Clifton Scannell Emerson Associates

Engineering Planning Report - Drainage & Water Services

CLUTTERLAND 110 kV GIS SUBSTATION & TRANSMISSION LINES

Date: 4th November 2020

Job Number: 20_055

Civil Engineering | Structural Engineering | Transport Engineering | Environmental Engineering | Project Management | Health and Safety

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Table of Contents

1 Introduction

1.1 Overview

The following report is being submitted as part of the Strategic Infrastructure Development (SID) Application for the provision of two no. 110kV transmission lines and a 110kV Gas Insulated Switchgear (GIS) substation compound along with associated and ancillary works.

1.2 Description of the site

The Proposed Development is to be located on a site of c. 7.7 hectares that consists of a primarily greenfield site within the Grange Castle South Business Park. The proposed 110kV GIS Substation Compound; the transmission line to the existing 110kV underground Kilmahud Corkagh circuit and the 49kVa (MV) cable installation are located on lands that at the time of making this application are in the control or ownership of SDCC. The transmission line to the existing 220kV / 110kV Castlebaggot Substation to the immediate south is located on lands that are in the control or ownership of SDCC and ESBN. Letters of consent are included within this submission.

Proposed 110kV GIS Substation

The proposed 110kV GIS substation is located on lands that are bounded by the realigned Baldonnel Road to the west; by the old and new Nangor Road to the north; by agricultural fields and the Grange Castle Motor Company to the east; and by the Grange Castle South Access Road that provides access off the Baldonnel Road into Grange Castle South Business Park and the Castlebaggot Substation to the south.

110kV transmission line to the Castlebaggot Substation

The route of the underground 110kV transmission line to the Castlebaggot Substation passes around the northern and part of the western boundary of the Castlebaggot Substation before passing into the Substation approximately half way along its western boundary with the Proposed Development site. The length of the 110kV cable route is c. 180m.

110kV transmission line to the Kilmahud-Corkagh circuit

The route of the underground 110kV transmission line to the Kilmahud-Corkagh circuit passes to the north of two of the permitted two storey data centre buildings (Buildings A and C) as permitted under Reg. Ref. SD20A/0121. It then passes under the former Nangor Road (now cut off at either end) before passing across SDCC owned land before passing under the culverted Griffeen River and under the realigned Nangor Road (R134) and passing along the wayleave on the east side of the Grange Castle Business Park internal access road before looping around to connect to the Kilmahud-Corkagh circuit. The length of the 110kV cable route is c. 1.1kms. A proposed joint bay is to be installed at the connection to the Kilmahud-Corkagh circuit as well as along this route.

Proposed 49kVa cable installation

The route of the proposed 49kVa cable installation will link from the proposed Clutterland Substation and pass within the SDCC wayleave to the west of the Castlebaggot Substation before connecting into existing MV cabling infrastructure within the SDCC wayleave along the Grange Castle South Business Park access road. The estimated length of the 49kVa cable route is c. 300m.

The Proposed Development is not located directly adjacent to any areas of national or local environmental sensitivity/designation.

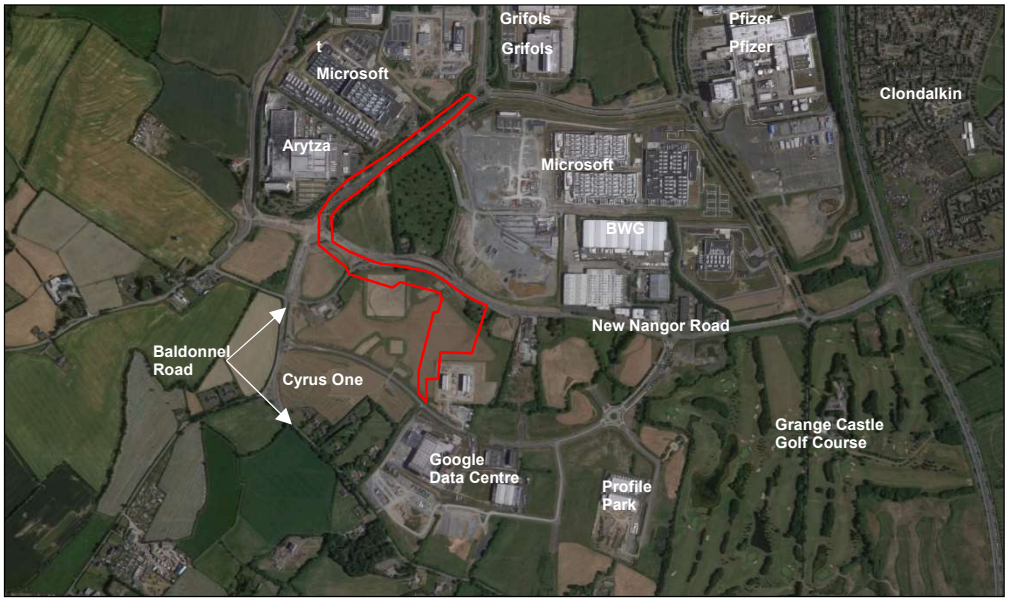

Figure 1.1 Site location of Proposed Development site

1.3 Permitted Development on Landholding

The proposed 110kV GIS Substation Compound is to be located on lands with an extant permission (SDCC Planning Register Reference: SD20A/0121) for the development of three no. two storey data centres with a gross floor area of 80,269sqm to be built over a ten year period.

The Permitted Development (SDCC Planning Register Reference: SD20A/0121) consists of various works that can be summarised as follows:

- Demolition of abandoned dwelling and associated buildings known as Ballybane, Old Nangor Road, Clondalkin, Dublin 22;
- Construction of three no. two storey data centre buildings (Buildings A, B and C) with mezzanine floors at each level and ancillary elements with a gross floor area of 80,269sqm;
- 1 no. two storey data centre (Building A) that will be located to the south-west of the site and will have a gross floor area of 28,573sqm. It will include 26 no. emergency generators located at ground floor level within a compound to the northern side of the data centre with associated flues that will be 25m in height. The facility will also include 26 no. ventilation shafts that will be located above the northern end of each emergency generator that will measure 20m in height;
- 1 no. two storey data centre (Building B) that will be located to the north-west of the site, and to the immediate north of Building A and will have a gross floor area of 21,725sqm. It will include 18 no. emergency generators located at ground floor level within a compound to the northern side of the data centre with associated flues that will be 25m in height. The facility will also include 18 no. ventilation shafts that will be located above the southern end of each emergency generator that will measure 20m in height;
- 1 no. two storey data centre (Building C) that will be constructed last and will be located to the eastern part of the site on a north-south axis and will have a gross floor area of

28,573sqm. It will include 26 no. emergency generators located at ground floor level within a compound to the western side of the data centre with associated flues that will be 25m in height. The facility will also include 26 no. ventilation shafts that will be located above the western end of each emergency generator that will measure 20m in height;

- Each of the three data centres will includes data storage rooms, associated electrical and mechanical plant rooms, loading bays, maintenance and storage spaces, office administration areas, and plant including PV panels at roof level as well as a separate house generator for each facility that will provide emergency power to the admin and ancillary spaces. Each data centre will also include a diesel tank and a refuelling area to serve the proposed emergency generators;
- The overall height of each data centre apart from the flues and plant at roof level is c. 19.85m above the finished floor level;
- Construction of internal road network and circulation areas, security hut (30sqm) at entrance; footpaths, provision of 150 no. car parking spaces, and 78 no. cycle parking spaces, with 50 no car parking spaces and 26 no. cycle parking spaces being provided for each building;
- single storey and temporary substation (29sqm);
- 3 no. single storey MV buildings (each 249sqm - 747sqm in total) that manage the supply of electricity from the Substations to each data centre and are located to the immediate west of the generator compound within Buildings A and B, and to the south of the generator compound within Building C;
- 8 no. prefabricated containerised electrical rooms (65sqm each and 520sqm overall) that are stacked in pairs to the immediate south of the temporary substation; and
- Ancillary site development works, that will include attenuation ponds and the installation and connection to the underground foul and storm water drainage network, and installation of utility ducts and cables, that will include the drilling and laying of ducts and cables under the Baldonnel Stream. Other ancillary site development works will include hard and soft landscaping, lighting, fencing, signage, services road, entrance gate, sprinkler tank house (72sqm), security hut (30sqm) and 150 no. car parking spaces, and 78 no. sheltered bicycle parking spaces. The development will be enclosed with landscaping to all frontages including a wetland to the west.

1.4 Proposed Infrastructure on Landholding

The Proposed Development comprises:

- The provision of two no. 110kV transmission lines and a 110kV Gas Insulated Switchgear (GIS) substation compound along with associated and ancillary works and is described as follows:

- The proposed 110kV GIS Substation Compound is to be located on lands to the east of the 3 no. data centres permitted under South Dublin County Council Reg. Ref. SD20A/0121, and within an overall landholding bound to the north by the R134 / New Nangor Road; to the west by the realigned Baldonnel Road; to the south by the Grange Castle South Business Park access road; and to the east by the Grange Castle Motor Company within Baldonnel, Dublin 22. The site of the proposed development has an area of c. 7.7 hectares;
- The proposed 110kV Gas Insulated Switchgear (GIS) Substation Compound includes the provision of a two storey GIS Substation building (with a gross floor area of 1,447sqm) (known as the Clutterland Substation), four transformers, a Client Control Building (with a gross floor area of 380sqm), lighting masts, car parking, associated underground services and roads within a 2.6m high fenced compound and all associated construction and ancillary works;

- A proposed underground single circuit 110kV transmission line will connect the proposed Clutterland 110kV GIS Substation to the existing 220kV / 110kV Castlebaggot Substation to the immediate south. The proposed transmission line covers a distance of approximately 180m within the townlands of Ballybane, and Aungierstown and Ballybane;

- A proposed underground single circuit 110kV transmission line will connect the proposed Clutterland 110kV GIS Substation to the existing 110kV underground Kilmahud-Corkagh circuit to the north-west. The proposed transmission line covers a distance of approximately 1.1km within the townlands of Ballybane and Grange and will include 3 joint bays along its length;

- The development includes provision of a unit substation and 49kVa electricity connection (approximately 300m in length to the Grange Castle South Business Park access road to the south of the proposed substation) for the proposed GIS substation building. The development includes the connections to the two substations (existing and proposed) as well as to the Kilmahud-Corkagh circuit, changes to landscaping permitted under SDCC Reg. Ref. SD20A/0121 and changes to planting within Grange Castle Business Park and all associated construction works, and all ancillary works.

Figure 1.2 presents a site layout plan showing the route of the proposed underground 110kV transmission line, the proposed GIS substation, the 49kVA underground cable installation and the proposed cable bays.

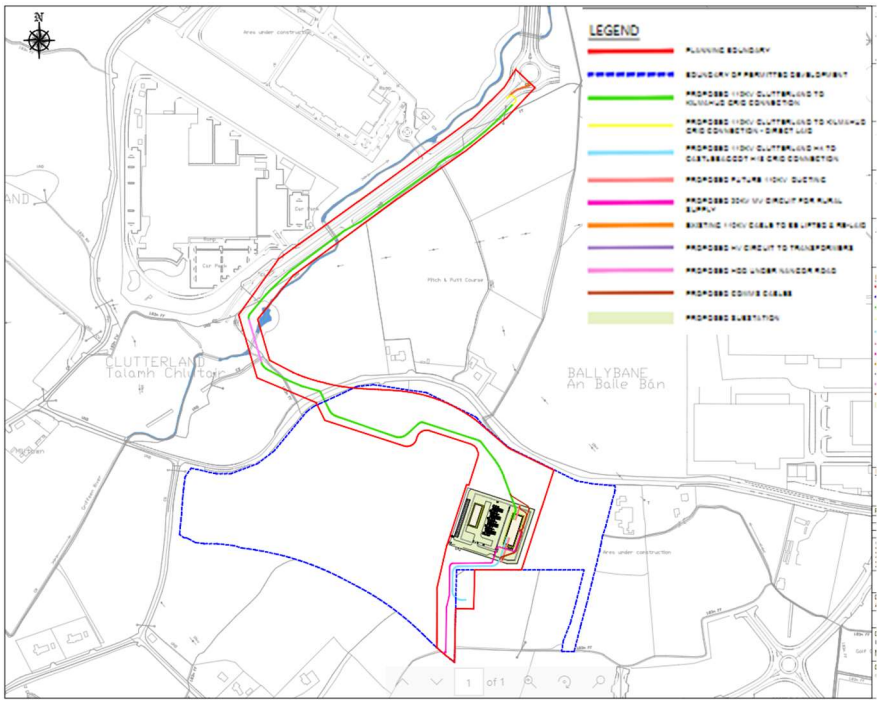

Figure 1.2 Proposed site layout plan of the Proposed Development site indicating proposed 110kV transmission lines (Source: Drawing no. CLDHV-CSE-00-XX-DR-C-2102, CSEA Consulting Engineers)

2 Surface Water Drainage

2.1 Overview

The proposed surface water network to the Substation collects runoff from roofs, roads, and other hard standing areas in a sealed system of pipes and gullies. The surface water drainage system discharges to a permitted attenuation basin to the east of the site which has been designed to facilitate the proposed development. The proposed surface water is designed in accordance with the requirements of the Greater Dublin Strategic Drainage Study (GDSDS).

The substation catchment area has been accounted for as part of the overall catchment (16.5ha) of the Permitted Development. South Dublin County Council require that all stormwater generated on site to be retained and realised at a controlled rate of 2l/sec/Ha or the natural greenfield run off rate, (Q-bar), whichever is the greater in accordance with Greater Dublin Strategic Drainage Study. Taking Met Eireann rainfall data for the site and soil type from the soil maps produced as part of the flood studies report, the greenfield run off rate for the site was calculated to be 2.01/sec/Ha. The Permitted Development (SDCC Planning Register Reference: SD20A/0121) has been designed to convey all the captured storm water on site, including the Substation site, and to direct it to 4 no. attenuation areas (with a capacity of 10,385m^3) located along the western, northern and eastern boundaries of the Permitted Development site. This proposed development will ultimately flow to the permitted attenuation basin 4 with a required storage of 1090m^3 (2l/sec discharge rate) located in the eastern side of the site. The proposed attenuation system outfalls via a carrier drain which discharges attenuated flows to the Baldonnel stream.

The documentation (Appendix A) provided in support of the Permitted Development (SD20A/0121) addressed pre-development greenfield run-off rates for the entire landholding which includes the site subject to this planning application.

The catchment area of the transformers will be excluded from discharge to the proposed surface water network and will be connected to the proposed foul network (will be discussed further in Section 3).

We would note that the underground transmission lines will have no impact on the existing drainage network system.

2.2 Existing Storm Water Infrastructure

There is two storm water sewers 450mm in diameter to the south of the proposed development lands. They drain from east to west combine and turn north and discharge into the Griffeen River.

2.3 Proposed Surface Water Network

The permitted and proposed stormwater layout has been designed using 'Windes' software (see Appendix A) to ensure correct sizing of storm sewers and to check for potential clashes with the proposed foul drainage system. While the proposed development will not be taken in charge by South Dublin County Council it has been designed to taking in charge standards, notably the Greater Dublin Strategic Drainage Study & The Regional Code of Practice for Drainage Works.

The pipe network is designed in accordance with the requirement of Table 6.4 of the Greater Dublin Strategic Drainage Study (GDSDS) – See Figure 2.1 below. Manholes shall be provided at junctions in the network, at changes of direction and gradient and at no more than 90m centres.

Parameter	Surface Water Sewers
Minimum depth	1.2m cover under highways 0.9m elsewhere
Maximum depth	Normally 5m
Minimum sewer size	225mm
Runoff factors for pipe sizing	100% paved and roof surfaces 0% off pervious surfaces
Rainfall for initial pipe sizing	50mm/hr rainfall intensity
Minimum velocity (pipe full)	1.0m/s
Flooding	Checks made for adequate protection * No flooding for return period less than 30 years except where explicitly planned Simulation modelling is required for sites greater than 24ha**
Roughness – ks	0.6mm

Figure 2.1 Extract from GDSDS - Pipe Design Criteria

A further stage to improve overall storm water quality is the construction of 'forebays' that allow small intensity rainfall events to be stored separated from the main water body. This allows for any detritus material to be removed from the water and aids in particulate removal, increasing overall storm water quality prior to disposal

The proposed Surface water drainage network from the Carpark is collected in the Surface water network which discharges to treatment unit (see Section 2.4) before discharging to the attenuation pond.

It is proposed that a Downstream Defender Manhole by Hydro INT see Appendix C to be installed downstream from SW.G12 that provides reliable removal of fine and coarse particles, hydrocarbons and floatable debris from surface water runoff, delivering high levels of stormwater treatment.

The proposed and existing Surface Water Drainage layout is indicated on Drawing No. CLDHV -CSE-00-DR-C-2110. The permitted connection point is shown on Figure 2.2 below.

2.4 Pollution Control Measures on Surface Water Network

The proposed Surface water drainage network from the Carpark will pass into Full Retention interceptor (Type NSBE010, 150 litres oil storage capacity; or equivalent) located at downstream of Manhole SW.G13. Details of the full retention separator are provided in Appendix B. Reference to Drawing No. CLDHV-CSE-00-XX-DR-C-2110.

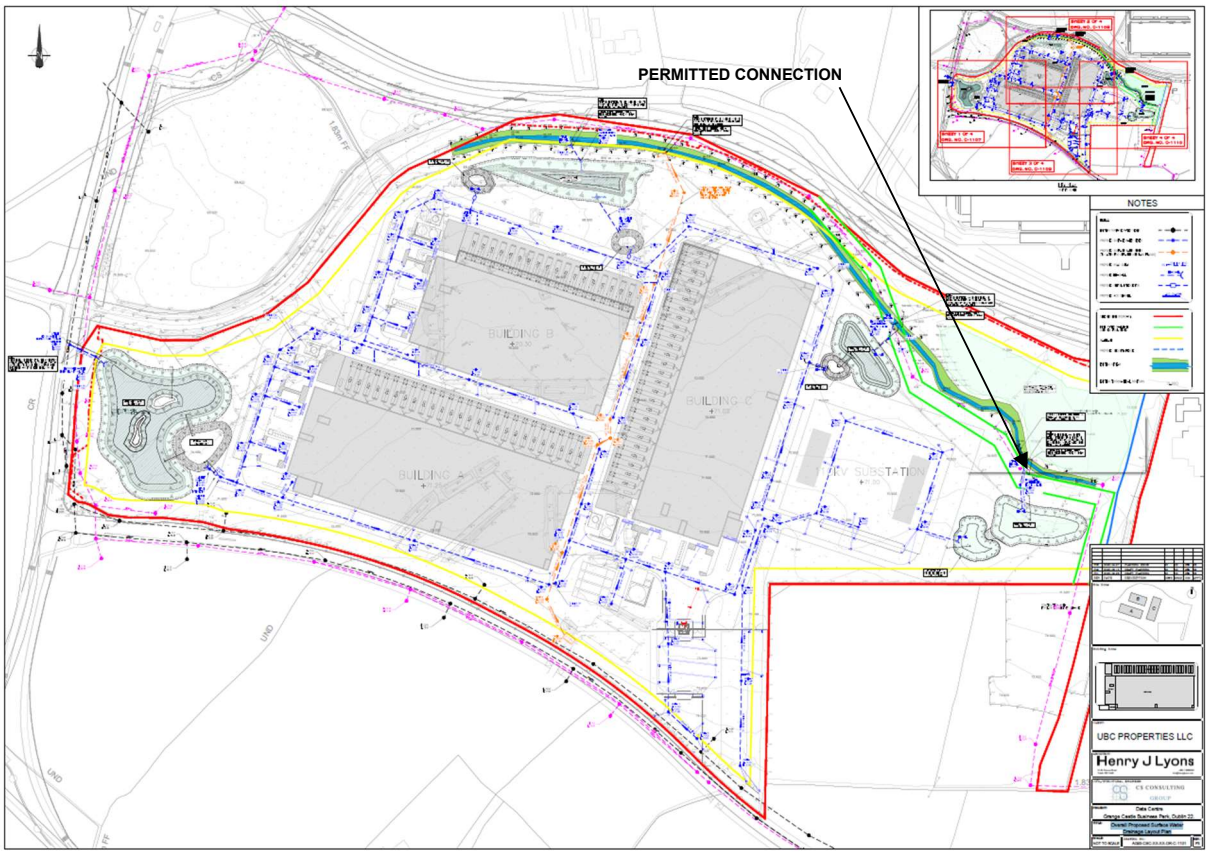

Figure 2.2 Overall Permitted Surface Water Drainage Layout Plan DWG NO A093-CSC-XX-XX-DR-C-1101

3 Foul Water Drainage

3.1 Overview

The Permitted Development (SDCC Planning Reg. Ref. SD20A/0121) has been designed to convey all the captured foul water on site, including the Substation site. The proposed 110kV GIS Substation compound has a single foul water connection to the GIS building which services a single toilet and tea-station.

A connection application for the Permitted Development (Reference No CDS200000724) has received a connection offer from Irish Water which has been paid and returned to Irish Water for the overall development campus.

The proposed development will connect to a permitted development foul water network. The permitted gravity pipe network outfalls to the 375mmø Irish Water foul sewer to the south east of the site.

The proposed foul water flows from the development are outlined in Table 1 below:-

Appliance	Flow per use (litres)	Average use per week	Weekly Flow (litres)	Average Daily Flow (litres)
WC	6	1	6	0.85
WHB	1	1	1	0.15
Total			**7**	**1**

Table 1 – Average Foul Water Daily Demand

As can be seen in Table 1 the average daily foul water demand of 1 litre per day represents a negligible volume in terms of the volume permitted by IW for the entire landholding.

3.2 Existing Wastewater Network

A private sewer is adjacent to the site discharging into a 600mm diameter Irish Water sewer via privately owned Grange Castle Pumping Station and associated 200mm rising main.

3.3 Proposed Wastewater Network

A new connection to the existing network is feasible without upgrade on the condition that the Grange Castle pumping station does not increase maximum output flow rate of Phase 2 PS set up 55 l/s.

The proposed wastewater drainage network collects domestic wastewater flows from the proposed 110kV GIS Substation compound. In addition, rainfall which pass through in the transformers is collected in the wastewater network which discharges to treatment unit (see Section 3.4) before connecting to the main wastewater pipe network.

The proposed wastewater network ties-in to the permitted drainage network Ref: SDCC Planning Reg. Ref. SD20A/0121 - refer to Appendix A) and will discharge into the foul manhole (Ø225mm pipe) in the adjacent road to the east of the site.

The proposed foul pipe network has pipe sizes of Ø100mm. The gradient of these pipes is in accordance with Section 3.6 of Irish Water Code of Practice IW-CDS-5030-03 (Revision 2 – 2020).

The proposed Foul Water Drainage Network is indicated on Drawing No. CLDHV -CSE-00-DR-C-2111 Proposed and existing foul water drainage layout. The permitted connection point is shown on Figure 3.1 below.

3.4 Pollution Control Measures on Wastewater Network

An additional foul sewer is to be provided to the west of the transformers area in order to capture possible contaminated rainwater from the transformers, the drainage from transformers will pass into Full Retention interceptor (Type NSFA010, 100 litres oil storage capacity; or equivalent) located at downstream of Manhole FS.G04. Details of the full retention separator are provided in **Appendix B**. The transformers' bunds will provide surface water storage during the 1 in 30 years storm event prior to discharge into the foul main. Reference to Drawing No. CLDHV-CSE-00-XX-DR-C-2111.

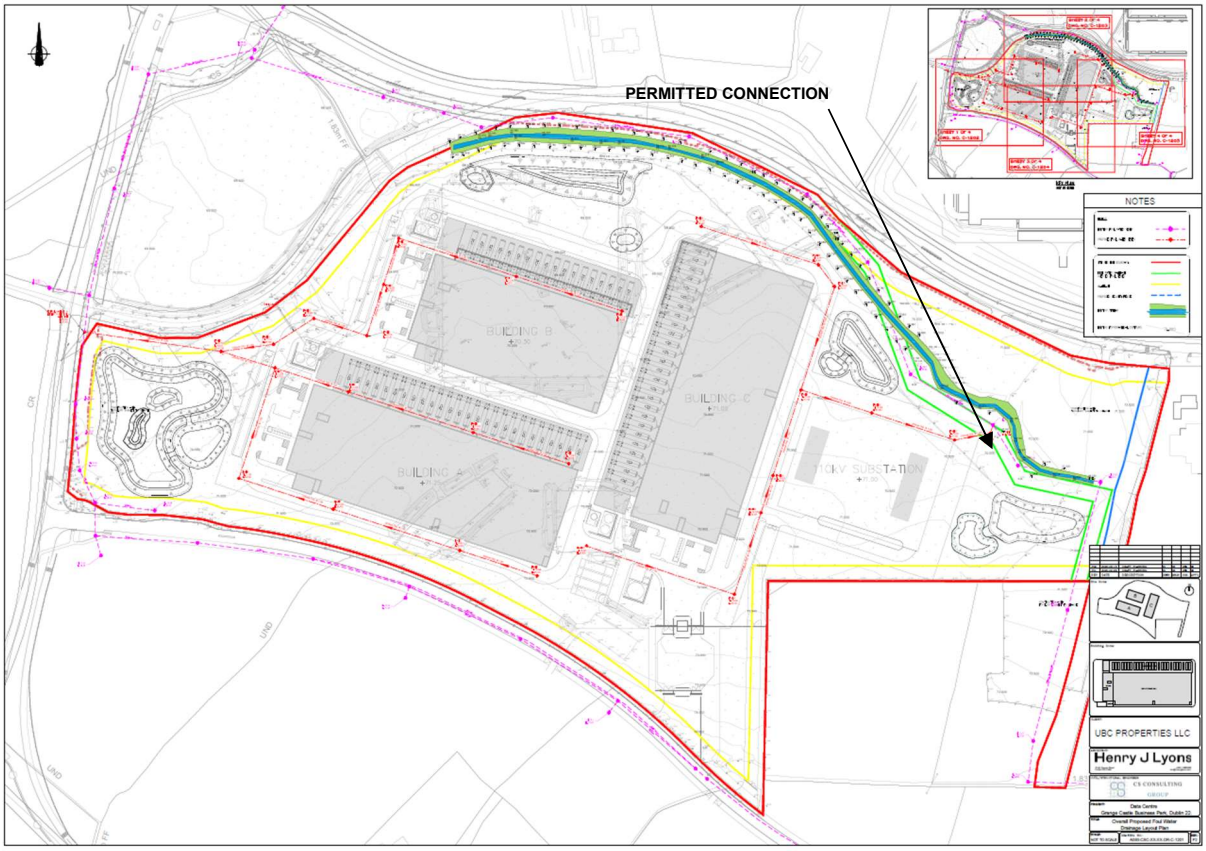

Figure 3.1 Overall Permitted Foul Water Drainage Layout Plan DWG NO A093-CSC-XX-XX-DR-C-1201

4 Water Supply

4.1 Overview of Potable Water Requirements

A connection application for the Permitted Development (Reference No CDS200000724) has received a connection offer from Irish Water which has been paid and returned to Irish Water for the overall development campus. The permitted and proposed development required water supply is in line with the Irish Water connection offer.

