is a valuable resource, and it is intended to incorporate various nature-based SUDS systems in the scheme, particularly within the various amenity areas. Appropriate nature-based SUDS tools will be employed to enhance biodiversity, beauty, tranquillity and the natural aesthetic of buildings, places and landscapes and it can help make them more resilient to the changing climate.

This SUDS approach involves slowing down and reducing the quantity of surface water runoff from a developed area to manage downstream flood risk and reducing the risk of that runoff causing pollution. This is achieved by harvesting, infiltrating, slowing, storing, conveying, and treating runoff on site and, where possible, on the surface rather than underground.

By adopting this approach, it is intended to deliver and enhance the green space within the development and link to wider green networks, supporting the provision of habitats and places for wildlife to live and flourish, aligning with the wider design ambitions. The applicant is currently undertaking extensive geotechnical Site Investigation on site to inform the appropriate nature-based SUDS approach.

Further enhancing the site's sustainable urban drainage system (SUDS), the proposal includes permeable paving for driveways and parking bays. This choice promotes increased water infiltration, reducing surface runoff and aiding in groundwater recharge. Additionally, the incorporation of rain harvesting systems, including rain butts, underscores a commitment to water conservation. These systems capture and store rainwater for later use, contributing to both sustainable water management and the overall eco-friendly design of the site. By seamlessly integrating permeable paving and rain harvesting solutions, the project not only addresses stormwater concerns but also aligns with environmentally responsible practices, fostering a more resilient and resource-conscious urban environment.

4.1 SUDs Objectives

4.1.1 Quantity Control Processes – Outline

Several techniques can be employed to regulate the quantity of runoff from a development, each offering distinct advantages in stormwater control, flood risk management, water conservation, and groundwater recharge. Various techniques can be applied to manage runoff from a development, each offering specific benefits in stormwater control, flood risk management, water conservation, and groundwater recharge.

a) Infiltration:
Involves soaking water into the ground, considered the most favourable method for restoring the natural hydrologic process, impacted by subsoil characteristics.
b) Detention / Attenuation:
Slows down surface water flows using storage volumes and constrained outlets, ideally above ground, reducing peak flow rates while maintaining overall runoff volume.

c) Conveyance:
Transfers runoff through channels, trenches, and pipes, crucial for linking Sustainable Drainage System (SuDS) components; uncontrolled conveyance to the environment is not sustainable.
d) Water Harvesting:
Captures and uses runoff on-site for domestic or irrigation purposes, contributing to Flood Risk Management by efficiently managing and utilizing runoff.

4.1.2 Quality Control Processes

A number of natural water quality treatment processes can be exploited within SuDS design. Different processes will predominate for each SuDS technique and will be present at different stages in the treatment train.

a)	Sedimentation – reducing flow velocities to a level at which the sediment particles fall out of suspension;
b)	Filtration & Biofiltration – trapping pollutants within the soil or aggregate matrix, on plants or on geotextile layers;
c)	Adsorption – pollutants attach or bind to the surface of soil or aggregate particles;
d)	Biodegradation – Microbial communities in the ground degrade organic pollutants such as oils and grease;
e)	Volatilisation – transfer of a compound from solution in water to the soil atmosphere and then to the general atmosphere;
f)	Precipitation – transform dissolved constituents to form a suspension of particles of insoluble precipitates;
g)	Plant Uptake – removal of nutrients from water by plants in ponds and wetland;
h)	Nitrification – Ammonia and ammonium ions can be oxidised by bacteria in the ground to form nitrate which readily used as a nutrient by plants;
i)	Photolysis – The breakdown of organic pollutants by exposure to ultraviolet light.

4.1.3 Amenity & Biodiversity Processes

SuDS provides opportunities to create attractive landscaping features which offer a variety of amenity/biodiversity. The following are typical SuDS components offering aesthetic, amenity, and ecological benefits.

Typical Primary Processes:	
a)	Green Roofs
b)	Grassed channels/Swales
c)	Filter strips
d)	Bioretention Areas
e)	Vegetated swales and detention basins
f)	Infiltration Basins (Not part of this application)
Benefits subject to design:	
a)	Ponds
b)	Wetlands

4.2 SUDs Techniques

Apart from the previously mentioned goals, the replication of a natural drainage system requires the implementation of a 'Management Train.' This hierarchy of Sustainable Drainage System (SuDS) techniques follows a sequence:

- Prevention: Aims to prevent both runoff and pollution.
- Source Control: Focuses on controlling runoff at or close to its source.

- Site Control: Involves managing surface water within the site or local area.
- Regional Control: Encompasses the collective management of surface water from multiple sites.

Different SuDS components align with these objectives and are better suited for specific stages of the Management Train. The fundamental principle is to locally manage surface water in smaller sub-catchments, reducing the reliance on conveyance to larger systems downstream.

Source Control	Site Control	Regional Control
Rainwater Harvesting	Permeable Paving	Detention Ponds/Basins
Green Roofs	Bioretention Strips	Retention Ponds/Basins
Permeable Paving	Infiltration Trenches	Wetlands
Bioretention Strips	Filter Drains	Infiltration Basins
Filter Drains	Filter Strips	Detention Basins
Infiltration Trenches	Swales	Petrol Interceptors
Filter Strips	Sand Filters	
Soakaways	Infiltration Basins	
Swales	Detention Basins	
	Petrol Interceptors*	

Figure 4.1: SuDS Techniques for Source, Site & Regional Control

As noted above, source control, site control and regional control that are used on site have been highlighted.

Please refer to the appendix of this report which provides further details on the SUDs elements proposed to be used on site as part of the stormwater management train system.

The new drainage system provided for the proposed development will be entirely separated from the wastewater sewer network. Noting this methodology, the site is to be split into separate sub catchment zones for attenuation purposes.

The site's impervious areas are proposed to be attenuated by SUDs methods coupled with tanking solutions. The SUDs design philosophy will incorporate multiple controls to ensure the water management train is developed throughout the site. The following image shows the desirable management train where source infiltration of roofs and hardstanding area are to be captured by permeable paving and soakaways before the public hard standing areas are collected by further application of basins.

The graphics above demonstrates the appraisal of existing topography in terms of level, catchments and flow paths which provide the basis for determining development drainage proposals on site. This drainage appraisal methodology is evident in the following figures for the applicant's site.

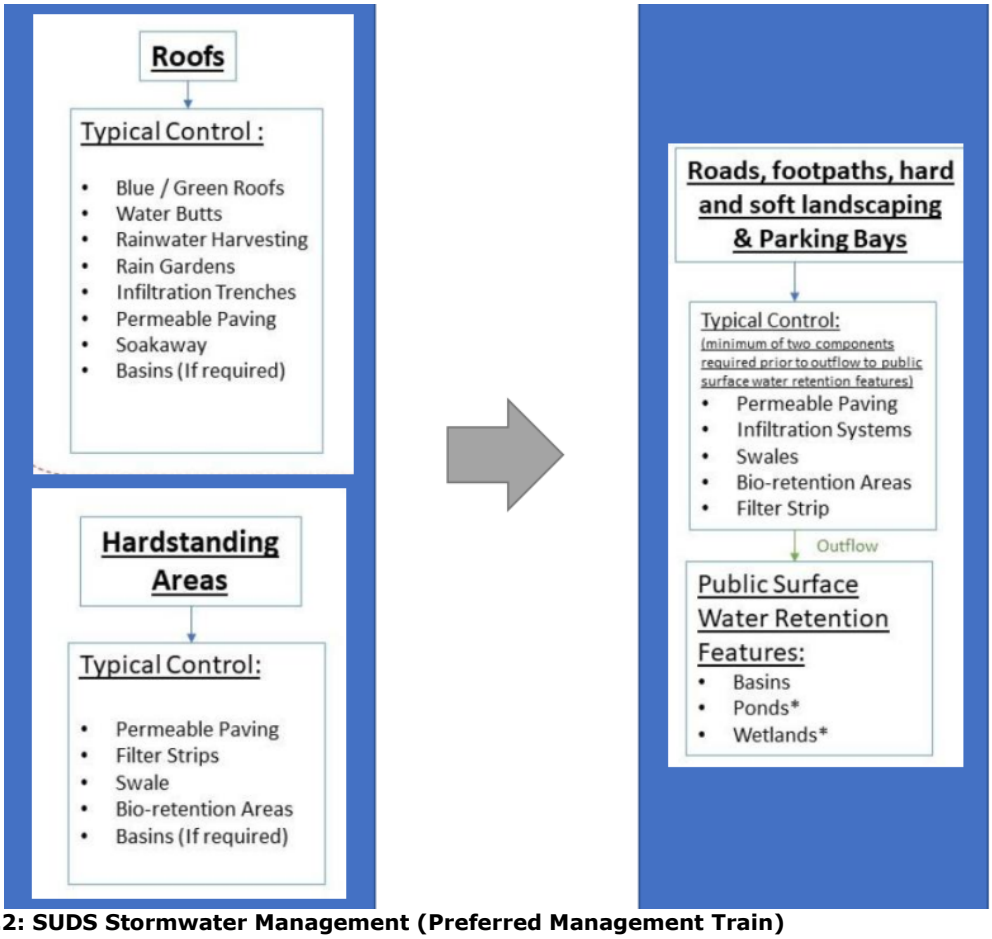


Figure 4.2: SUDS Stormwater Management (Preferred Management Train)

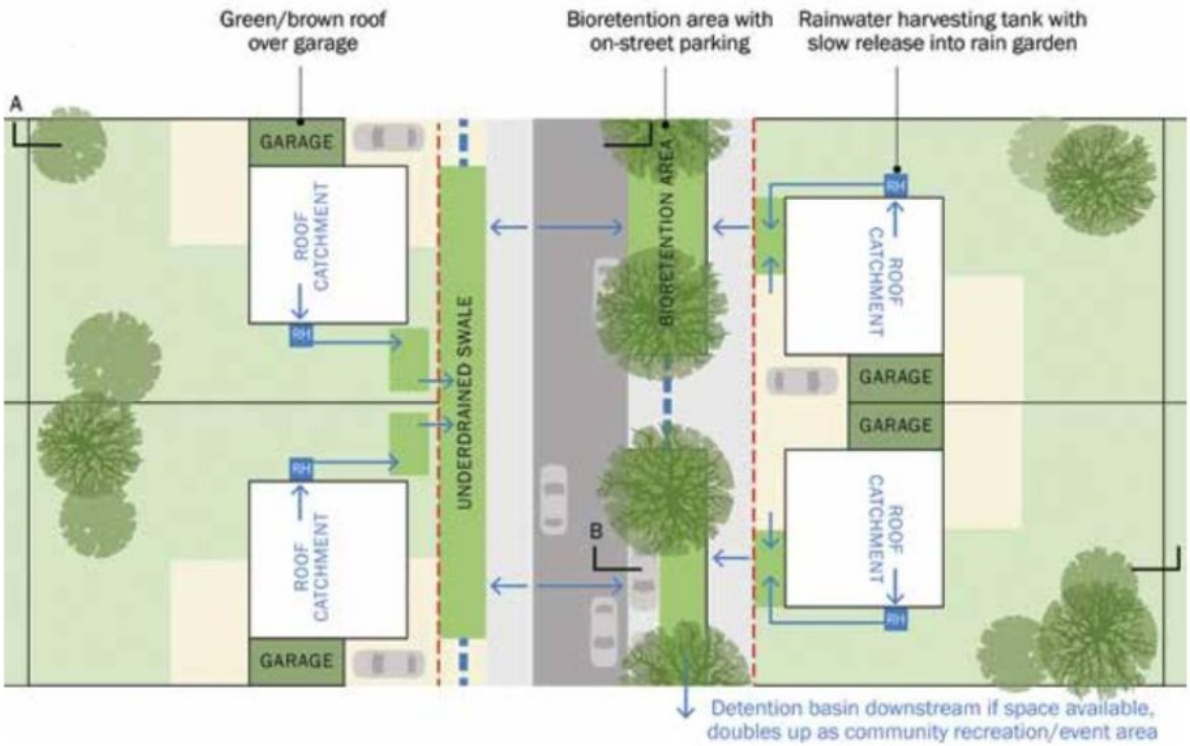


Figure 4.3 Typical Swale and Bioretention site layout incorporation.

This proposed storm system will alleviate any untoward effects of the development on downstream receiving environment, habitats/water quality and represent a sustainable design solution.



Figure 4.4: Suds / surface water conveyance channel in greenspace areas.

The following SuDS features have been identified as applicable and will be provided within the proposed scheme:

- Permeable Paving: Permeable paving is designed to allow rainwater to infiltrate through the surface, either into underlying layers or underground storage and released at a controlled rate to surface water sewers. Permeable paving can provide attenuation of rainfall, and potentially can also store runoff from surrounding areas, if designed and sized appropriately. It is proposed that each house will be provided with a permeable paved driveway, of average area of 25m2. The storm water from the roofed areas within each property shall be collected by rain harvesting/water butts and discharged to a soakaway via distribution connection.

- Tree Pits: Tree pits will be used where feasible. Tree pits will be used across the development to provide interception storage and will contain engineered soil-filled tree boxes with drainage pipes beneath.

- Swales: Swales will run alongside road edges where practical and will receive runoff from the development's roads and footpaths. The swales will be a shallow landscaped depression at the surface with a drainage layer beneath and will be utilised to convey surface water flows.

- Basins: basins can be used to manage the volume of runoff expected from the development and provide long-term stormwater storage. The size of the basins will be minimised with the implementation of the SuDS measures previously discussed upstream of them.

- Concrete Attenuation Tanks: will be required to manage the volume of runoff expected as previously noted.

5 OPERATION AND MAINTENANCE

To uphold the intended performance standards, it's essential to conduct regular inspections and maintenance of all proposed Sustainable Drainage Systems (SuDS) areas. Following the guidelines outlined in CIRIA C753, a "passive maintenance" strategy will be adopted, integrating many SuDS maintenance tasks into typical site management practices. This approach encompasses a range of routine, periodic, and corrective maintenance measures to ensure the effective functioning of the SuDS system.

The site management plan must incorporate regular removal of litter from all applicable Sustainable Drainage Systems (SuDS) features, including permeable paving, swales, and basins. Grass maintenance is also crucial for all SuDS components. Typically, grass within swales should be maintained between 75-150 mm in length, with longer lengths unlikely to affect functionality. It's essential to remove grass clippings from swales and dispose of them properly. For detention basins, grass cover should be kept between 35-50mm in length, with cuttings left in place. Proper management of SuDS vegetation green waste should be integrated into regular site green waste protocols.

Regular inspections of the inlets and outlets of SuDS features are necessary to identify and remove any silt or debris buildup. These inspections should occur periodically. Additionally, to ensure accessibility for maintenance purposes, inlets and outlets should be strimmed approximately 1.0m all around. Control chambers should undergo annual inspections, and any accumulated silt should be removed as necessary during these inspections.

Annual inspections of swales and basins are recommended to assess for silt accumulation. If any buildup is identified, it should be promptly removed. Silt removed from the site can undergo dewatering and then be applied to land outside the SuDS component profile. This ensures the continued effectiveness and functionality of the SuDS features while managing silt in an environmentally responsible manner.

Permeable paving should be swept, and a suction brush should be used when ponding occurs, which is likely at 10–15-year intervals.

The proposed Sustainable Drainage Systems (SuDS) system is designed to require low maintenance, as many of the listed actions are part of standard site upkeep and are necessary regardless. Regular inspections should be conducted to detect any damage or operational issues with the SuDS system. Access to outfalls can be facilitated through the biodiversity area, and planting has not been implemented over the two outfall areas to ensure ongoing access for maintenance or repairs. In case of the need for cleaning or other interventions, appropriate all-terrain machinery can be utilised in these areas to access outfalls effectively. This approach ensures that maintenance can be carried out efficiently while minimizing disruption to the surrounding environment.

5.1 Oil/Petrol Interceptor

Petrol Interceptor requires periodic inspection and removal of the separated oils and petrol residues to ensure it continues to operate effectively. Safe access must be provided for the provision of maintenance to the petrol interceptor.

5.2 Rainwater Harvest Butt

These are designed to allow storm water to permeate through to the ground, periodic inspections are required to ensure that the water is draining freely through the system

and that it has not been impacted by silts and other debris which may reduce the permeability of the system. Any build-up of silts should be removed during dry weather conditions.

5.3 Infiltration Basin / Tank

Infiltration systems can also be affected by silts and debris if not maintained. This reduces the permeability of the basin and could cause overflow in storm conditions if not properly maintained along with the inflow and discharge pipes which must be inspected to ensure there are no obstructions.

Inspection of inlet and outlet pipes of infiltration basin should be performed quarterly to ensure there is no clogging, which could result in a build-up of water within the basin. Furthermore, the basin should be inspected for nuisance vegetation quarterly for the first 2-3 years, which should be removed if discovered to maintain a healthy treatment system and establish the marsh. Aquatic vegetation within the basin should be cut back and thinned when necessary.

The basin will need to be checked for erosion, subsidence, and sediment accumulation, which will be required to be removed once every 5 to 7 years or when half of the forebay depth is filled with sediment. The size of the infiltration basin has been designed with 3d computer design software.

Please refer to the layouts as submitted noting the drainage runs and SUDs details.

6 FLOODING

The flood extents of the River Martin were examined using flood mapping available at floodinfo.ie.

A Flood Risk Assessment which assesses the flood risks in the area, and which is used to assess the flood risk associated with the development in a separate, stand-alone document has been prepared by JBA in support of this application.

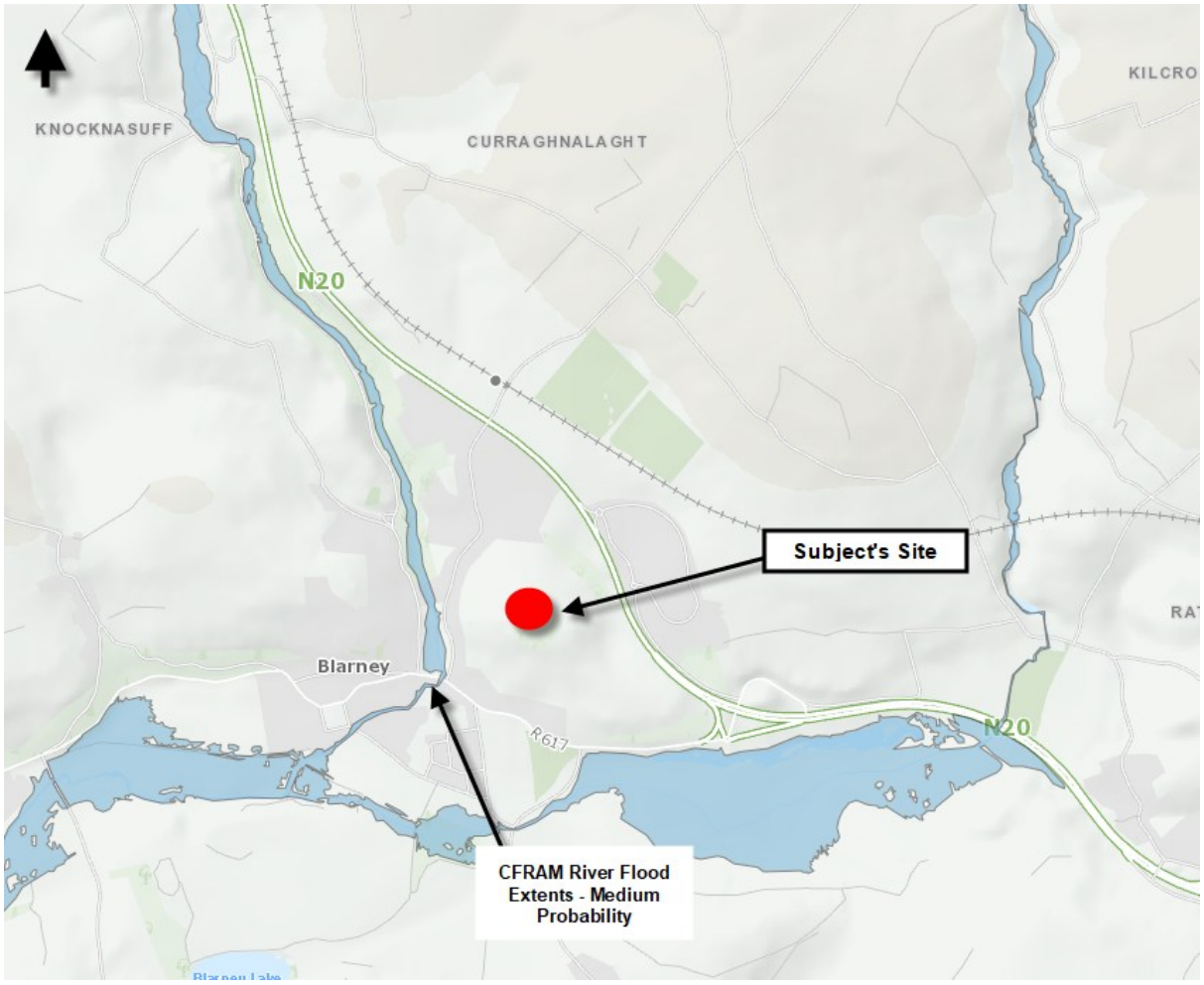


Figure 6.1: Proposed site's proximity to nearby watercourse/ stream.

The developable area is located outside the predicted flood extents of the nearby watercourse. The risk of flooding (fluvial, pluvial, groundwater and coastal flooding) to the proposed development is considered not significant, and as such the development as it is currently proposed is considered 'appropriate' in line with the PSFRM Guidelines.

7 AMENITY AND BIODIVERSITY

Achieving amenity and biodiversity standards is all about creating attractive, pleasant, and liveable urban areas for both people and nature.

The proposed Sustainable Drainage Systems (SuDS) features in this development are carefully designed to offer a range of benefits. They will not only enhance the visual appeal but also create habitats for wildlife while managing rainfall effectively. The detention basins, for instance, will be planted with native meadow grasses to boost biodiversity within the landscape.

These basins serve multiple purposes, functioning as public spaces when not holding runoff. They could be used for sports or social activities, providing both recreation and ecological benefits. Situating them within the housing development ensures easy access for residents and encourages the use of open spaces during dry periods.

The construction details of these features will be finalised through collaboration with landscape design and ecological experts, ensuring that they are effective and environmentally friendly. The attached drawings provide initial guidelines, which will be further refined before construction begins on-site.

7.1 Summary of Ecological Importance

Site flora and fauna assessments and bat surveys were carried out. In summary, no terrestrial mammals, or signs of mammals of conservation importance were noted on site. No flora of conservation importance was noted on site. The site consists of cultivated farmland, grassland, hedging and treelines.

7.2 Sensitive Receptors

Please refer to Ecology Chapter of the EIAR. Potential receptors are as noted in the figure below.

Sensitive Receptor	Location/ Potential Impact
Watercourses	Onsite works will also involve ground clearance, re-profiling, groundworks, and construction, with potential for runoff, dust, light, and noise impacts.
Residents	As seen in the proposed site development layout is proximal a number of houses located along Station Road from the site that would be sensitive to noise, dust and lighting impacts. Mitigation measures should be put in place to avoid impacting the residents proximal to the proposed development during the site clearance and construction phase of the project
Terrestrial Fauna and Flora	On-site Fauna and flora of conservation importance to be reviewed by Ecologist.
Birds	Subsequent planting should be supplemented with bird boxes.
Bats	Clearance of the site, particularly the woodland scrub area in the west of the site. Mitigation measures may include a pre-construction bat survey and measures to protect bats during site clearance if individuals are found on site.

Figure 7.1: Sensitive Receptors/ Potential Impact

8 SUDS STATEMENT

SUDSSELECTIONHIERARCHYSHEET			
Suds Measures		**Measures to be used on site**	**Rational for selecting / not selecting measure including discharge rate applied with supporting calculations**
Water butt – 150L capacity or more (based water use demand) with means of overflow		YES	Suitable for development type.
Permeable paving – consider for all hard paved areas without heavy traffic		YES	Suitable for development type.
Tree pits – disconnect downpipe connection into drains and allow roof runoff into planter with means of overflow		YES	Suitable for development type.
Rain garden - disconnect downpipe/RWP into the planted flower bed		YES	Suitable for development type.
Other		Basin/ soak away	Suitable for development type.

SUDS SELECTION HIERARCHY SHEET FOR LARGE-SCALE DEVELOPMENT AND AGRICULTURAL DEVELOPMENT				
Suds Measures	**Measures to be used on site**	**Rational for selecting / not selecting measure**	**Area of feature (m^2)**	**Attenuation volume of feature (m^3) (see No. 8)**
Source Control Providing storage at source				
Swales	YES	Site geometry/ SI findings	As per submitted layouts	As per submitted layout proposals
Integrated constructed tree pits	YES	Site geometry/ SI findings	As per submitted layouts	As per submitted layout proposals
Rainwater Butts	YES	Site geometry/ SI findings	As per submitted layouts	As per submitted layout proposals
Soak ways	YES	Site geometry/ SI findings	As per submitted layouts	As per submitted layout proposals
Infiltration trenches	NO	Site geometry/ SI findings		
Permeable pavement (Grass Crete, Block Paving, Porous Asphalt etc.)	YES	Site geometry/ SI findings	As per submitted layouts	As per submitted layout proposals
Green Roofs	NO	Site geometry/ SI findings		As per submitted layout proposals
Green wall	NO	Site geometry/ SI findings		
Filter strips	NO	Site geometry/ SI findings		
Bio-retention systems/Raingardens	NO	Site geometry/ SI findings		
Filter Drain	NO	Site geometry/ SI findings		
Site Control				
Detention Basins	YES	Site geometry/ SI findings	As per submitted layouts	As per submitted layout proposals
Retention basins	NO	Site geometry/ SI findings		
Regional Control				
Ponds	NO	Site geometry/ SI findings		
Wetlands	NO	Site geometry/ SI findings		
Other				
Petrol/Oil interceptor/Grit Trap	YES	Site geometry/ SI findings	As per submitted layouts	As per submitted layout proposals
Attenuation tank –	YES	Site geometry/ SI findings	As per submitted layouts	As per submitted layout proposals
Oversized pipes– only as a last resort where other measures are not feasible	NO	Site geometry/ SI findings		
Other	NO	Site geometry/ SI findings		

9 APPENDIX

(Page left intentionally blank)

10 APPENDIX A: SUDS DETAILS- TYPICAL

10.1 Water Butts

Water Butts are compact, independent storage devices crafted to gather runoff from roofs. They serve as the prevalent method for harvesting rainwater in gardens, typically offering a capacity of less than 0.5m3. Two-stage devices can offer additional storage volume for attenuation through a controlled overflow, though it's important to note that inadequate maintenance can result in blockages. This solution is deemed suitable for all types of developments.



Figure 10.1: Domestic Water Butt (Susdrain.org)

Water Butts are recommended for all residential properties.

10.2 Rainwater Harvesting

Rainwater harvesting entails gathering rainwater from roofs and hard surfaces, akin to the concept of Water Butts but on a larger scale. The collected water is commonly utilised for non-potable purposes such as irrigation, toilet flushing, and operating washing machines. The size of the harvesting tank is determined by factors such as catchment area, seasonal rainfall patterns, demand fluctuations, and the desired retention time. Additionally, the tank can serve as a means of stormwater attenuation by providing extra storage capacity.

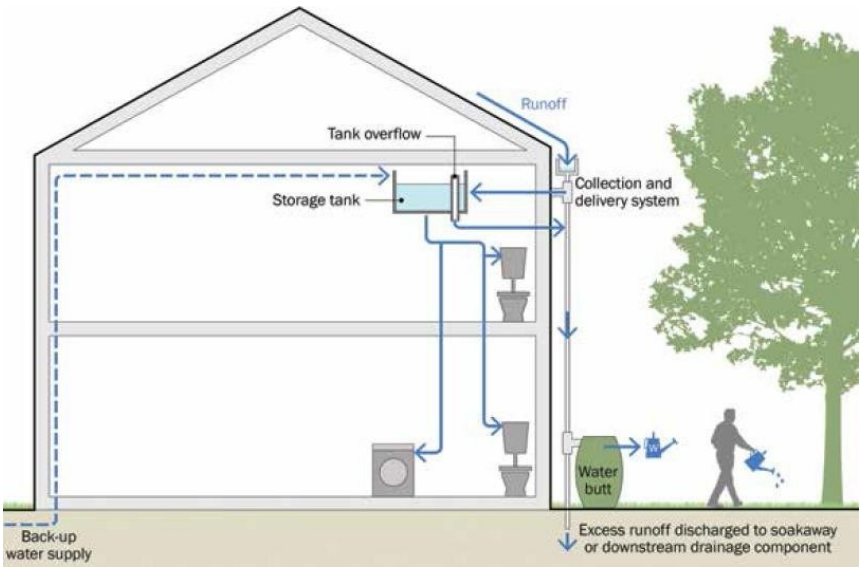


Figure 10.2: Rainwater Harvesting Schematic (CIRIA 753)

Rainwater Harvesting is recommended for use in commercial, industrial, and educational buildings, in this case at the proposed creche site.

10.3 Permeable Paving

Permeable pavements offer surfaces suitable for both pedestrian and vehicular traffic, enabling rainwater to permeate through the pavement and reach the underlying layers. From there, the water either infiltrates into the ground or is collected and directed to the drainage network. This type of pavement is best suited for areas with light traffic loads and volume. Typically designed to handle rainwater directly falling on its surface, permeable pavements can also accommodate runoff from other impermeable areas, including Water Butts, Modified Planters, or directly from rainwater goods and paved surfaces.

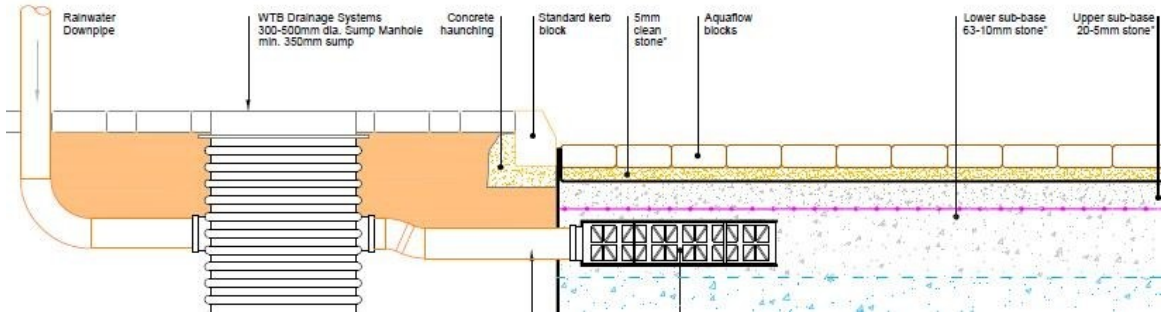


Figure 10.3: Typical Permeable Paving Detail (c: Roadstone)

Permeable paving is endorsed for both residential and commercial parking spaces. Additionally, lightly trafficked roads could benefit from the implementation of permeable block paving. However, a comprehensive site investigation is essential to assess whether total, partial, or no infiltration to groundwater is feasible. This detailed examination helps determine the most suitable approach for implementing permeable paving based on site-specific conditions.

10.4 Soakaways

Soakaways are excavations filled with a void-forming material, enabling the temporary storage of water before it infiltrates into the ground. Typically suitable for small catchments, such as those within the curtilage of a dwelling, many soakaways are now constructed using geocellular units due to their excellent overall storage capacity.

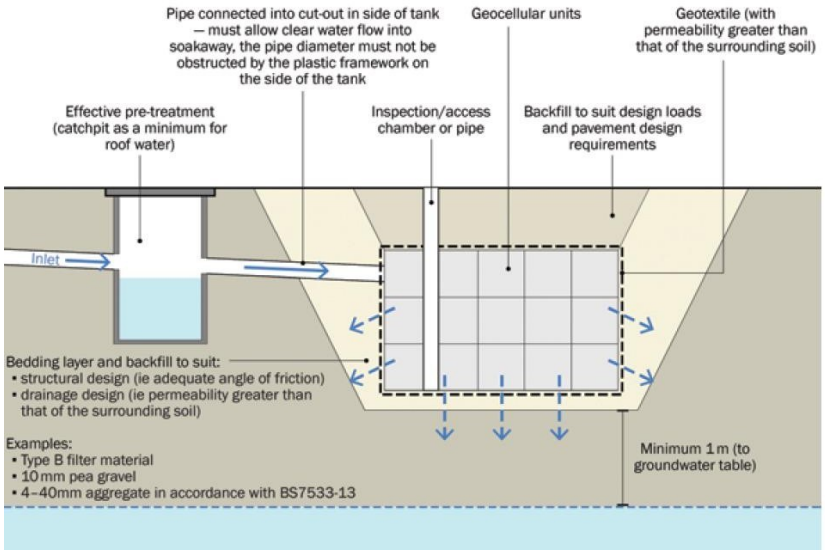


Figure 10.4: Typical Schematic of a Soakaway (c: SuDS Manual)

When ground conditions are suitable, soakaways are recommended for draining residential gardens and other small, grassed areas, especially in instances where subsoil permeability is acceptable.

10.4.1 Swales

Swales are expansive, shallow, and vegetated drainage channels designed for the conveyance or storage of surface water. Ideal for small catchments with impermeable areas, swales are commonly located along roads in grass verges. These features can be tailored for either infiltration into the subsoil or detention and conveyance to another stage in the management train. Conveyance may occur in the open channel or through a perforated pipe within a filter bed beneath the channel's base.



Figure 10.5: Typical Swale details.

Swales are recommended for managing runoff from access roads, offering water treatment, and mitigating peak flow. Dry swales, particularly recommended based on local subsoil conditions, facilitate infiltration, further reducing runoff volume. In situations where both vehicle and pedestrian access are necessary across a swale, a causeway can be installed. The levels at the outer swale banks will be higher than at the centre of the crossing point, creating a drop in level that serves as an overflow route for runoff during extreme rainfall events.

10.4.2 Modified Planters

Tree pits areas function as stormwater controls, collecting and treating runoff through the use of soils and vegetation in shallow landscaped basins to remove pollutants. The treated runoff can then be collected and conveyed downstream, and/or allowed to infiltrate into the subsoil. Additionally, a portion of the runoff volume is naturally reduced through processes like evaporation and plant transpiration.

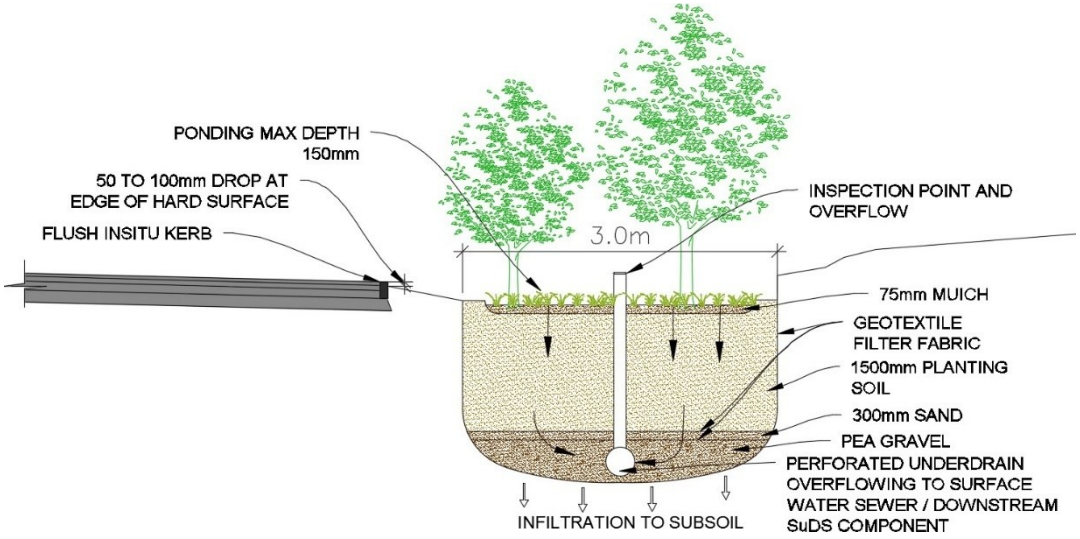


Figure 10.6: Tree pit schematic.

10.4.3 Detention Basins

Detention Basins serve as dry basins designed to attenuate stormwater runoff by providing temporary storage with controlled flow. They are applicable to various types of developments. In residential areas, these basins are typically dry and often double as recreational facilities, such as sports fields or playgrounds. Detention basins may be constructed in two main ways: online, where surface runoff is directed through them during storm events with an outflow restriction, or offline, where runoff usually bypasses the basin until a designated storm event triggers its use. In the offline configuration, runoff is temporarily stored until the inflow recedes below a design level. The presence of small permanent pools at the outlet can enhance water treatment quality.



Figure 10.7: Example Detention Basin (c: Suds Wales)



Figure 10.8: Example Detention Basin (c: Phys.org)

11 APPENDIX B: GREENFIELD RATES

(Page left intentionally Blank)

Greenfield runoff rate estimation tool

hrwallingford www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

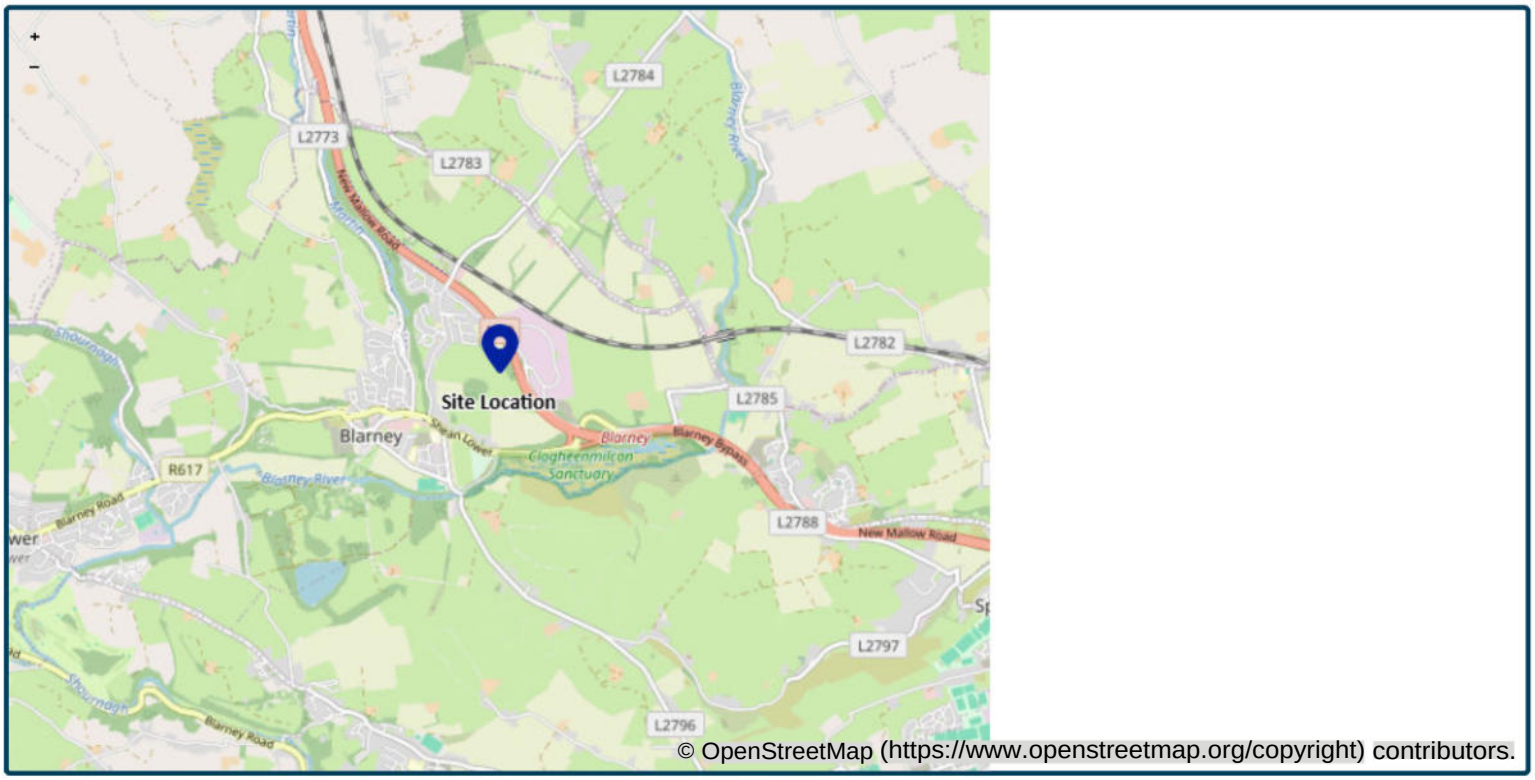
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	
Calculated by	MHL
Reference	BLR-2-02-
Model version	2.2.2

Location

Site name	2A
Site location	Blarney



Site easting (Irish Grid)	162020
Site northing (Irish Grid)	76005
Site easting (Irish Transverse Mercator)	561978
Site northing (Irish Transverse Mercator)	576066

Site details

Total site area (ha)	2.3 ha

We use cookies on this site to enhance your user experience

By clicking the Accept button, you agree to us doing so.

OK, I AGREE MORE INFO

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	1172 mm		1172
How should SPR be derived?	WRAP soil type		
WRAP soil type	2		2
SPR	0.3		
QBar (IH124) (l/s)	7.7 l/s		

Growth curve factors

	My value		Map value
Hydrological region	13		13
1 year growth factor	0.85		
2 year growth factor	0.95		
10 year growth factor	1.4		
30 year growth factor	1.65		
100 year growth factor	1.95		
200 year growth factor	2.15		

Results

Method	IH124
Flow rate 1 year (l/s)	6.5 l/s
Flow rate 2 year (l/s)	7.3 l/s
Flow rate 10 years (l/s)	10.7 l/s
Flow rate 30 years (l/s)	12.6 l/s
Flow rate 100 years (l/s)	14.9 l/s
Flow rate 200 years (l/s)	16.5 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.2) developed by HR Wallingford and available at uksuds.com (https://www.uksuds.com/). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

We use cookies on this site to enhance your user experience

By clicking the Accept button, you agree to us doing so.

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

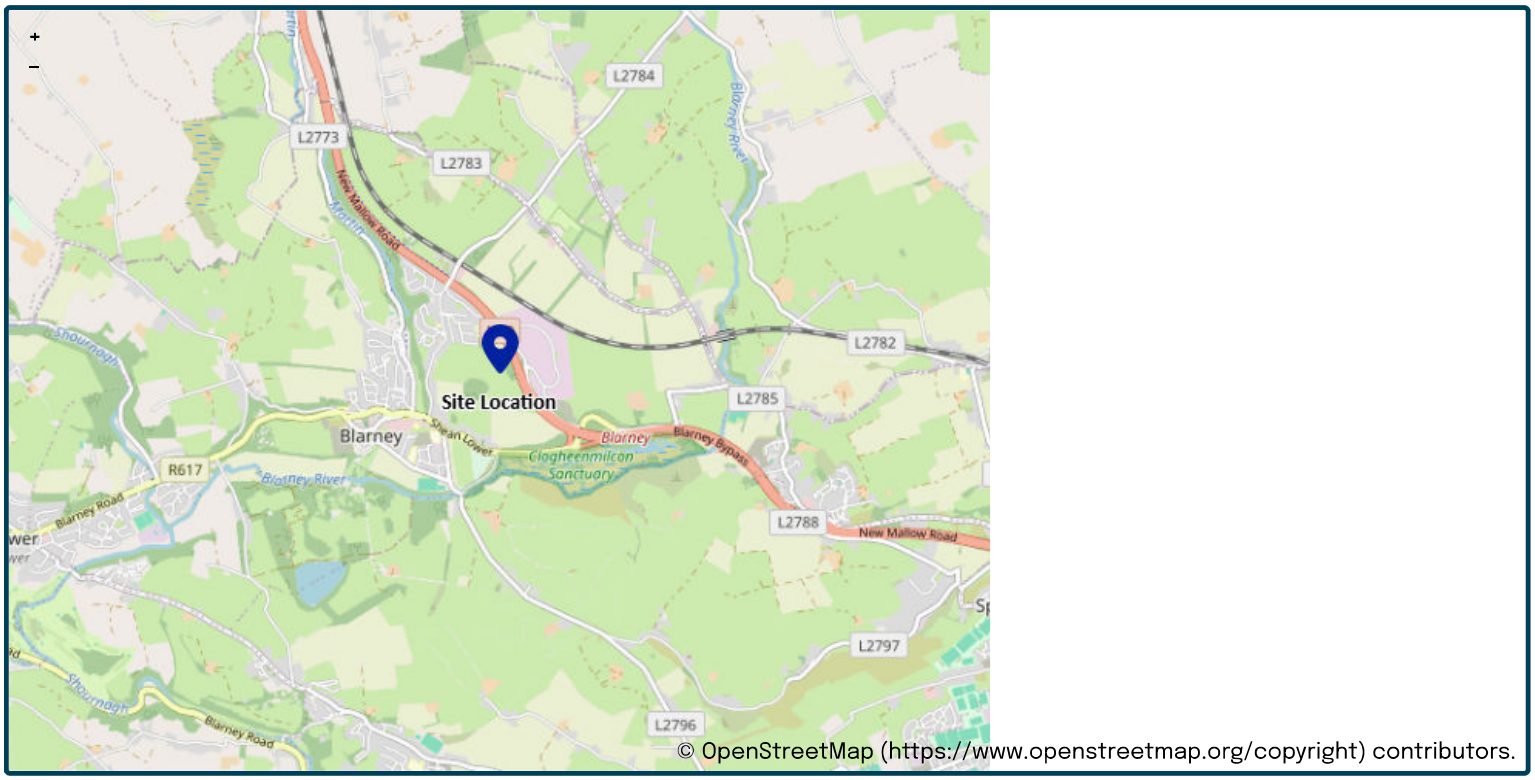
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	
Calculated by	MHL
Reference	BLR-2-02-
Model version	2.2.2

Location

Site name	2B
Site location	Blarney



Site easting (Irish Grid)	162020
Site northing (Irish Grid)	76005
Site easting (Irish Transverse Mercator)	561978
Site northing (Irish Transverse Mercator)	576066

Site details

Total site area (ha)	1.69 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	1172 mm		1172
How should SPR be derived?	WRAP soil type		
WRAP soil type	2		2
SPR	0.3		
QBar (IH124) (l/s)	5.6 l/s		

Growth curve factors

	My value		Map value
Hydrological region	13		13
1 year growth factor	0.85		
2 year growth factor	0.95		
10 year growth factor	1.4		
30 year growth factor	1.65		
100 year growth factor	1.95		
200 year growth factor	2.15		

Results

Method	IH124
Flow rate 1 year (l/s)	4.8 l/s
Flow rate 2 year (l/s)	5.3 l/s
Flow rate 10 years (l/s)	7.9 l/s
Flow rate 30 years (l/s)	9.3 l/s
Flow rate 100 years (l/s)	11.0 l/s
Flow rate 200 years (l/s)	12.1 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.2) developed by HR Wallingford and available at uksuds.com (https://www.uksuds.com/). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

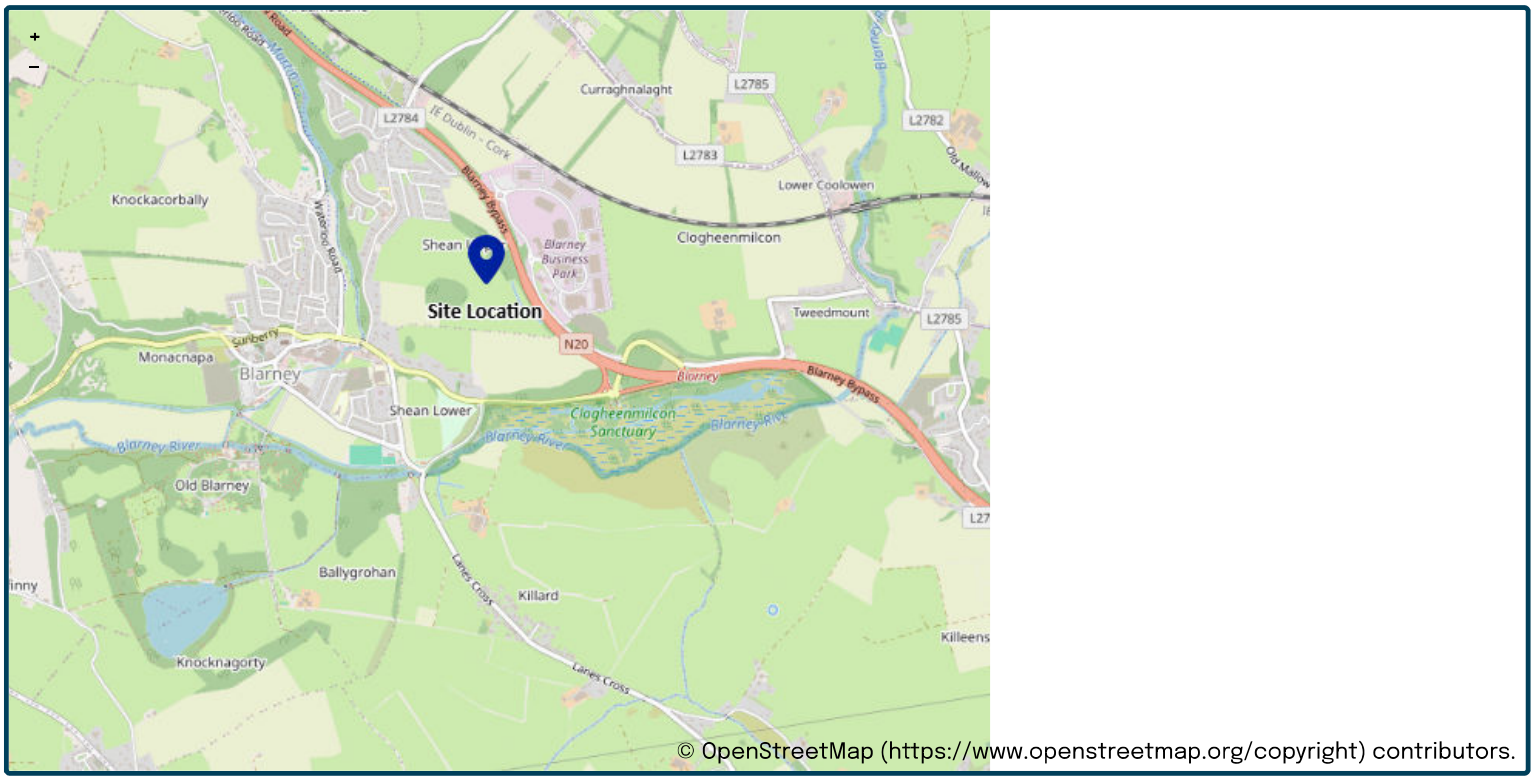
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	
Calculated by	MHL
Reference	BLR-2-02-
Model version	2.2.2

Location

Site name	2C
Site location	Blarney



Site easting (Irish Grid)	162020
Site northing (Irish Grid)	76005
Site easting (Irish Transverse Mercator)	561978
Site northing (Irish Transverse Mercator)	576066

Site details

Total site area (ha)	2.3 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	1172 mm		1172
How should SPR be derived?	WRAP soil type		
WRAP soil type	2		2
SPR	0.3		
QBar (IH124) (l/s)	7.7 l/s		

Growth curve factors

	My value		Map value
Hydrological region	13		13
1 year growth factor	0.85		
2 year growth factor	0.95		
10 year growth factor	1.4		
30 year growth factor	1.65		
100 year growth factor	1.95		
200 year growth factor	2.15		

Results

Method	IH124
Flow rate 1 year (l/s)	6.5 l/s
Flow rate 2 year (l/s)	7.3 l/s
Flow rate 10 years (l/s)	10.7 l/s
Flow rate 30 years (l/s)	12.6 l/s
Flow rate 100 years (l/s)	14.9 l/s
Flow rate 200 years (l/s)	16.5 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.2) developed by HR Wallingford and available at uksuds.com (https://www.uksuds.com/). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

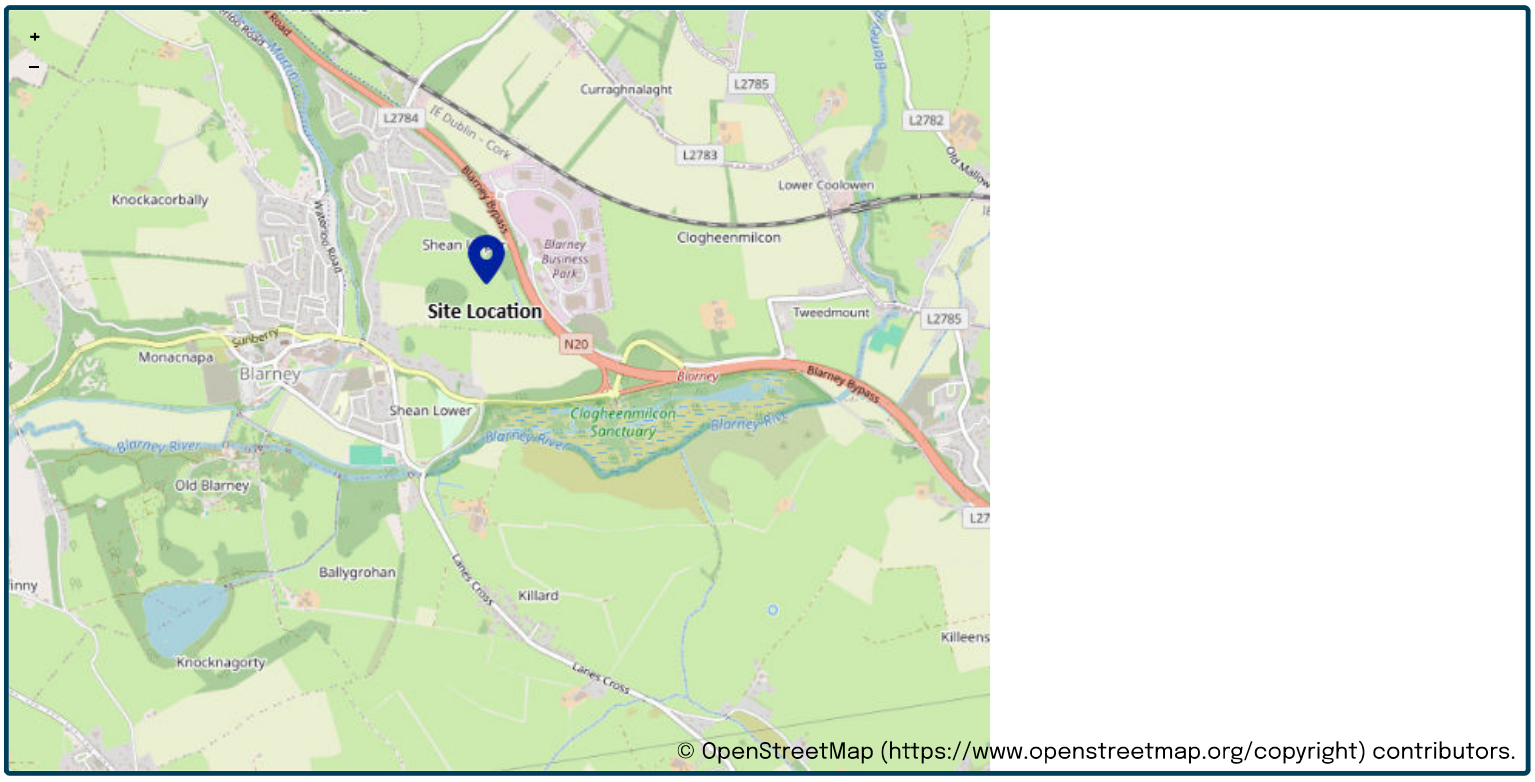
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	
Calculated by	MHL
Reference	BLR-2-02-
Model version	2.2.2

Location

Site name	2D
Site location	Blarney



Site easting (Irish Grid)	162020
Site northing (Irish Grid)	76005
Site easting (Irish Transverse Mercator)	561978
Site northing (Irish Transverse Mercator)	576066

Site details

Total site area (ha)	1.5 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	1172 mm		1172
How should SPR be derived?	WRAP soil type		
WRAP soil type	2		2
SPR	0.3		
QBar (IH124) (l/s)	5 l/s		

Growth curve factors

	My value		Map value
Hydrological region	13		13
1 year growth factor	0.85		
2 year growth factor	0.95		
10 year growth factor	1.4		
30 year growth factor	1.65		
100 year growth factor	1.95		
200 year growth factor	2.15		

Results

Method	IH124
Flow rate 1 year (l/s)	4.2 l/s
Flow rate 2 year (l/s)	4.7 l/s
Flow rate 10 years (l/s)	7.0 l/s
Flow rate 30 years (l/s)	8.2 l/s
Flow rate 100 years (l/s)	9.7 l/s
Flow rate 200 years (l/s)	10.7 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.2) developed by HR Wallingford and available at uksuds.com (https://www.uksuds.com/). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

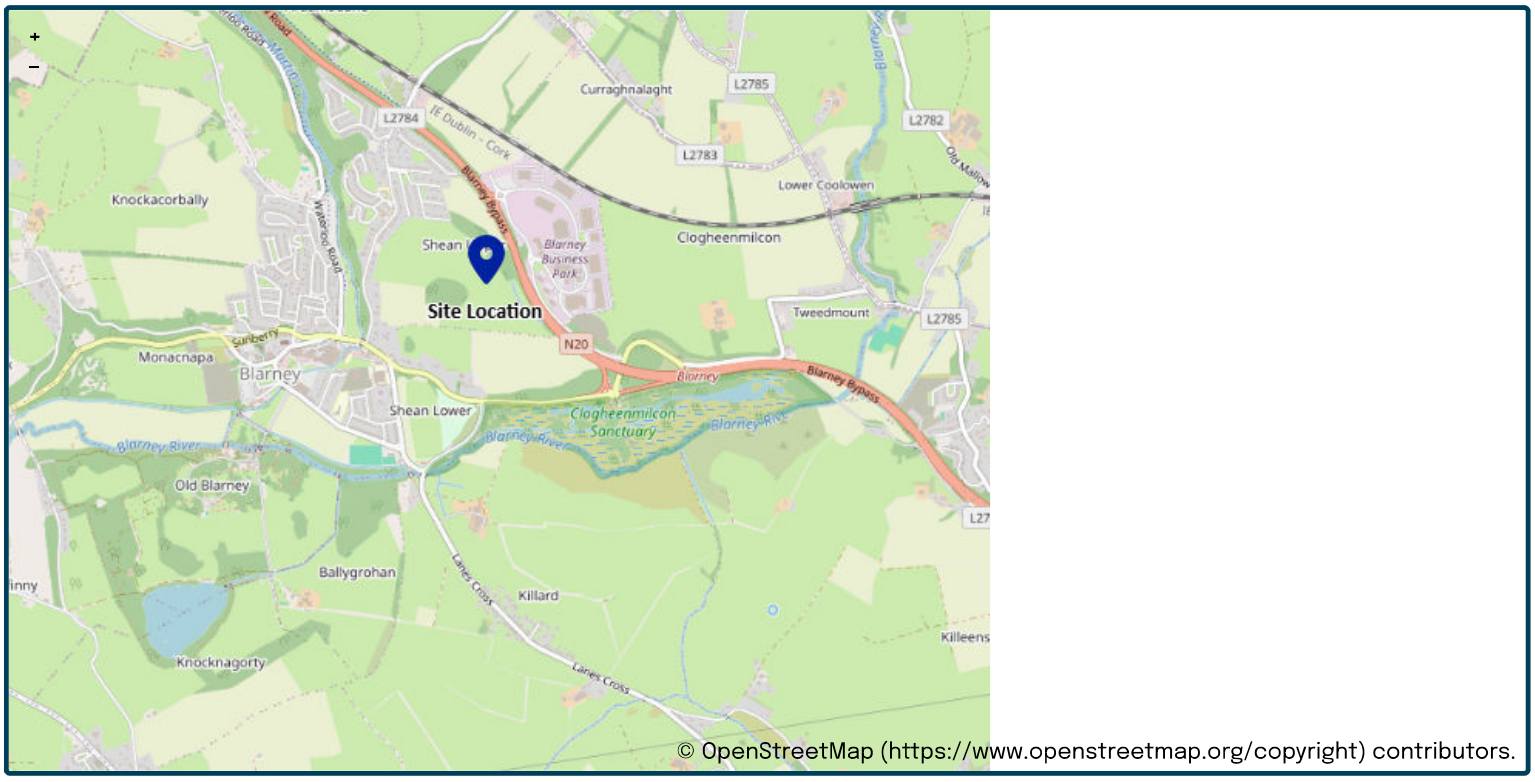
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	
Calculated by	MHL
Reference	BLR-2-02-
Model version	2.2.2

Location

Site name	2D
Site location	Blarney



Site easting (Irish Grid)	162020
Site northing (Irish Grid)	76005
Site easting (Irish Transverse Mercator)	561978
Site northing (Irish Transverse Mercator)	576066

Site details

Total site area (ha)	2.12 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	1172 mm		1172
How should SPR be derived?	WRAP soil type		
WRAP soil type	2		2
SPR	0.3		
QBar (IH124) (l/s)	7.1 l/s		

Growth curve factors

	My value		Map value
Hydrological region	13		13
1 year growth factor	0.85		
2 year growth factor	0.95		
10 year growth factor	1.4		
30 year growth factor	1.65		
100 year growth factor	1.95		
200 year growth factor	2.15		

Results

Method	IH124
Flow rate 1 year (l/s)	6.0 l/s
Flow rate 2 year (l/s)	6.7 l/s
Flow rate 10 years (l/s)	9.9 l/s
Flow rate 30 years (l/s)	11.7 l/s
Flow rate 100 years (l/s)	13.8 l/s
Flow rate 200 years (l/s)	15.2 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.2) developed by HR Wallingford and available at uksuds.com (https://www.uksuds.com/). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	
Calculated by	MHL
Reference	BLR-2-02-
Model version	2.2.2

Location

Site name	2D
Site location	Blarney



Site easting (Irish Grid)	162020
Site northing (Irish Grid)	76005
Site easting (Irish Transverse Mercator)	561978
Site northing (Irish Transverse Mercator)	576066

Site details

Total site area (ha)	.7 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	1172 mm		1172
How should SPR be derived?	WRAP soil type		
WRAP soil type	2		2
SPR	0.3		
QBar (IH124) (l/s)	2.3 l/s		

Growth curve factors

	My value		Map value
Hydrological region	13		13
1 year growth factor	0.85		
2 year growth factor	0.95		
10 year growth factor	1.4		
30 year growth factor	1.65		
100 year growth factor	1.95		
200 year growth factor	2.15		

Results

Method	IH124
Flow rate 1 year (l/s)	2.0 l/s
Flow rate 2 year (l/s)	2.2 l/s
Flow rate 10 years (l/s)	3.3 l/s
Flow rate 30 years (l/s)	3.8 l/s
Flow rate 100 years (l/s)	4.5 l/s
Flow rate 200 years (l/s)	5.0 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.2) developed by HR Wallingford and available at uksuds.com (https://www.uksuds.com/). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

12 APPENDIX C: HYDRAULIC MODELLING

(Page left intentionally Blank)

MHL & Associates Ltd.
Consulting Engineers

Carraig Mór House,
10 High Street,
Douglas Road, Cork
Tel: 021-4840214

Residential Development in Ringwood, Blarney

Revision			
Job No:	**BLR-2-02-SW**	Page:	**P/01**
Prepared By:	**DM**	Date:	

Section: **Attenuation tank- Sub Catchment Drainage Area 2a**

GENERAL DATA		
site location:	**Scotland and N Ireland**	
60 min rainfall depth of 5 year return period 'R' *[mm]* =	**17**	
M5-60 to M5-2d rainfall ratio 'r' =	**0.30**	
proposed discharge rate 'v_1' *[litre/s]* =	**7.70**	
proposed discharge rate 'v_2' *[litre/s]* =	**0.00**	
allowance for climate change:	**20%**	

SUMMARY OF CALCULATIONS		
required storage volume for discharge rate 'v_1' =	**434.78**	m^3
required storage volume for discharge rate 'v_2' =		m^3

AREA DATA		impermeability *[%]*	effective area *[m^2]*
impermeable area 'A_1' *[m^2]* =	**8940**	100.00	8940
landscaping and/or green roof area 'A_2' *[m^2]* =	**6000**	**0.30**	18
other partially permeable area 'A_3' *[m^2]* =		**30.00**	0
AREA DRAINED TO ATTENUATION TANK =			**8958 m^2**

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v_1

rainfall duration *[min]*	rainfall factor Z1	**M5-D** rainfalls *[mm]*	**M100-D** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	outflow from attenuation tank *[m^3]*	required storage *[m^3]*
5	0.34	5.78	1.88	13.02	116.63							2.31	114.32
10	0.49	8.33	1.93	19.32	173.11							4.62	168.49
15	0.59	10.03	1.97	23.71	212.41							6.93	205.48
30	0.77	13.09	1.98	31.04	278.07							13.86	264.21
60	1.00	17.00	1.96	39.98	358.18							27.72	330.46
120	1.25	21.25	1.92	48.96	438.58							55.44	383.14
240	1.57	26.69	1.88	60.10	538.37							110.88	427.49
360	1.78	30.26	1.85	67.10	601.10							166.32	**434.78**
600	2.12	36.04	1.80	77.92	698.00							277.20	420.80
1440	2.84	48.28	1.73	100.15	897.13							665.28	231.85

** Z2 is a growth factor from M5 rainfalls*

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v_2

rainfall duration *[min]*	rainfall factor Z1	**M5-D** rainfalls *[mm]*	**M100-D** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	outflow from attenuation tank *[m^3]*	required storage *[m^3]*
5	0.34	5.78											
10	0.49	8.33											
15	0.59	10.03											
30	0.77	13.09											
60	1.00	17.00											
120	1.25	21.25											
240	1.57	26.69											
360	1.78	30.26											
600	2.12	36.04											
1440	2.84	48.28											

** Z2 is a growth factor from M5 rainfalls*

MHL & Associates Ltd.
Consulting Engineers

Carraig Mór House,
10 High Street,
Douglas Road, Cork
Tel: 021-4840214

Residential Development in Ringwood, Blarney

Revision			
Job No:	**BLR-2-02-SW**	Page:	**P/01**
Prepared By:	**DM**	Date:	

Section: **Attenuation tank- Sub Catchment Drainage Area 2b**

GENERAL DATA	
site location:	**Scotland and N Ireland**
60 min rainfall depth of 5 year return period 'R' *[mm]* =	**17**
M5-60 to M5-2d rainfall ratio 'r' =	**0.30**
proposed discharge rate 'v_1' *[litre/s]* =	**5.60**
proposed discharge rate 'v_2' *[litre/s]* =	**0.00**
allowance for climate change:	**20%**

SUMMARY OF CALCULATIONS		
required storage volume for discharge rate 'v_1' =	**318.03**	m^3
required storage volume for discharge rate 'v_2' =		m^3

AREA DATA		impermeability *[%]*	effective area *[m^2]*
impermeable area 'A_1' *[m^2]* =	**6530**	100.00	6530
landscaping and/or green roof area 'A_2' *[m^2]* =	**4053**	**0.30**	12.159
other partially permeable area 'A_3' *[m^2]* =		**30.00**	0
AREA DRAINED TO ATTENUATION TANK =	**6542.159 m^2**		

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v_1

rainfall duration *[min]*	rainfall factor Z1	**M5-D** rainfalls *[mm]*	**M100-D** Z2	**M100-D** rainfalls *[mm]*	**M100-D** inflow *[m^3]*	**ignore** Z2	**ignore** rainfalls *[mm]*	**ignore** inflow *[m^3]*	**ignore** Z2	**ignore** rainfalls *[mm]*	**ignore** inflow *[m^3]*	outflow from attenuation tank *[m^3]*	required storage *[m^3]*
5	0.34	5.78	1.88	13.02	85.18							1.68	83.50
10	0.49	8.33	1.93	19.32	126.43							3.36	123.07
15	0.59	10.03	1.97	23.71	155.13							5.04	150.09
30	0.77	13.09	1.98	31.04	203.08							10.08	193.00
60	1.00	17.00	1.96	39.98	261.58							20.16	241.42
120	1.25	21.25	1.92	48.96	320.30							40.32	279.98
240	1.57	26.69	1.88	60.10	393.18							80.64	312.54
360	1.78	30.26	1.85	67.10	438.99							120.96	**318.03**
600	2.12	36.04	1.80	77.92	509.76							201.60	308.16
1440	2.84	48.28	1.73	100.15	655.19							483.84	171.35

** Z2 is a growth factor from M5 rainfalls*

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v_2

rainfall duration *[min]*	rainfall factor Z1	**M5-D** rainfalls *[mm]*	**M100-D** Z2	**M100-D** rainfalls *[mm]*	**M100-D** inflow *[m^3]*	**ignore** Z2	**ignore** rainfalls *[mm]*	**ignore** inflow *[m^3]*	**ignore** Z2	**ignore** rainfalls *[mm]*	**ignore** inflow *[m^3]*	outflow from attenuation tank *[m^3]*	required storage *[m^3]*
5	0.34	5.78											
10	0.49	8.33											
15	0.59	10.03											
30	0.77	13.09											
60	1.00	17.00											
120	1.25	21.25											
240	1.57	26.69											
360	1.78	30.26											
600	2.12	36.04											
1440	2.84	48.28											

** Z2 is a growth factor from M5 rainfalls*

MHL & Associates Ltd.
Consulting Engineers

Carraig Mór House,
10 High Street,
Douglas Road, Cork
Tel: 021-4840214

Residential Development in Ringwood, Blarney

Revision			
Job No:	**BLR-2-02-SW**	Page:	**P/01**
Prepared By:	**DM**	Date:	

Section: **Attenuation tank- Sub Catchment Drainage Area 2c**

GENERAL DATA	
site location:	**Scotland and N Ireland**
60 min rainfall depth of 5 year return period 'R' *[mm]* =	**17**
M5-60 to M5-2d rainfall ratio 'r' =	**0.30**
proposed discharge rate 'v_1' *[litre/s]* =	**7.70**
proposed discharge rate 'v_2' *[litre/s]* =	**0.00**
allowance for climate change:	**20%**

SUMMARY OF CALCULATIONS		
required storage volume for discharge rate 'v_1' =	**431.99**	m^3
required storage volume for discharge rate 'v_2' =		m^3