Irish Water's connection offer notes the following:

- Connection should be to the existing 450mm via 150mm connection main to the West boundary of the site.
- Allowable peak flow of 4.9l/s
- Allowable annual limit of 4,959m^3

The proposed water flows from the Proposed Development are outlined in Table 2 below:-

Appliance	Flow per use (litres)	Average use per week	Weekly Flow (litres)	Average Daily Flow (litres)
WC	6	1	6	0.85
WHB	1	1	1	0.15
Total			**7**	**1**

Table 2 – Average Water Daily Demand

The proposed development has a daily flow of 1l/day. This is 0.00001 l/s. This equates to 0.0000001% of the daily permitted allowance of 4.9 l/s.

As you can see the daily water usage for the Proposed Development is negligible.

The proposed Water Supply Network is indicated on Drawing No. CLDHV-CSE-00-DR-C-2112 Proposed and existing water supply layout.

The fire hydrants for the proposed development will be served by a Ø150mm watermain which has been permitted under Ref: SDCC Planning Reg. Ref. SD20A/0121.

The details of the fire main and hydrants are detailed in Drg No. CLDHV-CSE-00-DR-C-2112

The permitted connection point is shown on Figure 4.1 below.

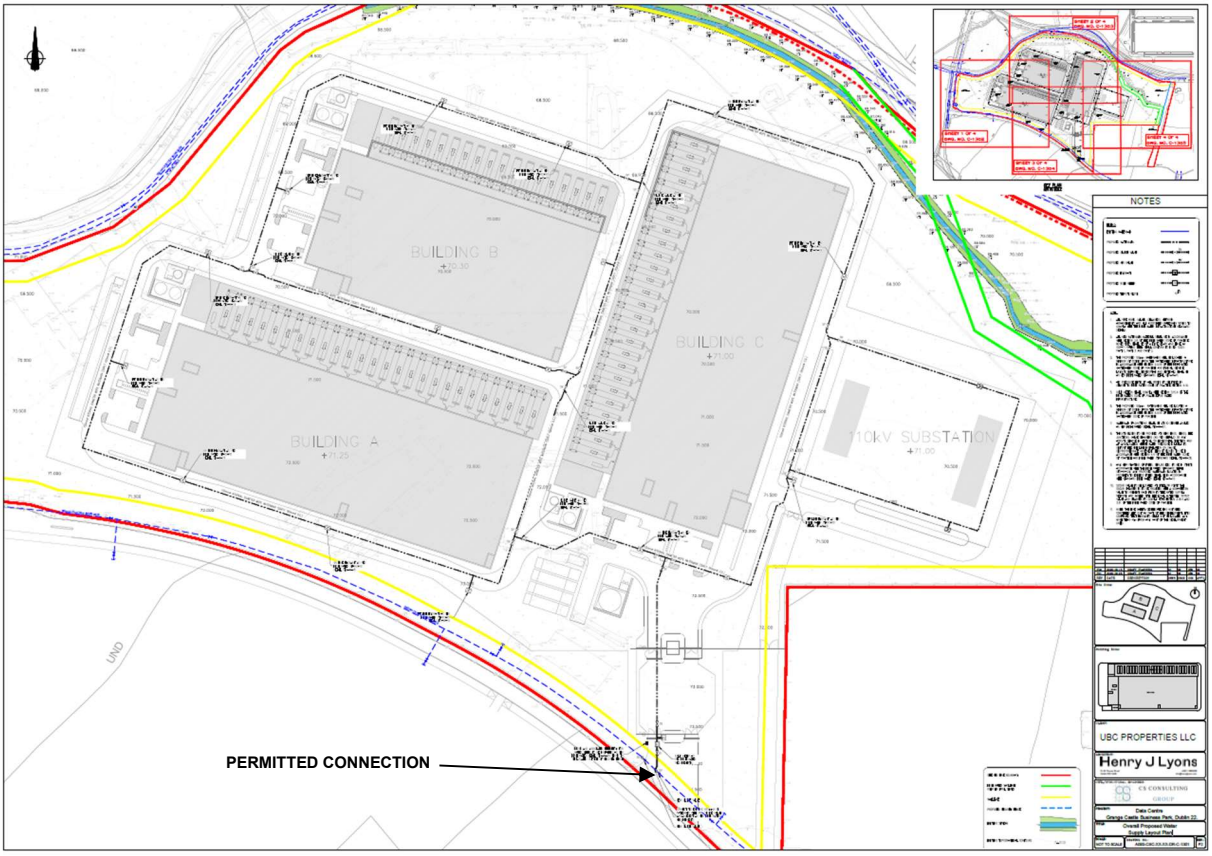

Figure 4.1 Overall Permitted Water Supply Layout Plan DWG NO A093-CSC-XX-XX-DR-C-1301

5 Flood Risk Assessment

A site specific Stage 2 Flood Risk Assessment was carried out by AWN Consulting and is a part of Environmental Impact Assessment Report (EIAR) – refer to Chapter 8 - Hydrology and Appendix 8.2 and 8.3 of the EIAR.

Below is an extract from the above noted EIAR

> ‘’*This report sets out the Flood Risk Assessment Stage 2 desktop assessment of the application site, in accordance with the FRM Guidelines. The assessment is based on the best data available in the public domain at the time of writing.*
>
> *The sequential approach, as outlined in the FRM Guidelines, was followed. As the proposed development is located in an area at risk from flooding (0.1% - 1% AEP Event) and adhering to the first stage of the sequential approach, a Stage 2 assessment was undertaken with a requirement for a justification test.*
>
> *Part of the proposed development resides within Flood Zone B and is not at risk of flooding from a 10% event. As drainage is designed to adhere to the Local Authority requirements, the Greater Dublin Strategic Drainage Study and has incorporated SuDS measures, it is not expected that the proposed development would adversely impact on flood risk for other neighbouring properties. Under the sequential approach and within section 3.5 under the FRM guidelines (2009) any building that is used for “Essential Infrastructure such as….utilities distribution, including electricity generating power stations and substations” is deemed “Highly Vulnerable Development” (see Table 1.1). Part of the Proposed Development resides in Flood Zone B (based OPW Eastern CFRAM Mapping). Therefore, a justification test was required. Based on the assessment the proposed scheme satisfies the Justification Test criteria for Development Management.’’*

6 Accompanied Information

6.1 Planning Drawings:

This report should be read in conjunction with the following planning drawings issued in support of this application:

Table 3 Planning Drawings list

Drawing Number	Title
CLDHV-CSE-00-XX-DR-C-2101	SITE LOCATION MAP
CLDHV -CSE-00-XX-DR-C-2102	OSI MAPPING & EXISTING WAYLEAVES
CLDHV -CSE-00-XX-DR-C-2103	OVERALL SITE LAYOUT
CLDHV -CSE-00-XX-DR-C-2104	PROPOSED SITE LAYOUT & SITE LEVELS
CLDHV -CSE-00-XX-DR-C-2110	PROPOSED & EXISTING SURFACE WATER DRAINAGE LAYOUT
CLDHV -CSE-00-XX-DR-C-2111	PROPOSED & EXISTING FOUL WATER DRAINAGE LAYOUT
CLDHV -CSE-00-XX-DR-C-2112	PROPOSED & EXISTING WATER SUPPLY LAYOUT

6.2 Report Appendices

The report appendices are as listed below:

Table 4 Report Appendices

Appendix	Description
Appendix A	Permitted Development Engineering Services Report
Appendix B	Proposed Full Retention Separator
Appendix C	Proposed Downstream Defender Manhole

Appendix A – Permitted Development Engineering Services Report

CS CONSULTING

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Engineering Services Report

Proposed Data Centres

Grange Castle South Business Park, Baldonnel Road, Dublin 22.

Client: UBC Properties Ltd.

Job No. A093

May 2020

CS CONSULTING

GROUP

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ENGINEERING SERVICES REPORT

PROPOSED DATA CENTRES, GRANGE CASTLE SOUTH BUSINESS PARK, BALDONNEL ROAD, DUBLIN 22.

CONTENTS

File Location: J:\A_JOBS\Job-A093\B_Documents\C_Civil\A_CS Reports\Engineering Services Report

Job Ref.	Author	Reviewed By	Authorised By	Issue Date	Rev. No.
A093	RFM	OS	OS	25.05.2020	*

1.0 INTRODUCTION

1.1 Scope

Cronin & Sutton Consulting Engineers (CS Consulting) have been commissioned by UBC Properties Ltd to prepare an Engineering Services Report for a Proposed Data Storage Facilities Grange Castle Business Park South, Baldonnel, Dublin 22 In preparing this report, CS Consulting has made reference to the following:

- South Dublin County Council Development Plan 2016–2022,
- Regional Code of Practice for Drainage Works,
- Irish Water Code of Practice For Water Infrastructure,
- Irish Water Code of Practice For Waste Water Infrastructure,
- Irish Water Utility Records,
- South Dublin County Council Drainage Records,
- Greater Dublin Strategic Drainage Study.

1.2 Objective

The objective of this report is to examine the engineering services implications associated with the proposed development, in terms of site reprofiling, surface water, foul & potable resources in the area.

A *site Specific Flood Risk Assessment* is addressed under a separate report also submitted by CS Consulting as part of this application.

2.0 SITE LOCATION AND PROPOSED DEVELOPMENT

2.1 Site Location

The site of the proposed development is located within the southern section of the Grange Castle Business Park in Dublin 22, approx. 1.2km south of the Grand Canal and approx. 1.2km north of Casement Aerodrome. The site has a total area of approx. 16.5ha and is located in the administrative jurisdiction of South Dublin County Council.

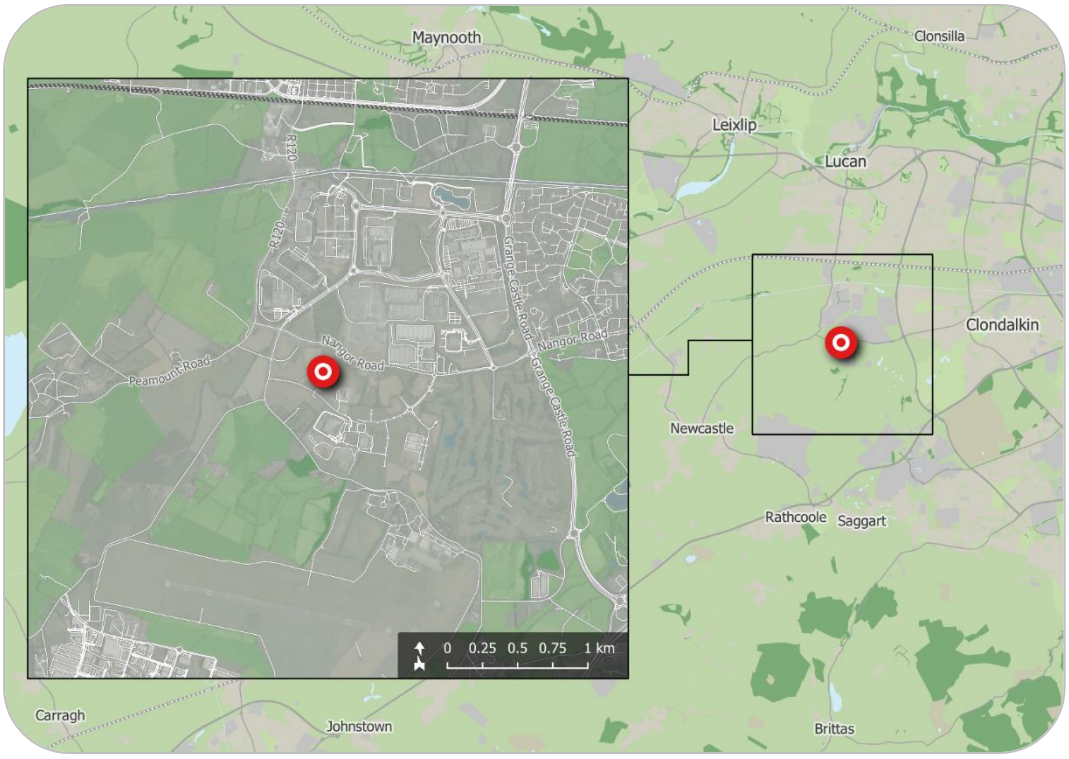


Figure 1 – Location of proposed development site
(*map data & imagery: EPA, OSM Contributors, Google*)

The location of the proposed development site is shown in Figure 1 above; the indicative extents of the development site shown in more detail in Figure 2.

The development site is bounded generally to the south by the Grange Castle Business Park South access road, to the west by Baldonnel Road (L2001), to the north by Nangor Road (R134), to the north-west by the former alignment of the old Nangor Road, to the east by a motor dealership and repair business, and to the south-east by the EirGrid Castlebaggot electrical substation. The site has a road frontage of approx. 480m onto the Grange Castle Business Park South access road, at its southern boundary, on which it is proposed to locate the principal vehicular access to the development.

Figure 2 – Site extents and transport infrastructure
(*map data & imagery: OSM Contributors, Microsoft*)

2.2 Existing Land Use

The subject site is greenfield and has historically been exclusively in agricultural use, with the exception of shallow archaeological excavations conducted on the site in 2017-2018.

The site falls generally from south to north, with topographical levels ranging from 75.223mAOD in the south east to 67.8mAOD in the north west of the site. There is a water course (Baldonnel Stream) passing through the subject lands from west to east along the norther boundary of the site.

In accordance with the requirements of the Local Authority a 10m Riparian strip is required to be applied to the water course from the top of bank on either side of the stream.

2.3 Description of Proposed Development

The development will consist of the following:

- The demolition of the existing two storey dwelling of Ballybane and associated farm buildings (565sqm); and the construction of 3 no. two storey data centres with mezzanine floors at each level of each facility and associated ancillary development that will have a gross floor area of 80,269sqm on an overall site of 16.5 hectares.
- 1 no. two storey data centre (Building A) that will be located to the south-west of the site and will have a gross floor area of 28,573sqm. It will include 26 no. emergency generators located at ground floor level within a compound to the northern side of the data centre with associated flues that will be 25m in height. The facility will also include 26 no. ventilation shafts that will be located above the northern end of each emergency generator that will measure 20m in height;
- 1 no. two storey data centre (Building B) that will be located to the north-west of the site, and to the immediate north of Building A and will have a gross floor area of 21,725sqm. It will include 18 no. emergency generators located at ground floor level within a compound to the northern side of the data centre with associated flues that will be 25m in height. The facility will also include 18

no. ventilation shafts that will be located above the southern end of each emergency generator that will measure 20m in height;

- 1 no. two storey data centre (Building C) that will be constructed last and will be located to the eastern part of the site on a north-south axis and will have a gross floor area of 28,573sqm. It will include 26 no. emergency generators located at ground floor level within a compound to the western side of the data centre with associated flues that will be 25m in height. The facility will also include 26 no. ventilation shafts that will be located above the western end of each emergency generator that will measure 20m in height;
- Each of the three data centres will includes data storage rooms, associated electrical and mechanical plant rooms, loading bays, maintenance and storage spaces, office administration areas, and plant including PV panels at roof level as well as a separate house generator for each facility that will provide emergency power to the admin and ancillary spaces. Each data centre will also include a diesel tank and a refuelling area to serve the proposed emergency generators;
- The overall height of each data centre apart from the flues and plant at roof level is c. 19.85m above the finished floor level;
- 1 no. temporary and single storey substation (29sqm);
- 3 no. single storey MV buildings (each 249sqm - 747sqm in total) that manage the supply of electricity from the Substations to each data centre and are located to the immediate west of the generator compound within Buildings A and B, and to the south of the generator compound within Building C; and
- 8 no. prefabricated containerised electrical rooms (65sqm each and 520sqm overall) that are stacked in pairs to the immediate south of the temporary substation.
- Ancillary site development works, that will include attenuation ponds and the installation and connection to the underground foul and storm water drainage network, and installation of utility ducts and cables, that will include the drilling

and laying of ducts and cables under the Baldonnel Stream. Other ancillary site development works will include hard and soft landscaping, lighting, fencing, signage, services road, entrance gate, sprinkler tank house (72sqm), security hut (30sqm) and 150 no. car parking spaces, and 78 no. sheltered bicycle parking spaces. The development will be enclosed with landscaping to all frontages including a wetland to the west.

The development will be accessed from the Grange Castle South Access Road from the south via the Baldonnel Road. An Environmental Impact Assessment Report (EIAR) has been submitted with this application.

3.0 SITE RE-PROFILING

It Is proposed to alter the site levels to incorporate the proposed development. The large footprint of the proposed units combined with the associated required infrastructure, notably to provide onsite attenuation basins & compensatory emergency storage for the predicated overland flood flows, refer to the *Site Specific Flood Risk Assessment* for details of same.

The proposed re-profiling will generate cut & fill volumes in the order of:

Cut: **43,164m3**,

Fill: **54,298m3**,

Net imported material: **(Fill): 11,134m3**m^3.

4.0 SURFACE WATER INFRASTRUCTURE

The proposed development is required to deal with storm water generated on site in both a qualitative & quantitative manner. The proposed stormwater layout has been designed using 'Windes' software to ensure the correct sizing of storm sewers and to check for potential clashes with the proposed foul drainage system. While the proposed development will not be taken in charge by South Dublin County Council it has been designed to taking in charge standards, notably the *Greater Dublin Strategic Drainage Study* & *The Regional Code of Practice for Drainage Works*.

4.1 Existing Storm Water Infrastructure

To the south of the subject lands there is two stormwater sewers, 450mm in diameter. They drain rom east to west combine and turn north ultimately discharging into the Griffeen River. South Dublin drainage records do not indicate any storm water sewers crossing the subject lands. To the north on the subject lands there is an existing stream known as the Baldonnel Stream, its drains from east to west and outfalls into the Griffeen River. The reach of the Baldonnel Stream changes from a culverted section to the east, to a re-aligned open section, for 280m, before draining into a culvert to the west. See **Appendix A** for drainage records.

4.2 Proposed Storm Water Infrastructure Attenuation Requirements.

South Dublin County Council require all storm water generated on site to be retained, on site and released at a controlled rate of 2l/sec/Ha or the natural greenfield runoff rate, (Q-bar), whichever is the greater in accordance with the requirements of the *Greater Dublin Strategic Drainage Study*. Taking Met Éireann rainfall data for the site and *soil type* from the soil maps produced as part of the Flood Studies Report, the greenfield run off rate for the site was calculated to be 2.01l/sec/Ha.

The proposed development will require 4No. attenuation storage areas, due to the proposed phasing of the development. The proposed storage areas have been designed as retention basins to not only allow for rainwater retention to enhance local ecology, but also to provide sufficient storm water storage for the predicated 1-in-100 year extreme storm event, increased by 10% for the predicated affects of climate change.

- **Pond 1** has a required storage capacity of 4751m^3, (8.6/sec discharge rate),
- **Pond 2** has a required storage capacity of 2600m^3, (4.7l/sec discharge rate),
- **Pond 3** has a required storage capacity of 936m^3, (2.0l/sec discharge rate).
- **Pond 4** has a required storage capacity of 1090m3, (2.0l/sec discharge rate).

The proposed storm water drainage system will operate under gravity, taking from water runoff from hardstanding locations, roofs/paths & roads, and outfalling into one of the attenuation areas. The storm water will be gathered in down pipes from buildings & road gullies. The proposed storm water drainage network has been modelled using industry software to ensure adequate pipe sizes for the future storm events. The storm water drainage network was modelled for a multiple of storm water duration periods, these included 15 / 30 / 45 / 60 / 90 / 120 / 180 /360 / 720 & 1440mins.

The simulation is carried out to ensure that the proposed storm water infrastructure can convey the predicated storm water flows without flooding the network. The proposed model is also modelled for the 1-in-100 storm event increased by a factor of 1.1 for the predicated effects of climate change on rainfall intensity profiles. The 'Windes' modelling

software also allows the proposed storm water network to be checked against the proposed foul drainage system to ensure no physical clashes are present in the network. To limit the discharges from the attenuation zones to pre-development levels flow control devises are required. It is proposed to use 'Hydrobrake' flow control systems to achieve the required discharge rates. See drawing A093-CSC-XX-XX-DR-C0009 to C0012 for details of the proposed attenuation storage areas.

See **Appendix B** for SAAR & rainfall data and **Appendix C** for Attenuation calculations for the four zones.

4.3 Overland Flow

Modelling carried out by RPS Consulting Engineers into local flooding conditions has highlighted the possibility of overland flow entering the site from the south. This is addressed in greater detail in the *Site Specific Flood Risk Assessment* for the site which accompanies this planning submission.

However, the modelling indicated that should the overland flow route be realised then a dedicated flood route pipe works is required to be provided. As part of the design a 450-diameter pipe will be installed at the south of the site to address this possible overland flood route. The flood route waters is then conveyed and passed through the site via the 450 diameter pipe and discharged to the Baldonnell stream. We refer to **Appendix D** for RPS Flood analysis for reporting and hydraulic modelling.

4.4 Sustainable Urban Drainage Systems

A second aspect of South Dublin's requirements following ensuring storm water flows are restricted is the provision for the use of sustainable drainage systems to improve the overall quality of storm water prior to ultimate disposal. Proposals to address same are to conform to the general recommendations of the Regional Drainage Code of Practice and the UK's

Sustainable Urban Drainage Systems Manual, (CIRIA C697). The principle aims of employing SuDs features is to enhance the overall quality of storm water prior to disposal. Due to the type and nature of the proposed development SuDs features are limited in nature in the scheme.

The key benefits and objectives of SUDs considered as part of this development and listed below include:

• Reduction of run-off rates via control measures on site.

• Provision of volume storage via forebays and pond construction

• Volume treatment provided via forebays and petrol interceptor

• Water quality improvement via permeable paving, forebays and petrol interceptor

• Biodiversity via increased measures along the existing stream and around landscaped corridors.

It is proposed to gather storm water in the new drainage network and direct it to attenuation areas, as noted in Section 4.2. Prior to storm water entering the attenuation retention ponds, storm water is directed into 'forebays'. The forebays allow small intensity rainfall events to be stored separated from the main water body. This allows for any detritus material to be removed from the water and aids in particulate removal, increasing overall storm water quality prior to disposal.

Car parking bays to be constructed using permeable paving materials. This will allow rainwater to percolate into the substrata and recharge the groundwater.

All storm water generated on site from roof areas, hardstanding, & roads will pass through a suitably sized oil separator prior to disposal. Refer to drawing A093-CSC-XX-XX-DR-C-3200 for details.

5.0 FOUL WATER INFRASTRUCTURE

5.1 Existing Foul Infrastructure

Drainage records from Irish Water indicate a number of foul sewers in the vicinity of the subject lands. Notable;

i) 375mm foul sewer crossing the subject lands to the northern side of the site,

ii) A 225mm foul sewer along the southern boundary,

iii) The 225mm sewer in turn north and outfalls into a 375m sewer,

iv) To the north west of the subject lands both 375mm sewers converge into a 450mm foul sewer.

The foul network ultimately discharges into a regional pumping station before final treatment and disposal at Ringsend Wastewater Treatment plant in Dublin. See **Appendix A** for drainage records indicating the sewers noted above.

The existing 375mm sewer which traverses the northern section of the subject lands, has an Irish Water wayleave of 3m from each face of the sewer on it. To allow Irish Water personnel maintenance access if required. See CS Consulting drawing A093-CSC-XX-XX-DR-C-1200, for details.

5.2 Proposed Foul Infrastructure

All internal foul drainage networks are to be designed in accordance with;

i) Irish Waters Code of Practice for Waste Water Infrastructure,

ii) National Building Regulations Technical Guidance Document H – Drainage & Waste Disposal.

The proposed network will take effluent from internal sanitary locations and outfall into the proposed external foul network. The proposed works will conform to the requirements of the Building Regulations & Irish Waters Code of Practice for Wastewater Infrastructure.

It is proposed to use 225mm uPVC pipes & precast manholes for the external drainage network. It is proposed to outfall into the existing foul network at two location, one to the west & a second to the east. The proposed western outfall will cater for foul flows from Blocks A, B & 50% of Block C. while the second outfall to the east will cater for 50% of Block C & the welfare facilities associated with the Substation.

In additional to domestic effluent generated on site there is a requirement to have the capability to discharge run-off from coolant effluent into the foul network. The coolant effluent is a bi-product of potable water used, when atmospheric temperatures are in excess of 25C to cool components within the facility.

The predicated effluent loading has been established as:

Number of Staff - 150 for full campus

Daily Consumption (G) = 50 liter per head per day (Irish Water Code of Practice for Wastewater Infrastructure, Document No. IW-CDS-5030-03, Appendix D)

Pf Ind = 6.0 (Section 6.2.5 of IW-TEC-800-01)

Dry Weather Flow (DWF) = 150 x 50 / (24 x 60 x 60) = 0.09 liters / sec

Design Flow = DWF x Pf Ind = 0.09 x 6.0 = 0.54 liters / sec

Water-based cooling systems are only used when ambient temperature is above 25*C.

This has occurred a maximum of 4 days in one year since 1989 (years 1995 and 2018).

During these days, cooling systems will drain to domestic wastewater network.

Industrial Cooling Water:

Peak Demand (adiabatic coolers) = 300,000 L/day

Storage Replenishment Criteria = 24 hours at peak demand

Storage Replenishment Rate = 3.5 l/s

+0.2 l/s for other site uses = 3.7 l/s

(Refer to *Section 6.4* for discussions with Irish Water and annual water demand figures).

5.3 Irish Water Discussions

It is a requirement of Irish Water to submit a pre-connection enquiry form to Irish Water (IW) to verify any operational or capacity issues. This has been submitted and a copy of the response (COF) is included in **Appendix E**.

CS Consulting had detailed discussions with Irish Water and the Local Authority water services department prior to issuing of the COF from IW. Based on the COF issued we confirm the following;

Wastewater

- The applicant welcomes that a connection is feasible and can be accommodated subject to comments made on the COF.

- The applicant acknowledges the statement from IW in relation to the current design capacity of the existing pumping stations and that the applicant will engage with IW on any studies such as a Project Works Services Agreement if required.
- The applicant acknowledges that this study/services agreement will, if required be facilitated prior to commencement of development and understand that the mechanism to carry out such investigations will be addressed in the wastewater connection application post planning.
- We have issued the drainage design and drawings to IW as required under the COF.
- The applicant confirms that they have the required consent from the Local Authority to connect to the services.