AREA DATA		impermeability *[%]*	effective area *[m^2]*
impermeable area 'A_1' *[m^2]* =	**8900**	100.00	8900
landscaping and/or green roof area 'A_2' *[m^2]* =	**5500**	**0.30**	16.5
other partially permeable area 'A_3' *[m^2]* =		**30.00**	0
AREA DRAINED TO ATTENUATION TANK =			**8916.5 m^2**

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v_1

rainfall duration *[min]*	rainfall factor Z1	**M5-D** rainfalls *[mm]*	**M100-D** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	outflow from attenuation tank *[m^3]*	required storage *[m^3]*
5	0.34	5.78	1.88	13.02	116.09							2.31	113.78
10	0.49	8.33	1.93	19.32	172.31							4.62	167.69
15	0.59	10.03	1.97	23.71	211.42							6.93	204.49
30	0.77	13.09	1.98	31.04	276.78							13.86	262.92
60	1.00	17.00	1.96	39.98	356.52							27.72	328.80
120	1.25	21.25	1.92	48.96	436.55							55.44	381.11
240	1.57	26.69	1.88	60.10	535.88							110.88	425.00
360	1.78	30.26	1.85	67.10	598.31							166.32	**431.99**
600	2.12	36.04	1.80	77.92	694.77							277.20	417.57
1440	2.84	48.28	1.73	100.15	892.97							665.28	227.69

** Z2 is a growth factor from M5 rainfalls*

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v_2

rainfall duration *[min]*	rainfall factor Z1	**M5-D** rainfalls *[mm]*	**M100-D** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	outflow from attenuation tank *[m^3]*	required storage *[m^3]*
5	0.34	5.78											
10	0.49	8.33											
15	0.59	10.03											
30	0.77	13.09											
60	1.00	17.00											
120	1.25	21.25											
240	1.57	26.69											
360	1.78	30.26											
600	2.12	36.04											
1440	2.84	48.28											

** Z2 is a growth factor from M5 rainfalls*

MHL & Associates Ltd.
Consulting Engineers

Carraig Mór House,
10 High Street,
Douglas Road, Cork
Tel: 021-4840214

Residential Development in Ringwood, Blarney

Revision			
Job No:	**BLR-2-02-SW**	Page:	**P/01**
Prepared By:	**DM**	Date:	

Section: **Attenuation tank- Sub Catchment Drainage Area 2d**

GENERAL DATA	
site location:	**Scotland and N Ireland**
60 min rainfall depth of 5 year return period 'R' *[mm]* =	**17**
M5-60 to M5-2d rainfall ratio 'r' =	**0.30**
proposed discharge rate 'v_1' *[litre/s]* =	**5.00**
proposed discharge rate 'v_2' *[litre/s]* =	**0.00**
allowance for climate change:	**20%**

SUMMARY OF CALCULATIONS		
required storage volume for discharge rate 'v_1' =	**274.51**	m^3
required storage volume for discharge rate 'v_2' =		m^3

AREA DATA		impermeability *[%]*	effective area *[m^2]*
impermeable area 'A_1' *[m^2]* =	**5690**	100.00	5690
landscaping and/or green roof area 'A_2' *[m^2]* =	**3504**	**0.30**	10.512
other partially permeable area 'A_3' *[m^2]* =		**30.00**	0
AREA DRAINED TO ATTENUATION TANK =	**5700.512 m^2**		

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v_1

rainfall duration *[min]*	rainfall factor Z1	**M5-D** rainfalls *[mm]*	**M100-D** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	outflow from attenuation tank *[m^3]*	required storage *[m^3]*
5	0.34	5.78	1.88	13.02	74.22							1.50	72.72
10	0.49	8.33	1.93	19.32	110.16							3.00	107.16
15	0.59	10.03	1.97	23.71	135.17							4.50	130.67
30	0.77	13.09	1.98	31.04	176.95							9.00	167.95
60	1.00	17.00	1.96	39.98	227.93							18.00	209.93
120	1.25	21.25	1.92	48.96	279.10							36.00	243.10
240	1.57	26.69	1.88	60.10	342.60							72.00	270.60
360	1.78	30.26	1.85	67.10	382.51							108.00	**274.51**
600	2.12	36.04	1.80	77.92	444.18							180.00	264.18
1440	2.84	48.28	1.73	100.15	570.90							432.00	138.90

** Z2 is a growth factor from M5 rainfalls*

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v_2

rainfall duration *[min]*	rainfall factor Z1	**M5-D** rainfalls *[mm]*	**M100-D** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	outflow from attenuation tank *[m^3]*	required storage *[m^3]*
5	0.34	5.78											
10	0.49	8.33											
15	0.59	10.03											
30	0.77	13.09											
60	1.00	17.00											
120	1.25	21.25											
240	1.57	26.69											
360	1.78	30.26											
600	2.12	36.04											
1440	2.84	48.28											

** Z2 is a growth factor from M5 rainfalls*

MHL & Associates Ltd.
Consulting Engineers

Carraig Mór House,
10 High Street,
Douglas Road, Cork
Tel: 021-4840214

Residential Development in Ringwood, Blarney

Revision			
Job No:	**BLR-2-02-SW**	Page:	**P/01**
Prepared By:	**DM**	Date:	

Section: **Attenuation tank- Sub Catchment Drainage Area 2d**

GENERAL DATA	
site location:	**Scotland and N Ireland**
60 min rainfall depth of 5 year return period 'R' *[mm]* =	**17**
M5-60 to M5-2d rainfall ratio 'r' =	**0.30**
proposed discharge rate 'v_1' *[litre/s]* =	**7.10**
proposed discharge rate 'v_2' *[litre/s]* =	**0.00**
allowance for climate change:	**20%**

SUMMARY OF CALCULATIONS		
required storage volume for discharge rate 'v_1' =	**397.89**	m^3
required storage volume for discharge rate 'v_2' =		m^3

AREA DATA		impermeability *[%]*	effective area *[m^2]*
impermeable area 'A_1' *[m^2]* =	**8200**	100.00	8200
landscaping and/or green roof area 'A_2' *[m^2]* =	**5073**	**0.30**	15.219
other partially permeable area 'A_3' *[m^2]* =		**30.00**	0
AREA DRAINED TO ATTENUATION TANK =	**8215.219 m^2**		

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v_1

rainfall duration *[min]*	rainfall factor Z1	**M5-D** rainfalls *[mm]*	**M100-D** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	outflow from attenuation tank *[m^3]*	required storage *[m^3]*
5	0.34	5.78	1.88	13.02	106.96							2.13	104.83
10	0.49	8.33	1.93	19.32	158.76							4.26	154.50
15	0.59	10.03	1.97	23.71	194.80							6.39	188.41
30	0.77	13.09	1.98	31.04	255.02							12.78	242.24
60	1.00	17.00	1.96	39.98	328.48							25.56	302.92
120	1.25	21.25	1.92	48.96	402.22							51.12	351.10
240	1.57	26.69	1.88	60.10	493.73							102.24	391.49
360	1.78	30.26	1.85	67.10	551.25							153.36	**397.89**
600	2.12	36.04	1.80	77.92	640.12							255.60	384.52
1440	2.84	48.28	1.73	100.15	822.74							613.44	209.30

** Z2 is a growth factor from M5 rainfalls*

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v_2

rainfall duration *[min]*	rainfall factor Z1	**M5-D** rainfalls *[mm]*	**M100-D** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	outflow from attenuation tank *[m^3]*	required storage *[m^3]*
5	0.34	5.78											
10	0.49	8.33											
15	0.59	10.03											
30	0.77	13.09											
60	1.00	17.00											
120	1.25	21.25											
240	1.57	26.69											
360	1.78	30.26											
600	2.12	36.04											
1440	2.84	48.28											

** Z2 is a growth factor from M5 rainfalls*

MHL & Associates Ltd.
Consulting Engineers

Carraig Mór House,
10 High Street,
Douglas Road, Cork
Tel: 021-4840214

Residential Development in Ringwood, Blarney

Revision			
Job No:	**BLR-2-02-SW**	Page:	**P/01**
Prepared By:	**DM**	Date:	

Section: **Attenuation tank- Sub Catchment Drainage Area 2f**

GENERAL DATA	
site location:	**Scotland and N Ireland**
60 min rainfall depth of 5 year return period 'R' *[mm]* =	**17**
M5-60 to M5-2d rainfall ratio 'r' =	**0.30**
proposed discharge rate 'v_1' *[litre/s]* =	**2.30**
proposed discharge rate 'v_2' *[litre/s]* =	**0.00**
allowance for climate change:	**20%**

SUMMARY OF CALCULATIONS		
required storage volume for discharge rate 'v_1' =	**126.79**	m^3
required storage volume for discharge rate 'v_2' =		m^3

AREA DATA		impermeability *[%]*	effective area *[m^2]*
impermeable area 'A_1' *[m^2]* =	**2625**	100.00	2625
landscaping and/or green roof area 'A_2' *[m^2]* =	**1616**	**0.30**	4.848
other partially permeable area 'A_3' *[m^2]* =		**30.00**	0
AREA DRAINED TO ATTENUATION TANK =	**2629.848 m^2**		

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v_1

rainfall duration *[min]*	rainfall factor Z1	**M5-D** rainfalls *[mm]*	**M100-D** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	outflow from attenuation tank *[m^3]*	required storage *[m^3]*
5	0.34	5.78	1.88	13.02	34.24							0.69	33.55
10	0.49	8.33	1.93	19.32	50.82							1.38	49.44
15	0.59	10.03	1.97	23.71	62.36							2.07	60.29
30	0.77	13.09	1.98	31.04	81.64							4.14	77.50
60	1.00	17.00	1.96	39.98	105.15							8.28	96.87
120	1.25	21.25	1.92	48.96	128.76							16.56	112.20
240	1.57	26.69	1.88	60.10	158.05							33.12	124.93
360	1.78	30.26	1.85	67.10	176.47							49.68	**126.79**
600	2.12	36.04	1.80	77.92	204.92							82.80	122.12
1440	2.84	48.28	1.73	100.15	263.37							198.72	64.65

** Z2 is a growth factor from M5 rainfalls*

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v_2

rainfall duration *[min]*	rainfall factor Z1	**M5-D** rainfalls *[mm]*	**M100-D** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	**ignore** Z2	rainfalls *[mm]*	inflow *[m^3]*	outflow from attenuation tank *[m^3]*	required storage *[m^3]*
5	0.34	5.78											
10	0.49	8.33											
15	0.59	10.03											
30	0.77	13.09											
60	1.00	17.00											
120	1.25	21.25											
240	1.57	26.69											
360	1.78	30.26											
600	2.12	36.04											
1440	2.84	48.28											

** Z2 is a growth factor from M5 rainfalls*

Network Details

Manhole Schedule

Manhole	Catchment Area (ha)	Diameter (m)	Type	CL (m)	IL (m)	Depth To Soffit (m)	Easting (m)	Northing (m)
SW244	0.138	1.200	Type B	64.761	62.890	1.571	561714.270	576468.424
SW224	0.076	1.200	Type B	64.951	62.569	2.081	561763.318	576461.832
SW243	0.194	1.350	Type C	65.796	64.370	1.201	561803.300	576403.766
SW245	0.039	1.350	Type B	65.171	63.421	1.525	561809.531	576431.396
SW225	0.021	1.350	Type B	64.781	62.241	2.240	561811.260	576455.327
SW261	0.000	1.200	Type B	64.197	61.760	2.137	561832.099	576452.316
SW230	0.062	1.350	Unknown	68.427	66.560	1.342	561820.392	576541.378
SW231	0.053	1.500	Unknown	66.241	64.460	1.256	561835.665	576497.119
SW264	0.049	1.500	Unknown	64.805	63.030	1.250	561839.968	576466.853
S67	0.000	1.200	Type B	64.355	62.223	1.832	561864.228	576452.730
SW232	0.059	1.500	Type B	64.014	61.430	2.134	561843.192	576448.615
SW233	0.172	1.500	Type B	63.160	60.930	1.705	561858.966	576410.014
SW247	0.189	1.350	Type C	66.513	64.898	1.315	561723.019	576389.042
SW226	0.029	1.200	Type B	67.041	64.628	2.114	561763.427	576386.073
S46	0.058	1.350	Type C	67.414	66.069	1.194	561770.147	576348.485
SW237	0.075	1.200	Type B	66.419	64.438	1.681	561792.049	576380.814
SW238	0.045	1.350	Type B	65.749	63.932	1.517	561817.535	576365.041
SW248	0.081	1.350	Type B	65.244	63.220	1.724	561834.982	576353.260
SW239	0.020	1.200	Type B	64.353	62.255	1.798	561864.047	576327.967
SW263	0.117	1.200	Type B	64.197	62.103	1.794	561870.101	576328.279
SW241	0.032	1.200	Type B	63.272	60.690	2.282	561889.327	576347.941
SW253	0.000	1.350	Type B	62.479	60.200	1.979	561901.535	576362.967
SW234	0.072	1.500	Unknown	61.767	59.910	1.407	561907.620	576366.122
SW260	0.192	1.200	Type B	61.347	58.954	2.018	561940.955	576320.224
SW255	0.103	1.200	Unknown	60.615	58.750	1.415	561948.942	576330.324
S38	0.129	1.350	Type B	64.230	62.400	1.605	561873.931	576316.517
S48	0.035	1.350	Type B	63.285	61.440	1.620	561900.642	576292.501
S39	0.133	1.350	Type B	62.653	60.860	1.568	561918.040	576276.978
S40	0.000	1.350	Type B	61.575	59.780	1.570	561947.680	576250.582
SW242	0.059	1.200	Type B	62.058	59.970	1.788	561946.279	576232.051
S41	0.000	1.350	Type B	61.492	59.103	2.090	561953.834	576246.262
SW240	0.008	1.350	Type B	61.224	58.950	1.974	561957.874	576252.750
SW265	0.130	1.350	Type B	60.593	58.710	1.583	561968.610	576264.912
SW246	0.019	1.350	Type C	59.876	58.100	1.476	561978.669	576276.354
SW266	0.000	1.200	Unknown	59.548	57.870	1.378	561987.298	576285.149
SW257	0.000	1.200	Type B	59.413	57.286	1.602	561991.882	576289.821
SW249	0.049	1.500	Type B	59.096	56.830	1.741	562003.305	576278.908
SW206	0.038	1.500	Type B	58.776	56.450	1.801	562014.981	576267.232
SW207	0.073	1.500	Type B	58.270	56.090	1.655	562032.652	576249.876
SW208	0.047	1.500	Type B	57.482	55.150	1.807	562051.587	576215.637
S51	0.030	1.500	Type B	57.097	54.380	2.192	562055.776	576196.593
SW166	0.087	1.200	Unknown	70.316	68.700	1.316	561696.497	576184.955
SW167	0.023	1.200	Unknown	69.556	68.000	1.256	561725.550	576204.368
SW168	0.108	1.200	Unknown	68.896	67.396	1.200	561754.395	576213.192
SW169	0.019	1.200	Unknown	68.312	66.850	1.162	561781.721	576213.859
SW170	0.080	1.350	Type B	67.677	65.200	2.102	561809.382	576207.010
SW171	0.116	1.350	Type B	67.060	64.000	2.685	561816.715	576229.070
SW172	0.101	1.350	Type A	66.215	62.700	3.140	561826.951	576258.382
SW173	0.000	1.350	Type A	65.732	62.300	3.057	561833.341	576275.832
SW174	0.064	1.350	Type C	67.429	65.800	1.329	561738.304	576312.517
S47	0.039	1.350	Type C	67.425	65.811	1.464	561768.819	576333.149
SW175	0.013	1.350	Type B	67.312	65.100	1.912	561766.275	576312.028
SW176	0.039	1.350	Type B	67.040	64.750	1.990	561775.847	576302.506
SW177	0.133	1.200	Type B	67.465	65.253	1.987	561747.572	576288.051
SW178	0.068	1.200	Type B	66.946	64.363	2.358	561779.734	576290.897
SW179	0.023	1.200	Type B	66.264	63.730	2.234	561812.178	576287.973
SW180	0.048	1.350	Type B	64.539	62.639	1.599	561862.583	576321.068
SW181	0.040	1.350	Type B	65.349	62.458	2.591	561845.545	576301.116
SW182	0.000	1.200	Type B	65.629	62.356	2.972	561837.806	576287.338
SW183	0.051	1.350	Type A	65.755	62.165	3.139	561835.836	576281.693
SW184	0.077	1.350	Type B	65.035	61.900	2.685	561866.361	576269.041
SW185	0.105	1.350	Type B	64.345	61.442	2.453	561889.631	576255.698
SW186	0.049	1.350	Type A	63.510	59.800	3.260	561915.473	576234.719
SW187	0.075	1.350	Type C	67.211	65.680	1.231	561829.392	576199.505

Manhole Schedule

Manhole	Catchment Area (ha)	Diameter (m)	Type	CL (m)	IL (m)	Depth To Soffit (m)	Easting (m)	Northing (m)
SW188	0.055	1.200	Unknown	66.225	64.808	1.117	561869.272	576177.148
SW189	0.050	1.500	Type C	64.750	63.100	1.350	561941.911	576123.469
S80	0.000	1.200	Type B	65.042	62.893	1.849	561921.711	576135.528
SW190	0.024	1.350	Type B	65.141	62.800	2.041	561914.009	576142.789
SW191	0.016	1.200	Type B	65.343	62.689	2.354	561905.193	576155.679
SW192	0.165	1.350	Type B	64.812	62.000	2.512	561912.157	576167.530
S2	0.203	1.350	Type B	64.648	62.081	2.267	561968.234	576156.341
SW194	0.059	1.200	Type B	63.967	61.400	2.267	561922.154	576183.487
SW195	0.000	1.350	Type B	62.629	60.400	1.929	561935.827	576211.238
S28	0.000	1.350	Type C	61.036	59.502	1.234	561966.278	576199.924
SW196	0.048	1.200	Unknown	62.494	58.747	3.447	561941.355	576214.343
S20	0.000	1.200	Unknown	62.252	57.714	4.013	561947.097	576218.779
SW197	0.000	1.500	Type A	62.000	56.400	5.000	561948.878	576219.882
SW198	0.000	1.500	Type A	59.939	55.806	3.683	561977.041	576206.076
S21	0.000	1.500	Type A	59.921	55.616	3.705	561980.204	576203.620
SW199	0.000	1.500	Type A	60.000	55.569	3.832	561983.302	576200.028
SW200A	0.000	1.500	Type A	60.013	55.514	3.899	561987.144	576196.154
SW203	0.000	1.500	Type A	59.582	55.430	3.552	561992.546	576189.710
SW204	0.000	1.500	Type B	57.935	54.550	2.785	562023.498	576184.245
SW205	0.000	1.500	Type A	57.065	53.370	3.245	562040.356	576183.057
SW209	0.000	1.500	Type A	56.790	52.780	3.560	562057.282	576181.971
SW210	0.000	1.500	Type A	55.916	50.390	5.001	562069.933	576170.391
SW292	0.000	1.500	Type A	53.843	47.474	5.769	562073.359	576156.688
SW165	0.000	1.350	Type C	56.662	55.020	1.192	562056.883	576175.380
SW144	0.091	1.200	Unknown	56.477	54.560	1.467	562055.659	576165.948
SW148	0.051	1.350	Type C	55.688	53.820	1.418	562045.946	576130.598
SW145	0.059	1.200	Unknown	54.833	52.990	1.393	562037.825	576101.618
SW146	0.053	1.200	Unknown	53.737	51.790	1.497	562038.621	576065.949
SW142	0.044	1.200	Type B	52.679	50.636	1.593	562051.195	576034.767
SW162	0.062	1.350	Type C	51.782	49.960	1.372	562069.035	576011.173
SW130	0.095	1.350	Type B	52.590	49.999	2.141	562172.023	575820.527
SW159	0.060	1.200	Type B	52.311	49.840	2.021	562181.853	575842.222
SW131	0.049	1.350	Type B	51.915	49.638	1.827	562186.310	575872.206
SW132	0.038	1.350	Type B	51.571	49.462	1.659	562182.465	575898.336
SW163	0.068	1.350	Type B	51.334	49.350	1.533	562177.229	575914.228
SW141	0.100	1.350	Type C	50.935	49.126	1.359	562156.205	575940.523
SW143	0.000	1.200	Unknown	50.501	46.307	3.744	562103.649	575984.144
S108	0.000	1.350	Type A	50.864	46.201	4.213	562108.547	575993.540
S55	0.000	1.350	Type B	49.357	46.153	2.753	562112.447	575996.332
S29	0.000	1.500	Type B	48.000	45.540	2.010	562140.845	576007.828
S30	0.000	1.500	Type C	47.000	45.086	1.464	562164.256	576012.734
SW289	0.000	1.350	Type C	44.980	44.762	-0.232	562188.187	576017.036
SW290	0.000	1.350	Type C	43.762	43.312	0.000	562239.576	575983.594

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (m)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)	DS Depth To Soffit (m)
1.000	SW244	62.890	SW224	62.569	Circ	0.3mØ	49.489	154.5	0.600	1.571	2.081
1.001	SW224	62.569	SW225	62.241	Circ	0.3mØ	48.381	147.4	0.600	2.081	2.240
2.000	SW243	64.370	SW245	63.421	Circ	0.225mØ	28.324	29.8	0.600	1.201	1.525
2.001	SW245	63.421	SW225	62.862	Circ	0.225mØ	23.994	43.0	0.600	1.525	1.694
1.002	SW225	62.241	SW261	61.760	Circ	0.3mØ	21.055	43.8	0.600	2.240	2.137
1.003	SW261	61.760	SW232	61.580	Circ	0.3mØ	11.695	65.0	0.600	2.137	2.134
3.000	SW230	66.560	SW231	64.460	Circ	0.525mØ	46.821	22.3	0.600	1.342	1.256
3.001	SW231	64.460	SW264	63.030	Circ	0.525mØ	30.570	21.4	0.600	1.256	1.250
3.002	SW264	63.030	SW232	61.430	Circ	0.525mØ	18.521	11.6	0.600	1.250	2.059
4.000	S67	62.223	SW232	61.580	Circ	0.3mØ	21.435	33.3	0.600	1.832	2.134
1.004	SW232	61.430	SW233	60.930	Circ	0.525mØ	41.699	83.4	0.600	2.059	1.705
1.005	SW233	60.930	SW234	59.910	Circ	0.525mØ	65.527	64.2	0.600	1.705	1.332
5.000	SW247	64.898	SW226	64.628	Circ	0.3mØ	40.517	149.8	0.600	1.315	2.114
5.001	SW226	64.628	SW237	64.438	Circ	0.3mØ	29.101	153.6	0.600	2.114	1.681
6.000	S46	66.069	SW237	64.870	Circ	0.15mØ	39.049	32.6	0.600	1.194	1.399
5.002	SW237	64.438	SW238	63.932	Circ	0.3mØ	29.972	59.2	0.600	1.681	1.517
5.003	SW238	63.932	SW248	63.220	Circ	0.3mØ	21.052	29.6	0.600	1.517	1.724
5.004	SW248	63.220	SW239	62.255	Circ	0.3mØ	38.529	39.9	0.600	1.724	1.798

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (m)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)	DS Depth To Soffit (m)
5.005	SW239	62.255	SW263	62.103	Circ	0.3mØ	6.063	40.0	0.600	1.798	1.794
5.006	SW263	62.103	SW241	60.690	Circ	0.3mØ	27.500	19.5	0.600	1.794	2.282
5.007	SW241	60.690	SW253	60.200	Circ	0.3mØ	19.360	39.5	0.600	2.282	1.979
5.008	SW253	60.200	SW234	60.060	Circ	0.3mØ	6.854	49.0	0.600	1.979	1.407
1.006	SW234	59.910	SW255	58.750	Circ	0.525mØ	54.672	47.1	0.600	1.332	1.340
7.000	SW260	58.954	SW255	58.825	Circ	0.375mØ	12.876	100.0	0.600	2.018	1.415
1.007	SW255	58.750	SW257	57.286	Circ	0.525mØ	59.027	40.3	0.600	1.340	1.602
8.000	S38	62.400	S48	61.440	Circ	0.225mØ	35.920	37.4	0.600	1.605	1.620
8.001	S48	61.440	S39	60.860	Circ	0.225mØ	23.316	40.2	0.600	1.620	1.568
8.002	S39	60.860	S40	59.780	Circ	0.225mØ	39.690	36.7	0.600	1.568	1.570
8.003	S40	59.780	S41	59.625	Circ	0.225mØ	7.519	48.5	0.600	1.570	1.642
9.000	SW242	59.970	S41	59.550	Circ	0.3mØ	16.095	38.3	0.600	1.788	1.642
8.004	S41	59.103	SW240	58.950	Circ	0.3mØ	7.643	50.0	0.600	2.090	1.974
8.005	SW240	58.950	SW265	58.710	Circ	0.3mØ	16.222	67.6	0.600	1.974	1.583
8.006	SW265	58.710	SW246	58.100	Circ	0.3mØ	15.236	25.0	0.600	1.583	1.476
8.007	SW246	58.100	SW266	57.870	Circ	0.3mØ	12.320	53.6	0.600	1.476	1.378
8.008	SW266	57.870	SW257	57.589	Circ	0.3mØ	6.545	23.3	0.600	1.378	1.524
1.008	SW257	57.286	SW249	56.980	Circ	0.525mØ	15.798	51.7	0.600	1.602	1.591
1.009	SW249	56.830	SW206	56.450	Circ	0.525mØ	16.512	43.5	0.600	1.741	1.801
1.010	SW206	56.450	SW207	56.090	Circ	0.525mØ	24.770	68.8	0.600	1.801	1.655
1.011	SW207	56.090	SW208	55.150	Circ	0.525mØ	39.126	41.6	0.600	1.655	1.807
1.012	SW208	55.150	S51	54.380	Circ	0.525mØ	19.499	25.3	0.600	1.807	2.192
1.013	S51	54.380	SW209	52.780	Circ	0.525mØ	14.700	9.2	0.600	2.192	3.485
10.000	SW166	68.700	SW167	68.000	Circ	0.3mØ	34.942	49.9	0.600	1.316	1.256
10.001	SW167	68.000	SW168	67.396	Circ	0.3mØ	30.164	49.9	0.600	1.256	1.200
10.002	SW168	67.396	SW169	66.850	Circ	0.3mØ	27.334	50.1	0.600	1.200	1.162
10.003	SW169	66.850	SW170	66.280	Circ	0.3mØ	28.496	50.0	0.600	1.162	1.097
10.004	SW170	65.200	SW171	64.690	Circ	0.375mØ	23.247	45.6	0.600	2.102	1.995
10.005	SW171	64.000	SW172	63.200	Circ	0.375mØ	31.048	38.8	0.600	2.685	2.640
10.006	SW172	62.700	SW173	62.400	Circ	0.375mØ	18.583	61.9	0.600	3.140	2.957
10.007	SW173	62.300	SW183	62.275	Circ	0.375mØ	6.370	254.8	0.600	3.057	3.105
11.000	SW174	65.800	SW175	65.368	Circ	0.3mØ	27.975	64.8	0.600	1.329	1.644
12.000	S47	65.811	SW175	65.250	Circ	0.15mØ	21.273	37.9	0.600	1.464	1.912
11.001	SW175	65.100	SW176	64.900	Circ	0.3mØ	13.501	67.5	0.600	1.912	1.840
11.002	SW176	64.750	SW178	64.576	Circ	0.3mØ	12.242	70.4	0.600	1.990	2.070
13.000	SW177	65.253	SW178	64.363	Circ	0.225mØ	32.288	36.3	0.600	1.987	2.358
11.003	SW178	64.363	SW179	63.730	Circ	0.3mØ	32.575	51.5	0.600	2.283	2.234
11.004	SW179	63.730	SW183	62.350	Circ	0.3mØ	24.477	17.7	0.600	2.234	3.105
14.000	SW180	62.639	SW181	62.458	Circ	0.3mØ	26.237	144.5	0.600	1.599	2.591
14.001	SW181	62.458	SW182	62.356	Circ	0.3mØ	15.803	155.4	0.600	2.591	2.972
14.002	SW182	62.356	SW183	62.315	Circ	0.3mØ	5.979	146.7	0.600	2.972	3.139
10.008	SW183	62.165	SW184	61.973	Circ	0.45mØ	33.043	171.3	0.600	3.139	2.612
10.009	SW184	61.900	SW185	61.442	Circ	0.45mØ	26.824	58.6	0.600	2.685	2.453
10.010	SW185	61.442	SW186	60.776	Circ	0.45mØ	33.286	50.0	0.600	2.453	2.284
10.011	SW186	59.800	SW196	59.200	Circ	0.45mØ	32.940	54.9	0.600	3.260	2.844
15.000	SW187	65.680	SW188	64.808	Circ	0.3mØ	45.719	52.4	0.600	1.231	1.117
15.001	SW188	64.808	SW191	63.776	Circ	0.3mØ	41.848	40.6	0.600	1.117	1.267
16.000	SW189	63.100	S80	62.893	Circ	0.3mØ	23.526	113.7	0.600	1.350	1.849
16.001	S80	62.893	SW190	62.800	Circ	0.3mØ	10.585	113.7	0.600	1.849	2.041
16.002	SW190	62.800	SW191	62.689	Circ	0.3mØ	15.616	140.7	0.600	2.041	2.354
15.002	SW191	62.689	SW192	62.200	Circ	0.3mØ	13.746	28.1	0.600	2.354	2.312
15.003	SW192	62.000	SW194	61.400	Circ	0.3mØ	18.830	31.4	0.600	2.512	2.267
17.000	S2	62.081	SW194	61.400	Circ	0.3mØ	53.482	78.5	0.600	2.267	2.267
15.004	SW194	61.400	SW195	60.400	Circ	0.3mØ	30.937	30.9	0.600	2.267	1.929
15.005	SW195	60.400	SW196	60.200	Circ	0.3mØ	6.340	31.7	0.600	1.929	1.994
18.000	S28	59.502	SW196	58.747	Circ	0.3mØ	28.793	38.1	0.600	1.234	3.447
10.012	SW196	58.747	S20	58.710	Circ	0.525mØ	7.256	196.1	0.600	3.222	3.017
10.013	S20	57.714	SW197	57.700	Circ	0.525mØ	2.095	149.6	0.600	4.013	3.775
10.014	SW197	56.400	SW198	56.250	Circ	0.6mØ	31.365	209.1	0.600	5.000	3.089
10.015	SW198	55.806	S21	55.766	Circ	0.45mØ	4.004	100.0	0.600	3.683	3.705
10.016	S21	55.616	SW199	55.569	Circ	0.6mØ	4.743	100.0	0.600	3.705	3.832
10.017	SW199	55.569	SW200A	55.514	Circ	0.6mØ	5.456	100.0	0.600	3.832	3.899
10.018	SW200A	55.514	SW203	55.430	Circ	0.6mØ	8.409	100.0	0.600	3.899	3.552
10.019	SW203	55.430	SW204	54.550	Circ	0.6mØ	31.431	35.7	0.600	3.552	2.785
10.020	SW204	54.550	SW205	53.370	Circ	0.6mØ	16.900	14.3	0.600	2.785	3.095
10.021	SW205	53.370	SW209	52.780	Circ	0.45mØ	16.961	28.7	0.600	3.245	3.560
1.014	SW209	52.780	SW210	52.666	Circ	0.525mØ	17.150	150.0	0.600	3.485	2.725
1.015	SW210	50.390	SW292	50.296	Circ	0.525mØ	14.124	150.0	0.600	5.001	3.022

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (m)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)	DS Depth To Soffit (m)
1.016	SW292	47.474	S29	45.840	Circ	0.6mØ	163.444	100.0	0.600	5.769	1.560
19.000	SW165	55.020	SW144	54.560	Circ	0.45mØ	9.511	20.7	0.600	1.192	1.467
19.001	SW144	54.560	SW148	53.820	Circ	0.45mØ	36.660	49.5	0.600	1.467	1.418
19.002	SW148	53.820	SW145	52.990	Circ	0.45mØ	30.097	36.3	0.600	1.418	1.393
19.003	SW145	52.990	SW146	51.790	Circ	0.45mØ	35.677	29.7	0.600	1.393	1.497
19.004	SW146	51.790	SW142	50.671	Circ	0.45mØ	33.622	30.1	0.600	1.497	1.558
19.005	SW142	50.636	SW162	49.960	Circ	0.45mØ	29.579	43.7	0.600	1.593	1.372
19.006	SW162	49.960	SW143	48.651	Circ	0.45mØ	43.917	33.6	0.600	1.372	1.400
20.000	SW130	49.999	SW159	49.840	Circ	0.45mØ	23.818	150.0	0.600	2.141	2.021
20.001	SW159	49.840	SW131	49.638	Circ	0.45mØ	30.313	150.0	0.600	2.021	1.827
20.002	SW131	49.638	SW132	49.462	Circ	0.45mØ	26.412	150.0	0.600	1.827	1.659
20.003	SW132	49.462	SW163	49.350	Circ	0.45mØ	16.732	150.0	0.600	1.659	1.533
20.004	SW163	49.350	SW141	49.126	Circ	0.45mØ	33.666	150.0	0.600	1.533	1.359
20.005	SW141	49.126	SW143	48.400	Circ	0.45mØ	68.301	94.1	0.600	1.359	1.651
19.007	SW143	46.307	S108	46.201	Circ	0.45mØ	10.596	100.0	0.600	3.744	4.213
19.008	S108	46.201	S55	46.153	Circ	0.45mØ	4.797	100.0	0.600	4.213	2.753
19.009	S55	46.153	S29	45.840	Circ	0.45mØ	30.637	97.9	0.600	2.753	1.710
1.017	S29	45.540	S30	45.160	Circ	0.45mØ	23.920	62.9	0.600	2.010	1.390
1.018	S30	45.086	SW289	44.762	Circ	0.45mØ	24.314	74.9	0.600	1.464	-0.232
1.019	SW289	44.762	SW290	43.312	Circ	0.45mØ	61.313	42.3	0.600	-0.232	0.000

Outfall Details

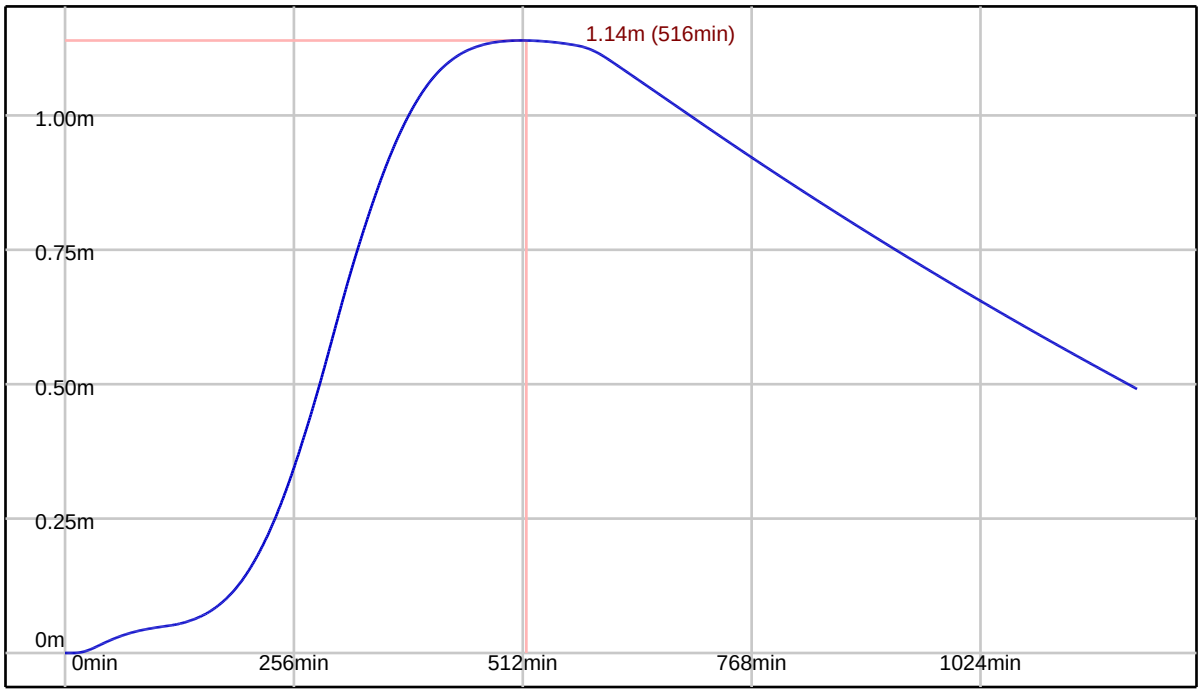
Outfall Manhole SW290 : Free Discharge

Flow Control Details

Tank Structure at Manhole SW198

Tank Invert (m)	Tank Height (m)	Porosity Ratio (%)	Area (m2)	Effective Area (m2) Area x Porosity Ratio	Max Storage (m3) Effective Area x Height	Infil Base (m/hr)	Infil Side (m/hr)	Safety Factor
55.806	1.800	100.00	835.475	835.475	1503.856	0.00000000	0.00000000	2.00

Tank at SW198 (100Yr+20% 600Min Winter)

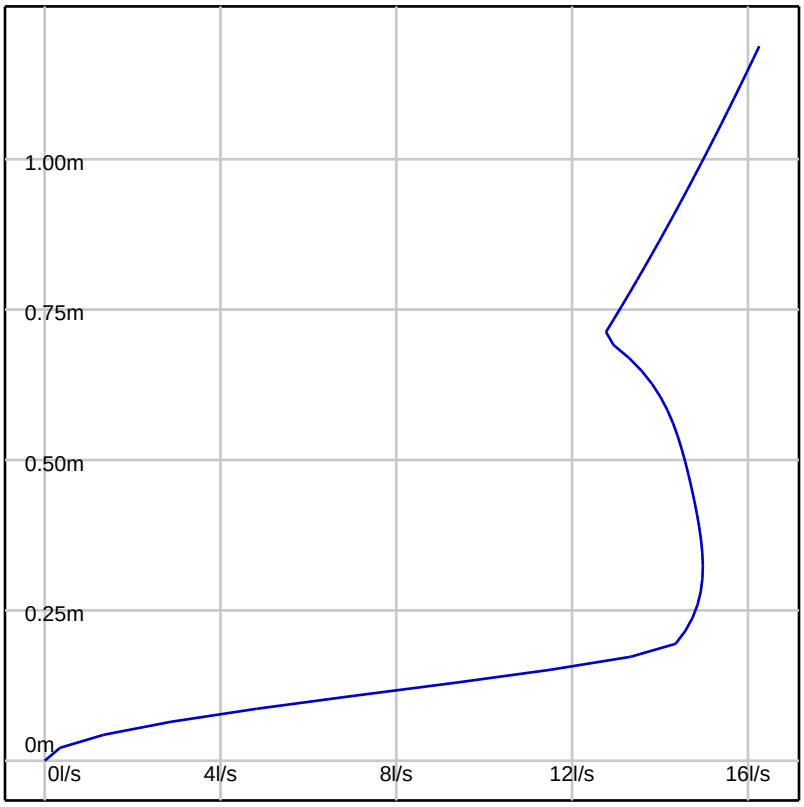


Controls within Manhole S21

Hydro-Brake® Optimum Control at Manhole S21

Model Ref	Design Depth (m)	Design Flow (l/s)	Depth Above Invert (m)	FF Head (m)	FF Flow (l/s)	KF Head (m)	KF Flow (l/s)
SHE-0175-1500-1000-1500	1.000	15.000	0.000	0.323	14.974	0.703	12.690

Hydro-Brake® Optimum Control at S21

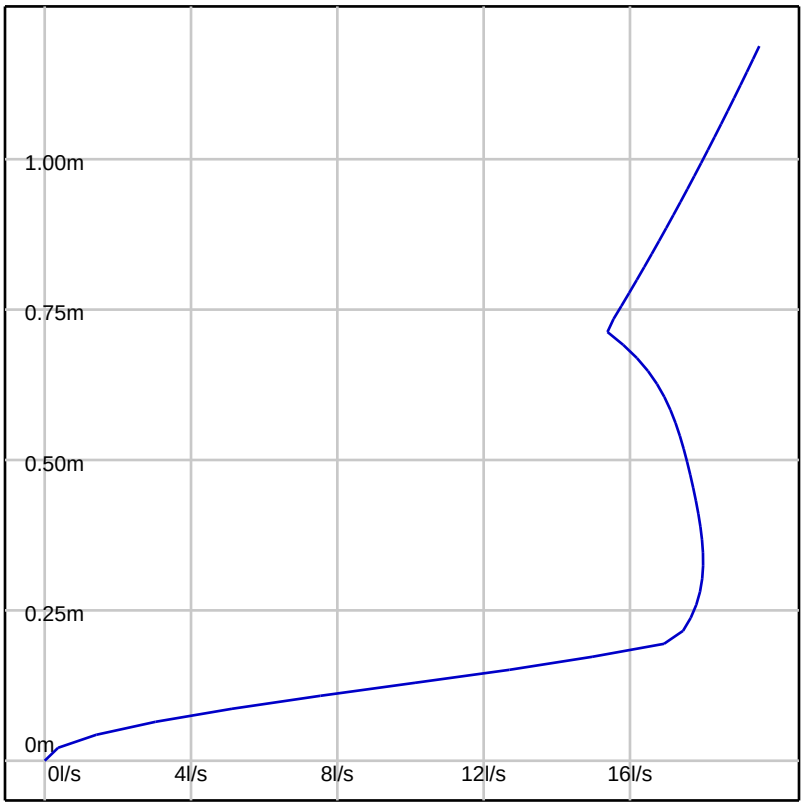


Controls within Manhole S29

Hydro-Brake® Optimum Control at Manhole S29

Model Ref	Design Depth (m)	Design Flow (l/s)	Depth Above Invert (m)	FF Head (m)	FF Flow (l/s)	KF Head (m)	KF Flow (l/s)
SHE-0190-1800-1000-1800	1.000	18.000	0.000	0.332	18.001	0.713	15.336

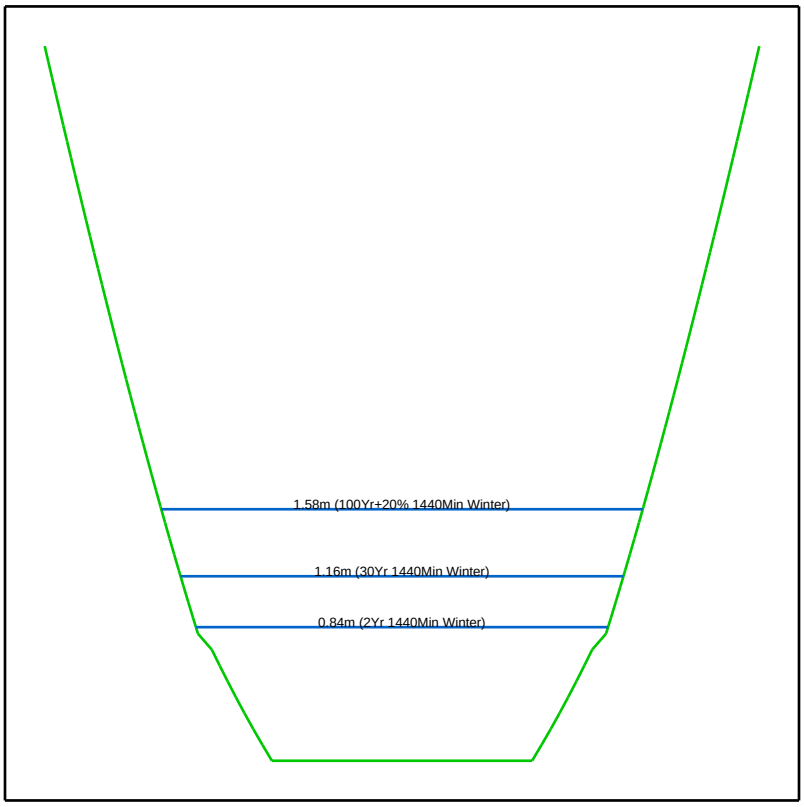
Hydro-Brake® Optimum Control at S29



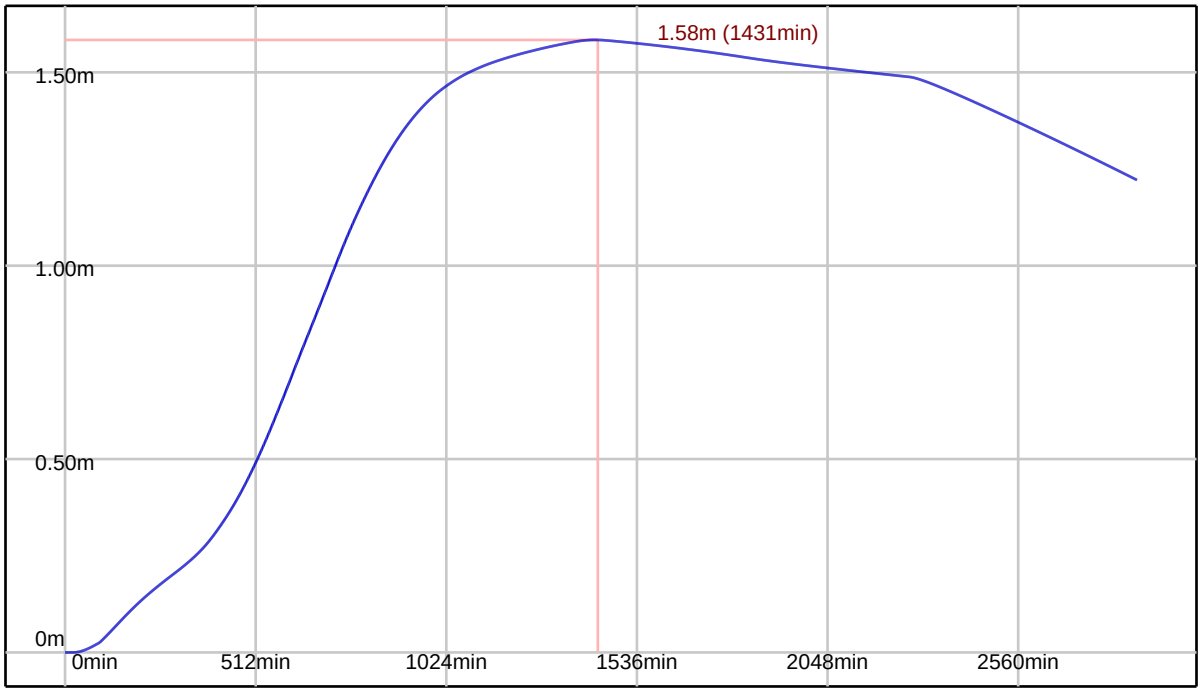
Pond Structure at Manhole S29

Pond Invert (m)	Max Depth (m)	Volume To Water Level (m3)	Water Level (m)	Freeboard (m)	Infil Base (m/hr)	Infil Side (m/hr)	Safety Factor
47.000	4.500	10026.861	50.500	1.000	0.00000000	0.00000000	2.00

Pond Depth/Area Diagram at S29



Pond at S29 (100Yr+20% 1440Min Winter)



Simulation Settings

FSR: M5-60=18.00, R=0.27, Locale=Scotland and Northern Ireland

Summer (Cv: 0.75), Winter (Cv: 0.84)

Global Time of Entry: 5.0 mins

Durations (mins): 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440

Return Periods (yrs) + Climate Change: (2, +0%), (30, +0%), (100, +20%)

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
2Yr 15Min Winter	31.946	0.00	1.03	30Yr 360Min Summer	8.225	0.00	0.84
2Yr 15Min Summer	31.946	0.00	1.12	30Yr 360Min Winter	8.225	0.00	0.85
2Yr 30Min Winter	22.823	0.00	0.71	30Yr 480Min Summer	6.758	0.00	0.79
2Yr 30Min Summer	22.823	0.00	0.81	30Yr 480Min Winter	6.758	0.00	0.79
2Yr 60Min Winter	15.128	0.00	0.55	30Yr 600Min Summer	5.801	0.00	0.72
2Yr 60Min Summer	15.128	0.00	0.59	30Yr 600Min Winter	5.801	0.00	0.75
2Yr 120Min Summer	9.856	0.00	0.41	30Yr 720Min Summer	5.119	0.00	0.63
2Yr 120Min Winter	9.856	0.00	0.43	30Yr 720Min Winter	5.119	0.00	0.68
2Yr 180Min Winter	7.650	0.00	0.41	30Yr 960Min Summer	4.201	0.00	0.43
2Yr 180Min Summer	7.650	0.00	0.36	30Yr 960Min Winter	4.201	0.00	0.53
2Yr 240Min Winter	6.377	0.00	0.42	30Yr 1440Min Summer	3.206	0.00	0.06
2Yr 240Min Summer	6.377	0.00	0.32	30Yr 1440Min Winter	3.206	0.00	0.17
2Yr 360Min Winter	4.928	0.00	0.38	100Yr+20% 15Min Summer	113.989	0.00	2.41
2Yr 360Min Summer	4.928	0.00	0.19	100Yr+20% 15Min Winter	113.989	0.00	2.76
2Yr 480Min Summer	4.102	0.00	0.10	100Yr+20% 30Min Summer	65.061	0.00	1.96
2Yr 480Min Winter	4.102	0.00	0.25	100Yr+20% 30Min Winter	65.061	0.00	2.13
2Yr 600Min Winter	3.557	0.00	0.11	100Yr+20% 60Min Summer	42.167	0.00	1.52
2Yr 600Min Summer	3.557	0.00	0.06	100Yr+20% 60Min Winter	42.167	0.00	1.13
2Yr 720Min Summer	3.165	0.00	0.04	100Yr+20% 120Min Summer	26.639	0.00	0.88
2Yr 720Min Winter	3.165	0.00	0.04	100Yr+20% 120Min Winter	26.639	0.00	0.77
2Yr 960Min Summer	2.633	0.00	0.04	100Yr+20% 180Min Summer	20.072	0.00	0.79
2Yr 960Min Winter	2.633	0.00	0.01	100Yr+20% 180Min Winter	20.072	0.00	0.79
2Yr 1440Min Winter	2.022	0.00	0.12	100Yr+20% 240Min Summer	16.449	0.00	0.79
2Yr 1440Min Summer	2.022	0.00	0.09	100Yr+20% 240Min Winter	16.449	0.00	0.83
30Yr 15Min Winter	67.925	0.00	1.12	100Yr+20% 360Min Summer	12.394	0.00	0.81
30Yr 15Min Summer	67.925	0.00	1.03	100Yr+20% 360Min Winter	12.394	0.00	0.87
30Yr 30Min Summer	41.542	0.00	0.77	100Yr+20% 480Min Summer	10.126	0.00	0.81
30Yr 30Min Winter	41.542	0.00	0.75	100Yr+20% 480Min Winter	10.126	0.00	0.87
30Yr 60Min Summer	27.111	0.00	0.63	100Yr+20% 600Min Summer	8.652	0.00	0.81
30Yr 60Min Winter	27.111	0.00	0.67	100Yr+20% 600Min Winter	8.652	0.00	0.86
30Yr 120Min Summer	17.290	0.00	0.77	100Yr+20% 720Min Summer	7.606	0.00	0.78
30Yr 120Min Winter	17.290	0.00	0.83	100Yr+20% 720Min Winter	7.606	0.00	0.86
30Yr 180Min Winter	13.148	0.00	0.86	100Yr+20% 960Min Summer	6.206	0.00	0.69
30Yr 180Min Summer	13.148	0.00	0.84	100Yr+20% 960Min Winter	6.206	0.00	0.81
30Yr 240Min Summer	10.831	0.00	0.86	100Yr+20% 1440Min Winter	4.722	0.00	0.57
30Yr 240Min Winter	10.831	0.00	0.86	100Yr+20% 1440Min Summer	4.722	0.00	0.44

Simulation Results

Return Period Yrs: 2.0

Climate Change %: 0

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SW244	15 min Winter	8	62.985	0.095	20.340		OK
SW224	15 min Winter	9	62.687	0.118	30.107		OK
SW243	15 min Winter	8	64.453	0.083	28.602		OK
SW245	15 min Winter	8	63.522	0.102	34.208		OK
SW225	15 min Winter	9	62.371	0.130	66.527		OK
SW261	15 min Winter	9	61.906	0.146	66.975		OK
SW230	15 min Winter	8	66.594	0.034	9.194		OK
SW231	15 min Winter	8	64.505	0.045	16.922		OK
SW264	15 min Winter	8	63.076	0.046	23.830		OK
S67	-	0	62.223	0.000	0.000		OK
SW232	15 min Winter	9	61.580	0.150	98.886		OK
SW233	15 min Winter	9	61.087	0.157	122.946		OK
SW247	15 min Winter	8	65.010	0.112	27.900		OK
SW226	15 min Winter	8	64.748	0.121	31.712		OK
S46	15 min Winter	8	66.122	0.053	8.552		OK
SW237	15 min Winter	9	64.561	0.122	49.851		OK
SW238	15 min Winter	9	64.038	0.107	56.625		OK
SW248	15 min Winter	9	63.348	0.128	68.180		OK
SW239	15 min Winter	9	62.386	0.131	71.197		OK
SW263	15 min Winter	9	62.224	0.120	87.560		OK
SW241	15 min Winter	9	60.841	0.151	92.155		OK
SW253	15 min Winter	9	60.362	0.162	92.239		OK
SW234	15 min Winter	9	60.108	0.198	225.013		OK
SW260	15 min Winter	8	59.049	0.095	28.385		OK
SW255	15 min Winter	9	58.957	0.207	264.706		OK
S38	15 min Winter	8	62.471	0.071	19.113		OK
S48	15 min Winter	8	61.522	0.082	24.153		OK
S39	15 min Winter	8	60.971	0.111	43.416		OK
S40	15 min Winter	9	59.901	0.121	42.376		OK
SW242	15 min Winter	8	60.014	0.044	8.650		OK
S41	15 min Winter	9	59.219	0.116	51.042		OK
SW240	15 min Winter	9	59.078	0.128	52.317		OK
SW265	15 min Winter	9	58.825	0.115	70.605		OK
SW246	15 min Winter	9	58.246	0.146	73.456		OK
SW266	15 min Winter	9	57.985	0.115	73.766		OK
SW257	15 min Winter	9	57.541	0.256	336.598		OK
SW249	15 min Winter	9	57.077	0.247	341.928		OK
SW206	15 min Winter	9	56.733	0.283	346.824		OK
SW207	15 min Winter	9	56.341	0.251	355.782		OK
SW208	15 min Winter	9	55.374	0.224	360.100		OK
S51	15 min Winter	10	54.546	0.166	364.971		OK
SW166	15 min Winter	8	68.757	0.057	12.870		OK
SW167	15 min Winter	8	68.063	0.063	16.078		OK
SW168	15 min Winter	8	67.485	0.089	31.708		OK
SW169	15 min Winter	9	66.944	0.094	33.703		OK
SW170	15 min Winter	9	65.298	0.098	45.235		OK
SW171	15 min Winter	9	64.110	0.110	61.671		OK
SW172	15 min Winter	9	62.838	0.138	76.082		OK
SW173	15 min Winter	9	62.503	0.203	76.416		OK
SW174	15 min Winter	8	65.852	0.052	9.396		OK
S47	15 min Winter	8	65.856	0.045	5.789		OK
SW175	15 min Winter	8	65.170	0.070	16.753		OK
SW176	15 min Winter	8	64.832	0.082	22.304		OK
SW177	15 min Winter	8	65.325	0.072	19.590		OK
SW178	15 min Winter	8	64.484	0.121	51.532		OK
SW179	15 min Winter	9	63.821	0.091	53.895		OK
SW180	15 min Winter	8	62.695	0.055	7.148		OK
SW181	15 min Winter	8	62.534	0.076	12.971		OK
SW182	15 min Winter	9	62.436	0.080	12.661		OK

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SW183	15 min Winter	9	62.415	0.249	150.833		OK
SW184	15 min Winter	9	62.090	0.190	162.974		OK
SW185	15 min Winter	9	61.633	0.191	177.816		OK
SW186	15 min Winter	9	60.000	0.200	184.245		OK
SW187	15 min Winter	8	65.733	0.053	11.026		OK
SW188	15 min Winter	9	64.873	0.065	18.193		OK
SW189	15 min Winter	8	63.153	0.053	7.401		OK
S80	15 min Winter	9	62.946	0.053	7.073		OK
SW190	15 min Winter	9	62.867	0.067	10.548		OK
SW191	15 min Winter	9	62.767	0.078	31.413		OK
SW192	15 min Winter	8	62.106	0.106	55.066		OK
S2	15 min Winter	8	62.179	0.098	30.059		OK
SW194	15 min Winter	9	61.541	0.141	91.537		OK
SW195	15 min Winter	9	60.542	0.142	92.377		OK
S28	-	0	59.502	0.000	0.000		OK
SW196	15 min Winter	9	59.096	0.349	282.941		OK
S20	15 min Winter	9	58.032	0.318	282.453		OK
SW197	15 min Winter	9	56.724	0.324	282.298		OK
SW198	360 min Winter	278	56.209	0.329	58.333		OK
S21	360 min Winter	232	56.352	0.736	19.411		Surcharged
SW199	1440 min Summer	800	55.629	0.060	14.900		OK
SW200A	600 min Winter	749	55.574	0.060	14.978		OK
SW203	15 min Winter	10	55.479	0.049	14.977		OK
SW204	240 min Summer	445	54.588	0.038	14.921		OK
SW205	480 min Winter	683	53.418	0.048	14.915		OK
SW209	15 min Winter	10	53.176	0.396	378.867		OK
SW210	15 min Winter	10	50.786	0.396	379.374		OK
SW292	15 min Winter	10	47.950	0.475	378.445		OK
SW165	-	0	55.020	0.000	0.000		OK
SW144	15 min Winter	8	54.611	0.051	13.427		OK
SW148	15 min Winter	8	53.879	0.059	20.761		OK
SW145	15 min Winter	9	53.056	0.066	28.338		OK
SW146	15 min Winter	9	51.864	0.074	36.007		OK
SW142	15 min Winter	9	50.725	0.088	42.508		OK
SW162	15 min Winter	9	50.051	0.091	51.300		OK
SW130	15 min Winter	8	50.068	0.069	14.097		OK
SW159	15 min Winter	8	49.927	0.087	22.830		OK
SW131	15 min Winter	9	49.737	0.099	29.029		OK
SW132	15 min Winter	9	49.571	0.109	34.605		OK
SW163	15 min Winter	9	49.473	0.123	44.453		OK
SW141	15 min Winter	9	49.251	0.124	58.648		OK
SW143	1440 min Winter	1207	47.841	1.534	1.546		Surcharged
S108	1440 min Winter	1207	47.841	1.640	1.546		Surcharged
S55	1440 min Winter	1207	47.841	1.688	1.546		Surcharged
S29	1440 min Winter	1207	47.841	0.841	16.283		Surcharged
S30	360 min Summer	187	45.153	0.067	17.999		OK
SW289	960 min Winter	1745	44.819	0.057	17.999		OK
SW290	960 min Winter	1745	43.369	0.057	17.999		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	9	SW244	SW224	0.106	0.895	19.881	0.223	OK
1.001	15 min Winter	9	SW224	SW225	0.124	1.109	30.526	0.334	OK
2.000	15 min Winter	8	SW243	SW245	0.092	1.843	28.394	0.297	OK
2.001	15 min Winter	8	SW245	SW225	0.101	1.935	33.600	0.423	OK
1.002	15 min Winter	9	SW225	SW261	0.138	2.116	66.975	0.398	OK
1.003	15 min Winter	9	SW261	SW232	0.146	1.978	67.297	0.488	OK
3.000	15 min Winter	8	SW230	SW231	0.040	1.217	9.066	0.009	OK
3.001	15 min Winter	8	SW231	SW264	0.045	1.815	16.607	0.016	OK
3.002	15 min Winter	9	SW264	SW232	0.098	0.862	23.584	0.016	OK
4.000	15 min Winter	9	S67	SW232	0.000	0.000	0.000	0.000	OK
1.004	15 min Winter	9	SW232	SW233	0.153	1.881	99.123	0.187	OK
1.005	15 min Winter	9	SW233	SW234	0.177	1.906	122.721	0.203	OK
5.000	15 min Winter	8	SW247	SW226	0.116	1.087	27.466	0.303	OK

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
5.001	15 min Winter	9	SW226	SW237	0.121	1.165	31.216	0.349	OK
6.000	15 min Winter	8	S46	SW237	0.053	1.502	8.325	0.266	OK
5.002	15 min Winter	9	SW237	SW238	0.114	2.033	50.408	0.348	OK
5.003	15 min Winter	9	SW238	SW248	0.117	2.219	56.898	0.278	OK
5.004	15 min Winter	9	SW248	SW239	0.130	2.341	68.449	0.388	OK
5.005	15 min Winter	9	SW239	SW263	0.126	2.536	71.300	0.405	OK
5.006	15 min Winter	9	SW263	SW241	0.136	2.817	87.658	0.346	OK
5.007	15 min Winter	9	SW241	SW253	0.157	2.472	92.239	0.520	OK
5.008	15 min Winter	9	SW253	SW234	0.162	2.376	92.289	0.580	OK
1.006	15 min Winter	9	SW234	SW255	0.203	2.900	223.603	0.316	OK
7.000	15 min Winter	9	SW260	SW255	0.113	1.199	28.155	0.141	OK
1.007	15 min Winter	9	SW255	SW257	0.231	2.857	262.664	0.343	OK
8.000	15 min Winter	8	S38	S48	0.077	1.578	18.911	0.222	OK
8.001	15 min Winter	8	S48	S39	0.097	1.456	23.764	0.289	OK
8.002	15 min Winter	8	S39	S40	0.116	2.079	42.759	0.497	OK
8.003	15 min Winter	9	S40	S41	0.121	1.971	42.815	0.572	OK
9.000	15 min Winter	8	SW242	S41	0.044	1.328	8.550	0.048	OK
8.004	15 min Winter	9	S41	SW240	0.122	1.888	51.177	0.325	OK
8.005	15 min Winter	9	SW240	SW265	0.122	1.957	52.583	0.389	OK
8.006	15 min Winter	9	SW265	SW246	0.130	2.405	70.845	0.317	OK
8.007	15 min Winter	9	SW246	SW266	0.131	2.499	73.766	0.485	OK
8.008	15 min Winter	9	SW266	SW257	0.115	2.958	73.934	0.320	OK
1.008	15 min Winter	9	SW257	SW249	0.255	3.214	335.099	0.496	OK
1.009	15 min Winter	9	SW249	SW206	0.265	3.121	341.535	0.464	OK
1.010	15 min Winter	9	SW206	SW207	0.267	3.126	345.715	0.591	OK
1.011	15 min Winter	10	SW207	SW208	0.238	3.746	354.037	0.470	OK
1.012	15 min Winter	10	SW208	S51	0.195	4.935	361.451	0.374	OK
1.013	15 min Winter	10	S51	SW209	0.281	3.187	365.567	0.228	OK
10.000	15 min Winter	8	SW166	SW167	0.060	1.261	12.716	0.081	OK
10.001	15 min Winter	8	SW167	SW168	0.076	1.109	15.728	0.100	OK
10.002	15 min Winter	9	SW168	SW169	0.091	1.719	31.201	0.198	OK
10.003	15 min Winter	9	SW169	SW170	0.094	1.811	34.110	0.217	OK
10.004	15 min Winter	9	SW170	SW171	0.098	1.991	45.506	0.153	OK
10.005	15 min Winter	9	SW171	SW172	0.110	2.303	62.046	0.193	OK
10.006	15 min Winter	9	SW172	SW173	0.138	2.064	76.416	0.300	OK
10.007	15 min Winter	9	SW173	SW183	0.203	1.257	76.607	0.614	OK
11.000	15 min Winter	8	SW174	SW175	0.052	1.127	9.179	0.066	OK
12.000	15 min Winter	8	S47	SW175	0.045	1.277	5.680	0.196	OK
11.001	15 min Winter	8	SW175	SW176	0.070	1.323	16.562	0.122	OK
11.002	15 min Winter	9	SW176	SW178	0.082	1.418	22.107	0.167	OK
13.000	15 min Winter	8	SW177	SW178	0.097	1.189	19.411	0.224	OK
11.003	15 min Winter	8	SW178	SW179	0.106	2.279	50.839	0.328	OK
11.004	15 min Winter	9	SW179	SW183	0.091	2.997	54.370	0.205	OK
14.000	15 min Winter	8	SW180	SW181	0.065	0.615	7.011	0.076	OK
14.001	15 min Winter	9	SW181	SW182	0.078	0.886	12.661	0.142	OK
14.002	15 min Winter	9	SW182	SW183	0.090	0.867	12.790	0.140	OK
10.008	15 min Winter	9	SW183	SW184	0.249	1.683	152.273	0.618	OK
10.009	15 min Winter	9	SW184	SW185	0.190	2.550	163.198	0.386	OK
10.010	15 min Winter	9	SW185	SW186	0.191	2.768	177.483	0.387	OK
10.011	15 min Winter	9	SW186	SW196	0.199	2.697	183.524	0.420	OK
15.000	15 min Winter	8	SW187	SW188	0.059	1.102	10.832	0.070	OK
15.001	15 min Winter	9	SW188	SW191	0.065	1.638	18.560	0.106	OK
16.000	15 min Winter	8	SW189	S80	0.053	0.868	7.287	0.070	OK
16.001	15 min Winter	9	S80	SW190	0.060	0.713	7.181	0.069	OK
16.002	15 min Winter	9	SW190	SW191	0.073	0.809	10.653	0.114	OK
15.002	15 min Winter	9	SW191	SW192	0.078	2.176	31.566	0.150	OK
15.003	15 min Winter	9	SW192	SW194	0.124	1.996	54.736	0.275	OK
17.000	15 min Winter	8	S2	SW194	0.119	1.129	29.555	0.236	OK
15.004	15 min Winter	9	SW194	SW195	0.142	2.810	92.377	0.461	OK
15.005	15 min Winter	9	SW195	SW196	0.142	2.805	92.762	0.469	OK
18.000	15 min Winter	8	S28	SW196	0.150	0.000	0.000	0.000	OK
10.012	15 min Winter	9	SW196	S20	0.349	1.849	282.453	0.818	OK
10.013	15 min Winter	9	S20	SW197	0.318	2.058	282.298	0.714	OK
10.014	15 min Winter	9	SW197	SW198	0.323	1.829	280.757	0.592	OK
10.015	360 min Winter	276	SW198	S21	0.389	1.382	141.475	0.438	OK
10.016	180 min Winter	126	S21	SW199	0.060	1.041	15.269	0.022	OK
10.017	240 min Summer	432	SW199	SW200A	0.060	1.023	14.995	0.022	OK
10.018	15 min Winter	10	SW200A	SW203	0.054	1.175	14.977	0.022	OK

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
10.019	360 min Winter	592	SW203	SW204	0.043	1.647	14.945	0.013	OK
10.020	960 min Winter	977	SW204	SW205	0.043	1.666	14.926	0.008	OK
10.021	15 min Winter	62	SW205	SW209	0.221	1.240	14.912	0.025	OK
1.014	15 min Winter	10	SW209	SW210	0.396	2.166	379.374	0.960	OK
1.015	15 min Winter	10	SW210	SW292	0.395	2.166	378.445	0.958	OK
1.016	1440 min Winter	1204	SW292	S29	0.484	0.753	45.888	0.067	OK
19.000	15 min Winter	8	SW165	SW144	0.026	0.000	0.000	0.000	OK
19.001	15 min Winter	8	SW144	SW148	0.055	1.187	13.225	0.029	OK
19.002	15 min Winter	8	SW148	SW145	0.062	1.529	20.375	0.038	OK
19.003	15 min Winter	9	SW145	SW146	0.070	1.818	28.629	0.048	OK
19.004	15 min Winter	9	SW146	SW142	0.074	2.118	36.405	0.062	OK
19.005	15 min Winter	9	SW142	SW162	0.089	1.903	42.639	0.087	OK
19.006	15 min Winter	9	SW162	SW143	0.091	2.255	51.527	0.092	OK
20.000	15 min Winter	8	SW130	SW159	0.078	0.757	13.908	0.053	OK
20.001	15 min Winter	9	SW159	SW131	0.093	0.942	22.282	0.085	OK
20.002	15 min Winter	9	SW131	SW132	0.104	1.050	29.366	0.111	OK
20.003	15 min Winter	9	SW132	SW163	0.116	1.075	34.949	0.133	OK
20.004	15 min Winter	9	SW163	SW141	0.124	1.259	44.713	0.170	OK
20.005	15 min Winter	9	SW141	SW143	0.124	1.612	57.524	0.173	OK
19.007	15 min Summer	9	SW143	S108	0.450	0.958	105.956	0.328	OK
19.008	15 min Summer	9	S108	S55	0.450	0.905	144.012	0.446	OK
19.009	180 min Summer	136	S55	S29	0.450	0.333	44.873	0.137	OK
1.017	1440 min Summer	1941	S29	S30	0.043	2.307	17.999	0.044	OK
1.018	1440 min Summer	1941	S30	SW289	0.062	1.350	17.999	0.048	OK
1.019	960 min Winter	1745	SW289	SW290	0.057	1.522	17.999	0.036	OK