6.0 POTABLE WATER INFRASTRUCTURE

6.1 Existing Potable Water Infrastructure

Watermain records from Irish Water indicate a number of watermains in the vicinity of the subject lands. Notable;

i) 110mm PE 2019 crossing the subject lands to the northern side of the site,

ii) A 4" (100mm) uPVC 1952 main & 700mm Ductile Iron 2003 main along the western boundary,

iii) A 500mm ductile Iron 2015 main to the south of the subject lands.

See **Appendix A** for watermain records indicating the sewers noted above. The existing 110mmmm sewer which traverses the northern section of the subject lands, has an Irish Water wayleave of 3m from each face of the pipe on it. To allow Irish Water personnel maintenance access if required. See CS Consulting drawing A093-CSC-XX-XX-DR-C-1300, for details.

6.2 Proposed Potable Water Infrastructure

The proposed internal potable water network is to be designed in accordance with Irish Waters Code of Practice for Water Infrastructure. It is proposed to take a metred 150mm uPVC connection from the existing 500mm Ductile Iron main to the south of the subject lands.

The proposed main, hydrants, values and bedding details are all to Irish Water standards. See A093-CSC-XX-XX-DR-C-1301 for detailed of the proposed watermain layout.

6.3 Proposed Potable Water Requirements

Staff Accommodation:

Number of Staff - 150 for the full campus

Daily consumption (G) = 45 liter per head per day (Irish Water Code of Practice for Water Infrastructure Doc. No. IW-CDS-5020-03 Section 3.28)

Peak flow Ind = 1.25*5 = 6.25 (Section 3.7.2 of IW-CDS-5020-03)

Dry Weather Flow (DWF) = 150 x 45 / (24 x 60 x 60) = 0.08 liters / sec

Design Flow = DWF x Pf Ind = 0.08 x 6.25 = 0.5 liters / sec

24 hours AHU/CRAH water demand storage @ 3.5 l/s = 3.5 l/s * 24 hours * 3600 s/hr = 300,000 L

Site storage tanks:

2No. 50,000 Litre Storage Tanks

6No. 50,000 Litre Storage Tanks for the entire site = 300,000 Litres

Sprinkler Tank:

Approximately 450,000 litre fire sprinkler tank (sizing subject to design) will be filled on building occupation, and have infrequent top-ups thereafter.

(Refer to *Section 6.4* for discussions with Irish Water and annual water demand figures).

6.4 Irish Water Discussions

It is a requirement of Irish Water to submit a pre-connection enquiry form to Irish Water (IW) to verify any operational or capacity issues. This has been submitted and a copy of the response (COF) is included in **Appendix E**.

CS Consulting had detailed discussions with Irish Water and the Local Authority water services department prior to issuing of the COF from IW. Based on the COF issued we confirm the following;

Water (potable)

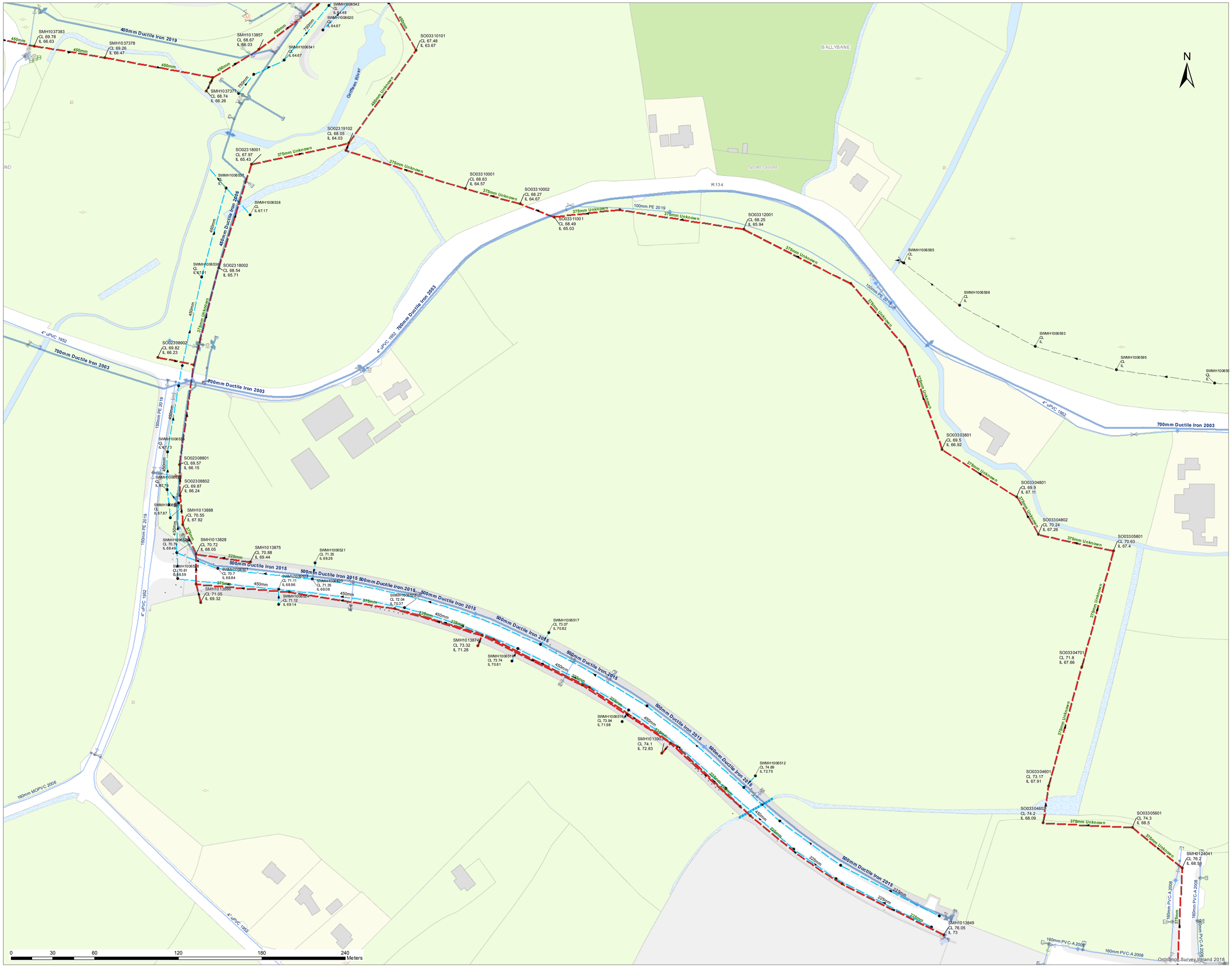
- The applicant welcomes that a connection is feasible and can be accommodated subject to comments made on the COF.
- The applicant acknowledges that the connection offer will be made limiting peak flow to 4.9 l/s with an annual limit of 4959 m3. Annual demand should not exceed 4959 m3 without consultation with Irish Water and that 4959 m3 allows for:
  - Domestic Demand (913 m3 *3) 2739 m3;
  - Cooling and cleaning of storage including flushing (740 m3 *3) 2220 m3.
- The applicant acknowledges if they require to refill their storage and if going over their annual allowance, they should in the first instance contact Irish Water. In the event of IW are unable to refill the tanks, IW would need to be informed of the alternative source of supply.
- The applicant acknowledges the water mains/storage will need to be designed to ensure there is no possibility of backflow from another source of water into the Irish Water system.
- It will be a requirement that a meter that can be hooked up to our telemetry system and a flow control valve are installed as part of the connection.

7.0 SERVICES BENEATH BALDONNEL STREAM.

In order to provide a route for utility ducts and cables to service the proposed development it is a requirement to construct a new services route. The proposed new route will require cables to be brought from the north east under the Baldonnell River into the site and to provide a distribution network across the site. CS Consulting have discussed the possibility of same with the Office of Public Works, who do not have a fundamental objection to the proposal. See **Appendix F** for a copy of communications between CS Consulting & the Office of Public Works.

Appendix A:

Irish Water Service Records



UISCE ÉIREANN : IRISH WATER

Legend

- Pump Stations
- Irish Water
- Private
- Irish Water
- Non IW
- Gravity - Combined
- Gravity - Foul
- Gravity - Overflow
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Overflow
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Syphon - Overflow
- Overflow
- Gravity - Combined
- Gravity - Foul
- Gravity - Overflow
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Overflow
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Syphon - Overflow
- Overflow
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

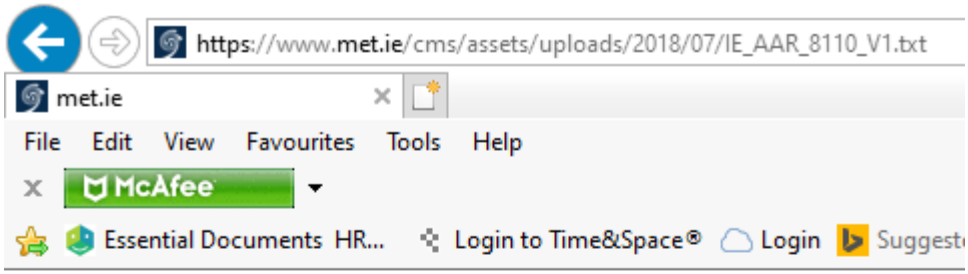
Appendix B:

Standard Annual Average Rainfall Values

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 303223, Northing: 230894,

	Interval		Years											
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.3,	3.4,	4.1,	5.0,	5.7,	6.2,	7.9,	9.9,	11.3,	13.2,	14.9,	16.3,	18.5,	20.2,	21.6,	N/A ,
10 mins	3.3,	4.8,	5.7,	7.0,	7.9,	8.6,	11.0,	13.8,	15.7,	18.4,	20.8,	22.7,	25.7,	28.1,	30.1,	N/A ,
15 mins	3.8,	5.6,	6.7,	8.2,	9.3,	10.1,	13.0,	16.2,	18.5,	21.6,	24.5,	26.8,	30.3,	33.0,	35.4,	N/A ,
30 mins	5.0,	7.4,	8.6,	10.6,	12.0,	13.0,	16.5,	20.6,	23.4,	27.3,	30.8,	33.6,	37.9,	41.3,	44.1,	N/A ,
1 hours	6.6,	9.6,	11.2,	13.7,	15.4,	16.7,	21.1,	26.2,	29.6,	34.5,	38.8,	42.2,	47.5,	51.6,	55.1,	N/A ,
2 hours	8.7,	12.5,	14.5,	17.7,	19.8,	21.5,	27.0,	33.3,	37.5,	43.5,	48.9,	53.0,	59.5,	64.6,	68.8,	N/A ,
3 hours	10.2,	14.5,	16.9,	20.5,	22.9,	24.9,	31.1,	38.3,	43.1,	49.8,	55.9,	60.6,	67.9,	73.6,	78.3,	N/A ,
4 hours	11.4,	16.2,	18.8,	22.8,	25.5,	27.6,	34.5,	42.3,	47.5,	54.9,	61.5,	66.6,	74.5,	80.7,	85.8,	N/A ,
6 hours	13.4,	18.9,	21.9,	26.5,	29.5,	31.9,	39.8,	48.7,	54.6,	62.9,	70.4,	76.1,	85.0,	92.0,	97.7,	N/A ,
9 hours	15.7,	22.1,	25.5,	30.7,	34.2,	37.0,	45.9,	56.0,	62.7,	72.1,	80.5,	87.0,	97.0,	104.8,	111.2,	N/A ,
12 hours	17.5,	24.6,	28.4,	34.2,	38.0,	41.0,	50.8,	61.9,	69.2,	79.4,	88.6,	95.6,	106.5,	115.0,	122.0,	N/A ,
18 hours	20.6,	28.7,	33.1,	39.7,	44.1,	47.5,	58.6,	71.2,	79.4,	91.0,	101.3,	109.3,	121.5,	131.0,	138.8,	N/A ,
24 hours	23.0,	32.1,	36.9,	44.1,	48.9,	52.7,	64.9,	78.6,	87.6,	100.3,	111.5,	120.1,	133.4,	143.7,	152.2,	182.0,
2 days	28.9,	39.1,	44.5,	52.4,	57.6,	61.6,	74.5,	88.8,	98.1,	111.0,	122.3,	130.9,	144.1,	154.2,	162.6,	191.4,
3 days	33.7,	44.8,	50.6,	59.0,	64.6,	68.9,	82.4,	97.3,	106.9,	120.1,	131.6,	140.4,	153.7,	163.9,	172.3,	201.1,
4 days	37.9,	49.8,	56.0,	64.9,	70.7,	75.2,	89.3,	104.7,	114.6,	128.1,	139.9,	148.8,	162.4,	172.7,	181.1,	210.0,
6 days	45.2,	58.5,	65.3,	75.0,	81.3,	86.1,	101.3,	117.6,	128.0,	142.1,	154.4,	163.6,	177.6,	188.1,	196.8,	226.1,
8 days	51.7,	66.2,	73.4,	83.8,	90.6,	95.7,	111.7,	128.8,	139.6,	154.3,	167.0,	176.5,	190.9,	201.7,	210.5,	240.4,
10 days	57.7,	73.2,	80.9,	91.8,	99.0,	104.3,	121.1,	138.9,	150.2,	165.4,	178.4,	188.2,	202.9,	213.9,	222.9,	253.3,
12 days	63.3,	79.7,	87.8,	99.3,	106.7,	112.3,	129.8,	148.3,	159.9,	175.5,	188.9,	198.9,	213.9,	225.2,	234.4,	265.3,
16 days	73.8,	91.7,	100.5,	113.0,	121.0,	127.0,	145.7,	165.3,	177.5,	193.9,	207.9,	218.4,	234.0,	245.7,	255.2,	287.0,
20 days	83.4,	102.7,	112.2,	125.5,	134.0,	140.4,	160.1,	180.7,	193.5,	210.6,	225.2,	236.0,	252.2,	264.2,	274.0,	306.6,
25 days	94.7,	115.6,	125.8,	140.1,	149.1,	155.9,	176.8,	198.4,	211.8,	229.7,	244.9,	256.2,	272.9,	285.4,	295.5,	329.0,

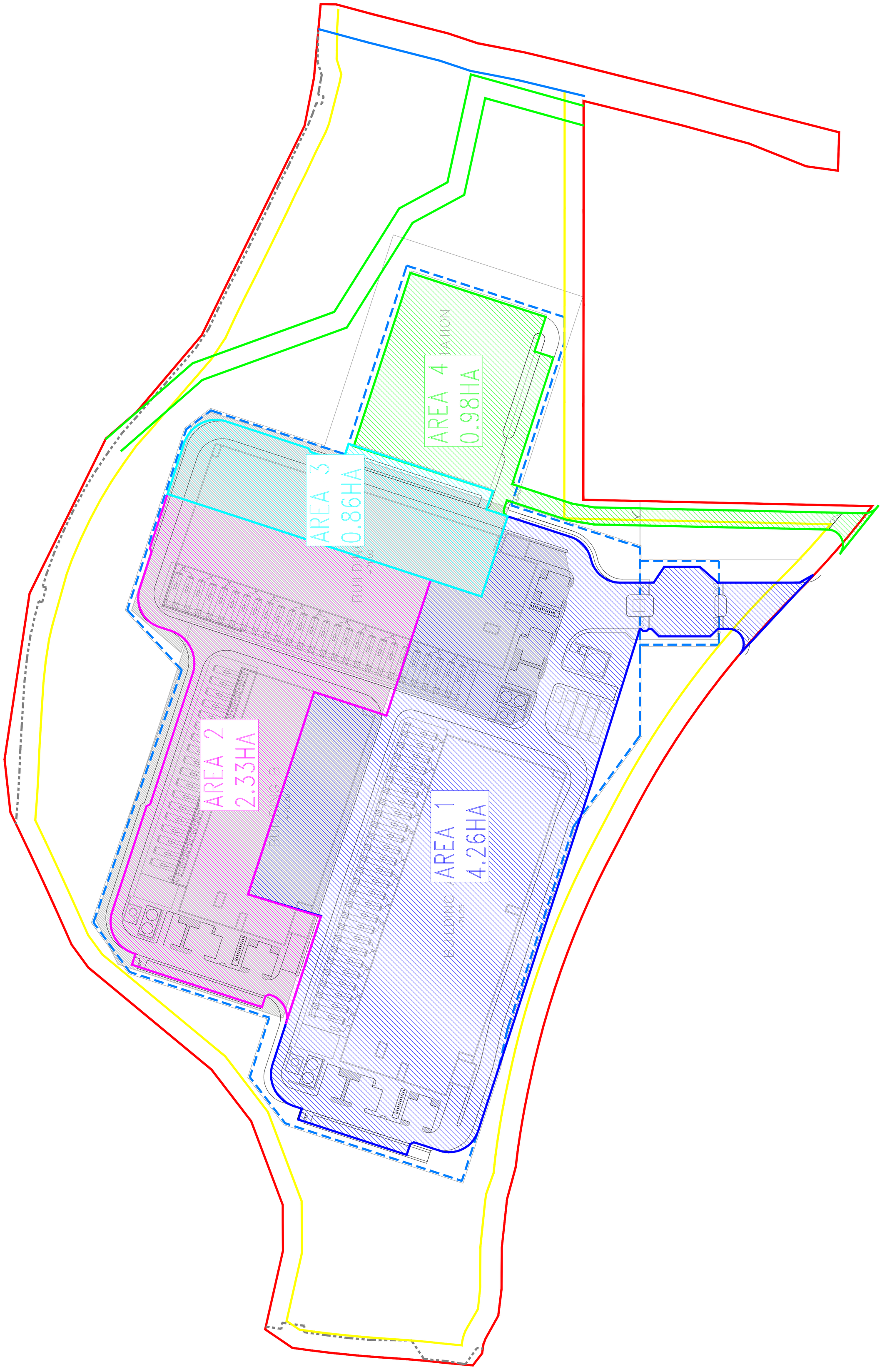
NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf



303000	221000	1105
303000	222000	1089
303000	223000	1062
303000	224000	1040
303000	225000	962
303000	226000	882
303000	227000	850
303000	228000	809
303000	229000	771
303000	230000	760
303000	231000	761
303000	232000	771
303000	233000	773
303000	234000	775
303000	235000	776
303000	236000	773
303000	237000	775
303000	238000	782
303000	239000	789
303000	240000	799
303000	241000	804
303000	242000	809
303000	243000	814
303000	244000	819
303000	245000	822
303000	246000	824
303000	247000	825
303000	248000	828
303000	249000	828
303000	250000	823
303000	251000	816

Appendix C:

Attenuation Calculations


AREA 4
0.98HA
AREA 3
0.86HA
BUILDING A
AREA 2
2.33HA
BUILDING B
AREA 1
4.26HA
BUILDING C

Project: Data Centre-Grange Castle South
Project No.: A093 - AREA 1
Calculation: Attenuation 100-year
Calcs By: DD
Checked By: RFM
Date: 23/1/20

CS CONSULTING GROUP
DUBLIN - LONDON - LIMERICK

Site Location:	Grange Castle		
Design Storm Return Period:	100 years		
Climate Change Factor:	10 %		
Soil Type:	2		
Total Site Area:	4.26 ha		
Hardstand Area:	4.26 ha	.....@	100% Impervious
Softstand Area:	0.00 ha	.....@	0% Impervious
Effective Impermeable Area:	4.26 ha		

Allowable Outflow	**Calculate**	
IH124: QBAR = 0.00108 x $AREA^{0.89}$ x $SAAR^{1.17}$ x $SOIL^{2.17}$		
AREA:	0.0426 km^2	
SAAR:	761 mm	
SOIL:	0.3	
QBAR/ha	2.01 l/s/ha	
Allowable Outflow	**8.6 l/s**	Smallest Allowable Discharge Rate

Storage required =	**4751 m^3**	

Duration (min)	Rainfall 100-Year (mm)	Rainfall 100-Year with CCF (mm)	Intensity (mm/hr)	Discharge (Q = 2.78iA) (l/s)	Proposed Runoff (m^3)	Contiguous Land Runoff (m^3)	Total Runoff (m^3)	Allowable Outflow (m^3)	Storage Required (m^3)
5	16.3	17.9	215.2	2484	745	0	745	3	743
10	22.7	25.0	149.8	1730	1038	0	1038	5	1033
15	26.8	29.5	117.9	1361	1225	0	1225	8	1218
30	33.6	37.0	73.9	853	1536	0	1536	15	1521
60	42.2	46.4	46.4	536	1929	0	1929	31	1898
120	53.0	58.3	29.2	337	2423	0	2423	62	2361
180	60.6	66.7	22.2	257	2770	0	2770	92	2678
240	66.6	73.3	18.3	211	3045	0	3045	123	2921
360	76.1	83.7	14.0	161	3479	0	3479	185	3294
540	87.0	95.7	10.6	123	3977	0	3977	277	3700
720	95.6	105.2	8.8	101	4371	0	4371	370	4001
1080	109.3	120.2	6.7	77	4997	0	4997	555	4442
1440	120.1	132.1	5.5	64	5491	0	5491	740	4751
2880	130.9	144.0	3.0	35	5984	0	5984	1479	4505
4320	140.4	154.4	2.1	25	6419	0	6419	2219	4200
5760	148.8	163.7	1.7	20	6803	0	6803	2959	3844
8640	163.6	180.0	1.2	14.4275	7479	0	7479	4438	3041
11520	176.5	194.2	1.0	12	8069	0	8069	5917	2152
14400	188.2	207.0	0.9	10	8604	0	8604	7397	1207
17280	198.9	218.8	0.8	9	9093	0	9093	8876	217
23040	218.4	240.2	0.6	7	9985	0	9985	11835	-1850
28800	236.0	259.6	0.5	6	10789	0	10789	14793	-4004
36000	256.2	281.8	0.5	5	11713	0	11713	18492	-6779

Project: Data Centre-Grange Castle South
Project No.: A093 - AREA 2
Calculation: Attenuation 100-year
Calcs By: DD
Checked By: RFM
Date: 23/1/20

CS CONSULTING GROUP
DUBLIN - LONDON - LIMERICK

Site Location:	Grange Castle		
Design Storm Return Period:	100 years		
Climate Change Factor:	10 %		
Soil Type:	2		
Total Site Area:	2.33 ha		
Hardstand Area:	2.33 ha	.....@	100% Impervious
Softstand Area:	0.00 ha	.....@	0% Impervious
Effective Impermeable Area:	2.33 ha		

Allowable Outflow	**Calculate**	
IH124: QBAR = 0.00108 x AREA$^{0.89}$ x SAAR$^{1.17}$ x SOIL$^{2.17}$		
AREA:	0.0233 km^2	
SAAR:	761 mm	
SOIL:	0.3	
QBAR/ha	2.00 l/s/ha	
Allowable Outflow	**4.7 l/s**	Smallest Allowable Discharge Rate

Storage required =	**2600 m^3**	

Duration (min)	Rainfall 100-Year (mm)	Rainfall 100-Year with CCF (mm)	Intensity (mm/hr)	Discharge (Q = 2.78iA) (l/s)	Proposed Runoff (m^3)	Contiguous Land Runoff (m^3)	Total Runoff (m^3)	Allowable Outflow (m^3)	Storage Required (m^3)
5	16.3	17.9	215.2	1359	408	0	408	1	406
10	22.7	25.0	149.8	946	568	0	568	3	565
15	26.8	29.5	117.9	745	670	0	670	4	666
30	33.6	37.0	73.9	467	840	0	840	8	832
60	42.2	46.4	46.4	293	1055	0	1055	17	1038
120	53.0	58.3	29.2	184	1325	0	1325	34	1292
180	60.6	66.7	22.2	140	1515	0	1515	50	1465
240	66.6	73.3	18.3	116	1665	0	1665	67	1598
360	76.1	83.7	14.0	88	1903	0	1903	101	1802
540	87.0	95.7	10.6	67	2175	0	2175	151	2024
720	95.6	105.2	8.8	55	2390	0	2390	201	2189
1080	109.3	120.2	6.7	42	2733	0	2733	302	2431
1440	120.1	132.1	5.5	35	3003	0	3003	403	2600
2880	130.9	144.0	3.0	19	3273	0	3273	805	2468
4320	140.4	154.4	2.1	14	3511	0	3511	1208	2303
5760	148.8	163.7	1.7	11	3721	0	3721	1610	2110
8640	163.6	180.0	1.2	7.8911	4091	0	4091	2416	1675
11520	176.5	194.2	1.0	6	4413	0	4413	3221	1192
14400	188.2	207.0	0.9	5	4706	0	4706	4026	680
17280	198.9	218.8	0.8	5	4973	0	4973	4831	142
23040	218.4	240.2	0.6	4	5461	0	5461	6442	-981
28800	236.0	259.6	0.5	3	5901	0	5901	8052	-2151
36000	256.2	281.8	0.5	3	6406	0	6406	10066	-3659

Project: Data Centre-Grange Castle South
Project No.: A093 - AREA 3
Calculation: Attenuation 100-year
Calcs By: DD
Checked By: RFM
Date: 23/1/20

CS CONSULTING GROUP
DUBLIN - LONDON - LIMERICK

Site Location:	Grange Castle		
Design Storm Return Period:	100 years		
Climate Change Factor:	10 %		
Soil Type:	2		
Total Site Area:	0.86 ha		
Hardstand Area:	0.86 ha	.....@	100% Impervious
Softstand Area:	0.00 ha	.....@	0% Impervious
Effective Impermeable Area:	0.86 ha		

Allowable Outflow	**Calculate**	
IH124: QBAR = 0.00108 x AREA$^{0.89}$ x SAAR$^{1.17}$ x SOIL$^{2.17}$		
AREA:	0.0086 km^2	
SAAR:	761 mm	
SOIL:	0.3	
QBAR/ha	2.00 l/s/ha	
Allowable Outflow	**2.0 l/s**	Smallest Allowable Discharge Rate