Return Period Yrs: 30.0

Climate Change %: 0

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SW244	15 min Winter	8	63.033	0.143	43.248		OK
SW224	15 min Winter	9	62.754	0.184	63.909		OK
SW243	15 min Winter	8	64.499	0.129	60.816		OK
SW245	15 min Winter	8	63.586	0.166	72.802		OK
SW225	15 min Winter	9	62.450	0.209	141.871		OK
SW261	15 min Winter	9	62.022	0.262	143.083		OK
SW230	15 min Winter	8	66.609	0.049	19.549		OK
SW231	15 min Winter	8	64.525	0.065	36.039		OK
SW264	15 min Winter	8	63.096	0.066	50.899		OK
S67	-	0	62.223	0.000	0.000		OK
SW232	15 min Winter	9	61.654	0.224	209.796		OK
SW233	15 min Winter	9	61.165	0.235	260.350		OK
SW247	15 min Winter	8	65.072	0.174	59.321		OK
SW226	15 min Winter	8	64.818	0.190	67.513		OK
S46	15 min Winter	8	66.150	0.081	18.183		OK
SW237	15 min Winter	8	64.630	0.191	107.574		OK
SW238	15 min Winter	9	64.095	0.164	120.589		OK
SW248	15 min Winter	9	63.425	0.205	145.229		OK
SW239	15 min Winter	9	62.466	0.211	151.819		OK
SW263	15 min Winter	9	62.292	0.189	186.761		OK
SW241	15 min Winter	9	61.110	0.420	196.583		Surcharged
SW253	15 min Winter	9	60.555	0.355	192.389		Surcharged
SW234	15 min Winter	9	60.214	0.304	473.708		OK
SW260	15 min Winter	8	59.102	0.148	60.352		OK
SW255	15 min Winter	9	59.072	0.322	558.199		OK
S38	15 min Winter	8	62.508	0.108	40.639		OK
S48	15 min Winter	8	61.567	0.127	51.436		OK
S39	15 min Winter	9	61.060	0.200	88.903		OK
S40	15 min Winter	9	60.071	0.291	90.603		Surcharged
SW242	15 min Winter	8	60.034	0.064	18.390		OK
S41	15 min Winter	9	59.287	0.184	108.211		OK
SW240	15 min Winter	9	59.153	0.203	110.705		OK
SW265	15 min Winter	9	58.887	0.177	149.077		OK
SW246	15 min Winter	9	58.345	0.245	154.818		OK
SW266	15 min Winter	9	58.047	0.177	155.051		OK
SW257	15 min Winter	10	57.721	0.435	688.828		OK
SW249	15 min Winter	10	57.323	0.493	716.081		OK
SW206	15 min Winter	10	57.043	0.593	727.224		Surcharged
SW207	15 min Winter	10	56.501	0.411	746.385		OK
SW208	15 min Winter	10	55.497	0.347	758.596		OK
S51	15 min Winter	10	54.629	0.249	766.559		OK
SW166	15 min Winter	8	68.783	0.083	27.364		OK
SW167	15 min Winter	8	68.093	0.093	34.254		OK
SW168	15 min Winter	8	67.531	0.135	67.679		OK
SW169	15 min Winter	8	66.991	0.141	72.936		OK
SW170	15 min Winter	8	65.345	0.145	96.830		OK
SW171	15 min Winter	8	64.165	0.165	132.522		OK
SW172	15 min Winter	9	62.917	0.217	162.009		OK
SW173	15 min Winter	9	62.679	0.379	162.247		Surcharged
SW174	15 min Winter	8	65.876	0.076	19.978		OK
S47	15 min Winter	8	65.879	0.068	12.309		OK
SW175	15 min Winter	8	65.204	0.104	35.786		OK
SW176	15 min Winter	8	64.873	0.123	47.694		OK
SW177	15 min Winter	8	65.362	0.109	41.652		OK
SW178	15 min Winter	8	64.552	0.189	110.045		OK
SW179	15 min Winter	8	63.867	0.137	116.078		OK
SW180	15 min Winter	8	62.720	0.081	15.198		OK
SW181	15 min Winter	9	62.663	0.205	26.401		OK
SW182	15 min Winter	9	62.649	0.293	26.053		OK
SW183	15 min Winter	9	62.643	0.478	314.176		Surcharged
SW184	15 min Winter	9	62.192	0.292	330.224		OK
SW185	15 min Winter	9	61.734	0.292	360.088		OK
SW186	15 min Winter	10	60.111	0.311	371.744		OK

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SW187	15 min Winter	8	65.758	0.078	23.444		OK
SW188	15 min Winter	8	64.904	0.096	40.453		OK
SW189	15 min Winter	8	63.177	0.077	15.736		OK
S80	15 min Winter	8	62.972	0.079	15.540		OK
SW190	15 min Winter	8	62.901	0.101	22.931		OK
SW191	15 min Winter	9	62.804	0.115	66.849		OK
SW192	15 min Winter	8	62.164	0.164	118.304		OK
S2	15 min Winter	8	62.229	0.148	63.911		OK
SW194	15 min Winter	9	61.636	0.236	194.613		OK
SW195	15 min Winter	9	60.640	0.240	196.978		OK
S28	-	0	59.502	0.000	0.000		OK
SW196	15 min Winter	9	59.297	0.550	582.353		Surcharged
S20	15 min Winter	9	58.212	0.498	582.571		OK
SW197	15 min Winter	9	56.942	0.542	582.635		OK
SW198	480 min Winter	396	56.558	0.678	14.099		Surcharged
S21	480 min Winter	396	56.558	0.942	14.132		Surcharged
SW199	1440 min Winter	654	55.629	0.060	14.915		OK
SW200A	15 min Summer	8	55.574	0.060	14.959		OK
SW203	15 min Winter	8	55.479	0.049	14.928		OK
SW204	1440 min Summer	561	54.588	0.038	14.923		OK
SW205	15 min Winter	10	53.613	0.243	14.860		OK
SW209	15 min Winter	10	53.584	0.804	781.166		Surcharged
SW210	15 min Summer	10	51.147	0.757	768.660		Surcharged
SW292	15 min Winter	12	49.248	1.774	678.706		Surcharged
SW165	-	0	55.020	0.000	0.000		OK
SW144	15 min Winter	8	54.634	0.074	28.549		OK
SW148	15 min Winter	8	53.905	0.085	44.246		OK
SW145	15 min Winter	8	53.086	0.096	62.091		OK
SW146	15 min Winter	8	51.898	0.108	78.056		OK
SW142	15 min Winter	9	50.765	0.129	90.320		OK
SW162	15 min Winter	9	50.093	0.133	109.087		OK
SW130	15 min Winter	8	50.100	0.101	29.974		OK
SW159	15 min Winter	8	49.968	0.128	48.598		OK
SW131	15 min Winter	8	49.786	0.148	63.403		OK
SW132	15 min Winter	9	49.627	0.165	74.061		OK
SW163	15 min Winter	9	49.534	0.184	95.282		OK
SW141	15 min Winter	9	49.314	0.188	125.603		OK
SW143	1440 min Winter	1399	48.162	1.855	1.121		Surcharged
S108	1440 min Winter	1399	48.162	1.961	1.121		Surcharged
S55	1440 min Winter	1399	48.162	2.009	1.121		Surcharged
S29	1440 min Winter	1399	48.162	1.162	18.995		Surcharged
S30	1440 min Winter	1399	45.155	0.069	18.974		OK
SW289	1440 min Winter	1400	44.821	0.059	18.974		OK
SW290	1440 min Winter	1400	43.371	0.059	18.974		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	8	SW244	SW224	0.164	1.076	42.488	0.477	OK
1.001	15 min Winter	9	SW224	SW225	0.196	1.333	65.349	0.716	OK
2.000	15 min Winter	8	SW243	SW245	0.147	2.195	60.441	0.633	OK
2.001	15 min Winter	8	SW245	SW225	0.165	2.294	71.514	0.899	OK
1.002	15 min Winter	9	SW225	SW261	0.236	2.481	143.083	0.850	OK
1.003	15 min Winter	9	SW261	SW232	0.270	2.298	142.810	1.035	OK
3.000	15 min Winter	8	SW230	SW231	0.057	1.524	19.336	0.019	OK
3.001	15 min Winter	8	SW231	SW264	0.065	2.283	35.541	0.034	OK
3.002	15 min Winter	9	SW264	SW232	0.145	1.049	50.520	0.035	OK
4.000	15 min Winter	9	S67	SW232	0.037	0.000	0.000	0.000	OK
1.004	15 min Winter	9	SW232	SW233	0.229	2.308	209.696	0.395	OK
1.005	15 min Winter	9	SW233	SW234	0.270	2.330	261.069	0.431	OK
5.000	15 min Winter	8	SW247	SW226	0.182	1.303	58.486	0.646	OK
5.001	15 min Winter	9	SW226	SW237	0.191	1.409	66.450	0.743	OK
6.000	15 min Winter	8	S46	SW237	0.081	1.832	17.797	0.569	OK
5.002	15 min Winter	9	SW237	SW238	0.177	2.470	107.372	0.742	OK
5.003	15 min Winter	9	SW238	SW248	0.184	2.666	121.240	0.591	OK

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
5.004	15 min Winter	9	SW248	SW239	0.208	2.792	145.976	0.828	OK
5.005	15 min Winter	9	SW239	SW263	0.200	3.036	152.188	0.864	OK
5.006	15 min Winter	9	SW263	SW241	0.245	3.198	187.023	0.739	OK
5.007	15 min Summer	9	SW241	SW253	0.300	2.727	184.795	1.043	Surcharged
5.008	15 min Summer	10	SW253	SW234	0.300	2.680	184.075	1.157	Surcharged
1.006	15 min Winter	9	SW234	SW255	0.313	3.492	470.619	0.665	OK
7.000	15 min Winter	9	SW260	SW255	0.193	1.326	60.196	0.301	OK
1.007	15 min Winter	9	SW255	SW257	0.378	3.330	555.242	0.726	OK
8.000	15 min Winter	8	S38	S48	0.117	1.922	40.289	0.473	OK
8.001	15 min Winter	9	S48	S39	0.163	1.683	50.756	0.617	OK
8.002	15 min Winter	9	S39	S40	0.213	2.363	90.603	1.053	OK
8.003	15 min Summer	9	S40	S41	0.225	2.216	88.101	1.178	OK
9.000	15 min Winter	8	SW242	S41	0.064	1.659	18.224	0.101	OK
8.004	15 min Winter	9	S41	SW240	0.193	2.247	108.279	0.688	OK
8.005	15 min Winter	9	SW240	SW265	0.190	2.350	110.759	0.819	OK
8.006	15 min Winter	9	SW265	SW246	0.211	2.820	149.267	0.669	OK
8.007	15 min Winter	9	SW246	SW266	0.211	2.920	155.051	1.020	OK
8.008	15 min Winter	9	SW266	SW257	0.177	3.567	155.162	0.671	OK
1.008	15 min Winter	10	SW257	SW249	0.456	3.708	704.171	1.043	OK
1.009	15 min Winter	10	SW249	SW206	0.509	3.406	717.848	0.974	OK
1.010	15 min Winter	10	SW206	SW207	0.468	3.575	728.537	1.246	OK
1.011	15 min Winter	10	SW207	SW208	0.379	4.461	746.966	0.992	OK
1.012	15 min Winter	10	SW208	S51	0.298	5.982	759.074	0.786	OK
1.013	15 min Winter	10	S51	SW209	0.387	4.484	767.103	0.478	OK
10.000	15 min Winter	8	SW166	SW167	0.088	1.564	27.106	0.172	OK
10.001	15 min Winter	8	SW167	SW168	0.114	1.369	33.701	0.214	OK
10.002	15 min Winter	8	SW168	SW169	0.138	2.111	66.853	0.425	OK
10.003	15 min Winter	9	SW169	SW170	0.141	2.225	72.491	0.460	OK
10.004	15 min Winter	9	SW170	SW171	0.145	2.462	96.825	0.326	OK
10.005	15 min Winter	9	SW171	SW172	0.164	2.839	132.166	0.411	OK
10.006	15 min Winter	9	SW172	SW173	0.248	2.394	162.247	0.638	OK
10.007	15 min Winter	9	SW173	SW183	0.372	1.563	159.291	1.278	OK
11.000	15 min Winter	8	SW174	SW175	0.076	1.406	19.634	0.142	OK
12.000	15 min Winter	8	S47	SW175	0.068	1.572	12.126	0.419	OK
11.001	15 min Winter	8	SW175	SW176	0.104	1.639	35.485	0.262	OK
11.002	15 min Winter	8	SW176	SW178	0.122	1.749	47.354	0.357	OK
13.000	15 min Winter	8	SW177	SW178	0.149	1.479	41.351	0.478	OK
11.003	15 min Winter	8	SW178	SW179	0.163	2.777	108.933	0.702	OK
11.004	15 min Winter	9	SW179	SW183	0.215	3.194	115.254	0.435	OK
14.000	15 min Winter	9	SW180	SW181	0.142	0.749	14.980	0.162	OK
14.001	15 min Winter	10	SW181	SW182	0.249	0.929	27.569	0.310	OK
14.002	15 min Winter	11	SW182	SW183	0.296	0.870	33.849	0.370	OK
10.008	15 min Winter	9	SW183	SW184	0.417	1.998	307.471	1.248	OK
10.009	15 min Winter	9	SW184	SW185	0.292	3.019	329.006	0.778	OK
10.010	15 min Winter	10	SW185	SW186	0.292	3.300	359.757	0.785	OK
10.011	15 min Winter	10	SW186	SW196	0.312	3.196	375.780	0.860	OK
15.000	15 min Winter	8	SW187	SW188	0.087	1.365	23.131	0.150	OK
15.001	15 min Winter	9	SW188	SW191	0.096	2.036	39.457	0.226	OK
16.000	15 min Winter	8	SW189	S80	0.078	1.063	15.540	0.149	OK
16.001	15 min Winter	8	S80	SW190	0.090	0.869	15.312	0.147	OK
16.002	15 min Winter	9	SW190	SW191	0.108	0.998	22.714	0.243	OK
15.002	15 min Winter	9	SW191	SW192	0.115	2.693	67.250	0.320	OK
15.003	15 min Winter	8	SW192	SW194	0.200	2.358	117.787	0.592	OK
17.000	15 min Winter	8	S2	SW194	0.192	1.329	63.066	0.503	OK
15.004	15 min Winter	9	SW194	SW195	0.238	3.280	196.978	0.983	OK
15.005	15 min Winter	9	SW195	SW196	0.240	3.269	198.046	1.000	OK
18.000	15 min Winter	5	S28	SW196	0.150	0.000	0.000	0.000	OK
10.012	15 min Winter	9	SW196	S20	0.506	2.723	582.571	1.688	OK
10.013	15 min Winter	9	S20	SW197	0.492	2.763	582.635	1.473	OK
10.014	15 min Winter	9	SW197	SW198	0.520	2.261	588.768	1.240	OK
10.015	600 min Summer	336	SW198	S21	0.450	1.386	161.814	0.501	OK
10.016	480 min Summer	241	S21	SW199	0.060	1.041	15.291	0.022	OK
10.017	15 min Summer	8	SW199	SW200A	0.060	1.021	14.959	0.022	OK
10.018	15 min Summer	8	SW200A	SW203	0.054	1.179	15.087	0.022	OK
10.019	15 min Winter	8	SW203	SW204	0.043	1.670	15.182	0.013	OK
10.020	15 min Winter	10	SW204	SW205	0.140	1.655	14.909	0.008	OK
10.021	15 min Winter	12	SW205	SW209	0.346	1.234	36.044	0.060	OK
1.014	15 min Summer	10	SW209	SW210	0.525	3.551	768.660	1.946	OK

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.015	15 min Summer	10	SW210	SW292	0.525	3.587	776.418	1.965	OK
1.016	1440 min Winter	972	SW292	S29	0.600	0.852	61.948	0.090	Surcharged
19.000	15 min Winter	8	SW165	SW144	0.037	0.000	0.000	0.000	OK
19.001	15 min Winter	8	SW144	SW148	0.080	1.485	28.223	0.061	OK
19.002	15 min Winter	8	SW148	SW145	0.090	1.913	43.641	0.081	OK
19.003	15 min Winter	8	SW145	SW146	0.102	2.272	61.361	0.103	OK
19.004	15 min Winter	9	SW146	SW142	0.108	2.643	77.342	0.131	OK
19.005	15 min Winter	9	SW142	SW162	0.131	2.365	90.672	0.185	OK
19.006	15 min Winter	9	SW162	SW143	0.133	2.809	110.175	0.197	OK
20.000	15 min Winter	8	SW130	SW159	0.114	0.932	29.628	0.112	OK
20.001	15 min Winter	8	SW159	SW131	0.138	1.159	47.944	0.182	OK
20.002	15 min Winter	9	SW131	SW132	0.156	1.288	62.920	0.239	OK
20.003	15 min Winter	9	SW132	SW163	0.174	1.320	75.074	0.285	OK
20.004	15 min Winter	9	SW163	SW141	0.186	1.549	95.974	0.364	OK
20.005	15 min Winter	9	SW141	SW143	0.188	2.003	125.831	0.378	OK
19.007	15 min Summer	9	SW143	S108	0.450	1.440	229.039	0.709	OK
19.008	15 min Summer	9	S108	S55	0.450	1.439	228.798	0.708	OK
19.009	60 min Summer	40	S55	S29	0.450	1.077	144.521	0.442	OK
1.017	1440 min Winter	1399	S29	S30	0.044	2.345	18.974	0.047	OK
1.018	1440 min Winter	1399	S30	SW289	0.064	1.372	18.974	0.051	OK
1.019	1440 min Winter	1400	SW289	SW290	0.059	1.545	18.974	0.038	OK

Return Period Yrs: 100.0

Climate Change %: 20

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SW244	15 min Winter	10	63.285	0.396	57.042		Surcharged
SW224	15 min Winter	10	63.168	0.599	89.301		Surcharged
SW243	15 min Winter	9	64.946	0.576	95.999		Surcharged
SW245	15 min Winter	10	64.087	0.666	104.918		Surcharged
SW225	15 min Winter	10	62.889	0.648	203.202		Surcharged
SW261	15 min Winter	10	62.238	0.478	200.190		Surcharged
SW230	15 min Winter	8	66.623	0.063	32.773		OK
SW231	15 min Winter	8	64.543	0.083	60.476		OK
SW264	15 min Winter	8	63.115	0.085	85.522		OK
S67	-	0	62.223	0.000	0.000		OK
SW232	15 min Winter	9	61.707	0.277	304.812		OK
SW233	15 min Winter	9	61.228	0.298	389.284		OK
SW247	15 min Winter	10	65.376	0.478	78.242		Surcharged
SW226	15 min Winter	10	65.187	0.559	91.566		Surcharged
S46	15 min Winter	8	66.186	0.117	30.481		OK
SW237	15 min Winter	10	65.008	0.569	145.893		Surcharged
SW238	15 min Winter	10	64.537	0.605	161.724		Surcharged
SW248	15 min Winter	10	64.133	0.913	191.604		Surcharged
SW239	15 min Winter	11	63.096	0.841	192.954		Surcharged
SW263	15 min Winter	11	62.917	0.814	231.081		Surcharged
SW241	15 min Winter	11	61.769	1.079	243.203		Surcharged
SW253	15 min Winter	11	60.890	0.690	243.038		Surcharged
SW234	15 min Winter	11	60.578	0.668	605.465		Surcharged
SW260	15 min Winter	11	59.798	0.844	58.522		Surcharged
SW255	15 min Winter	11	59.792	1.042	698.630		Surcharged
S38	15 min Winter	10	62.810	0.410	53.602		Surcharged
S48	15 min Winter	10	62.460	1.020	67.321		Surcharged
S39	15 min Winter	10	62.125	1.265	118.258		Surcharged
S40	15 min Winter	10	60.209	0.429	116.293		Surcharged
SW242	15 min Winter	8	60.053	0.083	30.830		OK
S41	15 min Winter	11	59.831	0.728	134.195		Surcharged
SW240	15 min Winter	11	59.726	0.776	135.851		Surcharged
SW265	15 min Winter	11	59.496	0.786	174.679		Surcharged
SW246	15 min Winter	11	59.141	1.041	180.318		Surcharged
SW266	15 min Winter	11	58.836	0.966	179.380		Surcharged
SW257	15 min Winter	11	58.676	1.390	876.459		Surcharged
SW249	15 min Winter	11	58.207	1.377	887.819		Surcharged
SW206	15 min Winter	11	57.702	1.252	897.944		Surcharged
SW207	15 min Winter	11	56.926	0.836	918.873		Surcharged
SW208	15 min Winter	11	55.552	0.402	932.804		OK
S51	15 min Winter	11	54.685	0.305	942.263		OK
SW166	15 min Winter	8	68.809	0.109	45.875		OK
SW167	15 min Winter	8	68.123	0.123	57.496		OK
SW168	15 min Winter	8	67.581	0.185	113.678		OK
SW169	15 min Winter	8	67.045	0.195	122.613		OK
SW170	15 min Winter	8	65.395	0.195	162.992		OK
SW171	15 min Winter	8	64.225	0.225	223.122		OK
SW172	15 min Winter	10	63.640	0.940	237.873		Surcharged
SW173	15 min Winter	10	63.397	1.097	240.043		Surcharged
SW174	15 min Winter	8	65.899	0.099	33.492		OK
S47	15 min Winter	8	65.904	0.093	20.635		OK
SW175	15 min Winter	8	65.238	0.138	60.097		OK
SW176	15 min Winter	9	64.925	0.175	77.838		OK
SW177	15 min Winter	9	65.409	0.156	65.748		OK
SW178	15 min Winter	9	64.813	0.450	177.915		Surcharged
SW179	15 min Winter	10	63.955	0.225	181.155		OK
SW180	15 min Winter	10	63.339	0.699	20.046		Surcharged
SW181	15 min Winter	10	63.331	0.873	34.166		Surcharged
SW182	15 min Winter	10	63.318	0.962	32.314		Surcharged
SW183	15 min Winter	10	63.313	1.147	472.887		Surcharged
SW184	15 min Winter	10	62.668	0.768	501.040		Surcharged
SW185	15 min Winter	10	62.079	0.637	540.580		Surcharged
SW186	15 min Winter	10	60.550	0.750	557.526		Surcharged

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SW187	15 min Winter	8	65.782	0.102	39.302		OK
SW188	15 min Winter	8	64.935	0.127	67.906		OK
SW189	15 min Winter	8	63.201	0.101	26.381		OK
S80	15 min Winter	10	63.066	0.173	21.512		OK
SW190	15 min Winter	10	63.082	0.282	28.402		OK
SW191	15 min Winter	10	63.061	0.372	98.496		Surcharged
SW192	15 min Winter	10	62.949	0.949	160.809		Surcharged
S2	15 min Winter	10	62.904	0.823	84.297		Surcharged
SW194	15 min Winter	10	62.596	1.196	268.196		Surcharged
SW195	15 min Winter	10	60.856	0.456	270.440		Surcharged
S28	-	0	59.502	0.000	0.000		OK
SW196	15 min Winter	10	59.437	0.690	844.729		Surcharged
S20	15 min Winter	10	58.283	0.569	844.476		Surcharged
SW197	15 min Winter	10	57.231	0.831	844.455		Surcharged
SW198	600 min Winter	511	57.019	1.139	16.237		Surcharged
S21	600 min Winter	511	57.019	1.403	16.259		Surcharged
SW199	1440 min Winter	905	55.631	0.062	16.259		OK
SW200A	240 min Winter	177	55.576	0.062	16.259		OK
SW203	480 min Winter	310	55.481	0.051	16.259		OK
SW204	960 min Winter	602	54.589	0.039	16.259		OK
SW205	15 min Winter	11	53.806	0.436	14.514		OK
SW209	15 min Winter	11	53.800	1.020	958.420		Surcharged
SW210	15 min Winter	11	51.321	0.931	955.896		Surcharged
SW292	15 min Winter	14	50.324	2.850	921.794		Surcharged
SW165	-	0	55.020	0.000	0.000		OK
SW144	15 min Winter	8	54.656	0.096	47.860		OK
SW148	15 min Winter	8	53.930	0.110	74.264		OK
SW145	15 min Winter	8	53.115	0.125	104.356		OK
SW146	15 min Winter	8	51.931	0.141	131.344		OK
SW142	15 min Winter	8	50.805	0.169	152.654		OK
SW162	15 min Winter	9	50.134	0.174	183.002		OK
SW130	15 min Winter	8	50.132	0.133	50.249		OK
SW159	15 min Winter	8	50.010	0.170	81.516		OK
SW131	15 min Winter	8	49.837	0.199	106.469		OK
SW132	15 min Winter	8	49.687	0.225	125.060		OK
SW163	15 min Winter	9	49.599	0.248	160.335		OK
SW141	15 min Winter	9	49.381	0.255	211.384		OK
SW143	1440 min Winter	1423	48.584	2.277	0.812		Surcharged
S108	1440 min Winter	1423	48.584	2.383	0.811		Surcharged
S55	1440 min Winter	1423	48.584	2.431	0.810		Surcharged
S29	1440 min Winter	1423	48.584	1.584	19.562		Surcharged
S30	480 min Winter	368	45.156	0.070	19.535		OK
SW289	360 min Winter	351	44.822	0.060	19.535		OK
SW290	360 min Winter	351	43.372	0.060	19.535		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	9	SW244	SW224	0.300	1.178	65.598	0.736	Surcharged
1.001	15 min Winter	8	SW224	SW225	0.300	1.415	91.066	0.998	Surcharged
2.000	15 min Winter	9	SW243	SW245	0.225	2.359	93.159	0.975	OK
2.001	15 min Winter	10	SW245	SW225	0.225	2.721	108.198	1.361	OK
1.002	15 min Winter	10	SW225	SW261	0.300	2.832	200.190	1.189	Surcharged
1.003	15 min Winter	11	SW261	SW232	0.300	2.829	199.955	1.449	Surcharged
3.000	15 min Winter	8	SW230	SW231	0.073	1.783	32.474	0.032	OK
3.001	15 min Winter	8	SW231	SW264	0.084	2.667	59.774	0.057	OK
3.002	15 min Winter	9	SW264	SW232	0.181	1.300	85.013	0.059	OK
4.000	15 min Winter	9	S67	SW232	0.064	0.000	0.000	0.000	OK
1.004	15 min Winter	9	SW232	SW233	0.288	2.514	304.189	0.573	OK
1.005	15 min Winter	10	SW233	SW234	0.408	2.574	389.126	0.643	OK
5.000	15 min Winter	9	SW247	SW226	0.300	1.399	89.570	0.990	Surcharged
5.001	15 min Winter	8	SW226	SW237	0.300	1.456	96.323	1.077	Surcharged
6.000	15 min Winter	10	S46	SW237	0.119	2.027	29.770	0.952	OK
5.002	15 min Winter	9	SW237	SW238	0.300	2.584	158.192	1.094	Surcharged
5.003	15 min Winter	9	SW238	SW248	0.300	2.698	171.883	0.838	Surcharged

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
5.004	15 min Winter	10	SW248	SW239	0.300	2.821	187.464	1.063	Surcharged
5.005	15 min Winter	13	SW239	SW263	0.300	3.015	199.646	1.133	Surcharged
5.006	15 min Winter	10	SW263	SW241	0.300	3.389	239.534	0.947	Surcharged
5.007	15 min Winter	9	SW241	SW253	0.300	3.550	250.936	1.416	Surcharged
5.008	15 min Winter	9	SW253	SW234	0.300	3.534	249.786	1.570	Surcharged
1.006	15 min Winter	10	SW234	SW255	0.525	3.543	643.360	0.910	OK
7.000	15 min Winter	9	SW260	SW255	0.375	1.362	93.600	0.468	Surcharged
1.007	15 min Winter	10	SW255	SW257	0.525	3.369	706.091	0.923	OK
8.000	15 min Winter	9	S38	S48	0.225	2.050	63.572	0.746	OK
8.001	15 min Winter	12	S48	S39	0.225	1.704	67.134	0.816	OK
8.002	15 min Winter	10	S39	S40	0.225	2.925	116.293	1.352	OK
8.003	15 min Winter	11	S40	S41	0.225	2.912	115.777	1.548	OK
9.000	15 min Winter	11	SW242	S41	0.172	1.926	30.597	0.170	OK
8.004	15 min Winter	9	S41	SW240	0.300	2.280	134.027	0.851	Surcharged
8.005	15 min Winter	12	SW240	SW265	0.300	2.275	137.368	1.016	Surcharged
8.006	15 min Winter	8	SW265	SW246	0.300	2.866	184.519	0.827	Surcharged
8.007	15 min Winter	8	SW246	SW266	0.300	2.902	184.587	1.214	Surcharged
8.008	15 min Winter	15	SW266	SW257	0.300	3.575	199.401	0.862	Surcharged
1.008	15 min Winter	12	SW257	SW249	0.525	4.034	873.300	1.293	OK
1.009	15 min Winter	12	SW249	SW206	0.525	4.096	886.783	1.204	OK
1.010	15 min Winter	12	SW206	SW207	0.525	4.147	897.815	1.535	OK
1.011	15 min Winter	11	SW207	SW208	0.464	4.540	918.408	1.220	OK
1.012	15 min Winter	11	SW208	S51	0.353	6.084	932.998	0.966	OK
1.013	15 min Winter	11	S51	SW209	0.415	5.137	942.160	0.587	OK
10.000	15 min Winter	8	SW166	SW167	0.116	1.805	45.512	0.289	OK
10.001	15 min Winter	8	SW167	SW168	0.154	1.554	56.718	0.360	OK
10.002	15 min Winter	8	SW168	SW169	0.190	2.385	112.414	0.714	OK
10.003	15 min Winter	9	SW169	SW170	0.194	2.513	121.720	0.773	OK
10.004	15 min Winter	9	SW170	SW171	0.194	2.820	162.627	0.548	OK
10.005	15 min Winter	9	SW171	SW172	0.299	3.199	221.157	0.687	OK
10.006	15 min Winter	8	SW172	SW173	0.375	2.378	262.625	1.032	Surcharged
10.007	15 min Winter	8	SW173	SW183	0.375	2.289	252.780	2.027	Surcharged
11.000	15 min Winter	8	SW174	SW175	0.099	1.630	33.002	0.239	OK
12.000	15 min Winter	8	S47	SW175	0.092	1.781	20.347	0.703	OK
11.001	15 min Winter	8	SW175	SW176	0.138	1.885	59.652	0.441	OK
11.002	15 min Winter	9	SW176	SW178	0.206	1.943	79.527	0.600	OK
13.000	15 min Winter	9	SW177	SW178	0.191	1.904	68.071	0.786	OK
11.003	15 min Winter	10	SW178	SW179	0.263	2.927	177.696	1.145	OK
11.004	15 min Winter	10	SW179	SW183	0.263	3.059	185.865	0.701	OK
14.000	15 min Winter	12	SW180	SW181	0.300	0.741	27.826	0.302	Surcharged
14.001	15 min Winter	13	SW181	SW182	0.300	1.043	64.967	0.731	Surcharged
14.002	15 min Winter	12	SW182	SW183	0.300	1.122	78.529	0.858	Surcharged
10.008	15 min Winter	10	SW183	SW184	0.450	2.950	469.101	1.904	OK
10.009	15 min Winter	10	SW184	SW185	0.450	3.125	496.950	1.175	OK
10.010	15 min Winter	10	SW185	SW186	0.450	3.545	537.346	1.173	OK
10.011	15 min Winter	11	SW186	SW196	0.450	3.488	554.821	1.270	OK
15.000	15 min Winter	8	SW187	SW188	0.114	1.572	38.866	0.253	OK
15.001	15 min Winter	8	SW188	SW191	0.127	2.347	66.325	0.379	OK
16.000	15 min Winter	10	SW189	S80	0.132	1.202	26.094	0.251	OK
16.001	15 min Winter	11	S80	SW190	0.227	0.956	27.307	0.262	OK
16.002	15 min Winter	11	SW190	SW191	0.291	1.088	41.268	0.442	OK
15.002	15 min Winter	9	SW191	SW192	0.300	2.895	103.429	0.492	Surcharged
15.003	15 min Winter	8	SW192	SW194	0.300	2.428	171.611	0.862	Surcharged
17.000	15 min Winter	10	S2	SW194	0.300	1.373	87.206	0.695	Surcharged
15.004	15 min Winter	10	SW194	SW195	0.300	3.826	270.440	1.349	Surcharged
15.005	15 min Winter	10	SW195	SW196	0.300	3.823	270.241	1.365	Surcharged
18.000	15 min Summer	5	S28	SW196	0.150	0.000	0.000	0.000	OK
10.012	15 min Winter	10	SW196	S20	0.525	3.901	844.476	2.447	OK
10.013	15 min Winter	10	S20	SW197	0.525	3.901	844.455	2.135	OK
10.014	600 min Winter	449	SW197	SW198	0.600	1.375	100.031	0.211	Surcharged
10.015	360 min Summer	179	SW198	S21	0.450	1.390	163.777	0.507	OK
10.016	1440 min Winter	905	S21	SW199	0.062	1.049	16.259	0.024	OK
10.017	240 min Winter	177	SW199	SW200A	0.062	1.046	16.259	0.024	OK
10.018	360 min Winter	241	SW200A	SW203	0.056	1.206	16.260	0.024	OK
10.019	600 min Winter	381	SW203	SW204	0.045	1.692	16.259	0.014	OK
10.020	15 min Winter	11	SW204	SW205	0.236	1.598	14.893	0.008	OK
10.021	15 min Winter	16	SW205	SW209	0.443	1.380	160.511	0.265	OK
1.014	15 min Winter	11	SW209	SW210	0.525	4.416	955.896	2.419	OK

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.015	15 min Winter	11	SW210	SW292	0.525	4.419	956.580	2.421	OK
1.016	60 min Winter	37	SW292	S29	0.600	2.321	633.712	0.921	Surcharged
19.000	15 min Winter	8	SW165	SW144	0.048	0.000	0.000	0.000	OK
19.001	15 min Winter	8	SW144	SW148	0.103	1.726	47.404	0.103	OK
19.002	15 min Winter	8	SW148	SW145	0.117	2.222	73.427	0.136	OK
19.003	15 min Winter	8	SW145	SW146	0.133	2.635	103.355	0.174	OK
19.004	15 min Winter	9	SW146	SW142	0.141	3.064	129.658	0.219	OK
19.005	15 min Winter	9	SW142	SW162	0.171	2.733	152.067	0.310	OK
19.006	15 min Winter	9	SW162	SW143	0.175	3.248	185.180	0.331	OK
20.000	15 min Winter	8	SW130	SW159	0.152	1.054	49.714	0.189	OK
20.001	15 min Winter	8	SW159	SW131	0.185	1.321	80.553	0.306	OK
20.002	15 min Winter	9	SW131	SW132	0.212	1.451	106.178	0.403	OK
20.003	15 min Winter	9	SW132	SW163	0.236	1.492	126.387	0.480	OK
20.004	15 min Winter	9	SW163	SW141	0.252	1.765	161.610	0.614	OK
20.005	15 min Winter	9	SW141	SW143	0.255	2.287	212.698	0.638	OK
19.007	15 min Winter	9	SW143	S108	0.450	2.511	399.347	1.236	OK
19.008	15 min Winter	9	S108	S55	0.450	2.522	401.115	1.241	OK
19.009	15 min Winter	14	S55	S29	0.450	3.285	405.102	1.240	OK
1.017	480 min Winter	368	S29	S30	0.045	2.366	19.535	0.048	OK
1.018	960 min Summer	651	S30	SW289	0.065	1.384	19.535	0.052	OK
1.019	480 min Winter	370	SW289	SW290	0.060	1.557	19.535	0.039	OK