Storage required =	**936 m^3**	

Duration (min)	Rainfall 100-Year (mm)	Rainfall 100-Year with CCF (mm)	Intensity (mm/hr)	Discharge (Q = 2.78iA) (l/s)	Proposed Runoff (m^3)	Contiguous Land Runoff (m^3)	Total Runoff (m^3)	Allowable Outflow (m^3)	Storage Required (m^3)
5	16.3	17.9	215.2	501	150	0	150	1	150
10	22.7	25.0	149.8	349	210	0	210	1	208
15	26.8	29.5	117.9	275	247	0	247	2	246
30	33.6	37.0	73.9	172	310	0	310	4	307
60	42.2	46.4	46.4	108	389	0	389	7	382
120	53.0	58.3	29.2	68	489	0	489	14	475
180	60.6	66.7	22.2	52	559	0	559	22	538
240	66.6	73.3	18.3	43	615	0	615	29	586
360	76.1	83.7	14.0	33	702	0	702	43	659
540	87.0	95.7	10.6	25	803	0	803	65	738
720	95.6	105.2	8.8	20	882	0	882	86	796
1080	109.3	120.2	6.7	16	1009	0	1009	130	879
1440	120.1	132.1	5.5	13	1108	0	1108	173	936
2880	130.9	144.0	3.0	7	1208	0	1208	346	862
4320	140.4	154.4	2.1	5	1296	0	1296	518	777
5760	148.8	163.7	1.7	4	1373	0	1373	691	682
8640	163.6	180.0	1.2	2.9126	1510	0	1510	1037	473
11520	176.5	194.2	1.0	2	1629	0	1629	1382	247
14400	188.2	207.0	0.9	2	1737	0	1737	1728	9
17280	198.9	218.8	0.8	2	1836	0	1836	2074	-238
23040	218.4	240.2	0.6	1	2016	0	2016	2765	-749
28800	236.0	259.6	0.5	1	2178	0	2178	3456	-1278
36000	256.2	281.8	0.5	1	2365	0	2365	4320	-1955

Project: Data Centre-Grange Castle South
Project No.: A093 - AREA 4
Calculation: Attenuation 100-year
Calcs By: DD
Checked By: RFM
Date: 23/1/20

CS CONSULTING GROUP
DUBLIN - LONDON - LIMERICK

Site Location:	Grange Castle		
Design Storm Return Period:	100 years		
Climate Change Factor:	10 %		
Soil Type:	2		
Total Site Area:	0.98 ha		
Hardstand Area:	0.98 ha	.....@	100% Impervious
Softstand Area:	0.00 ha	.....@	0% Impervious
Effective Impermeable Area:	0.98 ha		

Allowable Outflow	**Calculate**	
IH124: QBAR = 0.00108 x $AREA^{0.89}$ x $SAAR^{1.17}$ x $SOIL^{2.17}$		
AREA:	0.0098 km^2	
SAAR:	761 mm	
SOIL:	0.3	
QBAR/ha	2.00 l/s/ha	
Allowable Outflow	**2.0 l/s**	Smallest Allowable Discharge Rate

Storage required =	**1090 m^3**	

Duration (min)	Rainfall 100-Year (mm)	Rainfall 100-Year with CCF (mm)	Intensity (mm/hr)	Discharge (Q = 2.78iA) (l/s)	Proposed Runoff (m^3)	Contiguous Land Runoff (m^3)	Total Runoff (m^3)	Allowable Outflow (m^3)	Storage Required (m^3)
5	16.3	17.9	215.2	571	171	0	171	1	171
10	22.7	25.0	149.8	398	239	0	239	1	238
15	26.8	29.5	117.9	313	282	0	282	2	280
30	33.6	37.0	73.9	196	353	0	353	4	350
60	42.2	46.4	46.4	123	444	0	444	7	437
120	53.0	58.3	29.2	77	557	0	557	14	543
180	60.6	66.7	22.2	59	637	0	637	22	616
240	66.6	73.3	18.3	49	700	0	700	29	672
360	76.1	83.7	14.0	37	800	0	800	43	757
540	87.0	95.7	10.6	28	915	0	915	65	850
720	95.6	105.2	8.8	23	1005	0	1005	86	919
1080	109.3	120.2	6.7	18	1150	0	1150	130	1020
1440	120.1	132.1	5.5	15	1263	0	1263	173	1090
2880	130.9	144.0	3.0	8	1377	0	1377	346	1031
4320	140.4	154.4	2.1	6	1477	0	1477	518	958
5760	148.8	163.7	1.7	5	1565	0	1565	691	874
8640	163.6	180.0	1.2	3.3190	1721	0	1721	1037	684
11520	176.5	194.2	1.0	3	1856	0	1856	1382	474
14400	188.2	207.0	0.9	2	1979	0	1979	1728	251
17280	198.9	218.8	0.8	2	2092	0	2092	2074	18
23040	218.4	240.2	0.6	2	2297	0	2297	2765	-468
28800	236.0	259.6	0.5	1	2482	0	2482	3456	-974
36000	256.2	281.8	0.5	1	2694	0	2694	4320	-1626

FOUL SEWERAGE DESIGN

Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	222.00	Maximum Backdrop Height (m)	0.000
Persons per House	3.00	Min Design Depth for Optimisation (m)	0.000
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
F1.000	53.081	0.354	149.9	0.000	0	0.0	1.500	o	225
F1.001	86.476	0.577	149.9	0.000	0	0.0	1.500	o	225
F1.002	64.716	0.431	150.0	0.000	0	0.0	1.500	o	225
F1.003	75.837	0.506	150.0	0.000	0	0.0	1.500	o	225
F2.000	65.550	0.437	150.0	0.000	0	0.0	1.500	o	225
F2.001	85.254	0.568	150.0	0.000	0	0.0	1.500	o	225
F2.002	50.449	0.841	60.0	0.000	0	0.0	1.500	o	225
F1.004	36.543	0.241	151.6	0.000	0	0.0	1.500	o	225
F3.000	72.377	0.483	149.8	0.000	0	0.0	1.500	o	225
F3.001	80.411	0.536	150.0	0.000	0	0.0	1.500	o	225
F3.002	31.670	0.211	150.1	0.000	0	0.0	1.500	o	225
F3.003	35.122	0.234	150.1	0.000	0	0.0	1.500	o	225
F3.004	36.263	0.181	200.3	0.000	0	0.0	1.500	o	225
F3.005	31.099	0.155	200.6	0.000	0	0.0	1.500	o	225
F3.006	34.457	0.172	200.3	0.000	0	0.0	1.500	o	225

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	69.400	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F1.001	69.046	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F1.002	68.469	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F1.003	68.038	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F2.000	69.500	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F2.001	69.063	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F2.002	68.495	0.000	0.0	0	0.0	0	0.00	1.48	59.0	0.0
F1.004	67.532	0.000	0.0	0	0.0	0	0.00	0.93	37.0	0.0
F3.000	68.600	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F3.001	68.117	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F3.002	67.581	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F3.003	67.370	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F3.004	67.136	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F3.005	66.955	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F3.006	66.800	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
F1.005	89.871	0.449	200.0	0.000	0	0.0	1.500	o	225

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.005	66.628	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0

Manhole Schedules for Foul - Main

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
FFMH1	71.070	1.670	Open Manhole	1050	F1.000	69.400	225				
FFMH2	71.000	1.954	Open Manhole	1200	F1.001	69.046	225	F1.000	69.046	225	
FFMH3	71.036	2.567	Open Manhole	1200	F1.002	68.469	225	F1.001	68.469	225	
FFMH4	71.024	2.986	Open Manhole	1200	F1.003	68.038	225	F1.002	68.038	225	
FFMH7	71.000	1.500	Open Manhole	1050	F2.000	69.500	225				
FFMH8	71.000	1.937	Open Manhole	1200	F2.001	69.063	225	F2.000	69.063	225	
FFMH9	71.000	2.505	Open Manhole	1200	F2.002	68.495	225	F2.001	68.495	225	
FFMH10	71.100	3.568	Open Manhole	1200	F1.004	67.532	225	F1.003	67.532	225	
								F2.002	67.654	225	122
FFMH11	70.100	1.500	Open Manhole	1050	F3.000	68.600	225				
FFMH12	70.100	1.983	Open Manhole	1200	F3.001	68.117	225	F3.000	68.117	225	
FFMH13	70.140	2.559	Open Manhole	1200	F3.002	67.581	225	F3.001	67.581	225	
FFMH14	70.140	2.770	Open Manhole	1200	F3.003	67.370	225	F3.002	67.370	225	
FFMH15	70.772	3.636	Open Manhole	1200	F3.004	67.136	225	F3.003	67.136	225	
FFMH16	71.300	4.345	Open Manhole	1200	F3.005	66.955	225	F3.004	66.955	225	
FFMH18	71.125	4.325	Open Manhole	1200	F3.006	66.800	225	F3.005	66.800	225	
FFMH19	69.752	3.124	Open Manhole	1200	F1.005	66.628	225	F1.004	67.291	225	663
								F3.006	66.628	225	
FFOUL OUTFALL 1	69.800	3.621	Open Manhole	0		OUTFALL		F1.005	66.179	225	

PIPELINE SCHEDULES for Foul - Main

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	o	225	FFMH1	71.070	69.400	1.445	Open Manhole	1050
F1.001	o	225	FFMH2	71.000	69.046	1.729	Open Manhole	1200
F1.002	o	225	FFMH3	71.036	68.469	2.342	Open Manhole	1200
F1.003	o	225	FFMH4	71.024	68.038	2.761	Open Manhole	1200
F2.000	o	225	FFMH7	71.000	69.500	1.275	Open Manhole	1050
F2.001	o	225	FFMH8	71.000	69.063	1.712	Open Manhole	1200
F2.002	o	225	FFMH9	71.000	68.495	2.280	Open Manhole	1200
F1.004	o	225	FFMH10	71.100	67.532	3.343	Open Manhole	1200
F3.000	o	225	FFMH11	70.100	68.600	1.275	Open Manhole	1050
F3.001	o	225	FFMH12	70.100	68.117	1.758	Open Manhole	1200
F3.002	o	225	FFMH13	70.140	67.581	2.334	Open Manhole	1200
F3.003	o	225	FFMH14	70.140	67.370	2.545	Open Manhole	1200
F3.004	o	225	FFMH15	70.772	67.136	3.411	Open Manhole	1200
F3.005	o	225	FFMH16	71.300	66.955	4.120	Open Manhole	1200
F3.006	o	225	FFMH18	71.125	66.800	4.100	Open Manhole	1200
F1.005	o	225	FFMH19	69.752	66.628	2.899	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	53.081	149.9	FFMH2	71.000	69.046	1.729	Open Manhole	1200
F1.001	86.476	149.9	FFMH3	71.036	68.469	2.342	Open Manhole	1200
F1.002	64.716	150.0	FFMH4	71.024	68.038	2.761	Open Manhole	1200
F1.003	75.837	150.0	FFMH10	71.100	67.532	3.343	Open Manhole	1200
F2.000	65.550	150.0	FFMH8	71.000	69.063	1.712	Open Manhole	1200
F2.001	85.254	150.0	FFMH9	71.000	68.495	2.280	Open Manhole	1200
F2.002	50.449	60.0	FFMH10	71.100	67.654	3.221	Open Manhole	1200
F1.004	36.543	151.6	FFMH19	69.752	67.291	2.236	Open Manhole	1200
F3.000	72.377	149.8	FFMH12	70.100	68.117	1.758	Open Manhole	1200
F3.001	80.411	150.0	FFMH13	70.140	67.581	2.334	Open Manhole	1200
F3.002	31.670	150.1	FFMH14	70.140	67.370	2.545	Open Manhole	1200
F3.003	35.122	150.1	FFMH15	70.772	67.136	3.411	Open Manhole	1200
F3.004	36.263	200.3	FFMH16	71.300	66.955	4.120	Open Manhole	1200
F3.005	31.099	200.6	FFMH18	71.125	66.800	4.100	Open Manhole	1200
F3.006	34.457	200.3	FFMH19	69.752	66.628	2.899	Open Manhole	1200
F1.005	89.871	200.0	FFOUL OUTFALL 1	69.800	66.179	3.396	Open Manhole	0

Surcharged Outfall Details for Foul - Main

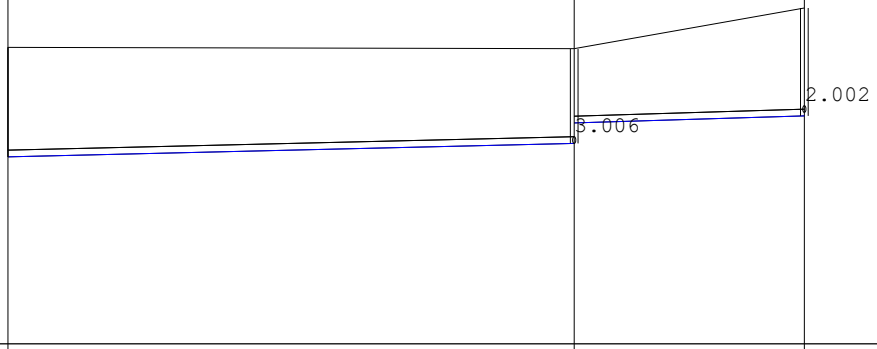
Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F1.005	FFOUL OUTFALL 1	69.800	66.179	66.050	0	0

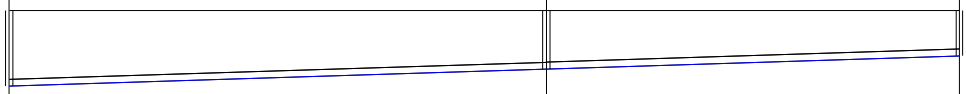
Input Hydrograph Type: User Defined

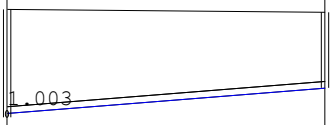
No Input Hydrograph data used for analysis due to offset specified.

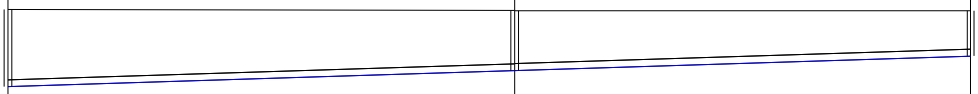
MH Name	FFMH3	FFMH2	FFMH1	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000				
PN		F1.001	F1.000	
Dia (mm)		225	225	
Slope (1:X)		149.9	149.9	
Cover Level (m)	71.036	71.000	71.070	
Invert Level (m)	68.469	69.046	69.046 69.400	
Length (m)		86.476	53.081	

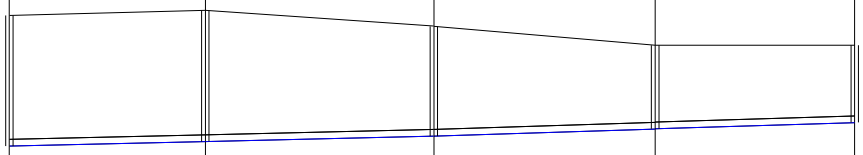
MH Name	FFMH10	FFMH4	FFMH3	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000		2.002		
PN		F1.003	F1.002	
Dia (mm)		225	225	
Slope (1:X)		150.0	150.0	
Cover Level (m)	71.100	71.024	71.036	
Invert Level (m)	67.532	68.038	68.038 68.469	
Length (m)		75.837	64.716	

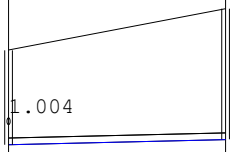
MH Name	FFOUL OUTFALL 1	FFMH19	FFMH10	
Hor Scale 1200 Ver Scale 250 Datum (m) 60.000				
PN		F1.005	F1.004	
Dia (mm)		225	225	
Slope (1:X)		200.0	151.6	
Cover Level (m)	69.800	69.752	71.100	
Invert Level (m)	66.179	66.628	67.291 67.532	
Length (m)		89.871	36.543	

MH Name	FFMH9	FFMH8	FFMH7	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000				
PN		F2.001	F2.000	
Dia (mm)		225	225	
Slope (1:X)		150.0	150.0	
Cover Level (m)	71.000	71.000	71.000	
Invert Level (m)	68.495	69.063	69.063 69.500	
Length (m)		85.254	65.550	

MH Name	FFMH10	FFMH9	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000			
PN		F2.002	
Dia (mm)		225	
Slope (1:X)		60.0	
Cover Level (m)	71.100	71.000	
Invert Level (m)	67.654	68.495	
Length (m)		50.449	

MH Name	FFMH13	FFMH12	FFMH11	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000				
PN		F3.001	F3.000	
Dia (mm)		225	225	
Slope (1:X)		150.0	149.8	
Cover Level (m)	70.140	70.100	70.100	
Invert Level (m)	67.581	68.117	68.117 68.600	
Length (m)		80.411	72.377	

MH Name	FFMH18	FFMH16	FFMH15	FFMH14	FFMH13	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000						
PN		F3.005	F3.004	F3.003	F3.002	
Dia (mm)		225	225	225	225	
Slope (1:X)		200.6	200.3	150.1	150.1	
Cover Level (m)	71.125	71.300	70.772	70.140	70.140	
Invert Level (m)		66.800	66.955	67.136	67.370	67.581
Length (m)		31.099	36.263	35.122	31.670	

MH Name	FFMH19	FFMH18	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000			
PN		F3.006	
Dia (mm)		225	
Slope (1:X)		200.3	
Cover Level (m)	69.752	71.125	
Invert Level (m)		66.628	66.800
Length (m)		34.457	

FOUL SEWERAGE DESIGN

Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	222.00	Maximum Backdrop Height (m)	0.000
Persons per House	3.00	Min Design Depth for Optimisation (m)	0.000
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
F1.000	101.217	0.675	150.0	0.000	0	0.0	1.500	o	225
F1.001	55.748	0.372	150.0	0.000	0	0.0	1.500	o	225
F1.002	25.466	0.170	150.0	0.000	0	0.0	1.500	o	225
F1.003	58.736	0.392	150.0	0.000	0	0.0	1.500	o	225
F2.000	79.757	0.399	200.0	0.000	0	0.0	1.500	o	225
F2.001	18.105	0.091	200.0	0.000	0	0.0	1.500	o	225
F2.002	70.549	0.353	200.0	0.000	0	0.0	1.500	o	225
F1.004	48.624	0.243	200.0	0.000	0	0.0	1.500	o	225
F1.005	56.753	0.284	200.0	0.000	0	0.0	1.500	o	225
F1.006	23.716	0.119	200.0	0.000	0	0.0	1.500	o	225
F1.007	5.608	0.028	200.3	0.000	0	0.0	1.500	o	225

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	69.400	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F1.001	68.725	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F1.002	68.354	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F1.003	68.184	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F2.000	69.240	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F2.001	68.841	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F2.002	68.751	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F1.004	67.792	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F1.005	67.549	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F1.006	67.265	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F1.007	67.147	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0

Manhole Schedules for Foul - Main

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
FFMH30	70.924	1.524	Open Manhole	1050	F1.000	69.400	225				
FFMH31	70.848	2.123	Open Manhole	1200	F1.001	68.725	225	F1.000	68.725	225	
FFMH35	70.700	2.346	Open Manhole	1200	F1.002	68.354	225	F1.001	68.354	225	
FFMH36	70.800	2.616	Open Manhole	1200	F1.003	68.184	225	F1.002	68.184	225	
FFMH38	70.741	1.501	Open Manhole	1050	F2.000	69.240	225				
FFMH39	70.641	1.800	Open Manhole	1200	F2.001	68.841	225	F2.000	68.841	225	
FFMH40	70.722	1.971	Open Manhole	1200	F2.002	68.751	225	F2.001	68.751	225	
FFMH41	70.760	2.968	Open Manhole	1200	F1.004	67.792	225	F1.003	67.792	225	
								F2.002	68.398	225	606
FFMH42	70.760	3.211	Open Manhole	1200	F1.005	67.549	225	F1.004	67.549	225	
FFMH43	70.760	3.495	Open Manhole	1200	F1.006	67.265	225	F1.005	67.265	225	
FFMH44	69.900	2.753	Open Manhole	1200	F1.007	67.147	225	F1.006	67.147	225	
FFOUL OUTFALL 2	69.900	2.781	Open Manhole	0		OUTFALL		F1.007	67.119	225	

PIPELINE SCHEDULES for Foul - Main

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	o	225	FFMH30	70.924	69.400	1.299	Open Manhole	1050
F1.001	o	225	FFMH31	70.848	68.725	1.898	Open Manhole	1200
F1.002	o	225	FFMH35	70.700	68.354	2.121	Open Manhole	1200
F1.003	o	225	FFMH36	70.800	68.184	2.391	Open Manhole	1200
F2.000	o	225	FFMH38	70.741	69.240	1.276	Open Manhole	1050
F2.001	o	225	FFMH39	70.641	68.841	1.575	Open Manhole	1200
F2.002	o	225	FFMH40	70.722	68.751	1.746	Open Manhole	1200
F1.004	o	225	FFMH41	70.760	67.792	2.743	Open Manhole	1200
F1.005	o	225	FFMH42	70.760	67.549	2.986	Open Manhole	1200
F1.006	o	225	FFMH43	70.760	67.265	3.270	Open Manhole	1200
F1.007	o	225	FFMH44	69.900	67.147	2.528	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	101.217	150.0	FFMH31	70.848	68.725	1.898	Open Manhole	1200
F1.001	55.748	150.0	FFMH35	70.700	68.354	2.121	Open Manhole	1200
F1.002	25.466	150.0	FFMH36	70.800	68.184	2.391	Open Manhole	1200
F1.003	58.736	150.0	FFMH41	70.760	67.792	2.743	Open Manhole	1200
F2.000	79.757	200.0	FFMH39	70.641	68.841	1.575	Open Manhole	1200
F2.001	18.105	200.0	FFMH40	70.722	68.751	1.746	Open Manhole	1200
F2.002	70.549	200.0	FFMH41	70.760	68.398	2.137	Open Manhole	1200
F1.004	48.624	200.0	FFMH42	70.760	67.549	2.986	Open Manhole	1200
F1.005	56.753	200.0	FFMH43	70.760	67.265	3.270	Open Manhole	1200
F1.006	23.716	200.0	FFMH44	69.900	67.147	2.528	Open Manhole	1200
F1.007	5.608	200.3	FFOUL OUTFALL 2	69.900	67.119	2.556	Open Manhole	0

Surcharged Outfall Details for Foul - Main

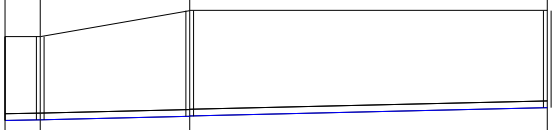
Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F1.007	FFOUL OUTFALL 2	69.900	67.119	67.110	0	0

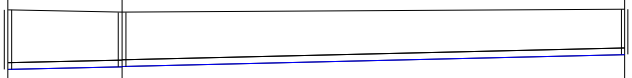
Input Hydrograph Type: User Defined

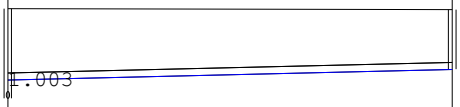
No Input Hydrograph data used for analysis due to offset specified.

MH Name	FFMH35	FFMH31	FFMH30
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000			
PN		F1.001	F1.000
Dia (mm)		225	225
Slope (1:X)		150.0	150.0
Cover Level (m)	70.700	70.848	70.924
Invert Level (m)		68.354 / 68.725	68.725 / 69.400
Length (m)		55.748	101.217

MH Name	FFMH42	FFMH41	FFMH36	FFMH35
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000			2.002	
PN		F1.004	F1.003	F1.002
Dia (mm)		225	225	225
Slope (1:X)		200.0	150.0	150.0
Cover Level (m)	70.760	70.760	70.800	70.700
Invert Level (m)		67.549 / 67.792	67.792 / 68.184	68.184 / 68.354
Length (m)		48.624	58.736	25.466

MH Name	FFOUL OUTFALL 2		FFMH43	FFMH42	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000					
PN			F1.006	F1.005	
Dia (mm)			225	225	
Slope (1:X)			200.0	200.0	
Cover Level (m)	69.900	69.900	70.760	70.760	
Invert Level (m)		67.147	67.147 67.265	67.265 67.549	
Length (m)			23.716	56.753	

MH Name	FFMH40	FFMH39	FFMH38	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000				
PN		F2.001	F2.000	
Dia (mm)		225	225	
Slope (1:X)		200.0	200.0	
Cover Level (m)	70.722	70.641	70.741	
Invert Level (m)		68.751 68.841	68.841 69.240	
Length (m)		18.105	79.757	

MH Name	FFMH41	FFMH40	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000			
PN		F2.002	
Dia (mm)		225	
Slope (1:X)		200.0	
Cover Level (m)	70.760	70.722	
Invert Level (m)	68.398	68.751	
Length (m)		70.549	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	Add Flow / Climate Change (%)	0
M5-60 (mm)	16.000	Minimum Backdrop Height (m)	0.000
Ratio R	0.269	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	0.000
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500
PIMP (%)	100		

Designed with Level Inverts

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	44.030	0.143	307.9	0.014	4.00	0.0	0.600	o	300
1.001	47.292	0.198	239.2	0.175	0.00	0.0	0.600	o	300
2.000	25.425	0.416	61.1	0.092	4.00	0.0	0.600	o	225
2.001	44.477	0.851	52.3	0.000	0.00	0.0	0.600	o	225
2.002	46.635	0.766	60.9	0.136	0.00	0.0	0.600	o	300
1.002	26.987	0.101	267.2	0.243	0.00	0.0	0.600	o	450
3.000	30.464	0.500	60.9	0.082	4.00	0.0	0.600	o	225
1.003	38.562	0.107	360.4	0.269	0.00	0.0	0.600	o	525
4.000	37.578	0.138	272.3	0.140	4.00	0.0	0.600	o	300
4.001	24.994	0.087	287.3	0.111	0.00	0.0	0.600	o	300
1.004	28.969	0.049	588.4	0.082	0.00	0.0	0.600	o	525
1.005	4.463	0.015	297.5	0.180	0.00	0.0	0.600	o	525