Network Details

Manhole Schedule

Manhole	Catchment Area (ha)	Diameter (m)	Type	CL (m)	IL (m)	Depth To Soffit (m)	Easting (m)	Northing (m)
SW25	0.000	1.350	Type B	52.606	50.244	1.912	562152.591	575799.723
SW11	0.151	1.350	Type B	52.310	49.624	2.235	562138.391	575787.711
SW10	0.000	1.350	Type B	51.357	48.515	2.393	562107.192	575776.123
SW9	0.211	1.350	Type B	50.228	47.632	2.146	562080.747	575774.935
SW8	0.138	1.350	Type C	46.222	44.644	1.128	561991.458	575782.809
SW7	0.000	1.350	Type C	44.540	42.704	1.386	561954.613	575794.991
SW6	0.000	1.350	Type B	42.061	39.920	1.692	561901.458	575811.607
SW5	0.101	1.350	Type B	40.908	38.641	1.818	561875.884	575811.810
SW4	0.000	1.200	Unknown	39.695	38.550	0.845	561851.528	575803.082
S100	0.000	1.350	Type B	40.167	37.867	2.000	561861.273	575806.708
S37	0.072	1.200	Unknown	40.000	38.339	1.436	561795.004	575703.561
S32	0.063	1.200	Type B	40.000	38.097	1.678	561814.380	575734.185
S44	0.161	1.350	Type C	40.003	38.545	1.233	561841.673	575718.603
S45	0.000	1.350	Type B	40.107	38.368	1.514	561839.313	575742.796
S33	0.000	1.200	Type B	39.887	37.906	1.756	561839.579	575747.995
S34	0.000	1.200	Type B	39.797	37.845	1.727	561844.996	575755.260
SW63	0.139	1.350	Type C	39.986	38.386	1.300	561898.656	575760.586
SW39	0.057	1.200	Type B	39.675	37.675	1.700	561857.209	575762.756
S81	0.000	1.200	Type B	39.907	37.620	1.987	561861.744	575769.628
S101	0.000	1.200	Type A	40.000	35.830	3.870	561862.833	575772.412
S56	0.000	1.200	Unknown	40.891	35.760	4.831	561863.624	575791.403
SW41	0.000	1.350	Type A	39.424	35.608	3.366	561851.233	575796.652
SW3	0.085	1.200	Unknown	39.215	35.554	3.212	561843.153	575797.645
S36	0.000	1.200	Type B	37.928	35.371	2.107	561822.692	575779.480
SW54	0.071	1.350	Type B	38.181	35.240	2.641	561793.354	575786.492
SW52	0.143	1.200	Type B	37.389	34.350	2.739	561814.757	575770.254
SW2	0.066	1.350	Type C	35.347	33.500	1.397	561791.247	575728.390
S106	0.000	1.350	Type B	34.928	32.629	1.849	561775.361	575719.613
S107	0.000	1.350	Type B	35.585	32.581	2.554	561763.787	575725.845
S104	0.000	1.350	Type B	34.823	32.565	1.809	561760.463	575720.260
S105	0.000	1.200	Type B	34.583	32.535	1.599	561762.868	575712.807
SW1	0.000	1.350	Type C	33.934	32.440	1.044	561772.574	575696.524
SW26	0.000	1.350	Type C	33.937	32.315	1.172	561772.516	575689.102
SW27	0.000	1.200	Unknown	33.677	32.044	1.184	561793.125	575674.525
SW28	0.000	1.200	Unknown	33.409	31.720	1.239	561814.992	575658.188
SW29	0.000	1.350	Type C	32.992	31.362	1.180	561838.743	575645.370

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (m)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)	DS Depth To Soffit (m)
1.000	SW25	50.244	SW11	49.624	Circ	0.45mØ	18.598	30.0	0.600	1.912	2.235
1.001	SW11	49.624	SW10	48.515	Circ	0.45mØ	33.282	30.0	0.600	2.235	2.393
1.002	SW10	48.515	SW9	47.632	Circ	0.45mØ	26.472	30.0	0.600	2.393	2.146
1.003	SW9	47.632	SW8	44.644	Circ	0.45mØ	89.636	30.0	0.600	2.146	1.128
1.004	SW8	44.644	SW7	42.704	Circ	0.45mØ	38.807	20.0	0.600	1.128	1.386
1.005	SW7	42.704	SW6	39.920	Circ	0.45mØ	55.692	20.0	0.600	1.386	1.692
1.006	SW6	39.920	SW5	38.641	Circ	0.45mØ	25.575	20.0	0.600	1.692	1.818
1.007	SW5	38.641	S100	37.867	Circ	0.45mØ	15.476	20.0	0.600	1.818	1.850
2.000	SW4	38.550	S100	37.867	Circ	0.3mØ	10.397	15.2	0.600	0.845	2.000
1.008	S100	37.867	S56	37.764	Circ	0.45mØ	15.484	150.0	0.600	1.850	2.678
3.000	S37	38.339	S32	38.097	Circ	0.225mØ	36.240	150.0	0.600	1.436	1.678
3.001	S32	38.097	S33	37.906	Circ	0.225mØ	28.735	150.0	0.600	1.678	1.756
4.000	S44	38.545	S45	38.368	Circ	0.225mØ	24.308	137.7	0.600	1.233	1.514
4.001	S45	38.368	S33	38.335	Circ	0.225mØ	5.206	157.9	0.600	1.514	1.326
3.002	S33	37.906	S34	37.845	Circ	0.225mØ	9.062	150.0	0.600	1.756	1.727
3.003	S34	37.845	SW39	37.750	Circ	0.225mØ	14.330	150.0	0.600	1.727	1.700
5.000	SW63	38.386	SW39	38.079	Circ	0.3mØ	41.503	134.9	0.600	1.300	1.297
3.004	SW39	37.675	S81	37.620	Circ	0.3mØ	8.233	150.0	0.600	1.700	1.987
3.005	S81	37.620	S101	37.600	Circ	0.3mØ	2.989	150.0	0.600	1.987	2.100
3.006	S101	35.830	S56	35.760	Circ	0.3mØ	19.008	271.5	0.600	3.870	4.831
1.009	S56	35.760	SW41	35.608	Circ	0.45mØ	13.457	88.4	0.600	4.681	3.366

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (m)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)	DS Depth To Soffit (m)
1.010	SW41	35.608	SW3	35.554	Circ	0.45mØ	8.141	150.0	0.600	3.366	3.212
1.011	SW3	35.554	S36	35.371	Circ	0.45mØ	27.361	150.0	0.600	3.212	2.107
1.012	S36	35.371	SW52	34.350	Circ	0.45mØ	12.168	11.9	0.600	2.107	2.589
6.000	SW54	35.240	SW52	34.350	Circ	0.3mØ	26.866	30.2	0.600	2.641	2.739
1.013	SW52	34.350	SW2	33.500	Circ	0.45mØ	48.014	56.5	0.600	2.589	1.397
1.014	SW2	33.500	S106	32.780	Circ	0.45mØ	18.149	25.2	0.600	1.397	1.698
1.015	S106	32.629	S107	32.581	Circ	0.45mØ	13.146	276.1	0.600	1.849	2.554
1.016	S107	32.581	S104	32.565	Circ	0.45mØ	6.499	385.3	0.600	2.554	1.809
1.017	S104	32.565	S105	32.535	Circ	0.45mØ	7.832	262.9	0.600	1.809	1.599
1.018	S105	32.535	SW1	32.440	Circ	0.45mØ	18.956	200.0	0.600	1.599	1.044
1.019	SW1	32.440	SW26	32.315	Circ	0.45mØ	7.422	59.4	0.600	1.044	1.172
1.020	SW26	32.315	SW27	32.044	Circ	0.45mØ	25.244	92.9	0.600	1.172	1.184
1.021	SW27	32.044	SW28	31.720	Circ	0.45mØ	27.295	84.4	0.600	1.184	1.239
1.022	SW28	31.720	SW29	31.362	Circ	0.45mØ	26.989	75.4	0.600	1.239	1.180

Outfall Details

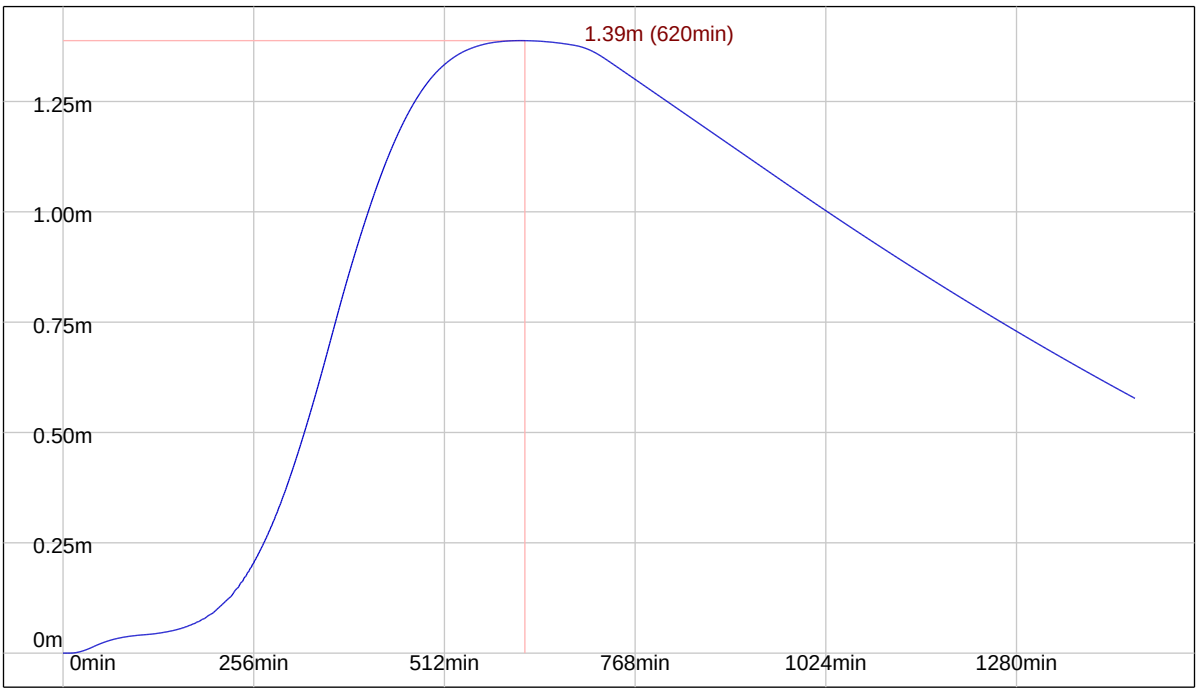
Outfall Manhole SW29 : Free Discharge

Flow Control Details

Tank Structure at Manhole S56

Tank Invert (m)	Tank Height (m)	Porosity Ratio (%)	Area (m2)	Effective Area (m2) Area x Porosity Ratio	Max Storage (m3) Effective Area x Height	Infil Base (m/hr)	Infil Side (m/hr)	Safety Factor
35.760	2.000	95.00	414.857	394.114	788.228	0.00000000	0.00000000	2.00

Tank at S56 (100Yr+20% 720Min Winter)

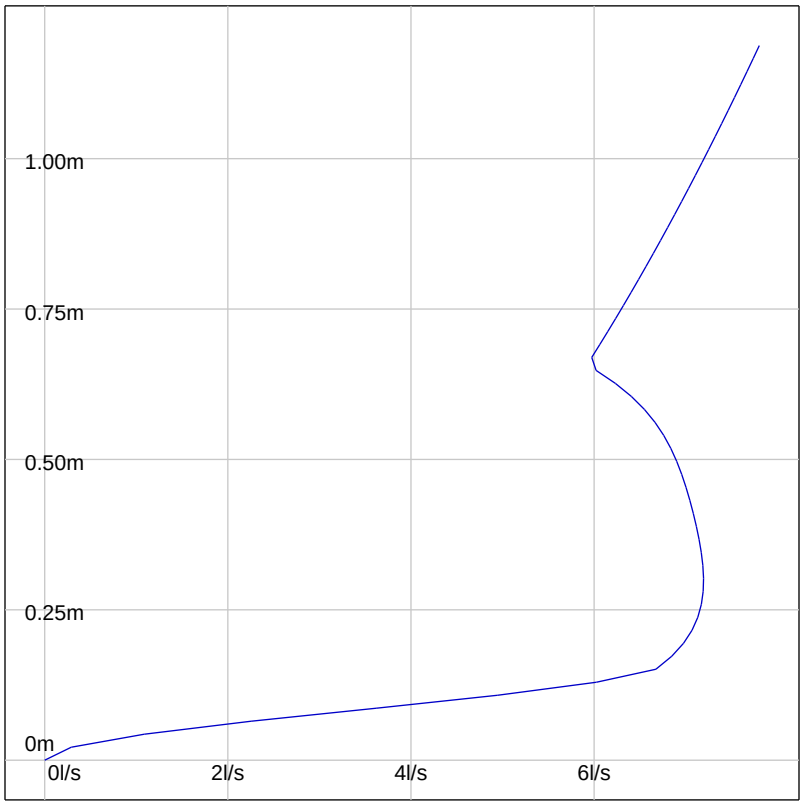


Controls within Manhole SW41

Hydro-Brake® Optimum Control at Manhole SW41

Model Ref	Design Depth (m)	Design Flow (l/s)	Depth Above Invert (m)	FF Head (m)	FF Flow (l/s)	KF Head (m)	KF Flow (l/s)
SHE-0125-7200-1000-7200	1.000	7.200	0.000	0.298	7.195	0.656	5.918

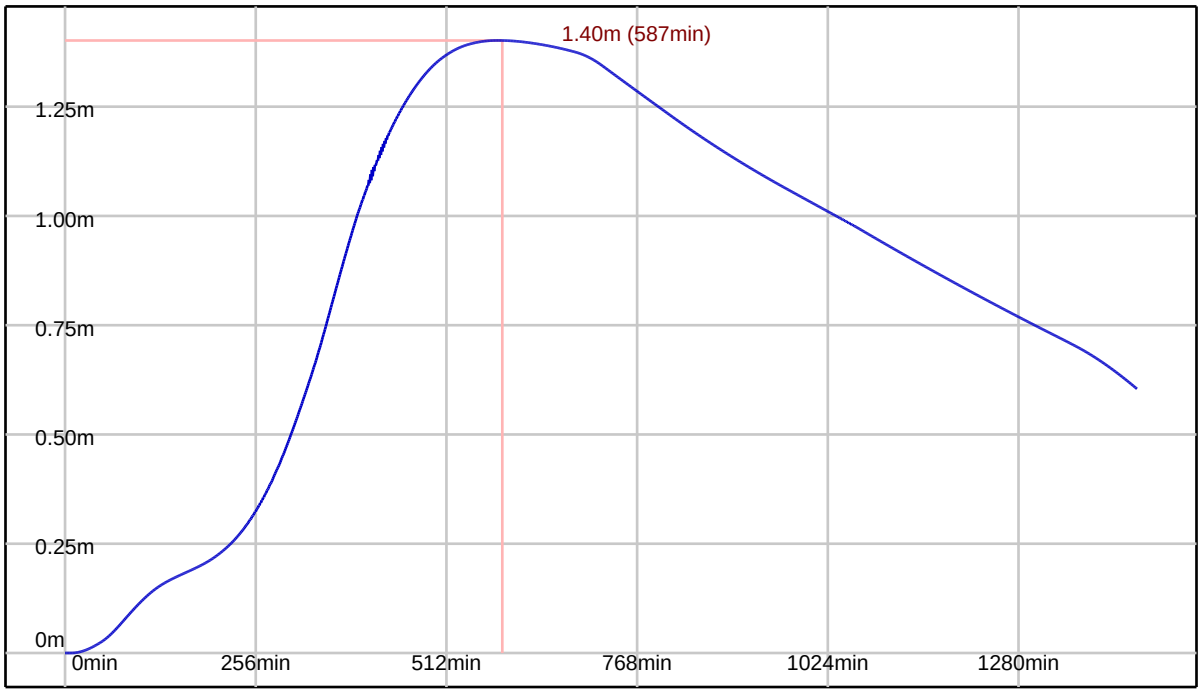
Hydro-Brake® Optimum Control at SW41



Tank Structure at Manhole S104

Tank Invert (m)	Tank Height (m)	Porosity Ratio (%)	Area (m2)	Effective Area (m2) Area x Porosity Ratio	Max Storage (m3) Effective Area x Height	Infil Base (m/hr)	Infil Side (m/hr)	Safety Factor
32.565	2.000	95.00	128.176	121.767	243.534	0.00000000	0.00000000	2.00

Tank at S104 (100Yr+20% 720Min Winter)

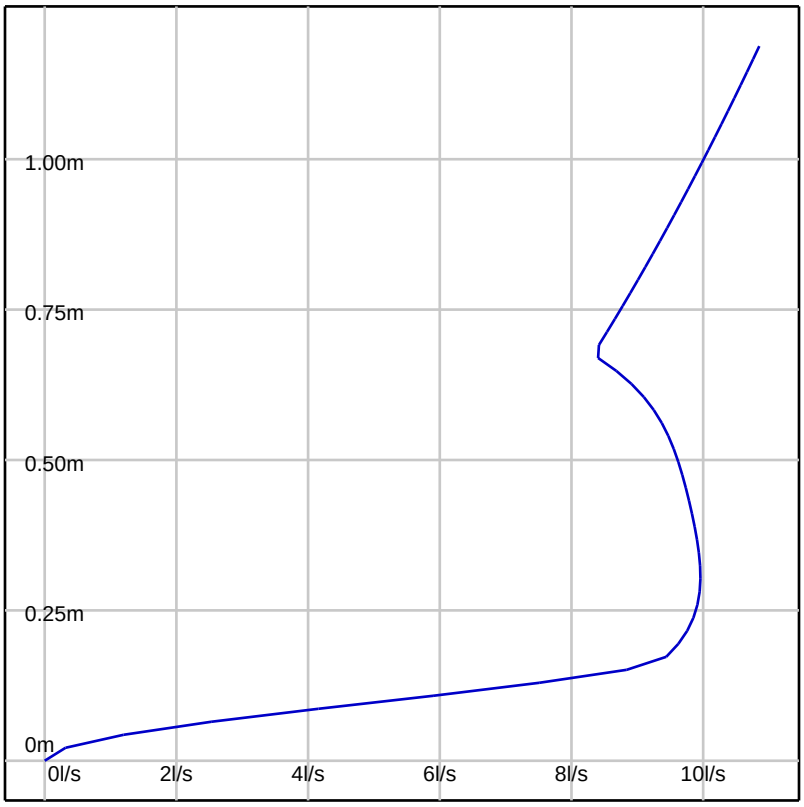


Controls within Manhole S105

Hydro-Brake® Optimum Control at Manhole S105

Model Ref	Design Depth (m)	Design Flow (l/s)	Depth Above Invert (m)	FF Head (m)	FF Flow (l/s)	KF Head (m)	KF Flow (l/s)
SHE-0146-1000-1000-1000	1.000	10.000	0.000	0.306	9.959	0.674	8.320

Hydro-Brake® Optimum Control at S105



Simulation Settings

FSR: M5-60=18.00, R=0.27, Locale=Scotland and Northern Ireland

Summer (Cv: 0.75), Winter (Cv: 0.84)

Global Time of Entry: 5.0 mins

Durations (mins): 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440

Return Periods (yrs) + Climate Change: (2, +0%), (30, +0%), (100, +20%)

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
2Yr 15Min Winter	31.946	0.00	-0.45	30Yr 360Min Summer	8.225	0.00	-0.01
2Yr 15Min Summer	31.946	0.00	-0.49	30Yr 360Min Winter	8.225	0.00	0.06
2Yr 30Min Winter	22.823	0.00	-0.24	30Yr 480Min Summer	6.758	0.00	-0.03
2Yr 30Min Summer	22.823	0.00	-0.28	30Yr 480Min Winter	6.758	0.00	-0.01
2Yr 60Min Winter	15.128	0.00	-0.13	30Yr 600Min Summer	5.801	0.00	-0.09
2Yr 60Min Summer	15.128	0.00	-0.20	30Yr 600Min Winter	5.801	0.00	-0.03
2Yr 120Min Summer	9.856	0.00	-0.19	30Yr 720Min Summer	5.119	0.00	-0.07
2Yr 120Min Winter	9.856	0.00	-0.10	30Yr 720Min Winter	5.119	0.00	-0.08
2Yr 180Min Winter	7.650	0.00	-0.12	30Yr 960Min Summer	4.201	0.00	-0.06
2Yr 180Min Summer	7.650	0.00	-0.21	30Yr 960Min Winter	4.201	0.00	-0.06
2Yr 240Min Winter	6.377	0.00	-0.17	30Yr 1440Min Summer	3.206	0.00	-0.06
2Yr 240Min Summer	6.377	0.00	-0.25	30Yr 1440Min Winter	3.206	0.00	-0.07
2Yr 360Min Winter	4.928	0.00	-0.18	100Yr+20% 15Min Summer	113.989	0.00	0.24
2Yr 360Min Summer	4.928	0.00	-0.21	100Yr+20% 15Min Winter	113.989	0.00	0.36
2Yr 480Min Summer	4.102	0.00	-0.19	100Yr+20% 30Min Summer	65.061	0.00	0.35
2Yr 480Min Winter	4.102	0.00	-0.16	100Yr+20% 30Min Winter	65.061	0.00	0.53
2Yr 600Min Winter	3.557	0.00	-0.15	100Yr+20% 60Min Summer	42.167	0.00	0.74
2Yr 600Min Summer	3.557	0.00	-0.20	100Yr+20% 60Min Winter	42.167	0.00	0.88
2Yr 720Min Summer	3.165	0.00	-0.22	100Yr+20% 120Min Summer	26.639	0.00	0.82
2Yr 720Min Winter	3.165	0.00	-0.16	100Yr+20% 120Min Winter	26.639	0.00	0.96
2Yr 960Min Summer	2.633	0.00	-0.29	100Yr+20% 180Min Summer	20.072	0.00	0.76
2Yr 960Min Winter	2.633	0.00	-0.21	100Yr+20% 180Min Winter	20.072	0.00	0.89
2Yr 1440Min Winter	2.022	0.00	-0.35	100Yr+20% 240Min Summer	16.449	0.00	0.68
2Yr 1440Min Summer	2.022	0.00	-0.32	100Yr+20% 240Min Winter	16.449	0.00	0.81
30Yr 15Min Winter	67.925	0.00	-0.03	100Yr+20% 360Min Summer	12.394	0.00	0.48
30Yr 15Min Summer	67.925	0.00	-0.06	100Yr+20% 360Min Winter	12.394	0.00	0.63
30Yr 30Min Summer	41.542	0.00	0.00	100Yr+20% 480Min Summer	10.126	0.00	0.30
30Yr 30Min Winter	41.542	0.00	0.04	100Yr+20% 480Min Winter	10.126	0.00	0.45
30Yr 60Min Summer	27.111	0.00	0.08	100Yr+20% 600Min Summer	8.652	0.00	0.11
30Yr 60Min Winter	27.111	0.00	0.18	100Yr+20% 600Min Winter	8.652	0.00	0.29
30Yr 120Min Summer	17.290	0.00	0.12	100Yr+20% 720Min Summer	7.606	0.00	0.00
30Yr 120Min Winter	17.290	0.00	0.31	100Yr+20% 720Min Winter	7.606	0.00	0.13
30Yr 180Min Winter	13.148	0.00	0.31	100Yr+20% 960Min Summer	6.206	0.00	-0.06
30Yr 180Min Summer	13.148	0.00	0.10	100Yr+20% 960Min Winter	6.206	0.00	-0.02
30Yr 240Min Summer	10.831	0.00	0.06	100Yr+20% 1440Min Winter	4.722	0.00	-0.04
30Yr 240Min Winter	10.831	0.00	0.24	100Yr+20% 1440Min Summer	4.722	0.00	-0.04

Simulation Results

Return Period Yrs: 2.0
Climate Change %: 0

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SW25	-	0	50.244	0.000	0.000		OK
SW11	15 min Winter	8	49.683	0.058	22.257		OK
SW10	15 min Winter	8	48.573	0.058	22.008		OK
SW9	15 min Winter	8	47.721	0.088	52.821		OK
SW8	15 min Winter	9	44.738	0.094	70.742		OK
SW7	15 min Winter	9	42.798	0.094	71.506		OK
SW6	15 min Winter	9	40.014	0.094	71.976		OK
SW5	15 min Winter	9	38.744	0.103	86.129		OK
SW4	-	0	38.550	0.000	0.000		OK
S100	15 min Winter	9	38.040	0.173	86.183		OK
S37	15 min Winter	8	38.414	0.075	10.590		OK
S32	15 min Winter	9	38.202	0.105	18.859		OK
S44	15 min Winter	8	38.661	0.116	23.759		OK
S45	15 min Winter	8	38.487	0.119	23.454		OK
S33	15 min Winter	9	38.085	0.179	42.203		OK
S34	15 min Winter	9	38.024	0.178	42.508		OK
SW63	15 min Winter	8	38.478	0.092	20.515		OK
SW39	15 min Winter	9	37.870	0.195	70.421		OK
S81	15 min Winter	9	37.815	0.195	70.480		OK
S101	360 min Winter	284	36.175	0.345	3.078		Surcharged
S56	360 min Winter	282	36.175	0.395	9.470		OK
SW41	360 min Winter	269	36.195	0.587	7.596		Surcharged
SW3	15 min Winter	9	35.638	0.084	18.861		OK
S36	15 min Winter	9	35.414	0.043	18.815		OK
SW54	15 min Winter	8	35.286	0.046	10.501		OK
SW52	15 min Winter	9	34.452	0.102	48.375		OK
SW2	15 min Winter	9	33.589	0.089	57.227		OK
S106	480 min Winter	337	33.027	0.398	10.222		OK
S107	480 min Winter	335	33.034	0.453	8.543		Surcharged
S104	480 min Winter	347	33.026	0.466	8.779		Surcharged
S105	480 min Winter	350	33.043	0.508	10.461		Surcharged
SW1	180 min Winter	233	32.487	0.047	9.958		OK
SW26	240 min Summer	269	32.367	0.052	9.958		OK
SW27	600 min Winter	596	32.095	0.051	9.958		OK
SW28	600 min Winter	596	31.770	0.050	9.958		OK
SW29	180 min Winter	234	31.412	0.050	9.958		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	8	SW25	SW11	0.029	0.000	0.000	0.000	OK
1.001	15 min Winter	8	SW11	SW10	0.058	1.825	22.008	0.037	OK
1.002	15 min Winter	8	SW10	SW9	0.073	1.293	21.690	0.037	OK
1.003	15 min Winter	9	SW9	SW8	0.091	2.250	51.598	0.087	OK
1.004	15 min Winter	9	SW8	SW7	0.094	2.973	71.506	0.099	OK
1.005	15 min Winter	9	SW7	SW6	0.094	2.983	71.976	0.099	OK
1.006	15 min Winter	9	SW6	SW5	0.098	2.800	72.101	0.099	OK
1.007	15 min Winter	9	SW5	S100	0.138	2.080	86.183	0.119	OK
2.000	15 min Winter	9	SW4	S100	0.087	0.000	0.000	0.000	OK
1.008	15 min Winter	9	S100	S56	0.173	1.525	86.080	0.327	OK
3.000	15 min Winter	8	S37	S32	0.090	0.702	10.367	0.245	OK
3.001	15 min Winter	9	S32	S33	0.142	0.734	19.172	0.453	OK
4.000	15 min Winter	8	S44	S45	0.117	1.117	23.454	0.531	OK
4.001	15 min Winter	8	S45	S33	0.119	1.085	23.075	0.560	OK
3.002	15 min Winter	9	S33	S34	0.179	1.254	42.508	1.005	OK
3.003	15 min Winter	9	S34	SW39	0.176	1.281	42.617	1.008	OK

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
5.000	15 min Winter	9	SW63	SW39	0.092	1.090	19.870	0.208	OK
3.004	15 min Winter	9	SW39	S81	0.195	1.448	70.480	0.779	OK
3.005	15 min Winter	9	S81	S101	0.195	1.448	70.521	0.779	OK
3.006	240 min Winter	159	S101	S56	0.300	0.854	18.175	0.271	Surcharged
1.009	360 min Winter	282	S56	SW41	0.423	0.747	73.996	0.215	OK
1.010	15 min Winter	45	SW41	SW3	0.067	0.707	7.217	0.027	OK
1.011	15 min Winter	9	SW3	S36	0.064	1.373	18.815	0.071	OK
1.012	15 min Winter	9	S36	SW52	0.072	1.292	18.598	0.020	OK
6.000	15 min Winter	9	SW54	SW52	0.073	0.802	10.397	0.051	OK
1.013	15 min Winter	9	SW52	SW2	0.095	1.957	48.060	0.112	OK
1.014	480 min Winter	337	SW2	S106	0.143	1.730	15.856	0.025	OK
1.015	480 min Winter	340	S106	S107	0.423	0.496	15.859	0.082	OK
1.016	480 min Winter	384	S107	S104	0.450	0.485	18.803	0.115	OK
1.017	600 min Winter	401	S104	S105	0.450	0.416	52.826	0.266	OK
1.018	180 min Winter	233	S105	SW1	0.055	0.891	9.958	0.044	OK
1.019	180 min Winter	233	SW1	SW26	0.050	1.039	9.958	0.024	OK
1.020	240 min Summer	269	SW26	SW27	0.052	0.977	9.958	0.030	OK
1.021	600 min Winter	596	SW27	SW28	0.050	1.015	9.958	0.028	OK
1.022	600 min Winter	596	SW28	SW29	0.050	1.037	9.958	0.027	OK

Return Period Yrs: 30.0
Climate Change %: 0

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SW25	-	0	50.244	0.000	0.000		OK
SW11	15 min Winter	8	49.709	0.084	47.335		OK
SW10	15 min Winter	8	48.598	0.084	46.904		OK
SW9	15 min Winter	8	47.762	0.129	112.603		OK
SW8	15 min Winter	8	44.782	0.138	154.161		OK
SW7	15 min Winter	9	42.842	0.138	151.699		OK
SW6	15 min Winter	9	40.057	0.138	152.785		OK
SW5	15 min Winter	9	38.792	0.151	183.342		OK
SW4	-	0	38.550	0.000	0.000		OK
S100	15 min Winter	9	38.137	0.270	183.793		OK
S37	15 min Winter	10	38.658	0.319	17.651		Surcharged
S32	15 min Winter	10	38.618	0.521	32.709		Surcharged
S44	15 min Winter	8	38.755	0.210	50.529		OK
S45	15 min Winter	8	38.563	0.195	49.378		OK
S33	15 min Winter	10	38.505	0.599	75.939		Surcharged
S34	15 min Winter	10	38.314	0.469	76.870		Surcharged
SW63	15 min Winter	8	38.525	0.139	43.633		OK
SW39	15 min Winter	9	38.018	0.343	132.400		Surcharged
S81	15 min Winter	9	37.912	0.292	132.351		OK
S101	600 min Winter	486	36.598	0.768	3.139		Surcharged
S56	600 min Winter	486	36.597	0.817	6.995		Surcharged
SW41	600 min Winter	486	36.597	0.990	6.994		Surcharged
SW3	15 min Winter	8	35.664	0.110	33.851		OK
S36	15 min Winter	8	35.428	0.057	33.374		OK
SW54	15 min Winter	8	35.306	0.066	22.335		OK
SW52	15 min Winter	8	34.497	0.147	100.193		OK
SW2	15 min Winter	8	33.629	0.129	119.894		OK
S106	600 min Winter	484	33.460	0.831	9.331		Surcharged
S107	600 min Winter	481	33.461	0.879	9.371		Surcharged
S104	600 min Winter	481	33.459	0.899	9.309		Surcharged
S105	600 min Winter	471	33.477	0.942	6.846		Surcharged
SW1	600 min Summer	916	32.487	0.047	9.958		OK
SW26	1440 min Summer	1376	32.367	0.052	9.958		OK
SW27	1440 min Winter	1610	32.095	0.051	9.958		OK
SW28	600 min Summer	917	31.770	0.050	9.958		OK
SW29	600 min Summer	917	31.412	0.050	9.958		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	8	SW25	SW11	0.042	0.000	0.000	0.000	OK
1.001	15 min Winter	8	SW11	SW10	0.084	2.284	46.904	0.079	OK
1.002	15 min Winter	8	SW10	SW9	0.107	1.611	46.394	0.078	OK
1.003	15 min Winter	8	SW9	SW8	0.134	2.801	110.723	0.187	OK
1.004	15 min Winter	9	SW8	SW7	0.137	3.695	151.817	0.209	OK
1.005	15 min Winter	9	SW7	SW6	0.138	3.702	152.785	0.211	OK
1.006	15 min Winter	9	SW6	SW5	0.145	3.475	153.525	0.212	OK
1.007	15 min Winter	9	SW5	S100	0.211	2.512	183.793	0.253	OK
2.000	15 min Winter	9	SW4	S100	0.135	0.000	0.000	0.000	OK
1.008	15 min Winter	9	S100	S56	0.270	1.851	184.783	0.702	OK
3.000	15 min Summer	10	S37	S32	0.225	0.807	19.669	0.465	OK
3.001	15 min Summer	12	S32	S33	0.225	0.880	35.007	0.828	OK
4.000	15 min Winter	8	S44	S45	0.203	1.314	49.378	1.118	OK
4.001	15 min Winter	9	S45	S33	0.189	1.377	49.192	1.194	OK
3.002	15 min Summer	10	S33	S34	0.225	1.880	74.759	1.768	OK
3.003	15 min Summer	10	S34	SW39	0.225	1.893	75.052	1.775	OK
5.000	15 min Winter	8	SW63	SW39	0.138	1.341	42.514	0.445	OK
3.004	15 min Winter	9	SW39	S81	0.296	1.879	132.351	1.463	OK
3.005	15 min Winter	9	S81	S101	0.282	1.919	132.319	1.463	OK
3.006	30 min Summer	23	S101	S56	0.300	2.111	111.083	1.658	Surcharged

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.009	120 min Summer	72	S56	SW41	0.450	0.775	89.185	0.259	OK
1.010	15 min Winter	11	SW41	SW3	0.080	0.709	7.175	0.027	OK
1.011	15 min Winter	8	SW3	S36	0.083	1.643	33.374	0.127	OK
1.012	15 min Winter	8	S36	SW52	0.102	1.283	33.246	0.035	OK
6.000	15 min Winter	8	SW54	SW52	0.107	0.985	22.165	0.109	OK
1.013	15 min Winter	8	SW52	SW2	0.138	2.401	99.159	0.230	OK
1.014	240 min Winter	149	SW2	S106	0.253	1.994	29.921	0.046	OK
1.015	120 min Summer	73	S106	S107	0.450	0.702	54.045	0.279	OK
1.016	60 min Winter	40	S107	S104	0.450	0.970	58.869	0.360	OK
1.017	960 min Winter	462	S104	S105	0.450	0.445	55.754	0.281	OK
1.018	960 min Summer	1167	S105	SW1	0.055	0.892	9.958	0.044	OK
1.019	360 min Summer	697	SW1	SW26	0.050	1.039	9.958	0.024	OK
1.020	1440 min Summer	1376	SW26	SW27	0.052	0.977	9.958	0.030	OK
1.021	480 min Winter	921	SW27	SW28	0.050	1.015	9.958	0.028	OK
1.022	600 min Summer	917	SW28	SW29	0.050	1.037	9.958	0.027	OK

Return Period Yrs: 100.0

Climate Change %: 20

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SW25	-	0	50.244	0.000	0.000		OK
SW11	15 min Winter	8	49.733	0.109	79.364		OK
SW10	15 min Winter	8	48.623	0.108	78.740		OK
SW9	15 min Winter	8	47.802	0.170	189.012		OK
SW8	15 min Winter	8	44.826	0.182	259.208		OK
SW7	15 min Winter	9	42.885	0.181	254.339		OK
SW6	15 min Winter	9	40.101	0.182	256.194		OK
SW5	15 min Winter	9	38.842	0.201	307.707		OK
SW4	-	0	38.550	0.000	0.000		OK
S100	15 min Winter	9	38.270	0.403	308.574		OK
S37	15 min Winter	11	39.492	1.153	21.923		Surcharged
S32	15 min Winter	11	39.416	1.319	43.847		Surcharged
S44	15 min Winter	10	39.644	1.099	66.631		Surcharged
S45	15 min Winter	11	39.255	0.886	57.216		Surcharged
S33	15 min Winter	11	39.189	1.283	107.113		Surcharged
S34	15 min Winter	11	38.802	0.957	109.460		Surcharged
SW63	15 min Winter	8	38.578	0.191	73.156		OK
SW39	15 min Winter	9	38.231	0.556	195.957		Surcharged
S81	15 min Winter	9	37.988	0.368	195.403		Surcharged
S101	720 min Winter	614	37.168	1.338	3.507		Surcharged
S56	720 min Winter	614	37.168	1.388	7.812		Surcharged
SW41	720 min Winter	614	37.168	1.560	7.804		Surcharged
SW3	15 min Winter	8	35.689	0.135	51.527		OK
S36	15 min Winter	8	35.441	0.070	51.547		OK
SW54	15 min Winter	8	35.326	0.086	37.446		OK
SW52	15 min Winter	8	34.541	0.191	163.503		OK
SW2	720 min Winter	581	33.962	0.462	10.857		Surcharged
S106	720 min Winter	581	33.962	1.333	10.857		Surcharged
S107	720 min Winter	581	33.962	1.380	10.857		Surcharged
S104	720 min Winter	581	33.962	1.402	10.857		Surcharged
S105	720 min Winter	581	33.961	1.427	10.852		Surcharged
SW1	240 min Winter	189	32.489	0.049	10.852		OK
SW26	360 min Winter	244	32.370	0.055	10.852		OK
SW27	480 min Winter	310	32.097	0.053	10.853		OK
SW28	480 min Winter	311	31.772	0.052	10.852		OK
SW29	480 min Winter	311	31.413	0.052	10.853		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	8	SW25	SW11	0.055	0.000	0.000	0.000	OK
1.001	15 min Winter	8	SW11	SW10	0.109	2.655	78.740	0.133	OK
1.002	15 min Winter	8	SW10	SW9	0.139	1.861	78.005	0.132	OK
1.003	15 min Winter	8	SW9	SW8	0.176	3.235	186.381	0.315	OK
1.004	15 min Winter	8	SW8	SW7	0.181	4.267	255.974	0.353	OK
1.005	15 min Winter	9	SW7	SW6	0.181	4.272	256.194	0.353	OK
1.006	15 min Winter	9	SW6	SW5	0.191	4.003	257.612	0.355	OK
1.007	15 min Winter	9	SW5	S100	0.302	2.721	308.574	0.425	OK
2.000	15 min Summer	7	SW4	S100	0.150	0.000	0.000	0.000	OK
1.008	15 min Winter	9	S100	S56	0.395	2.104	311.061	1.181	OK
3.000	15 min Winter	9	S37	S32	0.225	0.809	26.322	0.622	OK
3.001	15 min Winter	11	S32	S33	0.225	1.183	47.034	1.112	OK
4.000	15 min Winter	9	S44	S45	0.225	1.843	73.294	1.659	OK
4.001	15 min Winter	9	S45	S33	0.225	1.643	65.336	1.586	OK
3.002	15 min Winter	11	S33	S34	0.225	2.753	109.460	2.588	OK
3.003	15 min Winter	11	S34	SW39	0.225	2.788	110.856	2.621	OK
5.000	15 min Winter	8	SW63	SW39	0.191	1.518	71.443	0.749	OK
3.004	15 min Winter	9	SW39	S81	0.300	2.764	195.403	2.160	Surcharged
3.005	15 min Winter	9	S81	S101	0.300	2.763	195.272	2.158	Surcharged
3.006	15 min Winter	10	S101	S56	0.300	2.804	192.473	2.873	Surcharged

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.009	30 min Summer	20	S56	SW41	0.450	0.746	95.327	0.277	OK
1.010	15 min Winter	9	SW41	SW3	0.106	0.683	7.690	0.029	OK
1.011	15 min Winter	8	SW3	S36	0.103	1.885	51.547	0.196	OK
1.012	15 min Winter	8	S36	SW52	0.130	1.338	51.208	0.054	OK
6.000	15 min Winter	8	SW54	SW52	0.138	1.168	37.214	0.183	OK
1.013	720 min Winter	537	SW52	SW2	0.250	1.525	20.022	0.046	OK
1.014	720 min Winter	537	SW2	S106	0.450	1.706	71.438	0.111	OK
1.015	15 min Winter	12	S106	S107	0.450	1.554	193.640	1.000	OK
1.016	15 min Winter	11	S107	S104	0.450	1.612	192.408	1.177	OK
1.017	720 min Summer	326	S104	S105	0.450	0.436	56.407	0.284	OK
1.018	600 min Winter	377	S105	SW1	0.057	0.916	10.853	0.048	OK
1.019	360 min Winter	246	SW1	SW26	0.052	1.066	10.852	0.026	OK
1.020	480 min Winter	310	SW26	SW27	0.054	1.003	10.853	0.032	OK
1.021	360 min Winter	245	SW27	SW28	0.053	1.042	10.853	0.031	OK
1.022	480 min Winter	311	SW28	SW29	0.052	1.067	10.853	0.029	OK

Network Details

Manhole Schedule

Manhole	Catchment Area (ha)	Diameter (m)	Type	CL (m)	IL (m)	Depth To Soffit (m)	Easting (m)	Northing (m)
SW302	0.059	1.200	Unknown	70.423	69.000	1.123	561678.586	576185.834
SW303	0.051	1.200	Unknown	69.677	68.120	1.332	561680.149	576207.330
SW304	0.040	1.200	Type B	68.727	66.994	1.508	561680.984	576235.434
SW305	0.064	1.200	Type B	66.640	64.100	2.165	561625.941	576268.910
SW306	0.082	1.200	Type B	67.136	63.930	2.831	561630.496	576252.533
SW307	0.019	1.200	Unknown	67.700	63.733	3.592	561648.270	576244.053
SW308	0.011	1.200	Unknown	68.291	63.568	4.348	561671.516	576252.639
SW309	0.082	1.200	Type B	67.687	65.000	2.387	561726.482	576282.397
SW310	0.015	1.200	Type B	67.971	64.809	2.862	561700.121	576271.362
SW311	0.000	1.200	Unknown	68.185	63.400	4.485	561683.205	576260.675
SW312	0.000	1.200	Type A	67.000	61.923	4.777	561680.248	576267.334
SW277	0.133	1.200	Type B	66.138	64.089	1.749	561691.277	576387.901
SW274	0.032	1.200	Unknown	66.064	64.414	1.350	561651.877	576313.795
SW279	0.016	1.200	Type B	66.345	64.200	1.845	561667.214	576321.889
SW276	0.058	1.200	Type B	67.110	64.604	2.205	561716.312	576315.073
SW275	0.000	1.350	Type B	66.689	63.434	2.955	561688.648	576322.433
SW278	0.000	1.200	Type A	66.559	62.185	4.074	561687.755	576316.518
SW315	0.000	1.350	Type A	65.300	61.681	3.319	561650.666	576288.446
SW316	0.000	1.350	Type A	66.050	61.577	4.173	561641.280	576292.906
SW317	0.147	1.200	Type A	65.921	61.534	4.088	561637.279	576294.523
SW318	0.082	1.200	Type A	64.766	61.319	3.147	561606.993	576305.545
SW223	0.094	1.350	Type C	64.881	63.170	1.411	561692.343	576449.805
SW220	0.000	1.350	Type B	65.768	62.900	2.569	561690.685	576409.312
SW271	0.042	1.200	Type B	65.939	62.836	2.803	561689.690	576401.167
SW272	0.026	1.200	Type B	65.633	62.674	2.659	561665.522	576399.543
S78	0.063	1.350	Type C	63.684	62.028	1.356	561627.219	576443.774
S43	0.019	1.200	Type B	64.528	61.832	2.396	561637.809	576416.410
SW217	0.000	1.350	Type A	65.091	61.702	3.089	561640.017	576397.004
SW270	0.068	1.200	Type A	65.230	61.663	3.268	561639.809	576391.122
SW273	0.034	1.200	Type A	64.909	61.514	3.095	561622.012	576377.315
SW269	0.079	1.350	Type B	64.596	61.365	2.931	561609.224	576359.123
SW268	0.013	1.350	Type B	64.150	61.161	2.689	561595.774	576331.590
S42	0.000	1.200	Type B	63.877	61.041	2.537	561585.810	576316.537
SW319	0.037	1.350	Type A	63.522	59.566	3.656	561577.745	576320.066
SW298	0.078	1.200	Unknown	66.714	65.000	1.414	561566.291	576215.981
SW299	0.129	1.350	Type B	65.347	63.500	1.547	561553.076	576246.395
SW300	0.025	1.350	Type C	63.714	62.000	1.414	561547.691	576285.560
SW301	0.074	1.350	Type B	63.144	60.500	2.344	561549.450	576302.763
SW320	0.043	1.350	Type A	62.704	58.700	3.704	561560.032	576331.806
SW321	0.048	1.350	Type A	61.920	55.800	5.670	561546.879	576340.611
S95	0.044	1.350	Type A	64.649	61.148	3.051	561686.719	576463.283
SW222	0.070	1.350	Type A	64.485	61.026	3.009	561666.164	576456.794
SW216	0.047	1.350	Type B	63.791	60.850	2.491	561633.804	576454.525
SW218	0.064	1.350	Type A	63.408	59.169	3.790	561616.007	576448.852
SW215	0.071	1.350	Type A	62.949	58.966	3.533	561597.697	576436.750
SW221	0.066	1.350	Type A	62.522	58.700	3.372	561571.546	576409.319
SW214	0.070	1.200	Unknown	62.239	58.413	3.376	561552.631	576387.769
S98	0.017	1.350	Type A	62.011	58.246	3.315	561544.756	576373.004
SW213	0.000	1.350	Type B	61.539	58.106	2.982	561536.891	576361.491
SW322	0.000	1.350	Type A	61.156	55.652	5.054	561531.500	576356.642
SW323	0.000	1.350	Type A	61.669	55.613	5.606	561526.637	576359.787
SW324	0.000	1.200	Unknown	62.113	53.470	8.193	561520.725	576363.245
S8	0.000	1.500	Type A	59.463	53.270	5.743	561488.765	576360.311
S14	0.043	1.350	Type A	57.935	53.222	4.263	561484.276	576355.935
S1	0.043	1.350	Type A	57.547	53.187	3.911	561479.503	576353.662
S6	0.000	1.350	Type A	57.081	53.103	3.527	561471.217	576354.522
S5	0.043	1.350	Type B	56.192	52.913	2.829	561452.241	576356.233
SW326	0.052	1.350	Type B	55.936	52.822	2.663	561445.883	576349.787
SW349	0.000	1.350	Type A	55.905	51.662	3.793	561439.793	576339.179
SW350	0.000	1.350	Type A	55.680	51.478	3.752	561434.246	576321.575
SW351	0.000	1.350	Type B	54.371	51.106	2.815	561425.380	576285.429
SW352	0.000	1.350	Type B	53.069	50.776	1.843	561415.362	576254.051
SW353	0.000	1.350	Unknown	52.187	50.303	1.359	561402.874	576216.207
SW354	0.000	1.500	Unknown	52.414	50.069	1.820	561399.805	576193.040

Manhole Schedule

Manhole	Catchment Area (ha)	Diameter (m)	Type	CL (m)	IL (m)	Depth To Soffit (m)	Easting (m)	Northing (m)
SW355	0.000	1.500	Unknown	51.000	50.000	0.000	561388.652	576192.924

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (m)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)	DS Depth To Soffit (m)
1.000	SW302	69.000	SW303	68.120	Circ	0.3mØ	21.553	24.5	0.600	1.123	1.257
1.001	SW303	68.120	SW304	66.994	Circ	0.225mØ	28.116	25.0	0.600	1.332	1.508
1.002	SW304	66.994	SW308	66.012	Circ	0.225mØ	19.638	20.0	0.600	1.508	2.054
2.000	SW305	64.100	SW306	63.930	Circ	0.375mØ	16.999	100.0	0.600	2.165	2.831
2.001	SW306	63.930	SW307	63.733	Circ	0.375mØ	19.693	100.0	0.600	2.831	3.592
2.002	SW307	63.733	SW308	63.568	Circ	0.375mØ	24.781	150.2	0.600	3.592	4.348
1.003	SW308	63.568	SW311	63.400	Circ	0.375mØ	14.185	84.4	0.600	4.348	4.410
3.000	SW309	65.000	SW310	64.809	Circ	0.3mØ	28.578	149.6	0.600	2.387	2.862
3.001	SW310	64.809	SW311	64.654	Circ	0.3mØ	20.009	129.1	0.600	2.862	3.231
1.004	SW311	63.400	SW312	63.250	Circ	0.3mØ	7.286	48.6	0.600	4.485	3.450
1.005	SW312	61.923	SW315	61.681	Circ	0.3mØ	36.343	150.0	0.600	4.777	3.319
4.000	SW277	64.089	SW275	63.434	Circ	0.3mØ	65.522	100.0	0.600	1.749	2.955
5.000	SW274	64.414	SW279	64.200	Circ	0.3mØ	17.341	81.2	0.600	1.350	1.845
5.001	SW279	64.200	SW275	63.760	Circ	0.3mØ	21.441	48.7	0.600	1.845	2.629
6.000	SW276	64.604	SW275	63.760	Circ	0.3mØ	28.626	33.9	0.600	2.205	2.629
4.001	SW275	63.434	SW278	63.374	Circ	0.3mØ	5.982	100.0	0.600	2.955	2.885
4.002	SW278	62.185	SW315	61.720	Circ	0.3mØ	46.515	100.0	0.600	4.074	3.280
1.006	SW315	61.681	SW316	61.577	Circ	0.3mØ	10.391	100.0	0.600	3.319	4.173
1.007	SW316	61.577	SW317	61.534	Circ	0.3mØ	4.315	100.0	0.600	4.173	4.088
1.008	SW317	61.534	SW318	61.319	Circ	0.3mØ	32.229	150.0	0.600	4.088	3.147
1.009	SW318	61.319	S42	61.160	Circ	0.3mØ	23.865	150.0	0.600	3.147	2.418
7.000	SW223	63.170	SW220	62.900	Circ	0.3mØ	40.526	150.0	0.600	1.411	2.569
7.001	SW220	62.900	SW271	62.836	Circ	0.3mØ	8.206	128.4	0.600	2.569	2.803
7.002	SW271	62.836	SW272	62.674	Circ	0.3mØ	24.222	149.2	0.600	2.803	2.659
7.003	SW272	62.674	SW270	62.495	Circ	0.3mØ	27.057	151.5	0.600	2.659	2.435
8.000	S78	62.028	S43	61.832	Circ	0.3mØ	29.342	150.0	0.600	1.356	2.396
8.001	S43	61.832	SW217	61.702	Circ	0.3mØ	19.530	150.0	0.600	2.396	3.089
8.002	SW217	61.702	SW270	61.663	Circ	0.3mØ	5.886	150.0	0.600	3.089	3.268
7.004	SW270	61.663	SW273	61.514	Circ	0.3mØ	22.525	151.5	0.600	3.268	3.095
7.005	SW273	61.514	SW269	61.365	Circ	0.3mØ	22.236	149.7	0.600	3.095	2.931
7.006	SW269	61.365	SW268	61.161	Circ	0.3mØ	30.643	150.0	0.600	2.931	2.689
7.007	SW268	61.161	S42	61.041	Circ	0.3mØ	18.052	150.0	0.600	2.689	2.537
1.010	S42	61.041	SW319	60.982	Circ	0.3mØ	8.804	150.0	0.600	2.537	2.240
1.011	SW319	59.566	SW320	59.262	Circ	0.3mØ	21.250	69.9	0.600	3.656	3.142
9.000	SW298	65.000	SW299	63.973	Circ	0.3mØ	33.161	32.3	0.600	1.414	1.074
9.001	SW299	63.500	SW300	62.254	Circ	0.3mØ	39.533	31.7	0.600	1.547	1.160
9.002	SW300	62.000	SW301	61.502	Circ	0.3mØ	17.293	34.7	0.600	1.414	1.342
9.003	SW301	60.500	SW320	60.158	Circ	0.3mØ	30.911	90.4	0.600	2.344	2.246
1.012	SW320	58.700	SW321	58.205	Circ	0.3mØ	15.828	32.0	0.600	3.704	3.415
1.013	SW321	55.800	SW322	55.652	Circ	0.45mØ	22.215	150.0	0.600	5.670	5.054
10.000	S95	61.148	SW222	61.026	Circ	0.45mØ	21.555	176.3	0.600	3.051	3.009
10.001	SW222	61.026	SW216	60.850	Circ	0.45mØ	32.439	184.7	0.600	3.009	2.491
10.002	SW216	60.850	SW218	60.734	Circ	0.45mØ	18.680	160.8	0.600	2.491	2.224
10.003	SW218	59.169	SW215	58.966	Circ	0.45mØ	21.948	108.0	0.600	3.790	3.533
10.004	SW215	58.966	SW221	58.700	Circ	0.45mØ	37.898	142.7	0.600	3.533	3.372
10.005	SW221	58.700	SW214	58.413	Circ	0.45mØ	28.673	100.0	0.600	3.372	3.376
10.006	SW214	58.413	S98	58.246	Circ	0.45mØ	16.734	100.0	0.600	3.376	3.315
10.007	S98	58.246	SW213	58.106	Circ	0.45mØ	13.943	100.0	0.600	3.315	2.982
10.008	SW213	58.106	SW322	58.035	Circ	0.45mØ	7.251	102.1	0.600	2.982	2.671
1.014	SW322	55.652	SW323	55.613	Circ	0.45mØ	5.792	150.0	0.600	5.054	5.606
1.015	SW323	55.613	SW324	55.568	Circ	0.45mØ	6.849	150.0	0.600	5.606	6.095
1.016	SW324	53.470	S8	53.270	Circ	0.45mØ	32.094	160.5	0.600	8.193	5.743
1.017	S8	53.270	S14	53.222	Circ	0.45mØ	6.269	130.4	0.600	5.743	4.263
1.018	S14	53.222	S1	53.187	Circ	0.45mØ	5.287	150.0	0.600	4.263	3.911
1.019	S1	53.187	S6	53.103	Circ	0.45mØ	8.330	100.0	0.600	3.911	3.527
1.020	S6	53.103	S5	52.913	Circ	0.45mØ	19.053	100.0	0.600	3.527	2.829
1.021	S5	52.913	SW326	52.822	Circ	0.45mØ	9.054	100.0	0.600	2.829	2.663
1.022	SW326	52.822	SW349	52.700	Circ	0.45mØ	12.232	100.0	0.600	2.663	2.755
1.023	SW349	51.662	SW350	51.478	Circ	0.45mØ	18.457	100.0	0.600	3.793	3.752
1.024	SW350	51.478	SW351	51.106	Circ	0.45mØ	37.217	100.0	0.600	3.752	2.815

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (m)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)	DS Depth To Soffit (m)
1.025	SW351	51.106	SW352	50.776	Circ	0.45mØ	32.938	100.0	0.600	2.815	1.843
1.026	SW352	50.776	SW353	50.378	Circ	0.45mØ	39.851	100.0	0.600	1.843	1.359
1.027	SW353	50.303	SW354	50.069	Circ	0.525mØ	23.369	100.0	0.600	1.359	1.820
1.028	SW354	50.069	SW355	50.000	Circ	1mØ	11.154	161.6	0.600	1.345	0.000

Outfall Details

Outfall Manhole SW355 : Free Discharge

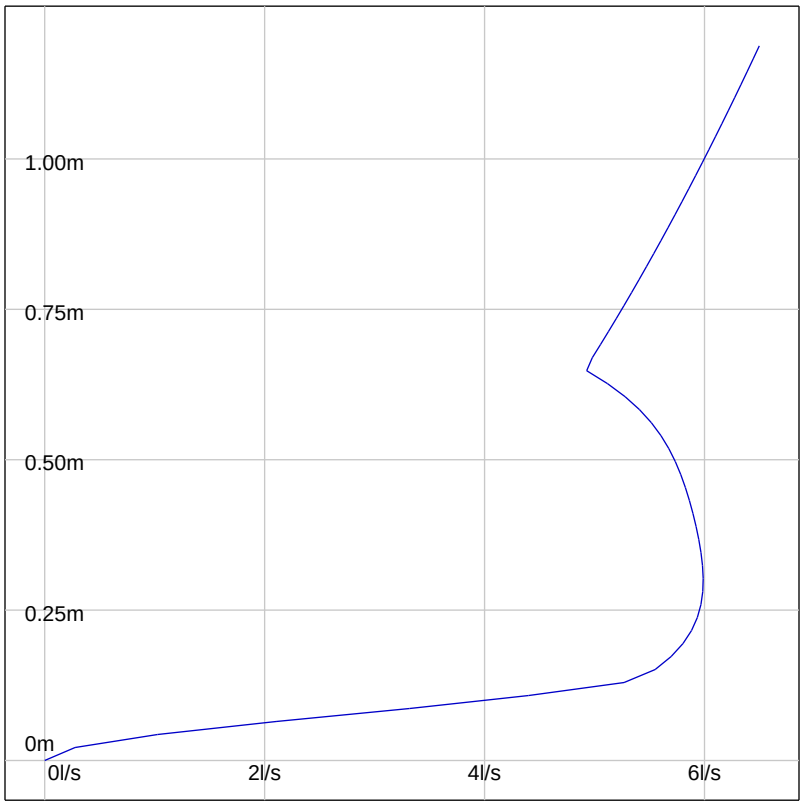
Flow Control Details

Controls within Manhole SW315

Hydro-Brake® Optimum Control at Manhole SW315

Model Ref	Design Depth (m)	Design Flow (l/s)	Depth Above Invert (m)	FF Head (m)	FF Flow (l/s)	KF Head (m)	KF Flow (l/s)
SHE-0115-6000-1000-6000	1.000	6.000	0.000	0.299	5.988	0.649	4.908

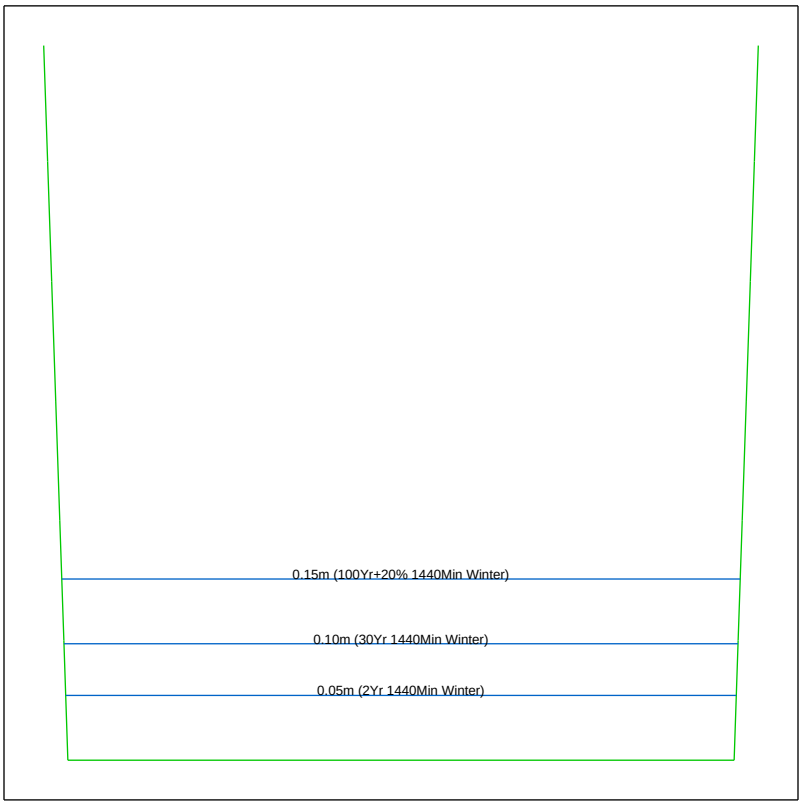
Hydro-Brake® Optimum Control at SW315



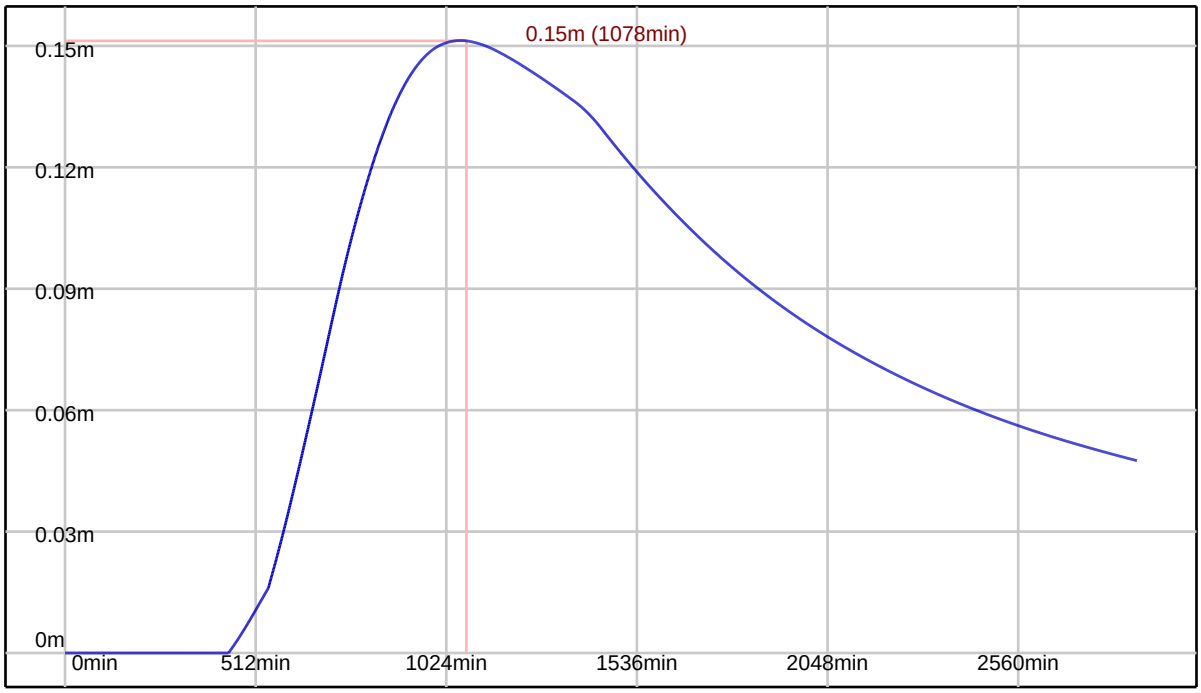
Pond Structure at Manhole SW315

Pond Invert (m)	Max Depth (m)	Volume To Water Level (m3)	Water Level (m)	Freeboard (m)	Infil Base (m/hr)	Infil Side (m/hr)	Safety Factor
65.300	0.597	673.367	65.597	0.300	0.00000000	0.00000000	2.00

Pond Depth/Area Diagram at SW315



Pond at SW315 (100Yr+20% 1440Min Winter)

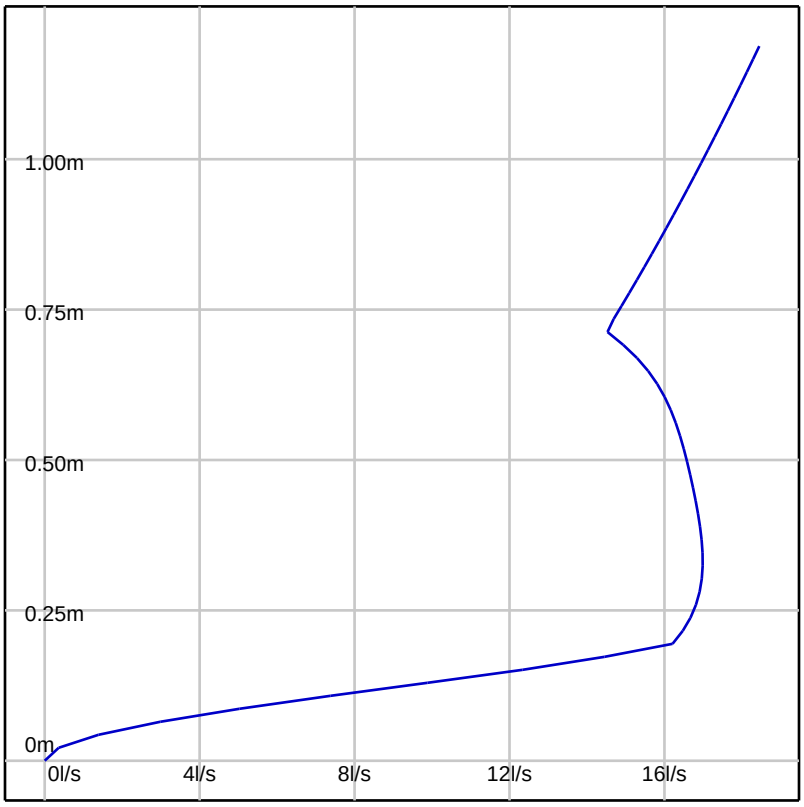


Controls within Manhole S8

Hydro-Brake® Optimum Control at Manhole S8

Model Ref	Design Depth (m)	Design Flow (l/s)	Depth Above Invert (m)	FF Head (m)	FF Flow (l/s)	KF Head (m)	KF Flow (l/s)
SHE-0185-1700-1000-1700	1.000	17.000	0.000	0.332	16.988	0.713	14.484

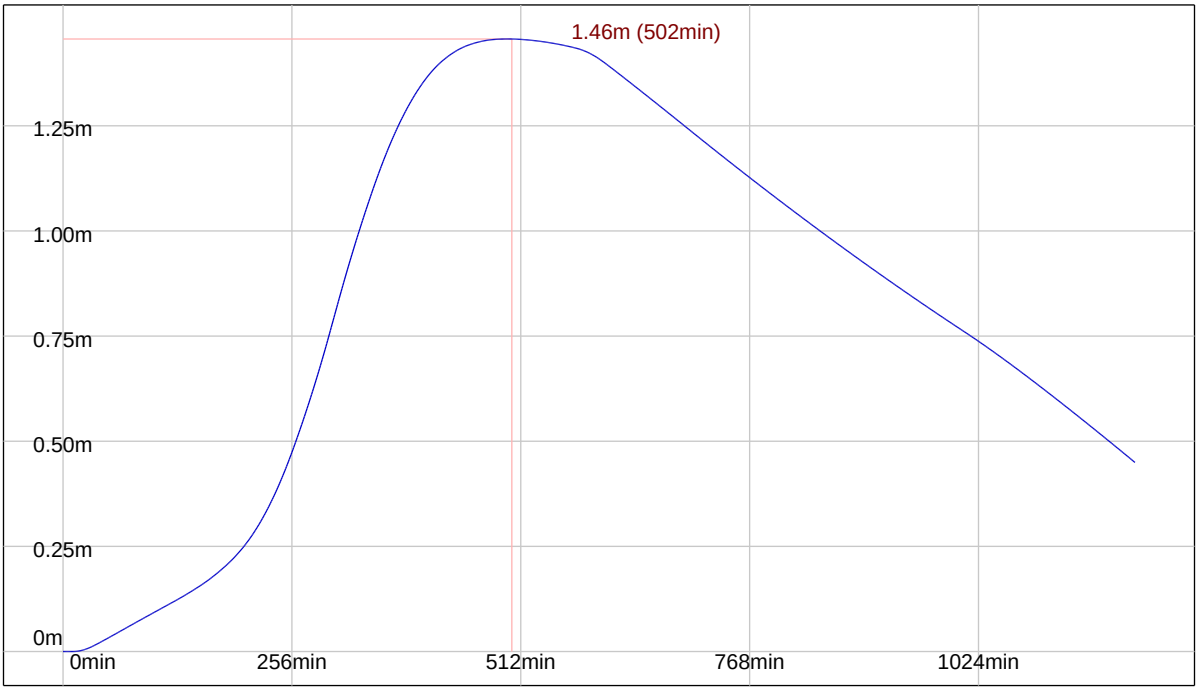
Hydro-Brake® Optimum Control at S8



Tank Structure at Manhole S8

Tank Invert (m)	Tank Height (m)	Porosity Ratio (%)	Area (m2)	Effective Area (m2) Area x Porosity Ratio	Max Storage (m3) Effective Area x Height	Infil Base (m/hr)	Infil Side (m/hr)	Safety Factor
53.270	2.200	100.00	495.004	495.004	1089.008	0.00000000	0.00000000	2.00

Tank at S8 (100Yr+20% 600Min Winter)



Simulation Results

Return Period Yrs: 2.0

Climate Change %: 0

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SW302	15 min Winter	8	69.040	0.040	8.767		OK
SW303	15 min Winter	8	68.179	0.059	16.198		OK
SW304	15 min Winter	8	67.059	0.065	21.881		OK
SW305	1440 min Winter	1274	65.354	1.254	0.110		Surcharged
SW306	1440 min Winter	1274	65.354	1.424	0.251		Surcharged
SW307	1440 min Winter	1274	65.354	1.621	0.284		Surcharged
SW308	1440 min Winter	1274	65.354	1.786	0.564		Surcharged
SW309	1440 min Winter	1279	65.354	0.354	0.139		Surcharged
SW310	1440 min Winter	1275	65.354	0.545	0.167		Surcharged
SW311	1440 min Winter	1274	65.354	1.954	0.731		Surcharged
SW312	1440 min Winter	1275	65.354	3.431	0.731		Surcharged
SW277	1440 min Winter	1284	65.354	1.265	0.225		Surcharged
SW274	1440 min Winter	1285	65.354	0.940	0.055		Surcharged
SW279	1440 min Winter	1285	65.354	1.154	0.082		Surcharged
SW276	1440 min Winter	1285	65.354	0.750	0.098		Surcharged
SW275	1440 min Winter	1285	65.354	1.920	0.406		Surcharged
SW278	1440 min Winter	1285	65.354	3.169	0.406		Surcharged
SW315	1440 min Winter	1282	65.354	0.054	1.126		Surcharged
SW316	15 min Winter	8	61.631	0.054	0.227		OK
SW317	15 min Winter	8	61.631	0.097	21.711		OK
SW318	15 min Winter	9	61.442	0.123	32.289		OK
SW223	15 min Winter	8	63.248	0.078	13.932		OK
SW220	15 min Winter	9	62.977	0.077	13.379		OK
SW271	15 min Winter	9	62.929	0.093	19.430		OK
SW272	15 min Winter	9	62.776	0.103	23.248		OK
S78	15 min Winter	8	62.091	0.063	9.239		OK
S43	15 min Winter	9	61.904	0.072	11.527		OK
SW217	15 min Winter	9	61.807	0.106	11.706		OK
SW270	15 min Winter	9	61.811	0.148	44.585		OK
SW273	15 min Winter	9	61.672	0.158	49.310		OK
SW269	15 min Winter	9	61.541	0.176	60.005		OK
SW268	15 min Winter	10	61.347	0.186	59.814		OK
S42	15 min Winter	9	61.281	0.240	93.005		OK
SW319	15 min Winter	9	59.754	0.188	97.616		OK
SW298	15 min Winter	8	65.049	0.049	11.573		OK
SW299	15 min Winter	8	63.578	0.078	30.359		OK
SW300	15 min Winter	8	62.084	0.084	33.581		OK
SW301	15 min Winter	9	60.626	0.126	43.520		OK
SW320	15 min Winter	9	58.890	0.190	147.014		OK
SW321	15 min Winter	9	56.058	0.258	153.248		OK
S95	15 min Winter	8	61.197	0.049	6.524		OK
SW222	15 min Winter	9	61.104	0.078	16.018		OK
SW216	15 min Winter	9	60.940	0.090	22.823		OK
SW218	15 min Winter	9	59.265	0.096	32.021		OK
SW215	15 min Winter	9	59.083	0.118	41.921		OK
SW221	15 min Winter	9	58.819	0.119	51.293		OK
SW214	15 min Winter	9	58.543	0.130	61.072		OK
S98	15 min Winter	9	58.379	0.133	63.556		OK
SW213	15 min Winter	9	58.240	0.133	63.541		OK
SW322	15 min Winter	9	55.952	0.300	215.852		OK
SW323	15 min Winter	9	55.913	0.299	214.429		OK
SW324	360 min Winter	256	53.842	0.372	17.092		OK
S8	360 min Winter	256	53.841	0.411	17.094		Surcharged
S14	60 min Winter	38	53.302	0.080	18.730		OK
S1	60 min Winter	38	53.263	0.077	21.222		OK
S6	60 min Winter	38	53.180	0.077	21.252		OK
S5	60 min Winter	38	52.994	0.081	23.741		OK
SW326	60 min Winter	37	52.908	0.086	26.893		OK
SW349	15 min Winter	9	51.748	0.086	26.904		OK