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.82	69.000	0.014	0.0	0.0	0.0	0.89	63.0	1.9
1.001	50.00	5.60	68.857	0.189	0.0	0.0	0.0	1.01	71.6	25.6
2.000	50.00	4.25	72.000	0.092	0.0	0.0	0.0	1.68	66.6	12.5
2.001	50.00	4.66	70.000	0.092	0.0	0.0	0.0	1.81	72.1	12.5
2.002	50.00	5.05	69.149	0.229	0.0	0.0	0.0	2.02	142.7	31.0
1.002	50.00	5.97	68.383	0.661	0.0	0.0	0.0	1.24	197.0	89.5
3.000	50.00	4.30	69.500	0.082	0.0	0.0	0.0	1.68	66.7	11.2
1.003	50.00	6.51	68.282	1.012	0.0	0.0	0.0	1.17	254.1	137.0
4.000	50.00	4.66	69.100	0.140	0.0	0.0	0.0	0.95	67.0	19.0
4.001	50.00	5.11	68.962	0.251	0.0	0.0	0.0	0.92	65.2	34.0
1.004	50.00	7.04	68.175	1.345	0.0	0.0	0.0	0.92	198.3	182.2
1.005	50.00	7.10	68.126	1.526	0.0	0.0	0.0	1.29	280.0	206.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
1.006	91.969	0.173	531.6	0.103	0.00	0.0	0.600	o	600
1.007	89.947	0.180	499.7	0.381	0.00	0.0	0.600	o	600
5.000	11.775	0.133	88.5	0.056	4.00	0.0	0.600	o	225
1.008	31.438	0.050	628.8	0.463	0.00	0.0	0.600	o	675
6.000	71.286	0.237	300.8	0.407	4.00	0.0	0.600	o	525
6.001	73.221	0.245	298.9	0.615	0.00	0.0	0.600	o	525
6.002	33.915	0.076	446.3	0.290	0.00	0.0	0.600	o	525
6.003	25.026	0.034	736.1	0.056	0.00	0.0	0.600	o	600
6.004	11.719	0.042	279.0	0.041	0.00	0.0	0.600	o	600
7.000	23.296	0.223	104.5	0.040	4.00	0.0	0.600	o	225
6.005	19.679	0.088	223.6	0.031	0.00	0.0	0.600	o	600
8.000	23.407	0.221	105.9	0.021	4.00	0.0	0.600	o	225
6.006	31.529	0.098	322.3	0.149	0.00	0.0	0.600	o	600
9.000	23.399	0.074	316.2	0.032	4.00	0.0	0.600	o	225
6.007	27.796	0.095	293.1	0.066	0.00	0.0	0.600	o	600
1.009	11.275	0.022	512.5	0.016	0.00	0.0	0.600	o	750
1.010	8.564	0.014	611.0	0.000	0.00	0.0	0.600	o	825
1.011	34.180	0.035	971.9	0.000	0.00	0.0	0.600	o	825

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.006	47.67	8.56	68.111	1.629	0.0	0.0	0.0	1.05	296.6	210.3
1.007	44.52	9.94	67.938	2.010	0.0	0.0	0.0	1.08	306.1	242.3
5.000	50.00	4.14	68.750	0.056	0.0	0.0	0.0	1.39	55.3	7.6
1.008	43.49	10.45	67.758	2.529	0.0	0.0	0.0	1.04	371.4	297.9
6.000	50.00	4.92	68.644	0.407	0.0	0.0	0.0	1.29	278.4	55.2
6.001	50.00	5.87	68.407	1.023	0.0	0.0	0.0	1.29	279.3	138.5
6.002	50.00	6.41	68.162	1.313	0.0	0.0	0.0	1.05	228.1	177.8
6.003	50.00	6.87	68.086	1.369	0.0	0.0	0.0	0.89	251.6	185.4
6.004	50.00	7.01	68.052	1.410	0.0	0.0	0.0	1.45	410.8	191.0
7.000	50.00	4.30	69.400	0.040	0.0	0.0	0.0	1.28	50.9	5.4
6.005	50.00	7.21	68.010	1.481	0.0	0.0	0.0	1.62	459.3	200.5
8.000	50.00	4.31	69.440	0.021	0.0	0.0	0.0	1.27	50.5	2.8
6.006	50.00	7.60	67.922	1.650	0.0	0.0	0.0	1.35	382.0	223.5
9.000	50.00	4.53	69.400	0.032	0.0	0.0	0.0	0.73	29.0	4.4
6.007	49.30	7.93	67.824	1.749	0.0	0.0	0.0	1.42	400.7	233.6
1.009	43.19	10.60	67.708	4.294	0.0	0.0	0.0	1.23	543.1	502.3
1.010	42.96	10.72	67.686	4.294	0.0	0.0	0.0	1.19	638.1	502.3
1.011	41.85	11.32	67.672	4.294	0.0	0.0	0.0	0.94	504.6	502.3

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
1.012	73.221	0.073	1003.0	0.000	0.00	0.0	0.600	o	900
1.013	18.845	0.031	607.9	0.000	0.00	0.0	0.600	o	225

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.012	39.77	12.57	67.637	4.294	0.0	0.0	0.0	0.98	624.0	502.3
1.013	50.00	4.60	67.500	0.000	8.6	0.0	0.0	0.52	20.8	8.6

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SWMHA1.1	70.800	1.800	Open Manhole	1200	1.000	69.000	300				
SWMHA1.5	70.809	1.952	Open Manhole	1200	1.001	68.857	300	1.000	68.857	300	
SWMHA1.6	74.450	2.450	Open Manhole	1200	2.000	72.000	225				
SWMHA1.7	73.740	3.740	Open Manhole	1200	2.001	70.000	225	2.000	71.584	225	1584
SWMHA1.8	71.850	2.701	Open Manhole	1200	2.002	69.149	300	2.001	69.149	225	
SWMHA1.9	70.794	2.411	Open Manhole	1500	1.002	68.383	450	1.001	68.659	300	126
								2.002	68.383	300	
SWMHA1.10	71.050	1.550	Open Manhole	1200	3.000	69.500	225				
SWMHA1.11	70.720	2.438	Open Manhole	1500	1.003	68.282	525	1.002	68.282	450	
								3.000	69.000	225	418
SWMHA1.12	70.840	1.740	Open Manhole	1200	4.000	69.100	300				
SWMHA1.13	70.650	1.688	Open Manhole	1200	4.001	68.962	300	4.000	68.962	300	
SWMHA1.14	70.861	2.686	Open Manhole	1500	1.004	68.175	525	1.003	68.175	525	
								4.001	68.875	300	475
SWMHA1.17	71.150	3.024	Open Manhole	1500	1.005	68.126	525	1.004	68.126	525	
SWMHA1.18	71.100	2.989	Open Manhole	1500	1.006	68.111	600	1.005	68.111	525	
SWMHA1.19	71.000	3.062	Open Manhole	1500	1.007	67.938	600	1.006	67.938	600	
SWMHA1.20	70.050	1.300	Open Manhole	1200	5.000	68.750	225				
SWMHA1.21	71.000	3.242	Open Manhole	1500	1.008	67.758	675	1.007	67.758	600	
								5.000	68.617	225	409
SWMHA1.22	71.200	2.556	Open Manhole	1500	6.000	68.644	525				
SWMHA1.23	71.000	2.593	Open Manhole	1500	6.001	68.407	525	6.000	68.407	525	
SWMHA1.24	70.900	2.738	Open Manhole	1500	6.002	68.162	525	6.001	68.162	525	
SWMHA1.25	71.200	3.114	Open Manhole	1500	6.003	68.086	600	6.002	68.086	525	
SWMHA1.29	71.000	2.948	Open Manhole	1500	6.004	68.052	600	6.003	68.052	600	
SWMHA1.30	70.900	1.500	Open Manhole	1200	7.000	69.400	225				
SWMHA1.31	71.100	3.090	Open Manhole	1500	6.005	68.010	600	6.004	68.010	600	
								7.000	69.177	225	792
SWMHA1.32	70.940	1.500	Open Manhole	1200	8.000	69.440	225				
SWMHA1.33	70.940	3.018	Open Manhole	1500	6.006	67.922	600	6.005	67.922	600	
								8.000	69.219	225	922
SWMHA1.34	70.900	1.500	Open Manhole	1200	9.000	69.400	225				
SWMHA1.35	71.039	3.215	Open Manhole	1500	6.007	67.824	600	6.006	67.824	600	
								9.000	69.326	225	1127
SWMHA1.36	71.024	3.316	Open Manhole	1800	1.009	67.708	750	1.008	67.708	675	
								6.007	67.729	600	
SWMHA1.37	70.000	2.314	Open Manhole	1800	1.010	67.686	825	1.009	67.686	750	
SWMHA1.38	69.500	1.828	Open Manhole	1800	1.011	67.672	825	1.010	67.672	825	
SWMHA1.39	69.500	1.863	Open Manhole	1800	1.012	67.637	900	1.011	67.637	825	
SWMHA1.40	70.000	2.500	Open Manhole	1800	1.013	67.500	225	1.012	67.564	900	739
SW AREA 1 OUTFALL	69.800	2.331	Open Manhole	0		OUTFALL		1.013	67.469	225	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	SWMHA1.1	70.800	69.000	1.500	Open Manhole	1200
1.001	o	300	SWMHA1.5	70.809	68.857	1.652	Open Manhole	1200
2.000	o	225	SWMHA1.6	74.450	72.000	2.225	Open Manhole	1200
2.001	o	225	SWMHA1.7	73.740	70.000	3.515	Open Manhole	1200
2.002	o	300	SWMHA1.8	71.850	69.149	2.401	Open Manhole	1200
1.002	o	450	SWMHA1.9	70.794	68.383	1.961	Open Manhole	1500
3.000	o	225	SWMHA1.10	71.050	69.500	1.325	Open Manhole	1200
1.003	o	525	SWMHA1.11	70.720	68.282	1.913	Open Manhole	1500
4.000	o	300	SWMHA1.12	70.840	69.100	1.440	Open Manhole	1200
4.001	o	300	SWMHA1.13	70.650	68.962	1.388	Open Manhole	1200
1.004	o	525	SWMHA1.14	70.861	68.175	2.161	Open Manhole	1500
1.005	o	525	SWMHA1.17	71.150	68.126	2.499	Open Manhole	1500
1.006	o	600	SWMHA1.18	71.100	68.111	2.389	Open Manhole	1500
1.007	o	600	SWMHA1.19	71.000	67.938	2.462	Open Manhole	1500
5.000	o	225	SWMHA1.20	70.050	68.750	1.075	Open Manhole	1200
1.008	o	675	SWMHA1.21	71.000	67.758	2.567	Open Manhole	1500
6.000	o	525	SWMHA1.22	71.200	68.644	2.031	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	44.030	307.9	SWMHA1.5	70.809	68.857	1.652	Open Manhole	1200
1.001	47.292	239.2	SWMHA1.9	70.794	68.659	1.835	Open Manhole	1500
2.000	25.425	61.1	SWMHA1.7	73.740	71.584	1.931	Open Manhole	1200
2.001	44.477	52.3	SWMHA1.8	71.850	69.149	2.476	Open Manhole	1200
2.002	46.635	60.9	SWMHA1.9	70.794	68.383	2.111	Open Manhole	1500
1.002	26.987	267.2	SWMHA1.11	70.720	68.282	1.988	Open Manhole	1500
3.000	30.464	60.9	SWMHA1.11	70.720	69.000	1.495	Open Manhole	1500
1.003	38.562	360.4	SWMHA1.14	70.861	68.175	2.161	Open Manhole	1500
4.000	37.578	272.3	SWMHA1.13	70.650	68.962	1.388	Open Manhole	1200
4.001	24.994	287.3	SWMHA1.14	70.861	68.875	1.686	Open Manhole	1500
1.004	28.969	588.4	SWMHA1.17	71.150	68.126	2.499	Open Manhole	1500
1.005	4.463	297.5	SWMHA1.18	71.100	68.111	2.464	Open Manhole	1500
1.006	91.969	531.6	SWMHA1.19	71.000	67.938	2.462	Open Manhole	1500
1.007	89.947	499.7	SWMHA1.21	71.000	67.758	2.642	Open Manhole	1500
5.000	11.775	88.5	SWMHA1.21	71.000	68.617	2.158	Open Manhole	1500
1.008	31.438	628.8	SWMHA1.36	71.024	67.708	2.641	Open Manhole	1800
6.000	71.286	300.8	SWMHA1.23	71.000	68.407	2.068	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
6.001	o	525	SWMHA1.23	71.000	68.407	2.068	Open Manhole	1500
6.002	o	525	SWMHA1.24	70.900	68.162	2.213	Open Manhole	1500
6.003	o	600	SWMHA1.25	71.200	68.086	2.514	Open Manhole	1500
6.004	o	600	SWMHA1.29	71.000	68.052	2.348	Open Manhole	1500
7.000	o	225	SWMHA1.30	70.900	69.400	1.275	Open Manhole	1200
6.005	o	600	SWMHA1.31	71.100	68.010	2.490	Open Manhole	1500
8.000	o	225	SWMHA1.32	70.940	69.440	1.275	Open Manhole	1200
6.006	o	600	SWMHA1.33	70.940	67.922	2.418	Open Manhole	1500
9.000	o	225	SWMHA1.34	70.900	69.400	1.275	Open Manhole	1200
6.007	o	600	SWMHA1.35	71.039	67.824	2.615	Open Manhole	1500
1.009	o	750	SWMHA1.36	71.024	67.708	2.566	Open Manhole	1800
1.010	o	825	SWMHA1.37	70.000	67.686	1.489	Open Manhole	1800
1.011	o	825	SWMHA1.38	69.500	67.672	1.003	Open Manhole	1800
1.012	o	900	SWMHA1.39	69.500	67.637	0.963	Open Manhole	1800
1.013	o	225	SWMHA1.40	70.000	67.500	2.275	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
6.001	73.221	298.9	SWMHA1.24	70.900	68.162	2.213	Open Manhole	1500
6.002	33.915	446.3	SWMHA1.25	71.200	68.086	2.589	Open Manhole	1500
6.003	25.026	736.1	SWMHA1.29	71.000	68.052	2.348	Open Manhole	1500
6.004	11.719	279.0	SWMHA1.31	71.100	68.010	2.490	Open Manhole	1500
7.000	23.296	104.5	SWMHA1.31	71.100	69.177	1.698	Open Manhole	1500
6.005	19.679	223.6	SWMHA1.33	70.940	67.922	2.418	Open Manhole	1500
8.000	23.407	105.9	SWMHA1.33	70.940	69.219	1.496	Open Manhole	1500
6.006	31.529	322.3	SWMHA1.35	71.039	67.824	2.615	Open Manhole	1500
9.000	23.399	316.2	SWMHA1.35	71.039	69.326	1.488	Open Manhole	1500
6.007	27.796	293.1	SWMHA1.36	71.024	67.729	2.695	Open Manhole	1800
1.009	11.275	512.5	SWMHA1.37	70.000	67.686	1.564	Open Manhole	1800
1.010	8.564	611.0	SWMHA1.38	69.500	67.672	1.003	Open Manhole	1800
1.011	34.180	971.9	SWMHA1.39	69.500	67.637	1.038	Open Manhole	1800
1.012	73.221	1003.0	SWMHA1.40	70.000	67.564	1.536	Open Manhole	1800
1.013	18.845	607.9	SW AREA 1 OUTFALL	69.800	67.469	2.106	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.014	0.014	0.014
1.001	User	-	100	0.130	0.130	0.130
	User	-	100	0.045	0.045	0.175
2.000	User	-	100	0.092	0.092	0.092
2.001	-	-	100	0.000	0.000	0.000
2.002	User	-	100	0.136	0.136	0.136
1.002	User	-	100	0.182	0.182	0.182
	User	-	100	0.061	0.061	0.243
3.000	User	-	100	0.082	0.082	0.082
1.003	User	-	100	0.269	0.269	0.269
4.000	User	-	100	0.140	0.140	0.140
4.001	User	-	100	0.111	0.111	0.111
1.004	User	-	100	0.082	0.082	0.082
1.005	User	-	100	0.115	0.115	0.115
	User	-	100	0.066	0.066	0.180
1.006	User	-	100	0.103	0.103	0.103
1.007	User	-	100	0.381	0.381	0.381
5.000	User	-	100	0.056	0.056	0.056
1.008	User	-	100	0.414	0.414	0.414
	User	-	100	0.049	0.049	0.463
6.000	User	-	100	0.407	0.407	0.407
6.001	User	-	100	0.615	0.615	0.615
6.002	User	-	100	0.290	0.290	0.290
6.003	User	-	100	0.040	0.040	0.040
	User	-	100	0.016	0.016	0.056
6.004	User	-	100	0.025	0.025	0.025
	User	-	100	0.016	0.016	0.041
7.000	User	-	100	0.040	0.040	0.040
6.005	User	-	100	0.031	0.031	0.031
8.000	User	-	100	0.021	0.021	0.021
6.006	User	-	100	0.149	0.149	0.149
9.000	User	-	100	0.032	0.032	0.032
6.007	User	-	100	0.066	0.066	0.066
1.009	User	-	100	0.016	0.016	0.016
1.010	-	-	100	0.000	0.000	0.000
1.011	-	-	100	0.000	0.000	0.000
1.012	-	-	100	0.000	0.000	0.000
1.013	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				4.294	4.294	4.294

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.013	SW AREA 1 OUTFALL	69.800	67.469	67.400	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	10.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	1.000
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	5760
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	24

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.000	Storm Duration (mins)	2880
Ratio R	0.269		

Online Controls for Storm

Weir Manhole: SWMHA1.39, DS/PN: 1.012, Volume (m³): 22.1

Discharge Coef 0.544 Width (m) 1.800 Invert Level (m) 68.600

Depth/Flow Relationship Manhole: SWMHA1.40, DS/PN: 1.013, Volume (m³): 51.8

Invert Level (m) 67.564

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	8.6000	1.400	8.6000	2.600	8.6000	3.800	8.6000	5.000	8.6000
0.400	8.6000	1.600	8.6000	2.800	8.6000	4.000	8.6000	5.200	8.6000
0.600	8.6000	1.800	8.6000	3.000	8.6000	4.200	8.6000	5.400	8.6000
0.800	8.6000	2.000	8.6000	3.200	8.6000	4.400	8.6000	5.600	8.6000
1.000	8.6000	2.200	8.6000	3.400	8.6000	4.600	8.6000	5.800	8.6000
1.200	8.6000	2.400	8.6000	3.600	8.6000	4.800	8.6000	6.000	8.6000

Storage Structures for Storm

Infiltration Basin Manhole: SWMHA1.39, DS/PN: 1.012

Invert Level (m) 67.581 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	400.0	1.200	0.0	2.400	0.0	3.600	0.0	4.800	0.0
0.200	480.0	1.400	0.0	2.600	0.0	3.800	0.0	5.000	0.0
0.400	560.0	1.600	0.0	2.800	0.0	4.000	0.0		
0.600	640.0	1.800	0.0	3.000	0.0	4.200	0.0		
0.800	720.0	2.000	0.0	3.200	0.0	4.400	0.0		
1.000	802.0	2.200	0.0	3.400	0.0	4.600	0.0		

Tank or Pond Manhole: SWMHA1.40, DS/PN: 1.013

Invert Level (m) 67.564

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	4100.0	1.200	0.0	2.400	0.0	3.600	0.0	4.800	0.0
0.200	4100.0	1.400	0.0	2.600	0.0	3.800	0.0	5.000	0.0
0.400	4100.0	1.600	0.0	2.800	0.0	4.000	0.0		
0.600	4100.0	1.800	0.0	3.000	0.0	4.200	0.0		
0.800	4100.0	2.000	0.0	3.200	0.0	4.400	0.0		
1.000	4100.0	2.200	0.0	3.400	0.0	4.600	0.0		

Summary of Results for 15 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA1.1	70.027	0.727	0.000	0.09	0.0	5.4	SURCHARGED
1.001	SWMHA1.5	70.025	0.868	0.000	0.61	0.0	41.2	SURCHARGED
2.000	SWMHA1.6	72.119	-0.106	0.000	0.55	0.0	33.9	OK
2.001	SWMHA1.7	70.160	-0.065	0.000	0.49	0.0	33.5	OK
2.002	SWMHA1.8	70.082	0.633	0.000	0.53	0.0	70.6	SURCHARGED
1.002	SWMHA1.9	69.969	1.136	0.000	0.90	0.0	150.0	SURCHARGED
3.000	SWMHA1.10	69.935	0.210	0.000	0.48	0.0	30.2	SURCHARGED
1.003	SWMHA1.11	69.897	1.090	0.000	1.05	0.0	232.1	SURCHARGED
4.000	SWMHA1.12	69.900	0.500	0.000	0.74	0.0	46.0	SURCHARGED
4.001	SWMHA1.13	69.863	0.601	0.000	1.29	0.0	75.1	SURCHARGED
1.004	SWMHA1.14	69.797	1.097	0.000	1.81	0.0	297.5	SURCHARGED
1.005	SWMHA1.17	69.648	0.998	0.000	2.06	0.0	336.6	SURCHARGED
1.006	SWMHA1.18	69.532	0.822	0.000	1.23	0.0	337.3	SURCHARGED
1.007	SWMHA1.19	69.267	0.729	0.000	1.33	0.0	376.8	SURCHARGED
5.000	SWMHA1.20	68.932	-0.043	0.000	0.44	0.0	20.7	OK
1.008	SWMHA1.21	68.920	0.487	0.000	1.47	0.0	438.6	SURCHARGED
6.000	SWMHA1.22	69.603	0.434	0.000	0.51	0.0	130.4	SURCHARGED
6.001	SWMHA1.23	69.569	0.637	0.000	0.93	0.0	239.3	SURCHARGED
6.002	SWMHA1.24	69.378	0.691	0.000	1.50	0.0	292.5	SURCHARGED
6.003	SWMHA1.25	69.226	0.540	0.000	1.81	0.0	296.9	SURCHARGED
6.004	SWMHA1.29	69.154	0.502	0.000	1.11	0.0	301.8	SURCHARGED
7.000	SWMHA1.30	69.486	-0.139	0.000	0.31	0.0	14.6	OK
6.005	SWMHA1.31	69.103	0.493	0.000	0.91	0.0	312.3	SURCHARGED
8.000	SWMHA1.32	69.501	-0.164	0.000	0.16	0.0	7.6	OK
6.006	SWMHA1.33	69.032	0.510	0.000	1.07	0.0	335.1	SURCHARGED
9.000	SWMHA1.34	69.505	-0.120	0.000	0.45	0.0	11.9	OK
6.007	SWMHA1.35	68.918	0.494	0.000	1.08	0.0	347.8	SURCHARGED
1.009	SWMHA1.36	68.805	0.348	0.000	3.17	0.0	789.7	SURCHARGED
1.010	SWMHA1.37	68.640	0.130	0.000	2.36	0.0	790.1	SURCHARGED
1.011	SWMHA1.38	68.562	0.065	0.000	2.37	0.0	779.8	SURCHARGED
1.012	SWMHA1.39	68.494	-0.043	0.000	0.00	0.0	0.0	OK
1.013	SWMHA1.40	67.503	-0.222	0.000	0.00	0.0	0.0	OK

Summary of Results for 30 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA1.1	70.035	0.735	0.000	0.08	0.0	5.0	SURCHARGED
1.001	SWMHA1.5	70.032	0.875	0.000	0.58	0.0	39.1	SURCHARGED
2.000	SWMHA1.6	72.104	-0.121	0.000	0.44	0.0	26.9	OK
2.001	SWMHA1.7	70.142	-0.083	0.000	0.39	0.0	26.9	OK
2.002	SWMHA1.8	70.072	0.623	0.000	0.44	0.0	58.8	SURCHARGED
1.002	SWMHA1.9	69.975	1.142	0.000	0.82	0.0	137.0	SURCHARGED
3.000	SWMHA1.10	69.948	0.223	0.000	0.38	0.0	23.9	SURCHARGED
1.003	SWMHA1.11	69.909	1.102	0.000	0.95	0.0	208.9	SURCHARGED
4.000	SWMHA1.12	69.916	0.516	0.000	0.58	0.0	36.2	SURCHARGED
4.001	SWMHA1.13	69.879	0.617	0.000	0.99	0.0	57.8	SURCHARGED
1.004	SWMHA1.14	69.816	1.116	0.000	1.67	0.0	274.3	SURCHARGED
1.005	SWMHA1.17	69.681	1.030	0.000	1.90	0.0	310.4	SURCHARGED
1.006	SWMHA1.18	69.579	0.868	0.000	1.18	0.0	323.8	SURCHARGED
1.007	SWMHA1.19	69.330	0.792	0.000	1.36	0.0	384.5	SURCHARGED
5.000	SWMHA1.20	68.998	0.023	0.000	0.35	0.0	16.5	SURCHARGED
1.008	SWMHA1.21	68.983	0.550	0.000	1.60	0.0	476.2	SURCHARGED
6.000	SWMHA1.22	69.673	0.504	0.000	0.40	0.0	102.1	SURCHARGED
6.001	SWMHA1.23	69.637	0.705	0.000	0.88	0.0	227.9	SURCHARGED
6.002	SWMHA1.24	69.447	0.760	0.000	1.46	0.0	284.6	SURCHARGED
6.003	SWMHA1.25	69.290	0.604	0.000	1.79	0.0	293.7	SURCHARGED
6.004	SWMHA1.29	69.216	0.564	0.000	1.11	0.0	300.2	SURCHARGED
7.000	SWMHA1.30	69.476	-0.149	0.000	0.25	0.0	11.5	OK
6.005	SWMHA1.31	69.164	0.554	0.000	0.91	0.0	312.8	SURCHARGED
8.000	SWMHA1.32	69.494	-0.171	0.000	0.13	0.0	6.0	OK
6.006	SWMHA1.33	69.091	0.569	0.000	1.09	0.0	341.6	SURCHARGED
9.000	SWMHA1.34	69.493	-0.132	0.000	0.35	0.0	9.4	OK
6.007	SWMHA1.35	68.973	0.549	0.000	1.12	0.0	359.4	SURCHARGED
1.009	SWMHA1.36	68.853	0.395	0.000	3.36	0.0	835.2	SURCHARGED
1.010	SWMHA1.37	68.782	0.271	0.000	2.50	0.0	836.3	SURCHARGED
1.011	SWMHA1.38	68.771	0.275	0.000	2.52	0.0	828.8	SURCHARGED
1.012	SWMHA1.39	68.756	0.219	0.000	0.34	0.0	185.8	SURCHARGED
1.013	SWMHA1.40	67.592	-0.133	0.000	0.08	0.0	1.2	OK

Summary of Results for 45 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA1.1	69.777	0.477	0.000	0.06	0.0	3.7	SURCHARGED
1.001	SWMHA1.5	69.775	0.618	0.000	0.51	0.0	34.1	SURCHARGED
2.000	SWMHA1.6	72.092	-0.133	0.000	0.35	0.0	21.6	OK
2.001	SWMHA1.7	70.087	-0.138	0.000	0.31	0.0	21.4	OK
2.002	SWMHA1.8	69.800	0.351	0.000	0.35	0.0	46.2	SURCHARGED
1.002	SWMHA1.9	69.723	0.890	0.000	0.75	0.0	124.5	SURCHARGED
3.000	SWMHA1.10	69.707	-0.018	0.000	0.31	0.0	19.2	OK
1.003	SWMHA1.11	69.669	0.862	0.000	0.86	0.0	190.1	SURCHARGED
4.000	SWMHA1.12	69.681	0.281	0.000	0.49	0.0	30.3	SURCHARGED
4.001	SWMHA1.13	69.646	0.384	0.000	0.80	0.0	46.5	SURCHARGED
1.004	SWMHA1.14	69.593	0.893	0.000	1.53	0.0	251.2	SURCHARGED
1.005	SWMHA1.17	69.483	0.832	0.000	1.74	0.0	284.4	SURCHARGED
1.006	SWMHA1.18	69.423	0.713	0.000	1.08	0.0	296.8	SURCHARGED
1.007	SWMHA1.19	69.214	0.676	0.000	1.26	0.0	358.1	SURCHARGED
5.000	SWMHA1.20	68.991	0.016	0.000	0.28	0.0	13.2	SURCHARGED
1.008	SWMHA1.21	68.985	0.552	0.000	1.49	0.0	443.3	SURCHARGED
6.000	SWMHA1.22	69.473	0.304	0.000	0.33	0.0	83.9	SURCHARGED
6.001	SWMHA1.23	69.440	0.508	0.000	0.79	0.0	203.5	SURCHARGED
6.002	SWMHA1.24	69.289	0.602	0.000	1.32	0.0	256.2	SURCHARGED
6.003	SWMHA1.25	69.157	0.471	0.000	1.60	0.0	261.8	SURCHARGED
6.004	SWMHA1.29	69.095	0.443	0.000	0.99	0.0	269.4	SURCHARGED
7.000	SWMHA1.30	69.468	-0.157	0.000	0.20	0.0	9.2	OK
6.005	SWMHA1.31	69.052	0.442	0.000	0.82	0.0	282.1	SURCHARGED
8.000	SWMHA1.32	69.489	-0.176	0.000	0.10	0.0	4.8	OK
6.006	SWMHA1.33	68.995	0.473	0.000	0.99	0.0	311.3	SURCHARGED
9.000	SWMHA1.34	69.482	-0.143	0.000	0.28	0.0	7.5	OK
6.007	SWMHA1.35	68.972	0.548	0.000	1.02	0.0	328.7	SURCHARGED
1.009	SWMHA1.36	68.947	0.489	0.000	3.12	0.0	775.4	SURCHARGED
1.010	SWMHA1.37	68.916	0.405	0.000	2.32	0.0	775.8	SURCHARGED
1.011	SWMHA1.38	68.894	0.398	0.000	2.34	0.0	770.3	SURCHARGED
1.012	SWMHA1.39	68.856	0.319	0.000	0.69	0.0	371.5	SURCHARGED
1.013	SWMHA1.40	67.635	-0.090	0.000	0.20	0.0	3.0	OK

Summary of Results for 60 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA1.1	69.522	0.222	0.000	0.04	0.0	2.6	SURCHARGED
1.001	SWMHA1.5	69.519	0.362	0.000	0.47	0.0	31.3	SURCHARGED
2.000	SWMHA1.6	72.084	-0.141	0.000	0.30	0.0	18.4	OK
2.001	SWMHA1.7	70.079	-0.146	0.000	0.27	0.0	18.3	OK
2.002	SWMHA1.8	69.535	0.086	0.000	0.32	0.0	42.3	SURCHARGED
1.002	SWMHA1.9	69.472	0.639	0.000	0.67	0.0	112.2	SURCHARGED
3.000	SWMHA1.10	69.578	-0.147	0.000	0.26	0.0	16.4	OK
1.003	SWMHA1.11	69.425	0.618	0.000	0.78	0.0	172.4	SURCHARGED
4.000	SWMHA1.12	69.440	0.040	0.000	0.44	0.0	27.1	SURCHARGED
4.001	SWMHA1.13	69.409	0.147	0.000	0.76	0.0	44.4	SURCHARGED
1.004	SWMHA1.14	69.362	0.662	0.000	1.38	0.0	225.6	SURCHARGED
1.005	SWMHA1.17	69.270	0.620	0.000	1.56	0.0	255.6	SURCHARGED
1.006	SWMHA1.18	69.221	0.511	0.000	0.98	0.0	269.5	SURCHARGED
1.007	SWMHA1.19	69.145	0.607	0.000	1.15	0.0	326.9	SURCHARGED
5.000	SWMHA1.20	69.059	0.084	0.000	0.24	0.0	11.2	SURCHARGED
1.008	SWMHA1.21	69.051	0.619	0.000	1.37	0.0	406.5	SURCHARGED
6.000	SWMHA1.22	69.255	0.086	0.000	0.29	0.0	73.6	SURCHARGED
6.001	SWMHA1.23	69.226	0.294	0.000	0.70	0.0	180.4	SURCHARGED
6.002	SWMHA1.24	69.174	0.487	0.000	1.17	0.0	228.2	SURCHARGED
6.003	SWMHA1.25	69.140	0.454	0.000	1.43	0.0	234.7	SURCHARGED
6.004	SWMHA1.29	69.117	0.465	0.000	0.89	0.0	241.1	SURCHARGED
7.000	SWMHA1.30	69.462	-0.163	0.000	0.17	0.0	7.9	OK
6.005	SWMHA1.31	69.099	0.489	0.000	0.73	0.0	252.5	SURCHARGED
8.000	SWMHA1.32	69.485	-0.180	0.000	0.09	0.0	4.1	OK
6.006	SWMHA1.33	69.073	0.551	0.000	0.89	0.0	279.6	SURCHARGED
9.000	SWMHA1.34	69.475	-0.150	0.000	0.24	0.0	6.4	OK
6.007	SWMHA1.35	69.040	0.616	0.000	0.92	0.0	295.8	SURCHARGED
1.009	SWMHA1.36	69.005	0.547	0.000	2.83	0.0	705.1	SURCHARGED
1.010	SWMHA1.37	68.964	0.453	0.000	2.11	0.0	705.6	SURCHARGED
1.011	SWMHA1.38	68.938	0.441	0.000	2.14	0.0	703.8	SURCHARGED
1.012	SWMHA1.39	68.890	0.353	0.000	0.79	0.0	425.9	SURCHARGED
1.013	SWMHA1.40	67.664	-0.061	0.000	0.28	0.0	4.3	OK

Summary of Results for 90 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA1.1	69.384	0.084	0.000	0.03	0.0	2.0	SURCHARGED
1.001	SWMHA1.5	69.382	0.225	0.000	0.36	0.0	24.3	SURCHARGED
2.000	SWMHA1.6	72.073	-0.152	0.000	0.23	0.0	14.2	OK
2.001	SWMHA1.7	70.069	-0.156	0.000	0.21	0.0	14.2	OK
2.002	SWMHA1.8	69.390	-0.059	0.000	0.26	0.0	35.1	OK
1.002	SWMHA1.9	69.342	0.509	0.000	0.54	0.0	89.7	SURCHARGED
3.000	SWMHA1.10	69.569	-0.156	0.000	0.20	0.0	12.7	OK
1.003	SWMHA1.11	69.310	0.503	0.000	0.63	0.0	139.2	SURCHARGED
4.000	SWMHA1.12	69.323	-0.077	0.000	0.35	0.0	21.4	OK
4.001	SWMHA1.13	69.310	0.048	0.000	0.66	0.0	38.3	SURCHARGED
1.004	SWMHA1.14	69.274	0.574	0.000	1.13	0.0	186.0	SURCHARGED
1.005	SWMHA1.17	69.247	0.596	0.000	1.29	0.0	211.3	SURCHARGED
1.006	SWMHA1.18	69.233	0.522	0.000	0.81	0.0	222.3	SURCHARGED
1.007	SWMHA1.19	69.174	0.636	0.000	0.96	0.0	270.7	SURCHARGED
5.000	SWMHA1.20	69.073	0.098	0.000	0.18	0.0	8.7	SURCHARGED
1.008	SWMHA1.21	69.061	0.628	0.000	1.15	0.0	342.2	SURCHARGED
6.000	SWMHA1.22	69.292	0.123	0.000	0.23	0.0	60.0	SURCHARGED
6.001	SWMHA1.23	69.261	0.329	0.000	0.55	0.0	141.1	SURCHARGED
6.002	SWMHA1.24	69.201	0.514	0.000	0.93	0.0	180.8	SURCHARGED
6.003	SWMHA1.25	69.165	0.479	0.000	1.14	0.0	187.1	SURCHARGED
6.004	SWMHA1.29	69.139	0.487	0.000	0.71	0.0	191.5	SURCHARGED
7.000	SWMHA1.30	69.454	-0.171	0.000	0.13	0.0	6.1	OK
6.005	SWMHA1.31	69.119	0.509	0.000	0.58	0.0	200.1	SURCHARGED
8.000	SWMHA1.32	69.478	-0.187	0.000	0.07	0.0	3.2	OK
6.006	SWMHA1.33	69.090	0.568	0.000	0.71	0.0	222.7	SURCHARGED
9.000	SWMHA1.34	69.466	-0.159	0.000	0.19	0.0	5.0	OK
6.007	SWMHA1.35	69.053	0.629	0.000	0.73	0.0	234.7	SURCHARGED
1.009	SWMHA1.36	69.015	0.557	0.000	2.31	0.0	576.0	SURCHARGED
1.010	SWMHA1.37	68.971	0.460	0.000	1.71	0.0	572.6	SURCHARGED
1.011	SWMHA1.38	68.943	0.447	0.000	1.75	0.0	573.9	SURCHARGED
1.012	SWMHA1.39	68.893	0.357	0.000	0.80	0.0	433.4	SURCHARGED
1.013	SWMHA1.40	67.708	-0.017	0.000	0.41	0.0	6.2	OK

Summary of Results for 120 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA1.1	69.293	-0.007	0.000	0.03	0.0	1.7	OK
1.001	SWMHA1.5	69.291	0.134	0.000	0.34	0.0	23.0	SURCHARGED
2.000	SWMHA1.6	72.066	-0.159	0.000	0.19	0.0	11.8	OK
2.001	SWMHA1.7	70.062	-0.163	0.000	0.17	0.0	11.8	OK
2.002	SWMHA1.8	69.297	-0.152	0.000	0.22	0.0	29.1	OK
1.002	SWMHA1.9	69.264	0.431	0.000	0.44	0.0	73.4	SURCHARGED
3.000	SWMHA1.10	69.562	-0.163	0.000	0.17	0.0	10.5	OK
1.003	SWMHA1.11	69.236	0.429	0.000	0.53	0.0	116.7	SURCHARGED
4.000	SWMHA1.12	69.249	-0.151	0.000	0.29	0.0	17.8	OK
4.001	SWMHA1.13	69.230	-0.032	0.000	0.55	0.0	32.0	OK
1.004	SWMHA1.14	69.202	0.502	0.000	0.96	0.0	157.4	SURCHARGED
1.005	SWMHA1.17	69.163	0.512	0.000	1.09	0.0	178.9	SURCHARGED
1.006	SWMHA1.18	69.146	0.436	0.000	0.68	0.0	187.9	SURCHARGED
1.007	SWMHA1.19	69.090	0.552	0.000	0.81	0.0	229.1	SURCHARGED
5.000	SWMHA1.20	69.018	0.043	0.000	0.15	0.0	7.2	SURCHARGED
1.008	SWMHA1.21	69.009	0.576	0.000	0.97	0.0	287.6	SURCHARGED
6.000	SWMHA1.22	69.226	0.057	0.000	0.20	0.0	50.4	SURCHARGED
6.001	SWMHA1.23	69.209	0.277	0.000	0.44	0.0	113.9	SURCHARGED
6.002	SWMHA1.24	69.163	0.476	0.000	0.75	0.0	145.4	SURCHARGED
6.003	SWMHA1.25	69.120	0.434	0.000	0.93	0.0	151.5	SURCHARGED
6.004	SWMHA1.29	69.091	0.439	0.000	0.57	0.0	154.7	SURCHARGED
7.000	SWMHA1.30	69.449	-0.176	0.000	0.11	0.0	5.1	OK
6.005	SWMHA1.31	69.070	0.460	0.000	0.47	0.0	162.4	SURCHARGED
8.000	SWMHA1.32	69.474	-0.191	0.000	0.06	0.0	2.6	OK
6.006	SWMHA1.33	69.042	0.520	0.000	0.58	0.0	181.5	SURCHARGED
9.000	SWMHA1.34	69.459	-0.166	0.000	0.16	0.0	4.1	OK
6.007	SWMHA1.35	69.005	0.581	0.000	0.60	0.0	192.2	SURCHARGED
1.009	SWMHA1.36	68.969	0.511	0.000	1.92	0.0	477.4	SURCHARGED
1.010	SWMHA1.37	68.932	0.421	0.000	1.42	0.0	475.2	SURCHARGED
1.011	SWMHA1.38	68.907	0.411	0.000	1.45	0.0	476.3	SURCHARGED
1.012	SWMHA1.39	68.863	0.327	0.000	0.77	0.0	413.9	SURCHARGED
1.013	SWMHA1.40	67.741	0.016	0.000	0.50	0.0	7.6	SURCHARGED

Summary of Results for 180 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA1.1	69.201	-0.099	0.000	0.02	0.0	1.4	OK
1.001	SWMHA1.5	69.199	0.042	0.000	0.27	0.0	18.1	SURCHARGED
2.000	SWMHA1.6	72.057	-0.168	0.000	0.15	0.0	9.1	OK
2.001	SWMHA1.7	70.054	-0.171	0.000	0.13	0.0	9.0	OK
2.002	SWMHA1.8	69.231	-0.218	0.000	0.17	0.0	22.4	OK
1.002	SWMHA1.9	69.176	0.343	0.000	0.34	0.0	56.9	SURCHARGED
3.000	SWMHA1.10	69.554	-0.171	0.000	0.13	0.0	8.1	OK
1.003	SWMHA1.11	69.152	0.345	0.000	0.40	0.0	87.0	SURCHARGED
4.000	SWMHA1.12	69.197	-0.203	0.000	0.22	0.0	13.7	OK
4.001	SWMHA1.13	69.148	-0.114	0.000	0.42	0.0	24.5	OK
1.004	SWMHA1.14	69.124	0.424	0.000	0.72	0.0	117.5	SURCHARGED
1.005	SWMHA1.17	69.090	0.439	0.000	0.82	0.0	133.5	SURCHARGED
1.006	SWMHA1.18	69.076	0.366	0.000	0.51	0.0	140.8	SURCHARGED
1.007	SWMHA1.19	69.030	0.492	0.000	0.62	0.0	174.8	SURCHARGED
5.000	SWMHA1.20	68.975	0.000	0.000	0.12	0.0	5.5	OK
1.008	SWMHA1.21	68.968	0.535	0.000	0.74	0.0	220.0	SURCHARGED
6.000	SWMHA1.22	69.156	-0.013	0.000	0.15	0.0	38.4	OK
6.001	SWMHA1.23	69.137	0.205	0.000	0.35	0.0	89.9	SURCHARGED
6.002	SWMHA1.24	69.099	0.412	0.000	0.59	0.0	114.7	SURCHARGED
6.003	SWMHA1.25	69.062	0.376	0.000	0.72	0.0	118.4	SURCHARGED
6.004	SWMHA1.29	69.038	0.386	0.000	0.45	0.0	121.3	SURCHARGED
7.000	SWMHA1.30	69.443	-0.182	0.000	0.08	0.0	3.9	OK
6.005	SWMHA1.31	69.019	0.409	0.000	0.37	0.0	127.5	SURCHARGED
8.000	SWMHA1.32	69.470	-0.195	0.000	0.04	0.0	2.0	OK
6.006	SWMHA1.33	68.995	0.473	0.000	0.45	0.0	141.9	SURCHARGED
9.000	SWMHA1.34	69.451	-0.174	0.000	0.12	0.0	3.2	OK
6.007	SWMHA1.35	68.964	0.540	0.000	0.47	0.0	150.5	SURCHARGED
1.009	SWMHA1.36	68.932	0.475	0.000	1.45	0.0	361.7	SURCHARGED
1.010	SWMHA1.37	68.901	0.390	0.000	1.08	0.0	361.6	SURCHARGED
1.011	SWMHA1.38	68.879	0.382	0.000	1.10	0.0	360.4	SURCHARGED
1.012	SWMHA1.39	68.840	0.304	0.000	0.67	0.0	360.8	SURCHARGED
1.013	SWMHA1.40	67.791	0.066	0.000	0.56	0.0	8.6	SURCHARGED

Summary of Results for 240 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA1.1	69.138	-0.162	0.000	0.02	0.0	1.1	OK
1.001	SWMHA1.5	69.137	-0.020	0.000	0.22	0.0	14.6	OK
2.000	SWMHA1.6	72.052	-0.173	0.000	0.12	0.0	7.4	OK
2.001	SWMHA1.7	70.049	-0.176	0.000	0.11	0.0	7.4	OK
2.002	SWMHA1.8	69.223	-0.226	0.000	0.14	0.0	18.4	OK
1.002	SWMHA1.9	69.116	0.283	0.000	0.29	0.0	49.0	SURCHARGED
3.000	SWMHA1.10	69.549	-0.176	0.000	0.11	0.0	6.6	OK
1.003	SWMHA1.11	69.095	0.288	0.000	0.34	0.0	75.4	SURCHARGED
4.000	SWMHA1.12	69.186	-0.214	0.000	0.18	0.0	11.3	OK
4.001	SWMHA1.13	69.103	-0.159	0.000	0.34	0.0	20.0	OK
1.004	SWMHA1.14	69.070	0.370	0.000	0.61	0.0	100.3	SURCHARGED
1.005	SWMHA1.17	69.040	0.389	0.000	0.70	0.0	113.8	SURCHARGED
1.006	SWMHA1.18	69.028	0.317	0.000	0.44	0.0	121.1	SURCHARGED
1.007	SWMHA1.19	68.987	0.449	0.000	0.53	0.0	149.0	SURCHARGED
5.000	SWMHA1.20	68.943	-0.032	0.000	0.09	0.0	4.4	OK
1.008	SWMHA1.21	68.936	0.503	0.000	0.63	0.0	187.5	SURCHARGED
6.000	SWMHA1.22	69.097	-0.072	0.000	0.12	0.0	31.1	OK
6.001	SWMHA1.23	69.084	0.152	0.000	0.30	0.0	77.6	SURCHARGED
6.002	SWMHA1.24	69.051	0.364	0.000	0.51	0.0	99.5	SURCHARGED
6.003	SWMHA1.25	69.019	0.333	0.000	0.63	0.0	103.8	SURCHARGED
6.004	SWMHA1.29	68.998	0.346	0.000	0.39	0.0	106.8	SURCHARGED
7.000	SWMHA1.30	69.438	-0.187	0.000	0.07	0.0	3.2	OK
6.005	SWMHA1.31	68.982	0.372	0.000	0.33	0.0	112.1	SURCHARGED
8.000	SWMHA1.32	69.467	-0.198	0.000	0.04	0.0	1.7	OK
6.006	SWMHA1.33	68.960	0.438	0.000	0.40	0.0	124.9	SURCHARGED
9.000	SWMHA1.34	69.447	-0.178	0.000	0.10	0.0	2.6	OK
6.007	SWMHA1.35	68.933	0.508	0.000	0.41	0.0	132.3	SURCHARGED
1.009	SWMHA1.36	68.904	0.447	0.000	1.29	0.0	320.7	SURCHARGED
1.010	SWMHA1.37	68.876	0.365	0.000	0.96	0.0	320.6	SURCHARGED
1.011	SWMHA1.38	68.857	0.360	0.000	0.97	0.0	319.5	SURCHARGED
1.012	SWMHA1.39	68.822	0.286	0.000	0.59	0.0	320.8	SURCHARGED
1.013	SWMHA1.40	67.828	0.103	0.000	0.56	0.0	8.6	SURCHARGED

Summary of Results for 360 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA1.1	69.046	-0.254	0.000	0.01	0.0	0.8	OK
1.001	SWMHA1.5	69.042	-0.115	0.000	0.17	0.0	11.2	OK
2.000	SWMHA1.6	72.046	-0.179	0.000	0.09	0.0	5.6	OK
2.001	SWMHA1.7	70.043	-0.182	0.000	0.08	0.0	5.6	OK
2.002	SWMHA1.8	69.213	-0.236	0.000	0.10	0.0	13.9	OK
1.002	SWMHA1.9	69.025	0.192	0.000	0.23	0.0	39.2	SURCHARGED
3.000	SWMHA1.10	69.542	-0.183	0.000	0.08	0.0	5.0	OK
1.003	SWMHA1.11	69.008	0.201	0.000	0.27	0.0	60.1	SURCHARGED
4.000	SWMHA1.12	69.174	-0.226	0.000	0.14	0.0	8.5	OK
4.001	SWMHA1.13	69.066	-0.196	0.000	0.26	0.0	15.3	OK
1.004	SWMHA1.14	68.988	0.288	0.000	0.49	0.0	80.0	SURCHARGED
1.005	SWMHA1.17	68.964	0.313	0.000	0.55	0.0	90.7	SURCHARGED
1.006	SWMHA1.18	68.954	0.244	0.000	0.35	0.0	97.0	SURCHARGED
1.007	SWMHA1.19	68.921	0.384	0.000	0.42	0.0	119.7	SURCHARGED
5.000	SWMHA1.20	68.886	-0.089	0.000	0.07	0.0	3.4	OK
1.008	SWMHA1.21	68.881	0.448	0.000	0.51	0.0	150.5	SURCHARGED
6.000	SWMHA1.22	69.008	-0.161	0.000	0.10	0.0	24.5	OK
6.001	SWMHA1.23	68.998	0.066	0.000	0.24	0.0	60.9	SURCHARGED
6.002	SWMHA1.24	68.972	0.285	0.000	0.40	0.0	78.2	SURCHARGED
6.003	SWMHA1.25	68.947	0.261	0.000	0.50	0.0	81.5	SURCHARGED
6.004	SWMHA1.29	68.930	0.278	0.000	0.31	0.0	84.0	SURCHARGED
7.000	SWMHA1.30	69.433	-0.192	0.000	0.05	0.0	2.4	OK
6.005	SWMHA1.31	68.917	0.307	0.000	0.26	0.0	88.2	SURCHARGED
8.000	SWMHA1.32	69.465	-0.200	0.000	0.03	0.0	1.3	OK
6.006	SWMHA1.33	68.900	0.378	0.000	0.31	0.0	98.3	SURCHARGED
9.000	SWMHA1.34	69.440	-0.185	0.000	0.07	0.0	2.0	OK
6.007	SWMHA1.35	68.878	0.454	0.000	0.32	0.0	104.1	SURCHARGED
1.009	SWMHA1.36	68.856	0.398	0.000	1.03	0.0	255.7	SURCHARGED
1.010	SWMHA1.37	68.833	0.322	0.000	0.76	0.0	255.7	SURCHARGED
1.011	SWMHA1.38	68.818	0.321	0.000	0.78	0.0	255.7	SURCHARGED
1.012	SWMHA1.39	68.791	0.254	0.000	0.47	0.0	255.4	SURCHARGED
1.013	SWMHA1.40	67.883	0.158	0.000	0.56	0.0	8.6	SURCHARGED

Summary of Results for 720 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA1.1	69.013	-0.287	0.000	0.01	0.0	0.5	OK
1.001	SWMHA1.5	68.930	-0.227	0.000	0.11	0.0	7.1	OK
2.000	SWMHA1.6	72.034	-0.191	0.000	0.06	0.0	3.5	OK
2.001	SWMHA1.7	70.032	-0.193	0.000	0.05	0.0	3.5	OK
2.002	SWMHA1.8	69.198	-0.251	0.000	0.06	0.0	8.6	OK
1.002	SWMHA1.9	68.887	0.054	0.000	0.15	0.0	24.7	SURCHARGED
3.000	SWMHA1.10	69.532	-0.193	0.000	0.05	0.0	3.1	OK
1.003	SWMHA1.11	68.877	0.070	0.000	0.17	0.0	37.9	SURCHARGED
4.000	SWMHA1.12	69.158	-0.242	0.000	0.08	0.0	5.2	OK
4.001	SWMHA1.13	69.042	-0.220	0.000	0.16	0.0	9.4	OK
1.004	SWMHA1.14	68.864	0.164	0.000	0.31	0.0	50.4	SURCHARGED
1.005	SWMHA1.17	68.849	0.198	0.000	0.35	0.0	57.1	SURCHARGED
1.006	SWMHA1.18	68.843	0.132	0.000	0.22	0.0	61.0	SURCHARGED
1.007	SWMHA1.19	68.822	0.284	0.000	0.27	0.0	75.2	SURCHARGED
5.000	SWMHA1.20	68.802	-0.173	0.000	0.04	0.0	2.1	OK
1.008	SWMHA1.21	68.797	0.364	0.000	0.32	0.0	94.6	SURCHARGED
6.000	SWMHA1.22	68.877	-0.292	0.000	0.06	0.0	15.3	OK
6.001	SWMHA1.23	68.870	-0.062	0.000	0.15	0.0	38.2	OK
6.002	SWMHA1.24	68.854	0.167	0.000	0.25	0.0	49.1	SURCHARGED
6.003	SWMHA1.25	68.838	0.152	0.000	0.31	0.0	51.2	SURCHARGED
6.004	SWMHA1.29	68.827	0.175	0.000	0.19	0.0	52.7	SURCHARGED
7.000	SWMHA1.30	69.426	-0.199	0.000	0.03	0.0	1.5	OK
6.005	SWMHA1.31	68.820	0.210	0.000	0.16	0.0	55.3	SURCHARGED
8.000	SWMHA1.32	69.458	-0.207	0.000	0.02	0.0	0.8	OK
6.006	SWMHA1.33	68.809	0.287	0.000	0.20	0.0	61.7	SURCHARGED
9.000	SWMHA1.34	69.431	-0.194	0.000	0.05	0.0	1.2	OK
6.007	SWMHA1.35	68.795	0.371	0.000	0.20	0.0	65.4	SURCHARGED
1.009	SWMHA1.36	68.781	0.323	0.000	0.65	0.0	160.6	SURCHARGED
1.010	SWMHA1.37	68.767	0.256	0.000	0.48	0.0	160.6	SURCHARGED
1.011	SWMHA1.38	68.757	0.261	0.000	0.49	0.0	160.5	SURCHARGED
1.012	SWMHA1.39	68.740	0.203	0.000	0.30	0.0	160.2	SURCHARGED
1.013	SWMHA1.40	67.989	0.264	0.000	0.56	0.0	8.6	SURCHARGED