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SW350	15 min Winter	9	51.564	0.086	26.947		OK
SW351	15 min Winter	9	51.192	0.086	26.931		OK
SW352	60 min Winter	38	50.862	0.086	26.886		OK
SW353	60 min Winter	38	50.385	0.083	26.885		OK
SW354	60 min Winter	38	50.146	0.077	26.879		OK
SW355	60 min Winter	39	50.077	0.077	26.864		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	8	SW302	SW303	0.049	1.140	8.700	0.039	OK
1.001	15 min Winter	8	SW303	SW304	0.062	1.789	15.995	0.153	OK
1.002	15 min Winter	8	SW304	SW308	0.065	2.261	21.586	0.185	OK
2.000	30 min Summer	23	SW305	SW306	0.375	0.669	11.308	0.057	Surcharged
2.001	30 min Summer	19	SW306	SW307	0.375	1.036	19.598	0.098	Surcharged
2.002	15 min Summer	12	SW307	SW308	0.375	0.914	22.712	0.139	Surcharged
1.003	15 min Summer	10	SW308	SW311	0.375	1.431	44.685	0.205	Surcharged
3.000	180 min Summer	108	SW309	SW310	0.300	0.677	4.954	0.055	Surcharged
3.001	120 min Summer	74	SW310	SW311	0.300	0.829	7.364	0.075	Surcharged
1.004	30 min Summer	15	SW311	SW312	0.300	1.605	51.821	0.324	Surcharged
1.005	1440 min Winter	1282	SW312	SW315	0.177	0.142	5.029	0.056	OK
4.000	120 min Summer	80	SW277	SW275	0.300	0.646	10.123	0.091	Surcharged
5.000	180 min Summer	154	SW274	SW279	0.300	0.622	1.962	0.016	Surcharged
5.001	180 min Summer	112	SW279	SW275	0.300	0.784	2.938	0.018	Surcharged
6.000	240 min Summer	211	SW276	SW275	0.300	0.855	2.987	0.016	Surcharged
4.001	15 min Summer	13	SW275	SW278	0.300	1.401	33.348	0.300	Surcharged
4.002	1440 min Winter	1282	SW278	SW315	0.177	0.121	4.552	0.041	OK
1.006	15 min Winter	8	SW315	SW316	0.027	0.000	0.000	0.000	OK
1.007	15 min Winter	11	SW316	SW317	0.076	0.078	0.497	0.004	OK
1.008	15 min Winter	8	SW317	SW318	0.110	0.902	21.175	0.234	OK
1.009	15 min Winter	9	SW318	S42	0.123	1.206	32.993	0.365	OK
7.000	15 min Winter	8	SW223	SW220	0.077	0.946	13.689	0.151	OK
7.001	15 min Winter	9	SW220	SW271	0.085	0.825	13.651	0.140	OK
7.002	15 min Winter	9	SW271	SW272	0.098	0.976	19.574	0.216	OK
7.003	15 min Winter	9	SW272	SW270	0.103	1.090	23.304	0.259	OK
8.000	15 min Winter	8	S78	S43	0.067	0.765	9.066	0.100	OK
8.001	15 min Winter	9	S43	SW217	0.089	0.735	11.706	0.129	OK
8.002	15 min Winter	9	SW217	SW270	0.127	0.432	11.834	0.131	OK
7.004	15 min Winter	9	SW270	SW273	0.153	1.228	44.555	0.495	OK
7.005	15 min Winter	9	SW273	SW269	0.167	1.219	49.066	0.542	OK
7.006	15 min Winter	9	SW269	SW268	0.181	1.334	59.460	0.657	OK
7.007	15 min Winter	10	SW268	S42	0.213	1.146	61.092	0.675	OK
1.010	15 min Winter	9	S42	SW319	0.238	1.539	92.434	1.022	OK
1.011	15 min Winter	10	SW319	SW320	0.187	2.100	97.266	0.731	OK
9.000	15 min Winter	8	SW298	SW299	0.048	1.535	11.358	0.058	OK
9.001	15 min Winter	8	SW299	SW300	0.078	2.046	29.842	0.151	OK
9.002	15 min Winter	8	SW300	SW301	0.084	2.050	33.285	0.176	OK
9.003	15 min Winter	9	SW301	SW320	0.126	1.571	44.211	0.378	OK
1.012	15 min Winter	9	SW320	SW321	0.190	3.104	146.567	0.743	OK
1.013	15 min Winter	9	SW321	SW322	0.279	1.476	152.409	0.579	OK
10.000	15 min Winter	8	S95	SW222	0.064	0.465	6.406	0.026	OK
10.001	15 min Winter	9	SW222	SW216	0.084	0.800	16.323	0.069	OK
10.002	15 min Winter	9	SW216	SW218	0.090	1.026	23.160	0.091	OK
10.003	15 min Winter	9	SW218	SW215	0.107	1.113	32.123	0.103	OK
10.004	15 min Winter	9	SW215	SW221	0.118	1.264	42.193	0.156	OK
10.005	15 min Winter	9	SW221	SW214	0.124	1.432	51.331	0.159	OK
10.006	15 min Winter	9	SW214	S98	0.131	1.582	61.153	0.189	OK
10.007	15 min Winter	9	S98	SW213	0.133	1.616	63.541	0.197	OK
10.008	15 min Winter	9	SW213	SW322	0.133	1.609	63.443	0.198	OK
1.014	15 min Winter	9	SW322	SW323	0.300	1.906	214.429	0.814	OK
1.015	15 min Winter	10	SW323	SW324	0.299	1.913	214.575	0.815	OK
1.016	360 min Winter	256	SW324	S8	0.392	0.925	44.169	0.173	OK
1.017	120 min Winter	101	S8	S14	0.065	1.236	16.984	0.060	OK
1.018	60 min Winter	38	S14	S1	0.078	1.025	18.737	0.071	OK
1.019	60 min Winter	38	S1	S6	0.077	1.181	21.252	0.066	OK

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.020	60 min Winter	38	S6	S5	0.079	1.132	21.230	0.066	OK
1.021	60 min Winter	38	S5	SW326	0.084	1.166	23.735	0.073	OK
1.022	60 min Winter	37	SW326	SW349	0.086	1.267	26.904	0.083	OK
1.023	15 min Winter	9	SW349	SW350	0.086	1.266	26.947	0.083	OK
1.024	15 min Winter	9	SW350	SW351	0.086	1.265	26.931	0.083	OK
1.025	60 min Winter	38	SW351	SW352	0.086	1.266	26.886	0.083	OK
1.026	60 min Winter	38	SW352	SW353	0.086	1.266	26.885	0.083	OK
1.027	60 min Winter	38	SW353	SW354	0.080	1.292	26.879	0.055	OK
1.028	60 min Winter	39	SW354	SW355	0.077	0.962	26.864	0.013	OK

Return Period Yrs: 30.0

Climate Change %: 0

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SW302	15 min Winter	8	69.058	0.058	18.648		OK
SW303	15 min Winter	8	68.208	0.088	34.489		OK
SW304	15 min Winter	8	67.092	0.098	46.657		OK
SW305	60 min Winter	38	65.554	1.454	6.597		Surcharged
SW306	60 min Winter	38	65.550	1.620	17.241		Surcharged
SW307	60 min Winter	38	65.549	1.816	18.422		Surcharged
SW308	60 min Winter	37	65.545	1.977	33.478		Surcharged
SW309	60 min Winter	37	65.549	0.549	9.258		Surcharged
SW310	60 min Winter	38	65.546	0.737	8.741		Surcharged
SW311	60 min Winter	38	65.541	2.141	46.290		Surcharged
SW312	60 min Winter	38	65.529	3.606	45.917		Surcharged
SW277	1440 min Winter	1088	65.397	1.308	0.629		Surcharged
SW274	1440 min Winter	1086	65.397	0.983	0.154		Surcharged
SW279	1440 min Winter	1086	65.397	1.197	0.231		Surcharged
SW276	1440 min Winter	1087	65.397	0.793	0.276		Surcharged
SW275	1440 min Winter	1087	65.397	1.964	1.137		Surcharged
SW278	1440 min Winter	1087	65.397	3.212	1.138		Surcharged
SW315	1440 min Winter	1089	65.397	0.097	3.128		Surcharged
SW316	15 min Winter	8	61.681	0.104	0.289		OK
SW317	15 min Winter	8	61.681	0.148	46.180		OK
SW318	15 min Winter	9	61.521	0.203	68.518		OK
SW223	15 min Winter	8	63.286	0.116	29.632		OK
SW220	15 min Winter	8	63.019	0.119	29.209		OK
SW271	15 min Winter	8	62.977	0.141	41.616		OK
SW272	15 min Winter	9	62.830	0.157	49.438		OK
S78	15 min Winter	8	62.121	0.093	19.652		OK
S43	15 min Winter	10	62.112	0.280	20.913		OK
SW217	15 min Winter	10	62.098	0.396	16.673		Surcharged
SW270	15 min Winter	10	62.094	0.432	79.362		Surcharged
SW273	15 min Winter	10	61.994	0.480	84.983		Surcharged
SW269	15 min Winter	10	61.874	0.509	104.194		Surcharged
SW268	15 min Winter	10	61.621	0.459	106.254		Surcharged
S42	15 min Winter	10	61.464	0.423	167.896		Surcharged
SW319	15 min Winter	9	60.078	0.512	178.978		Surcharged
SW298	15 min Winter	8	65.071	0.071	24.615		OK
SW299	15 min Winter	8	63.616	0.116	64.681		OK
SW300	15 min Winter	8	62.126	0.126	71.794		OK
SW301	15 min Winter	8	60.700	0.200	94.597		OK
SW320	15 min Winter	9	59.462	0.762	283.646		Surcharged
SW321	15 min Winter	9	56.373	0.573	293.894		Surcharged
S95	15 min Winter	8	61.219	0.071	13.876		OK
SW222	15 min Winter	8	61.141	0.115	35.772		OK
SW216	15 min Winter	8	60.981	0.131	49.785		OK
SW218	15 min Winter	8	59.311	0.142	68.548		OK
SW215	15 min Winter	9	59.141	0.175	89.634		OK
SW221	15 min Winter	9	58.878	0.178	109.783		OK
SW214	15 min Winter	9	58.610	0.196	131.347		OK
S98	15 min Winter	9	58.447	0.201	137.442		OK
SW213	15 min Winter	9	58.309	0.202	137.840		OK
SW322	15 min Winter	9	56.201	0.549	430.151		Surcharged
SW323	15 min Winter	9	56.106	0.493	429.014		Surcharged
SW324	15 min Winter	10	54.307	0.837	424.851		Surcharged
S8	480 min Winter	378	54.276	0.846	15.194		Surcharged
S14	30 min Winter	17	53.315	0.093	24.543		OK
S1	15 min Winter	10	53.284	0.097	34.121		OK
S6	15 min Winter	10	53.200	0.097	34.094		OK
S5	15 min Winter	9	53.027	0.114	45.531		OK
SW326	15 min Winter	9	52.952	0.130	60.735		OK
SW349	15 min Winter	9	51.792	0.130	60.771		OK
SW350	15 min Winter	9	51.608	0.130	60.832		OK
SW351	15 min Winter	9	51.235	0.129	60.763		OK
SW352	15 min Winter	10	50.906	0.129	60.303		OK
SW353	15 min Winter	10	50.426	0.123	60.747		OK

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SW354	15 min Winter	10	50.183	0.114	60.800		OK
SW355	15 min Winter	10	50.113	0.113	60.717		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	8	SW302	SW303	0.073	1.402	18.539	0.082	OK
1.001	15 min Winter	8	SW303	SW304	0.093	2.206	34.139	0.327	OK
1.002	15 min Winter	8	SW304	SW308	0.098	2.789	46.152	0.395	OK
2.000	15 min Summer	9	SW305	SW306	0.375	0.827	32.594	0.163	Surcharged
2.001	15 min Summer	9	SW306	SW307	0.375	1.273	39.994	0.200	Surcharged
2.002	15 min Summer	8	SW307	SW308	0.375	0.943	37.387	0.230	Surcharged
1.003	15 min Summer	7	SW308	SW311	0.375	1.528	56.841	0.261	Surcharged
3.000	15 min Summer	17	SW309	SW310	0.300	1.071	24.358	0.269	Surcharged
3.001	15 min Summer	13	SW310	SW311	0.300	1.227	28.667	0.294	Surcharged
1.004	15 min Summer	7	SW311	SW312	0.300	1.889	64.899	0.406	Surcharged
1.005	1440 min Winter	1089	SW312	SW315	0.199	0.188	7.769	0.086	OK
4.000	15 min Summer	14	SW277	SW275	0.300	1.151	39.509	0.356	Surcharged
5.000	60 min Summer	39	SW274	SW279	0.300	0.879	6.199	0.050	Surcharged
5.001	30 min Summer	22	SW279	SW275	0.300	1.267	11.904	0.075	Surcharged
6.000	60 min Winter	41	SW276	SW275	0.300	1.272	8.899	0.046	Surcharged
4.001	15 min Summer	8	SW275	SW278	0.300	1.623	64.472	0.581	Surcharged
4.002	1440 min Winter	1089	SW278	SW315	0.199	0.152	5.739	0.052	OK
1.006	15 min Winter	23	SW315	SW316	0.052	0.045	0.019	0.000	OK
1.007	15 min Winter	11	SW316	SW317	0.126	0.140	1.040	0.009	OK
1.008	15 min Winter	9	SW317	SW318	0.174	1.066	45.251	0.500	OK
1.009	15 min Winter	9	SW318	S42	0.251	1.288	69.559	0.769	OK
7.000	15 min Winter	8	SW223	SW220	0.117	1.139	29.209	0.323	OK
7.001	15 min Winter	9	SW220	SW271	0.130	0.984	28.879	0.295	OK
7.002	15 min Winter	9	SW271	SW272	0.149	1.189	41.630	0.459	OK
7.003	15 min Winter	9	SW272	SW270	0.157	1.336	49.974	0.555	OK
8.000	15 min Winter	10	S78	S43	0.182	0.947	19.378	0.214	OK
8.001	15 min Winter	12	S43	SW217	0.290	0.763	25.440	0.281	OK
8.002	15 min Summer	12	SW217	SW270	0.300	0.560	35.495	0.392	Surcharged
7.004	15 min Summer	9	SW270	SW273	0.300	1.324	82.606	0.918	Surcharged
7.005	15 min Summer	11	SW273	SW269	0.300	1.269	85.204	0.941	Surcharged
7.006	15 min Summer	11	SW269	SW268	0.300	1.422	100.544	1.111	Surcharged
7.007	15 min Summer	11	SW268	S42	0.300	1.499	105.959	1.171	Surcharged
1.010	15 min Winter	9	S42	SW319	0.299	2.386	167.965	1.857	OK
1.011	15 min Summer	10	SW319	SW320	0.300	2.490	175.992	1.323	Surcharged
9.000	15 min Winter	8	SW298	SW299	0.071	1.916	24.267	0.124	OK
9.001	15 min Winter	8	SW299	SW300	0.116	2.532	63.842	0.323	OK
9.002	15 min Winter	8	SW300	SW301	0.126	2.524	71.321	0.377	OK
9.003	15 min Winter	9	SW301	SW320	0.199	1.884	93.875	0.803	OK
1.012	15 min Summer	10	SW320	SW321	0.300	3.859	272.808	1.384	Surcharged
1.013	15 min Summer	10	SW321	SW322	0.450	1.803	286.806	1.089	OK
10.000	15 min Winter	8	S95	SW222	0.093	0.575	13.689	0.056	OK
10.001	15 min Winter	8	SW222	SW216	0.123	0.992	35.096	0.148	OK
10.002	15 min Winter	9	SW216	SW218	0.132	1.279	49.515	0.195	OK
10.003	15 min Winter	9	SW218	SW215	0.158	1.376	68.813	0.221	OK
10.004	15 min Winter	9	SW215	SW221	0.177	1.562	90.442	0.335	OK
10.005	15 min Winter	9	SW221	SW214	0.187	1.769	110.643	0.342	OK
10.006	15 min Winter	9	SW214	S98	0.199	1.955	132.334	0.410	OK
10.007	15 min Winter	9	S98	SW213	0.201	1.999	137.840	0.427	OK
10.008	15 min Winter	9	SW213	SW322	0.202	1.993	137.920	0.431	OK
1.014	15 min Summer	9	SW322	SW323	0.450	2.623	417.233	1.584	OK
1.015	15 min Winter	9	SW323	SW324	0.437	2.717	428.413	1.626	OK
1.016	60 min Winter	38	SW324	S8	0.450	2.073	233.135	0.916	OK
1.017	30 min Winter	89	S8	S14	0.072	1.236	16.986	0.060	OK
1.018	15 min Winter	11	S14	S1	0.094	1.029	24.435	0.093	OK
1.019	15 min Winter	10	S1	S6	0.097	1.357	34.094	0.106	OK
1.020	15 min Winter	10	S6	S5	0.105	1.227	34.014	0.105	OK
1.021	15 min Winter	9	S5	SW326	0.122	1.325	45.332	0.140	OK
1.022	15 min Winter	9	SW326	SW349	0.130	1.603	60.771	0.188	OK
1.023	15 min Winter	9	SW349	SW350	0.130	1.602	60.832	0.188	OK

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.024	15 min Winter	9	SW350	SW351	0.130	1.601	60.763	0.188	OK
1.025	15 min Winter	10	SW351	SW352	0.129	1.606	60.303	0.187	OK
1.026	15 min Winter	10	SW352	SW353	0.130	1.603	60.747	0.188	OK
1.027	15 min Winter	10	SW353	SW354	0.119	1.660	60.800	0.125	OK
1.028	15 min Winter	10	SW354	SW355	0.114	1.229	60.717	0.029	OK

Return Period Yrs: 100.0

Climate Change %: 20

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SW302	15 min Winter	8	69.074	0.074	31.288		OK
SW303	15 min Winter	8	68.238	0.118	57.895		OK
SW304	15 min Winter	8	67.127	0.133	78.355		OK
SW305	15 min Winter	12	66.055	1.955	13.276		Surcharged
SW306	15 min Winter	12	66.060	2.130	22.417		Surcharged
SW307	15 min Winter	12	66.060	2.327	31.837		Surcharged
SW308	15 min Winter	12	66.053	2.485	66.054		Surcharged
SW309	15 min Winter	12	66.048	1.048	17.029		Surcharged
SW310	15 min Winter	13	66.041	1.232	15.482		Surcharged
SW311	15 min Winter	12	66.037	2.637	83.240		Surcharged
SW312	15 min Winter	12	65.999	4.076	82.104		Surcharged
SW277	60 min Winter	39	65.524	1.435	19.431		Surcharged
SW274	60 min Winter	39	65.512	1.098	4.718		Surcharged
SW279	60 min Winter	39	65.509	1.308	6.034		Surcharged
SW276	60 min Winter	40	65.514	0.909	7.618		Surcharged
SW275	60 min Winter	40	65.511	2.077	31.919		Surcharged
SW278	60 min Winter	40	65.506	3.321	32.539		Surcharged
SW315	1440 min Winter	1062	65.451	0.151	5.318		Surcharged
SW316	15 min Winter	10	61.982	0.405	0.224		Surcharged
SW317	15 min Winter	10	61.983	0.449	60.940		Surcharged
SW318	15 min Winter	10	61.901	0.582	93.979		Surcharged
SW223	15 min Winter	8	63.326	0.156	49.717		OK
SW220	15 min Winter	8	63.064	0.165	49.016		OK
SW271	15 min Winter	8	63.034	0.198	69.944		OK
SW272	15 min Winter	11	62.987	0.314	56.386		Surcharged
S78	15 min Winter	11	62.935	0.907	19.081		Surcharged
S43	15 min Winter	11	62.928	1.096	24.622		Surcharged
SW217	15 min Winter	11	62.925	1.223	24.902		Surcharged
SW270	15 min Winter	11	62.920	1.258	104.439		Surcharged
SW273	15 min Winter	11	62.731	1.217	114.653		Surcharged
SW269	15 min Winter	11	62.505	1.140	138.336		Surcharged
SW268	15 min Winter	11	62.047	0.886	143.216		Surcharged
S42	15 min Winter	11	61.753	0.713	228.717		Surcharged
SW319	15 min Winter	10	61.403	1.837	241.319		Surcharged
SW298	15 min Winter	8	65.092	0.092	41.299		OK
SW299	15 min Winter	8	63.656	0.156	108.593		OK
SW300	15 min Winter	8	62.172	0.172	120.640		OK
SW301	15 min Winter	9	61.010	0.510	154.594		Surcharged
SW320	15 min Winter	10	60.462	1.762	398.332		Surcharged
SW321	15 min Winter	10	56.831	1.031	420.965		Surcharged
S95	15 min Winter	8	61.240	0.092	23.284		OK
SW222	15 min Winter	8	61.178	0.152	60.077		OK
SW216	15 min Winter	8	61.023	0.173	83.749		OK
SW218	15 min Winter	8	59.361	0.192	115.733		OK
SW215	15 min Winter	8	59.202	0.236	152.084		OK
SW221	15 min Winter	9	58.941	0.241	184.627		OK
SW214	15 min Winter	9	58.683	0.269	221.785		OK
S98	15 min Winter	9	58.522	0.276	231.742		OK
SW213	15 min Winter	9	58.384	0.277	232.372		OK
SW322	15 min Winter	10	56.478	0.826	640.487		Surcharged
SW323	15 min Winter	10	56.267	0.654	643.487		Surcharged
SW324	15 min Winter	10	55.068	1.598	644.795		Surcharged
S8	600 min Winter	498	54.886	1.456	18.428		Surcharged
S14	15 min Winter	9	53.341	0.119	37.527		OK
S1	15 min Winter	9	53.314	0.128	58.735		OK
S6	15 min Winter	9	53.231	0.128	58.591		OK
S5	15 min Winter	9	53.068	0.155	79.722		OK
SW326	15 min Winter	9	52.996	0.173	105.652		OK
SW349	15 min Winter	9	51.836	0.174	106.105		OK
SW350	15 min Winter	9	51.652	0.174	106.378		OK
SW351	15 min Winter	9	51.280	0.174	106.277		OK
SW352	15 min Winter	10	50.949	0.173	103.592		OK
SW353	15 min Winter	10	50.466	0.163	105.857		OK

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SW354	15 min Winter	10	50.218	0.149	106.172		OK
SW355	15 min Winter	10	50.149	0.149	106.667		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	8	SW302	SW303	0.096	1.591	31.134	0.138	OK
1.001	15 min Winter	8	SW303	SW304	0.126	2.513	57.350	0.549	OK
1.002	15 min Winter	8	SW304	SW308	0.133	3.170	77.554	0.664	OK
2.000	15 min Winter	7	SW305	SW306	0.375	0.860	25.656	0.128	Surcharged
2.001	15 min Winter	7	SW306	SW307	0.375	1.257	47.033	0.235	Surcharged
2.002	15 min Winter	6	SW307	SW308	0.375	1.029	41.556	0.255	Surcharged
1.003	15 min Winter	11	SW308	SW311	0.375	1.526	82.738	0.380	Surcharged
3.000	15 min Winter	9	SW309	SW310	0.300	1.213	42.243	0.466	Surcharged
3.001	15 min Winter	9	SW310	SW311	0.300	1.359	43.898	0.450	Surcharged
1.004	15 min Winter	11	SW311	SW312	0.300	2.132	90.340	0.565	Surcharged
1.005	1440 min Winter	1062	SW312	SW315	0.226	0.244	11.466	0.127	OK
4.000	15 min Winter	9	SW277	SW275	0.300	1.171	60.719	0.547	Surcharged
5.000	15 min Winter	10	SW274	SW279	0.300	1.159	16.875	0.137	Surcharged
5.001	15 min Winter	9	SW279	SW275	0.300	1.506	22.817	0.143	Surcharged
6.000	15 min Winter	11	SW276	SW275	0.300	1.833	30.422	0.159	Surcharged
4.001	15 min Winter	7	SW275	SW278	0.300	1.588	56.666	0.510	Surcharged
4.002	1440 min Winter	1062	SW278	SW315	0.226	0.164	6.416	0.058	OK
1.006	15 min Winter	25	SW315	SW316	0.150	0.527	0.214	0.002	OK
1.007	15 min Winter	12	SW316	SW317	0.300	0.305	8.695	0.078	Surcharged
1.008	15 min Winter	9	SW317	SW318	0.300	1.110	67.356	0.745	Surcharged
1.009	15 min Winter	9	SW318	S42	0.300	1.473	104.146	1.151	Surcharged
7.000	15 min Winter	8	SW223	SW220	0.160	1.277	49.016	0.542	OK
7.001	15 min Winter	9	SW220	SW271	0.181	1.088	48.457	0.495	OK
7.002	15 min Winter	11	SW271	SW272	0.230	1.322	69.891	0.771	OK
7.003	15 min Winter	11	SW272	SW270	0.300	1.463	83.715	0.930	Surcharged
8.000	15 min Winter	8	S78	S43	0.300	1.015	24.195	0.267	Surcharged
8.001	15 min Winter	16	S43	SW217	0.300	0.779	44.048	0.487	Surcharged
8.002	15 min Winter	16	SW217	SW270	0.300	0.834	55.257	0.611	Surcharged
7.004	15 min Winter	10	SW270	SW273	0.300	1.493	105.509	1.172	Surcharged
7.005	15 min Winter	13	SW273	SW269	0.300	1.679	118.669	1.310	Surcharged
7.006	15 min Winter	12	SW269	SW268	0.300	2.001	141.417	1.563	Surcharged
7.007	15 min Winter	12	SW268	S42	0.300	2.153	152.166	1.682	Surcharged
1.010	15 min Winter	12	S42	SW319	0.300	3.346	236.515	2.614	Surcharged
1.011	15 min Winter	12	SW319	SW320	0.300	3.666	259.113	1.948	Surcharged
9.000	15 min Winter	8	SW298	SW299	0.092	2.222	40.782	0.208	OK
9.001	15 min Winter	8	SW299	SW300	0.156	2.898	107.298	0.542	OK
9.002	15 min Winter	8	SW300	SW301	0.171	2.877	119.905	0.634	OK
9.003	15 min Winter	10	SW301	SW320	0.300	2.241	157.166	1.345	Surcharged
1.012	15 min Winter	10	SW320	SW321	0.300	5.674	401.039	2.034	Surcharged
1.013	15 min Winter	10	SW321	SW322	0.450	2.667	424.134	1.610	OK
10.000	15 min Winter	8	S95	SW222	0.122	0.661	23.025	0.095	OK
10.001	15 min Winter	8	SW222	SW216	0.163	1.144	59.101	0.249	OK
10.002	15 min Winter	9	SW216	SW218	0.173	1.480	83.286	0.327	OK
10.003	15 min Winter	9	SW218	SW215	0.214	1.561	115.706	0.372	OK
10.004	15 min Winter	9	SW215	SW221	0.238	1.778	152.149	0.563	OK
10.005	15 min Winter	9	SW221	SW214	0.255	2.009	187.019	0.579	OK
10.006	15 min Winter	9	SW214	S98	0.272	2.216	223.166	0.691	OK
10.007	15 min Winter	9	S98	SW213	0.276	2.268	232.372	0.719	OK
10.008	15 min Winter	9	SW213	SW322	0.277	2.262	232.589	0.727	OK
1.014	15 min Winter	10	SW322	SW323	0.450	4.046	643.487	2.443	OK
1.015	15 min Winter	10	SW323	SW324	0.450	4.054	644.795	2.448	OK
1.016	15 min Winter	12	SW324	S8	0.450	4.696	651.429	2.559	OK
1.017	15 min Winter	11	S8	S14	0.085	1.223	16.982	0.060	OK
1.018	15 min Winter	9	S14	S1	0.123	1.064	37.468	0.142	OK
1.019	15 min Winter	9	S1	S6	0.128	1.580	58.591	0.181	OK
1.020	15 min Winter	9	S6	S5	0.141	1.362	58.238	0.180	OK
1.021	15 min Winter	9	S5	SW326	0.164	1.518	79.787	0.247	OK
1.022	15 min Winter	9	SW326	SW349	0.174	1.875	106.105	0.328	OK
1.023	15 min Winter	9	SW349	SW350	0.174	1.872	106.378	0.329	OK

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.024	15 min Winter	9	SW350	SW351	0.174	1.870	106.277	0.329	OK
1.025	15 min Winter	9	SW351	SW352	0.173	1.872	105.289	0.326	OK
1.026	15 min Winter	10	SW352	SW353	0.173	1.876	105.857	0.328	OK
1.027	15 min Winter	10	SW353	SW354	0.156	1.970	106.172	0.219	OK
1.028	15 min Winter	10	SW354	SW355	0.149	1.460	106.667	0.052	OK

13 APPENDIX D: PERMITTED PHASE 1 LRD DATA



Figure 13.1: Development Site Layout Permitted Phase 1 (c: CSR/CCK Architects)

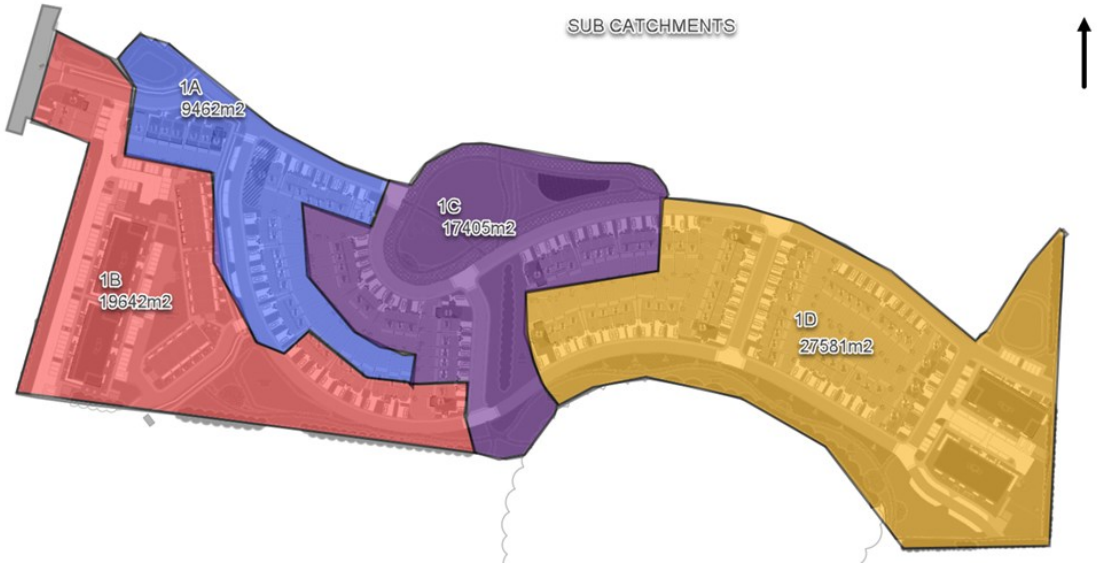


Figure 13.2: Development Site Sub catchments -Permitted Phase 1

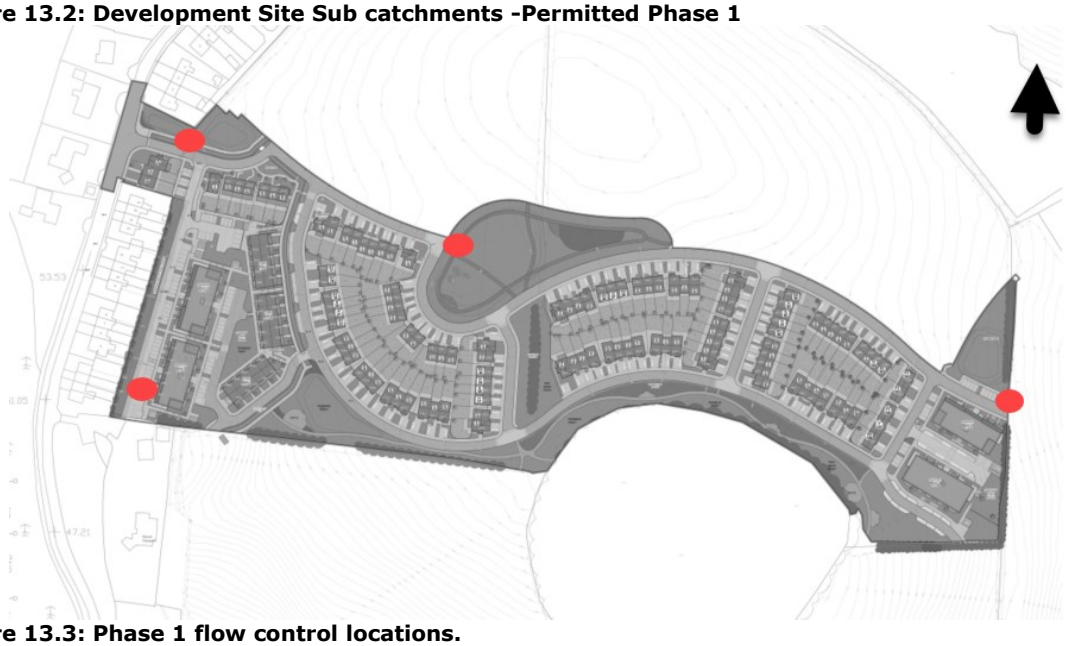


Figure 13.3: Phase 1 flow control locations.

MHL & ASSOCIATES LTD.

OFFICES:

CORK
Unit 1B,
The Atrium,
Blackpool,
Cork.

KERRY
HQ Tralee,
Abbey Street,
Tralee,
Kerry
Tel: +353 (0) 214840214
E: info@mhl.ie

MHL & Associates Consulting Engineers
Registration Number
311279

Visit us at:
www.mhl.ie