Summary of Results for 1440 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA1.1	69.008	-0.292	0.000	0.01	0.0	0.3	OK
1.001	SWMHA1.5	68.906	-0.251	0.000	0.06	0.0	4.4	OK
2.000	SWMHA1.6	72.027	-0.198	0.000	0.03	0.0	2.1	OK
2.001	SWMHA1.7	70.026	-0.199	0.000	0.03	0.0	2.1	OK
2.002	SWMHA1.8	69.187	-0.262	0.000	0.04	0.0	5.3	OK
1.002	SWMHA1.9	68.795	-0.038	0.000	0.09	0.0	15.2	OK
3.000	SWMHA1.10	69.526	-0.199	0.000	0.03	0.0	1.9	OK
1.003	SWMHA1.11	68.789	-0.018	0.000	0.11	0.0	23.3	OK
4.000	SWMHA1.12	69.144	-0.256	0.000	0.05	0.0	3.2	OK
4.001	SWMHA1.13	69.025	-0.237	0.000	0.10	0.0	5.8	OK
1.004	SWMHA1.14	68.777	0.077	0.000	0.19	0.0	31.0	SURCHARGED
1.005	SWMHA1.17	68.768	0.117	0.000	0.21	0.0	35.1	SURCHARGED
1.006	SWMHA1.18	68.764	0.054	0.000	0.14	0.0	37.5	SURCHARGED
1.007	SWMHA1.19	68.752	0.214	0.000	0.16	0.0	46.3	SURCHARGED
5.000	SWMHA1.20	68.775	-0.200	0.000	0.03	0.0	1.3	OK
1.008	SWMHA1.21	68.736	0.304	0.000	0.20	0.0	58.2	SURCHARGED
6.000	SWMHA1.22	68.787	-0.382	0.000	0.04	0.0	9.4	OK
6.001	SWMHA1.23	68.781	-0.151	0.000	0.09	0.0	23.5	OK
6.002	SWMHA1.24	68.771	0.084	0.000	0.16	0.0	30.2	SURCHARGED
6.003	SWMHA1.25	68.762	0.076	0.000	0.19	0.0	31.5	SURCHARGED
6.004	SWMHA1.29	68.755	0.103	0.000	0.12	0.0	32.4	SURCHARGED
7.000	SWMHA1.30	69.421	-0.204	0.000	0.02	0.0	0.9	OK
6.005	SWMHA1.31	68.750	0.140	0.000	0.10	0.0	34.1	SURCHARGED
8.000	SWMHA1.32	69.451	-0.214	0.000	0.01	0.0	0.5	OK
6.006	SWMHA1.33	68.744	0.222	0.000	0.12	0.0	38.0	SURCHARGED
9.000	SWMHA1.34	69.425	-0.200	0.000	0.03	0.0	0.7	OK
6.007	SWMHA1.35	68.735	0.311	0.000	0.12	0.0	40.2	SURCHARGED
1.009	SWMHA1.36	68.727	0.269	0.000	0.40	0.0	98.8	SURCHARGED
1.010	SWMHA1.37	68.718	0.207	0.000	0.30	0.0	98.8	SURCHARGED
1.011	SWMHA1.38	68.712	0.215	0.000	0.30	0.0	98.8	SURCHARGED
1.012	SWMHA1.39	68.701	0.165	0.000	0.18	0.0	98.7	SURCHARGED
1.013	SWMHA1.40	68.093	0.368	0.000	0.56	0.0	8.6	SURCHARGED

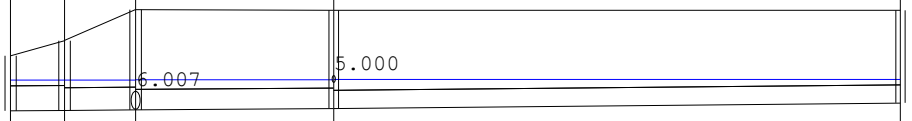
Summary of Results for 2880 minute 100 year Winter (Storm)

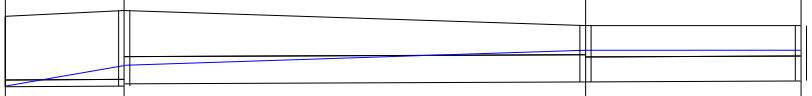
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

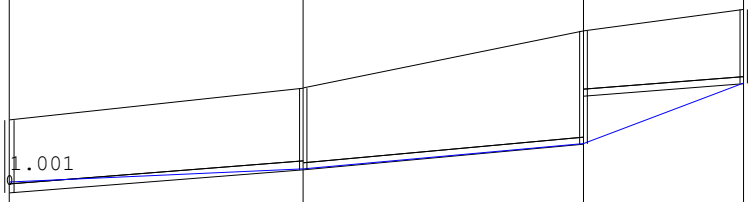
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA1.1	69.005	-0.295	0.000	0.00	0.0	0.2	OK
1.001	SWMHA1.5	68.895	-0.262	0.000	0.04	0.0	2.7	OK
2.000	SWMHA1.6	72.023	-0.202	0.000	0.02	0.0	1.3	OK
2.001	SWMHA1.7	70.020	-0.205	0.000	0.02	0.0	1.3	OK
2.002	SWMHA1.8	69.180	-0.269	0.000	0.02	0.0	3.2	OK
1.002	SWMHA1.9	68.739	-0.094	0.000	0.06	0.0	9.4	OK
3.000	SWMHA1.10	69.520	-0.205	0.000	0.02	0.0	1.2	OK
1.003	SWMHA1.11	68.735	-0.072	0.000	0.07	0.0	14.4	OK
4.000	SWMHA1.12	69.135	-0.265	0.000	0.03	0.0	2.0	OK
4.001	SWMHA1.13	69.010	-0.252	0.000	0.06	0.0	3.6	OK
1.004	SWMHA1.14	68.730	0.030	0.000	0.12	0.0	19.1	SURCHARGED
1.005	SWMHA1.17	68.724	0.074	0.000	0.13	0.0	21.6	SURCHARGED
1.006	SWMHA1.18	68.722	0.011	0.000	0.09	0.0	24.1	SURCHARGED
1.007	SWMHA1.19	68.714	0.176	0.000	0.10	0.0	29.3	SURCHARGED
5.000	SWMHA1.20	68.768	-0.207	0.000	0.02	0.0	0.8	OK
1.008	SWMHA1.21	68.705	0.272	0.000	0.12	0.0	36.5	SURCHARGED
6.000	SWMHA1.22	68.743	-0.426	0.000	0.02	0.0	5.8	OK
6.001	SWMHA1.23	68.732	-0.200	0.000	0.06	0.0	14.5	OK
6.002	SWMHA1.24	68.726	0.039	0.000	0.10	0.0	18.6	SURCHARGED
6.003	SWMHA1.25	68.720	0.034	0.000	0.12	0.0	19.4	SURCHARGED
6.004	SWMHA1.29	68.716	0.064	0.000	0.07	0.0	20.0	SURCHARGED
7.000	SWMHA1.30	69.413	-0.212	0.000	0.01	0.0	0.6	OK
6.005	SWMHA1.31	68.713	0.103	0.000	0.06	0.0	21.0	SURCHARGED
8.000	SWMHA1.32	69.447	-0.218	0.000	0.01	0.0	0.3	OK
6.006	SWMHA1.33	68.709	0.187	0.000	0.07	0.0	23.4	SURCHARGED
9.000	SWMHA1.34	69.418	-0.207	0.000	0.02	0.0	0.5	OK
6.007	SWMHA1.35	68.704	0.280	0.000	0.08	0.0	24.8	SURCHARGED
1.009	SWMHA1.36	68.699	0.241	0.000	0.24	0.0	60.9	SURCHARGED
1.010	SWMHA1.37	68.693	0.182	0.000	0.18	0.0	60.9	SURCHARGED
1.011	SWMHA1.38	68.690	0.193	0.000	0.19	0.0	60.9	SURCHARGED
1.012	SWMHA1.39	68.683	0.146	0.000	0.11	0.0	60.9	SURCHARGED
1.013	SWMHA1.40	68.177	0.452	0.000	0.56	0.0	8.6	SURCHARGED

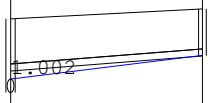
MH Name	SWMHA1.14	SWMHA1.11	SWMHA1.9	SWMHA1.5	SWMHA1.1	
		4.001	3.000	2.002		
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000						
PN		1.003	1.002	1.001	1.000	
Dia (mm)		525	450	300	300	
Slope (1:X)		360.4	267.2	239.2	307.9	
Cover Level (m)	70.861	70.720	70.794	70.809	70.800	
Invert Level (m)		68.175	68.282 / 68.282	68.383 / 68.659	68.857 / 68.857	69.000
Length (m)		38.562	26.987	47.292	44.030	

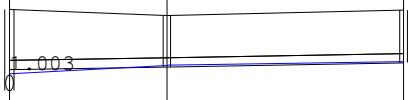
MH Name	SWMHA1.19	SWMHA1.18		SWMHA1.14	
				4.001	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000					
PN		1.006		1.004	
Dia (mm)		600		525	
Slope (1:X)		531.6		588.4	
Cover Level (m)	71.000	71.100	71.150	70.861	
Invert Level (m)	67.938	68.111	68.126	68.126 / 68.175	
Length (m)		91.969		28.969	

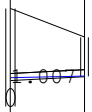
MH Name	SWMHA1.38			SWMHA1.21	SWMHA1.19	
						
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000						
PN				1.008	1.007	
Dia (mm)				675	600	
Slope (1:X)				628.8	499.7	
Cover Level (m)	69.500	70.000	71.024	71.000	71.000	
Invert Level (m)		67.686	67.686 67.708	67.708 67.758	67.758 67.938	
Length (m)				31.438	89.947	

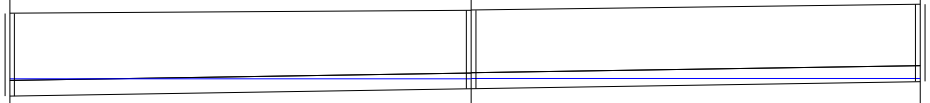
MH Name	SW	AREA 1 OUTFALL	SWMHA1.40	SWMHA1.39	SWMHA1.38	
						
Hor Scale 1200 Ver Scale 250 Datum (m) 60.000						
PN			1.013	1.012	1.011	
Dia (mm)			225	900	825	
Slope (1:X)			607.9	1003.0	971.9	
Cover Level (m)	69.800		70.000	69.500	69.500	
Invert Level (m)			67.469 67.500	67.564 67.637	67.637 67.672	
Length (m)			18.845	73.221	34.180	

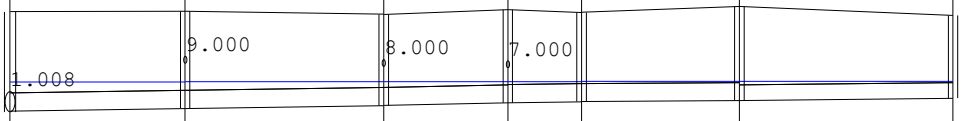
MH Name	SWMHA1.9	SWMHA1.8	SWMHA1.7	SWMHA1.6	
Hor Scale 1200 Ver Scale 250 Datum (m) 63.000					
PN		2.002	2.001	2.000	
Dia (mm)		300	225	225	
Slope (1:X)		60.9	52.3	61.1	
Cover Level (m)	70.794	71.850	73.740	74.450	
Invert Level (m)		68.383	69.149	70.000	71.584	72.000	
Length (m)		46.635	44.477	25.425	

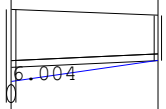
MH Name	SWMHA1.11	SWMHA1.10	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000			
PN		3.000	
Dia (mm)		225	
Slope (1:X)		60.9	
Cover Level (m)	70.720	71.050	
Invert Level (m)		69.000	69.500	
Length (m)		30.464	

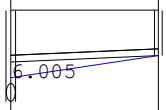
MH Name	SWMHA1.14	SWMHA1.13	SWMHA1.12	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000				
PN		4.001	4.000	
Dia (mm)		300	300	
Slope (1:X)		287.3	272.3	
Cover Level (m)	70.861	70.650	70.840	
Invert Level (m)		68.875 68.962	68.962 69.100	
Length (m)		24.994	37.578	

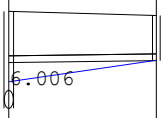
MH Name	SWMHA1.21		
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000			
PN			
Dia (mm)			
Slope (1:X)			
Cover Level (m)	71.000	70.050	
Invert Level (m)		68.617 68.750	
Length (m)			

MH Name	SWMHA1.24	SWMHA1.23	SWMHA1.22	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000				
PN		6.001	6.000	
Dia (mm)		525	525	
Slope (1:X)		298.9	300.8	
Cover Level (m)	70.900	71.000	71.200	
Invert Level (m)		68.162 68.407	68.407 68.644	
Length (m)		73.221	71.286	

MH Name	SWMHA1.36	SWMHA1.35	SWMHA1.33	SWMHA1.31		SWMHA1.25	SWMHA1.24	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000								
PN		6.007	6.006	6.005		6.003	6.002	
Dia (mm)		600	600	600		600	525	
Slope (1:X)		293.1	322.3	223.6		736.1	446.3	
Cover Level (m)	71.024	71.039	70.940	71.100	71.000	71.200	70.900	
Invert Level (m)		67.729 67.824	67.824 67.922	67.922 68.010	68.010 68.052	68.052 68.086	68.086 68.162	
Length (m)		27.796	31.529	19.679		25.026	33.915	

MH Name	SWMHA1.31	SWMHA1.30	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000			
PN		7.000	
Dia (mm)		225	
Slope (1:X)		104.5	
Cover Level (m)	71.100	70.900	
Invert Level (m)		69.177 69.400	
Length (m)		23.296	

MH Name	SWMHA1.33	SWMHA1.32	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000			
PN		8.000	
Dia (mm)		225	
Slope (1:X)		105.9	
Cover Level (m)	70.940	70.940	
Invert Level (m)		69.219 69.440	
Length (m)		23.407	

MH Name	SWMHA1.35	SWMHA1.34	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000			
PN		9.000	
Dia (mm)		225	
Slope (1:X)		316.2	
Cover Level (m)	71.039	70.900	
Invert Level (m)	69.326	69.400	
Length (m)		23.399	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	Add Flow / Climate Change (%)	0
M5-60 (mm)	16.600	Minimum Backdrop Height (m)	0.000
Ratio R	0.284	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	0.000
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500
PIMP (%)	100		

Designed with Level Inverts

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	29.443	0.148	198.7	0.014	4.00	0.0	0.600	o	300
1.001	16.350	0.041	403.3	0.076	0.00	0.0	0.600	o	300
2.000	23.096	0.115	200.6	0.053	4.00	0.0	0.600	o	225
1.002	32.201	0.056	571.9	0.061	0.00	0.0	0.600	o	300
3.000	22.877	0.114	200.0	0.069	4.00	0.0	0.600	o	225
1.003	22.438	0.045	500.0	0.055	0.00	0.0	0.600	o	300
4.000	22.683	0.113	200.0	0.084	4.00	0.0	0.600	o	225
1.004	17.256	0.035	500.0	0.057	0.00	0.0	0.600	o	375
1.005	19.847	0.040	500.0	0.016	0.00	0.0	0.600	o	375
1.006	25.095	0.050	500.7	0.013	0.00	0.0	0.600	o	375
5.000	33.534	0.335	100.0	0.313	4.00	0.0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.44	68.100	0.014	0.0	0.0	0.0	1.11	78.6	1.8
1.001	50.00	4.79	67.952	0.090	0.0	0.0	0.0	0.78	54.9	12.1
2.000	50.00	4.42	68.500	0.053	0.0	0.0	0.0	0.92	36.6	7.2
1.002	50.00	5.62	67.911	0.203	0.0	0.0	0.0	0.65	46.0	27.5
3.000	50.00	4.41	68.500	0.069	0.0	0.0	0.0	0.92	36.6	9.4
1.003	50.00	6.15	67.855	0.328	0.0	0.0	0.0	0.70	49.2	44.4
4.000	50.00	4.41	68.500	0.084	0.0	0.0	0.0	0.92	36.6	11.4
1.004	50.00	6.51	67.810	0.469	0.0	0.0	0.0	0.80	88.7	63.5
1.005	50.00	6.92	67.776	0.485	0.0	0.0	0.0	0.80	88.7	65.7
1.006	50.00	7.44	67.736	0.498	0.0	0.0	0.0	0.80	88.7	67.4
5.000	50.00	4.36	68.500	0.313	0.0	0.0	0.0	1.57	111.1	42.4

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
1.007	25.185	0.050	500.0	0.036	0.00	0.0	0.600	o	450
1.008	66.500	0.133	500.0	0.000	0.00	0.0	0.600	o	450
6.000	54.978	0.183	300.0	0.144	4.00	0.0	0.600	o	450
6.001	46.595	0.155	300.6	0.438	0.00	0.0	0.600	o	450
6.002	8.327	0.027	308.4	0.190	0.00	0.0	0.600	o	450
7.000	87.358	0.291	300.0	0.148	4.00	0.0	0.600	o	300
7.001	37.843	0.101	374.7	0.073	0.00	0.0	0.600	o	300
6.003	14.416	0.048	299.1	0.047	0.00	0.0	0.600	o	450
8.000	50.546	0.252	200.6	0.407	4.00	0.0	0.600	o	300
6.004	20.743	0.040	524.0	0.046	0.00	0.0	0.600	o	525
6.005	48.147	0.096	500.0	0.000	0.00	0.0	0.600	o	525
1.009	13.347	0.067	199.2	0.000	0.00	0.0	0.600	o	225

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.007	50.00	7.91	67.686	0.847	0.0	0.0	0.0	0.90	143.5	114.7
1.008	49.12	9.14	67.635	0.847	0.0	0.0	0.0	0.90	143.5	114.7
6.000	50.00	4.78	68.500	0.144	0.0	0.0	0.0	1.17	185.8	19.6
6.001	50.00	5.45	68.317	0.582	0.0	0.0	0.0	1.17	185.7	78.8
6.002	50.00	5.57	68.162	0.772	0.0	0.0	0.0	1.15	183.3	104.6
7.000	50.00	5.61	69.000	0.148	0.0	0.0	0.0	0.90	63.8	20.1
7.001	50.00	6.40	68.500	0.221	0.0	0.0	0.0	0.81	57.0	30.0
6.003	50.00	6.60	68.135	1.040	0.0	0.0	0.0	1.17	186.1	140.9
8.000	50.00	4.76	68.500	0.407	0.0	0.0	0.0	1.11	78.2	55.2
6.004	50.00	6.96	68.087	1.494	0.0	0.0	0.0	0.97	210.3	202.2
6.005	50.00	7.76	68.047	1.494	0.0	0.0	0.0	0.99	215.4	202.2
1.009	50.00	4.24	67.000	0.000	4.7	0.0	0.0	0.92	36.7	4.7

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SWMHA2.1	69.100	1.000	Open Manhole	1050	1.000	68.100	300				
SWMHA2.2	69.997	2.045	Open Manhole	1200	1.001	67.952	300	1.000	67.952	300	
SWMHA2.3	70.000	1.500	Open Manhole	1050	2.000	68.500	225				
SWMHA2.4	70.036	2.125	Open Manhole	1200	1.002	67.911	300	1.001	67.911	300	
								2.000	68.385	225	399
SWMHA2.5	70.000	1.500	Open Manhole	1050	3.000	68.500	225				
SWMHA2.6	70.004	2.149	Open Manhole	1200	1.003	67.855	300	1.002	67.855	300	
								3.000	68.386	225	456
SWMHA2.7	70.000	1.500	Open Manhole	1050	4.000	68.500	225				
SWMHA2.8	70.071	2.261	Open Manhole	1350	1.004	67.810	375	1.003	67.810	300	
								4.000	68.387	225	427
SWMHA2.9	70.007	2.231	Open Manhole	1350	1.005	67.776	375	1.004	67.776	375	
SWMHA2.12	70.200	2.464	Open Manhole	1350	1.006	67.736	375	1.005	67.736	375	
SWMHA2.13	70.024	1.524	Open Manhole	1050	5.000	68.500	300				
SWMHA2.14	70.021	2.335	Open Manhole	1350	1.007	67.686	450	1.006	67.686	375	
								5.000	68.165	300	329
SWMHA2.15	70.000	2.365	Open Manhole	1350	1.008	67.635	450	1.007	67.635	450	
SWMHA2.16	70.287	1.787	Open Manhole	1350	6.000	68.500	450				
SWMHA2.17	70.010	1.693	Open Manhole	1350	6.001	68.317	450	6.000	68.317	450	
SWMHA2.18	70.348	2.186	Open Manhole	1350	6.002	68.162	450	6.001	68.162	450	
SWMHA2.19	70.778	1.778	Open Manhole	1050	7.000	69.000	300				
SWMHA2.20	70.757	2.257	Open Manhole	1200	7.001	68.500	300	7.000	68.709	300	209
SWMHA2.21	70.348	2.213	Open Manhole	1350	6.003	68.135	450	6.002	68.135	450	
								7.001	68.399	300	114
SWMHA2.22	70.045	1.545	Open Manhole	1050	8.000	68.500	300				
SWMHA2.23	70.096	2.009	Open Manhole	1500	6.004	68.087	525	6.003	68.087	450	
								8.000	68.248	300	
SWMHA2.24	70.000	1.953	Open Manhole	1500	6.005	68.047	525	6.004	68.047	525	
SWMHA2.25	70.000	3.000	Open Manhole	1500	1.009	67.000	225	1.008	67.502	450	727
								6.005	67.951	525	1251
OUTFALL 2	70.000	3.067	Open Manhole	0		OUTFALL		1.009	66.933	225	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	SWMHA2.1	69.100	68.100	0.700	Open Manhole	1050
1.001	o	300	SWMHA2.2	69.997	67.952	1.745	Open Manhole	1200
2.000	o	225	SWMHA2.3	70.000	68.500	1.275	Open Manhole	1050
1.002	o	300	SWMHA2.4	70.036	67.911	1.825	Open Manhole	1200
3.000	o	225	SWMHA2.5	70.000	68.500	1.275	Open Manhole	1050
1.003	o	300	SWMHA2.6	70.004	67.855	1.849	Open Manhole	1200
4.000	o	225	SWMHA2.7	70.000	68.500	1.275	Open Manhole	1050
1.004	o	375	SWMHA2.8	70.071	67.810	1.886	Open Manhole	1350
1.005	o	375	SWMHA2.9	70.007	67.776	1.856	Open Manhole	1350
1.006	o	375	SWMHA2.12	70.200	67.736	2.089	Open Manhole	1350
5.000	o	300	SWMHA2.13	70.024	68.500	1.224	Open Manhole	1050
1.007	o	450	SWMHA2.14	70.021	67.686	1.885	Open Manhole	1350
1.008	o	450	SWMHA2.15	70.000	67.635	1.915	Open Manhole	1350
6.000	o	450	SWMHA2.16	70.287	68.500	1.337	Open Manhole	1350
6.001	o	450	SWMHA2.17	70.010	68.317	1.243	Open Manhole	1350
6.002	o	450	SWMHA2.18	70.348	68.162	1.736	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	29.443	198.7	SWMHA2.2	69.997	67.952	1.745	Open Manhole	1200
1.001	16.350	403.3	SWMHA2.4	70.036	67.911	1.825	Open Manhole	1200
2.000	23.096	200.6	SWMHA2.4	70.036	68.385	1.426	Open Manhole	1200
1.002	32.201	571.9	SWMHA2.6	70.004	67.855	1.849	Open Manhole	1200
3.000	22.877	200.0	SWMHA2.6	70.004	68.386	1.393	Open Manhole	1200
1.003	22.438	500.0	SWMHA2.8	70.071	67.810	1.961	Open Manhole	1350
4.000	22.683	200.0	SWMHA2.8	70.071	68.387	1.459	Open Manhole	1350
1.004	17.256	500.0	SWMHA2.9	70.007	67.776	1.856	Open Manhole	1350
1.005	19.847	500.0	SWMHA2.12	70.200	67.736	2.089	Open Manhole	1350
1.006	25.095	500.7	SWMHA2.14	70.021	67.686	1.960	Open Manhole	1350
5.000	33.534	100.0	SWMHA2.14	70.021	68.165	1.556	Open Manhole	1350
1.007	25.185	500.0	SWMHA2.15	70.000	67.635	1.915	Open Manhole	1350
1.008	66.500	500.0	SWMHA2.25	70.000	67.502	2.048	Open Manhole	1500
6.000	54.978	300.0	SWMHA2.17	70.010	68.317	1.243	Open Manhole	1350
6.001	46.595	300.6	SWMHA2.18	70.348	68.162	1.736	Open Manhole	1350
6.002	8.327	308.4	SWMHA2.21	70.348	68.135	1.763	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
7.000	o	300	SWMHA2.19	70.778	69.000	1.478	Open Manhole	1050
7.001	o	300	SWMHA2.20	70.757	68.500	1.957	Open Manhole	1200
6.003	o	450	SWMHA2.21	70.348	68.135	1.763	Open Manhole	1350
8.000	o	300	SWMHA2.22	70.045	68.500	1.245	Open Manhole	1050
6.004	o	525	SWMHA2.23	70.096	68.087	1.484	Open Manhole	1500
6.005	o	525	SWMHA2.24	70.000	68.047	1.428	Open Manhole	1500
1.009	o	225	SWMHA2.25	70.000	67.000	2.775	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
7.000	87.358	300.0	SWMHA2.20	70.757	68.709	1.748	Open Manhole	1200
7.001	37.843	374.7	SWMHA2.21	70.348	68.399	1.649	Open Manhole	1350
6.003	14.416	299.1	SWMHA2.23	70.096	68.087	1.559	Open Manhole	1500
8.000	50.546	200.6	SWMHA2.23	70.096	68.248	1.548	Open Manhole	1500
6.004	20.743	524.0	SWMHA2.24	70.000	68.047	1.428	Open Manhole	1500
6.005	48.147	500.0	SWMHA2.25	70.000	67.951	1.524	Open Manhole	1500
1.009	13.347	199.2	OUTFALL 2	70.000	66.933	2.842	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.014	0.014	0.014
1.001	User	-	100	0.076	0.076	0.076
2.000	User	-	100	0.053	0.053	0.053
1.002	User	-	100	0.061	0.061	0.061
3.000	User	-	100	0.069	0.069	0.069
1.003	User	-	100	0.055	0.055	0.055
4.000	User	-	100	0.084	0.084	0.084
1.004	User	-	100	0.057	0.057	0.057
1.005	User	-	100	0.016	0.016	0.016
1.006	User	-	100	0.013	0.013	0.013
5.000	User	-	100	0.313	0.313	0.313
1.007	User	-	100	0.036	0.036	0.036
1.008	-	-	100	0.000	0.000	0.000
6.000	User	-	100	0.144	0.144	0.144
6.001	User	-	100	0.438	0.438	0.438
6.002	User	-	100	0.190	0.190	0.190
7.000	User	-	100	0.148	0.148	0.148
7.001	User	-	100	0.073	0.073	0.073
6.003	User	-	100	0.047	0.047	0.047
8.000	User	-	100	0.407	0.407	0.407
6.004	User	-	100	0.046	0.046	0.046
6.005	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				2.340	2.340	2.340

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.009	OUTFALL 2	70.000	66.933	66.500	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	10.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	1.000
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	5760
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	24

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.600	Storm Duration (mins)	2880
Ratio R	0.284		

Online Controls for Storm

Weir Manhole: SWMHA2.15, DS/PN: 1.008, Volume (m³): 7.2

Discharge Coef 0.544 Width (m) 1.350 Invert Level (m) 68.700

Weir Manhole: SWMHA2.24, DS/PN: 6.005, Volume (m³): 7.6

Discharge Coef 0.544 Width (m) 1.350 Invert Level (m) 68.800

Depth/Flow Relationship Manhole: SWMHA2.25, DS/PN: 1.009, Volume (m³): 25.7

Invert Level (m) 67.000

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	4.7000	1.400	4.7000	2.600	4.7000	3.800	4.7000	5.000	4.7000
0.400	4.7000	1.600	4.7000	2.800	4.7000	4.000	4.7000	5.200	4.7000
0.600	4.7000	1.800	4.7000	3.000	4.7000	4.200	4.7000	5.400	4.7000
0.800	4.7000	2.000	4.7000	3.200	4.7000	4.400	4.7000	5.600	4.7000
1.000	4.7000	2.200	4.7000	3.400	4.7000	4.600	4.7000	5.800	4.7000
1.200	4.7000	2.400	4.7000	3.600	4.7000	4.800	4.7000	6.000	4.7000

Storage Structures for Storm

Infiltration Basin Manhole: SWMHA2.15, DS/PN: 1.008

Invert Level (m) 67.760 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	90.0	1.200	0.0	2.400	0.0	3.600	0.0	4.800	0.0
0.200	130.0	1.400	0.0	2.600	0.0	3.800	0.0	5.000	0.0
0.400	169.0	1.600	0.0	2.800	0.0	4.000	0.0		
0.600	208.0	1.800	0.0	3.000	0.0	4.200	0.0		
0.800	247.9	2.000	0.0	3.200	0.0	4.400	0.0		
1.000	287.4	2.200	0.0	3.400	0.0	4.600	0.0		

Infiltration Basin Manhole: SWMHA2.24, DS/PN: 6.005

Invert Level (m) 68.047 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	80.0	1.200	0.0	2.400	0.0	3.600	0.0	4.800	0.0
0.200	117.2	1.400	0.0	2.600	0.0	3.800	0.0	5.000	0.0
0.400	154.2	1.600	0.0	2.800	0.0	4.000	0.0		
0.600	191.6	1.800	0.0	3.000	0.0	4.200	0.0		
0.800	228.8	2.000	0.0	3.200	0.0	4.400	0.0		
1.000	266.0	2.200	0.0	3.400	0.0	4.600	0.0		

Tank or Pond Manhole: SWMHA2.25, DS/PN: 1.009

Invert Level (m) 67.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1500.0	0.600	1500.0	1.200	1500.0	1.800	0.0	2.400	0.0
0.100	1500.0	0.700	1500.0	1.300	1500.0	1.900	0.0	2.500	0.0
0.200	1500.0	0.800	1500.0	1.400	1500.0	2.000	0.0		
0.300	1500.0	0.900	1500.0	1.500	1500.0	2.100	0.0		
0.400	1500.0	1.000	1500.0	1.600	0.0	2.200	0.0		
0.500	1500.0	1.100	1500.0	1.700	0.0	2.300	0.0		

Summary of Results for 15 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA2.1	68.986	0.586	0.000	0.06	0.0	4.0	FLOOD RISK
1.001	SWMHA2.2	68.983	0.731	0.000	0.56	0.0	23.6	SURCHARGED
2.000	SWMHA2.3	68.992	0.267	0.000	0.56	0.0	18.9	SURCHARGED
1.002	SWMHA2.4	68.959	0.748	0.000	1.28	0.0	53.6	SURCHARGED
3.000	SWMHA2.5	68.904	0.179	0.000	0.74	0.0	24.8	SURCHARGED
1.003	SWMHA2.6	68.862	0.707	0.000	2.11	0.0	86.7	SURCHARGED
4.000	SWMHA2.7	68.743	0.018	0.000	0.97	0.0	32.5	SURCHARGED
1.004	SWMHA2.8	68.699	0.514	0.000	2.04	0.0	123.2	SURCHARGED
1.005	SWMHA2.9	68.607	0.457	0.000	1.91	0.0	126.3	SURCHARGED
1.006	SWMHA2.12	68.498	0.387	0.000	1.64	0.0	126.1	SURCHARGED
5.000	SWMHA2.13	68.915	0.115	0.000	1.14	0.0	116.2	SURCHARGED
1.007	SWMHA2.14	68.476	0.340	0.000	1.94	0.0	234.3	SURCHARGED
1.008	SWMHA2.15	68.476	0.391	0.000	0.00	0.0	0.0	SURCHARGED
6.000	SWMHA2.16	69.433	0.483	0.000	0.26	0.0	44.0	SURCHARGED
6.001	SWMHA2.17	69.410	0.643	0.000	1.08	0.0	180.6	SURCHARGED
6.002	SWMHA2.18	69.257	0.645	0.000	1.99	0.0	238.3	SURCHARGED
7.000	SWMHA2.19	69.391	0.091	0.000	0.82	0.0	50.3	SURCHARGED
7.001	SWMHA2.20	69.304	0.504	0.000	1.02	0.0	53.9	SURCHARGED
6.003	SWMHA2.21	69.185	0.600	0.000	2.04	0.0	288.6	SURCHARGED
8.000	SWMHA2.22	69.709	0.909	0.000	1.78	0.0	131.6	SURCHARGED
6.004	SWMHA2.23	69.047	0.435	0.000	2.87	0.0	422.4	SURCHARGED
6.005	SWMHA2.24	68.977	0.405	0.000	0.88	0.0	169.4	SURCHARGED
1.009	SWMHA2.25	67.061	-0.164	0.000	0.00	0.0	0.0	OK

Summary of Results for 30 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA2.1	68.950	0.550	0.000	0.04	0.0	3.1	FLOOD RISK
1.001	SWMHA2.2	68.947	0.695	0.000	0.49	0.0	20.4	SURCHARGED
2.000	SWMHA2.3	68.954	0.229	0.000	0.45	0.0	15.1	SURCHARGED
1.002	SWMHA2.4	68.928	0.717	0.000	1.11	0.0	46.8	SURCHARGED
3.000	SWMHA2.5	68.897	0.172	0.000	0.60	0.0	20.0	SURCHARGED
1.003	SWMHA2.6	68.863	0.708	0.000	1.84	0.0	75.6	SURCHARGED
4.000	SWMHA2.7	68.778	0.053	0.000	0.76	0.0	25.4	SURCHARGED
1.004	SWMHA2.8	68.742	0.557	0.000	1.77	0.0	107.2	SURCHARGED
1.005	SWMHA2.9	68.680	0.529	0.000	1.66	0.0	109.8	SURCHARGED
1.006	SWMHA2.12	68.668	0.557	0.000	1.44	0.0	110.7	SURCHARGED
5.000	SWMHA2.13	68.730	-0.070	0.000	0.93	0.0	95.0	OK
1.007	SWMHA2.14	68.662	0.526	0.000	1.67	0.0	200.7	SURCHARGED
1.008	SWMHA2.15	68.662	0.577	0.000	0.00	0.0	0.0	SURCHARGED
6.000	SWMHA2.16	69.454	0.504	0.000	0.21	0.0	35.7	SURCHARGED
6.001	SWMHA2.17	69.436	0.669	0.000	0.88	0.0	147.8	SURCHARGED
6.002	SWMHA2.18	69.339	0.727	0.000	1.64	0.0	196.5	SURCHARGED
7.000	SWMHA2.19	69.463	0.163	0.000	0.68	0.0	41.7	SURCHARGED
7.001	SWMHA2.20	69.378	0.578	0.000	0.95	0.0	50.1	SURCHARGED
6.003	SWMHA2.21	69.280	0.695	0.000	1.72	0.0	243.1	SURCHARGED
8.000	SWMHA2.22	69.589	0.789	0.000	1.45	0.0	106.6	SURCHARGED
6.004	SWMHA2.23	69.155	0.544	0.000	2.42	0.0	356.0	SURCHARGED
6.005	SWMHA2.24	69.032	0.460	0.000	1.33	0.0	255.2	SURCHARGED
1.009	SWMHA2.25	67.123	-0.102	0.000	0.00	0.0	0.0	OK

Summary of Results for 45 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA2.1	68.886	0.486	0.000	0.03	0.0	2.3	FLOOD RISK
1.001	SWMHA2.2	68.883	0.631	0.000	0.42	0.0	17.7	SURCHARGED
2.000	SWMHA2.3	68.889	0.164	0.000	0.35	0.0	11.6	SURCHARGED
1.002	SWMHA2.4	68.867	0.656	0.000	0.94	0.0	39.5	SURCHARGED
3.000	SWMHA2.5	68.848	0.123	0.000	0.48	0.0	16.2	SURCHARGED
1.003	SWMHA2.6	68.819	0.664	0.000	1.55	0.0	63.9	SURCHARGED
4.000	SWMHA2.7	68.795	0.070	0.000	0.60	0.0	20.1	SURCHARGED
1.004	SWMHA2.8	68.789	0.604	0.000	1.49	0.0	90.3	SURCHARGED
1.005	SWMHA2.9	68.779	0.628	0.000	1.40	0.0	92.8	SURCHARGED
1.006	SWMHA2.12	68.768	0.657	0.000	1.23	0.0	94.2	SURCHARGED
5.000	SWMHA2.13	68.770	-0.030	0.000	0.74	0.0	75.3	OK
1.007	SWMHA2.14	68.759	0.623	0.000	1.40	0.0	168.2	SURCHARGED
1.008	SWMHA2.15	68.751	0.666	0.000	0.10	0.0	13.7	SURCHARGED
6.000	SWMHA2.16	69.391	0.441	0.000	0.18	0.0	29.9	SURCHARGED
6.001	SWMHA2.17	69.374	0.608	0.000	0.74	0.0	123.5	SURCHARGED
6.002	SWMHA2.18	69.299	0.687	0.000	1.37	0.0	164.2	SURCHARGED
7.000	SWMHA2.19	69.395	0.095	0.000	0.54	0.0	33.3	SURCHARGED
7.001	SWMHA2.20	69.328	0.528	0.000	0.82	0.0	43.3	SURCHARGED
6.003	SWMHA2.21	69.255	0.670	0.000	1.50	0.0	211.8	SURCHARGED
8.000	SWMHA2.22	69.478	0.678	0.000	1.19	0.0	87.9	SURCHARGED
6.004	SWMHA2.23	69.149	0.537	0.000	2.09	0.0	307.6	SURCHARGED
6.005	SWMHA2.24	69.034	0.463	0.000	1.36	0.0	260.1	SURCHARGED
1.009	SWMHA2.25	67.173	-0.052	0.000	0.00	0.0	0.0	OK

Summary of Results for 60 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA2.1	68.870	0.470	0.000	0.03	0.0	1.9	FLOOD RISK
1.001	SWMHA2.2	68.869	0.617	0.000	0.37	0.0	15.4	SURCHARGED
2.000	SWMHA2.3	68.872	0.147	0.000	0.30	0.0	10.2	SURCHARGED
1.002	SWMHA2.4	68.860	0.649	0.000	0.82	0.0	34.5	SURCHARGED
3.000	SWMHA2.5	68.850	0.125	0.000	0.40	0.0	13.4	SURCHARGED
1.003	SWMHA2.6	68.837	0.682	0.000	1.34	0.0	55.3	SURCHARGED
4.000	SWMHA2.7	68.825	0.100	0.000	0.51	0.0	17.2	SURCHARGED
1.004	SWMHA2.8	68.816	0.631	0.000	1.29	0.0	78.1	SURCHARGED
1.005	SWMHA2.9	68.805	0.655	0.000	1.21	0.0	80.5	SURCHARGED
1.006	SWMHA2.12	68.795	0.684	0.000	1.07	0.0	82.0	SURCHARGED
5.000	SWMHA2.13	68.797	-0.003	0.000	0.63	0.0	64.3	OK
1.007	SWMHA2.14	68.783	0.647	0.000	1.21	0.0	145.3	SURCHARGED
1.008	SWMHA2.15	68.770	0.685	0.000	0.22	0.0	29.9	SURCHARGED
6.000	SWMHA2.16	69.317	0.367	0.000	0.16	0.0	26.6	SURCHARGED
6.001	SWMHA2.17	69.302	0.535	0.000	0.65	0.0	108.8	SURCHARGED
6.002	SWMHA2.18	69.242	0.631	0.000	1.21	0.0	144.5	SURCHARGED
7.000	SWMHA2.19	69.318	0.018	0.000	0.46	0.0	28.6	SURCHARGED
7.001	SWMHA2.20	69.265	0.465	0.000	0.75	0.0	39.4	SURCHARGED
6.003	SWMHA2.21	69.208	0.623	0.000	1.34	0.0	188.8	SURCHARGED
8.000	SWMHA2.22	69.387	0.587	0.000	1.05	0.0	77.3	SURCHARGED
6.004	SWMHA2.23	69.124	0.513	0.000	1.86	0.0	273.5	SURCHARGED
6.005	SWMHA2.24	69.027	0.455	0.000	1.29	0.0	247.5	SURCHARGED
1.009	SWMHA2.25	67.220	-0.005	0.000	0.00	0.0	0.0	OK

Summary of Results for 90 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA2.1	68.923	0.523	0.000	0.02	0.0	1.5	FLOOD RISK
1.001	SWMHA2.2	68.922	0.670	0.000	0.29	0.0	12.3	SURCHARGED
2.000	SWMHA2.3	68.925	0.200	0.000	0.23	0.0	7.6	SURCHARGED
1.002	SWMHA2.4	68.914	0.703	0.000	0.65	0.0	27.4	SURCHARGED
3.000	SWMHA2.5	68.906	0.181	0.000	0.31	0.0	10.3	SURCHARGED
1.003	SWMHA2.6	68.894	0.739	0.000	1.07	0.0	44.2	SURCHARGED
4.000	SWMHA2.7	68.881	0.156	0.000	0.38	0.0	12.8	SURCHARGED
1.004	SWMHA2.8	68.868	0.683	0.000	1.04	0.0	62.6	SURCHARGED
1.005	SWMHA2.9	68.849	0.699	0.000	0.97	0.0	64.2	SURCHARGED
1.006	SWMHA2.12	68.828	0.717	0.000	0.85	0.0	65.2	SURCHARGED
5.000	SWMHA2.13	68.833	0.033	0.000	0.49	0.0	49.5	SURCHARGED
1.007	SWMHA2.14	68.806	0.671	0.000	0.94	0.0	113.8	SURCHARGED
1.008	SWMHA2.15	68.786	0.700	0.000	0.37	0.0	49.1	SURCHARGED
6.000	SWMHA2.16	69.214	0.264	0.000	0.13	0.0	21.5	SURCHARGED
6.001	SWMHA2.17	69.202	0.435	0.000	0.52	0.0	87.3	SURCHARGED
6.002	SWMHA2.18	69.157	0.545	0.000	0.97	0.0	115.8	SURCHARGED
7.000	SWMHA2.19	69.218	-0.082	0.000	0.36	0.0	22.4	OK
7.001	SWMHA2.20	69.175	0.375	0.000	0.61	0.0	32.4	SURCHARGED
6.003	SWMHA2.21	69.131	0.546	0.000	1.09	0.0	154.5	SURCHARGED
8.000	SWMHA2.22	69.246	0.446	0.000	0.83	0.0	61.4	SURCHARGED
6.004	SWMHA2.23	69.074	0.463	0.000	1.51	0.0	222.7	SURCHARGED
6.005	SWMHA2.24	69.004	0.432	0.000	1.11	0.0	212.2	SURCHARGED
1.009	SWMHA2.25	67.290	0.065	0.000	0.00	0.0	0.0	SURCHARGED

Summary of Results for 120 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA2.1	68.944	0.544	0.000	0.02	0.0	1.3	FLOOD RISK
1.001	SWMHA2.2	68.943	0.691	0.000	0.24	0.0	10.2	SURCHARGED
2.000	SWMHA2.3	68.945	0.220	0.000	0.18	0.0	6.2	SURCHARGED
1.002	SWMHA2.4	68.936	0.724	0.000	0.55	0.0	23.1	SURCHARGED
3.000	SWMHA2.5	68.927	0.202	0.000	0.25	0.0	8.2	SURCHARGED
1.003	SWMHA2.6	68.914	0.759	0.000	0.90	0.0	37.0	SURCHARGED
4.000	SWMHA2.7	68.900	0.175	0.000	0.31	0.0	10.4	SURCHARGED
1.004	SWMHA2.8	68.884	0.699	0.000	0.87	0.0	52.5	SURCHARGED
1.005	SWMHA2.9	68.862	0.711	0.000	0.81	0.0	54.0	SURCHARGED
1.006	SWMHA2.12	68.840	0.729	0.000	0.72	0.0	55.3	SURCHARGED
5.000	SWMHA2.13	68.845	0.045	0.000	0.40	0.0	40.5	SURCHARGED
1.007	SWMHA2.14	68.817	0.681	0.000	0.79	0.0	95.7	SURCHARGED
1.008	SWMHA2.15	68.792	0.707	0.000	0.44	0.0	58.4	SURCHARGED
6.000	SWMHA2.16	69.157	0.207	0.000	0.11	0.0	18.5	SURCHARGED
6.001	SWMHA2.17	69.146	0.379	0.000	0.45	0.0	74.7	SURCHARGED
6.002	SWMHA2.18	69.107	0.495	0.000	0.83	0.0	99.2	SURCHARGED
7.000	SWMHA2.19	69.160	-0.140	0.000	0.31	0.0	19.1	OK
7.001	SWMHA2.20	69.122	0.322	0.000	0.53	0.0	27.8	SURCHARGED
6.003	SWMHA2.21	69.084	0.499	0.000	0.93	0.0	131.9	SURCHARGED
8.000	SWMHA2.22	69.168	0.368	0.000	0.71	0.0	52.4	SURCHARGED
6.004	SWMHA2.23	69.039	0.427	0.000	1.29	0.0	189.3	SURCHARGED
6.005	SWMHA2.24	68.986	0.414	0.000	0.97	0.0	184.7	SURCHARGED
1.009	SWMHA2.25	67.343	0.118	0.000	0.00	0.0	0.0	SURCHARGED

Summary of Results for 180 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA2.1	68.940	0.540	0.000	0.01	0.0	1.0	FLOOD RISK
1.001	SWMHA2.2	68.938	0.687	0.000	0.19	0.0	7.9	SURCHARGED
2.000	SWMHA2.3	68.941	0.216	0.000	0.14	0.0	4.7	SURCHARGED
1.002	SWMHA2.4	68.932	0.721	0.000	0.43	0.0	18.0	SURCHARGED
3.000	SWMHA2.5	68.924	0.199	0.000	0.19	0.0	6.3	SURCHARGED
1.003	SWMHA2.6	68.912	0.757	0.000	0.71	0.0	29.1	SURCHARGED
4.000	SWMHA2.7	68.899	0.174	0.000	0.23	0.0	7.7	SURCHARGED
1.004	SWMHA2.8	68.885	0.700	0.000	0.69	0.0	41.7	SURCHARGED
1.005	SWMHA2.9	68.864	0.714	0.000	0.65	0.0	42.8	SURCHARGED
1.006	SWMHA2.12	68.842	0.731	0.000	0.57	0.0	43.5	SURCHARGED
5.000	SWMHA2.13	68.848	0.048	0.000	0.30	0.0	30.5	SURCHARGED
1.007	SWMHA2.14	68.818	0.683	0.000	0.62	0.0	74.4	SURCHARGED
1.008	SWMHA2.15	68.793	0.708	0.000	0.45	0.0	60.6	SURCHARGED
6.000	SWMHA2.16	69.088	0.138	0.000	0.08	0.0	14.3	SURCHARGED
6.001	SWMHA2.17	69.080	0.313	0.000	0.34	0.0	57.6	SURCHARGED
6.002	SWMHA2.18	69.050	0.438	0.000	0.64	0.0	76.4	SURCHARGED
7.000	SWMHA2.19	69.116	-0.184	0.000	0.24	0.0	14.7	OK
7.001	SWMHA2.20	69.062	0.262	0.000	0.41	0.0	21.6	SURCHARGED
6.003	SWMHA2.21	69.033	0.448	0.000	0.72	0.0	102.2	SURCHARGED
8.000	SWMHA2.22	69.073	0.273	0.000	0.55	0.0	40.4	SURCHARGED
6.004	SWMHA2.23	68.998	0.387	0.000	1.00	0.0	146.9	SURCHARGED
6.005	SWMHA2.24	68.959	0.387	0.000	0.76	0.0	145.5	SURCHARGED
1.009	SWMHA2.25	67.423	0.198	0.000	0.00	0.0	0.0	SURCHARGED

Summary of Results for 240 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA2.1	68.926	0.526	0.000	0.01	0.0	0.9	FLOOD RISK
1.001	SWMHA2.2	68.925	0.673	0.000	0.16	0.0	6.5	SURCHARGED
2.000	SWMHA2.3	68.927	0.202	0.000	0.12	0.0	3.9	SURCHARGED
1.002	SWMHA2.4	68.919	0.708	0.000	0.36	0.0	15.0	SURCHARGED
3.000	SWMHA2.5	68.911	0.186	0.000	0.15	0.0	5.2	SURCHARGED
1.003	SWMHA2.6	68.901	0.746	0.000	0.59	0.0	24.2	SURCHARGED
4.000	SWMHA2.7	68.889	0.164	0.000	0.19	0.0	6.3	SURCHARGED
1.004	SWMHA2.8	68.875	0.690	0.000	0.57	0.0	34.6	SURCHARGED
1.005	SWMHA2.9	68.857	0.706	0.000	0.54	0.0	35.5	SURCHARGED
1.006	SWMHA2.12	68.836	0.726	0.000	0.47	0.0	36.1	SURCHARGED
5.000	SWMHA2.13	68.842	0.042	0.000	0.24	0.0	24.2	SURCHARGED
1.007	SWMHA2.14	68.815	0.679	0.000	0.52	0.0	62.2	SURCHARGED
1.008	SWMHA2.15	68.791	0.705	0.000	0.43	0.0	56.8	SURCHARGED
6.000	SWMHA2.16	69.047	0.097	0.000	0.07	0.0	11.8	SURCHARGED
6.001	SWMHA2.17	69.041	0.274	0.000	0.28	0.0	47.5	SURCHARGED
6.002	SWMHA2.18	69.016	0.404	0.000	0.53	0.0	63.0	SURCHARGED
7.000	SWMHA2.19	69.097	-0.203	0.000	0.20	0.0	12.1	OK
7.001	SWMHA2.20	69.026	0.226	0.000	0.34	0.0	17.9	SURCHARGED
6.003	SWMHA2.21	69.002	0.417	0.000	0.60	0.0	84.5	SURCHARGED
8.000	SWMHA2.22	69.024	0.224	0.000	0.45	0.0	33.2	SURCHARGED
6.004	SWMHA2.23	68.973	0.361	0.000	0.83	0.0	121.4	SURCHARGED
6.005	SWMHA2.24	68.940	0.368	0.000	0.63	0.0	120.5	SURCHARGED
1.009	SWMHA2.25	67.484	0.259	0.000	0.00	0.0	0.0	SURCHARGED

Summary of Results for 360 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA2.1	68.898	0.498	0.000	0.01	0.0	0.8	FLOOD RISK
1.001	SWMHA2.2	68.897	0.645	0.000	0.12	0.0	5.2	SURCHARGED
2.000	SWMHA2.3	68.899	0.174	0.000	0.09	0.0	3.1	SURCHARGED
1.002	SWMHA2.4	68.892	0.680	0.000	0.28	0.0	11.8	SURCHARGED
3.000	SWMHA2.5	68.886	0.161	0.000	0.12	0.0	4.0	SURCHARGED
1.003	SWMHA2.6	68.877	0.722	0.000	0.46	0.0	19.1	SURCHARGED
4.000	SWMHA2.7	68.866	0.141	0.000	0.15	0.0	4.9	SURCHARGED
1.004	SWMHA2.8	68.856	0.671	0.000	0.45	0.0	27.3	SURCHARGED
1.005	SWMHA2.9	68.840	0.690	0.000	0.42	0.0	28.1	SURCHARGED
1.006	SWMHA2.12	68.824	0.713	0.000	0.37	0.0	28.8	SURCHARGED
5.000	SWMHA2.13	68.828	0.028	0.000	0.18	0.0	18.5	SURCHARGED
1.007	SWMHA2.14	68.805	0.669	0.000	0.41	0.0	49.3	SURCHARGED
1.008	SWMHA2.15	68.785	0.700	0.000	0.36	0.0	48.0	SURCHARGED
6.000	SWMHA2.16	68.997	0.047	0.000	0.05	0.0	8.9	SURCHARGED
6.001	SWMHA2.17	68.992	0.226	0.000	0.21	0.0	35.7	SURCHARGED
6.002	SWMHA2.18	68.974	0.362	0.000	0.40	0.0	47.4	SURCHARGED
7.000	SWMHA2.19	69.077	-0.223	0.000	0.15	0.0	9.1	OK
7.001	SWMHA2.20	68.981	0.181	0.000	0.26	0.0	13.5	SURCHARGED
6.003	SWMHA2.21	68.963	0.378	0.000	0.45	0.0	63.8	SURCHARGED
8.000	SWMHA2.22	68.979	0.179	0.000	0.34	0.0	25.0	SURCHARGED
6.004	SWMHA2.23	68.941	0.330	0.000	0.62	0.0	91.6	SURCHARGED
6.005	SWMHA2.24	68.916	0.344	0.000	0.48	0.0	91.1	SURCHARGED
1.009	SWMHA2.25	67.578	0.353	0.000	0.00	0.0	0.0	SURCHARGED

Summary of Results for 720 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA2.1	68.845	0.445	0.000	0.01	0.0	0.5	FLOOD RISK
1.001	SWMHA2.2	68.844	0.593	0.000	0.08	0.0	3.4	SURCHARGED
2.000	SWMHA2.3	68.846	0.121	0.000	0.06	0.0	2.0	SURCHARGED
1.002	SWMHA2.4	68.841	0.630	0.000	0.18	0.0	7.6	SURCHARGED
3.000	SWMHA2.5	68.837	0.112	0.000	0.08	0.0	2.6	SURCHARGED
1.003	SWMHA2.6	68.832	0.677	0.000	0.30	0.0	12.3	SURCHARGED
4.000	SWMHA2.7	68.825	0.100	0.000	0.09	0.0	3.1	SURCHARGED
1.004	SWMHA2.8	68.818	0.633	0.000	0.29	0.0	17.6	SURCHARGED
1.005	SWMHA2.9	68.808	0.658	0.000	0.27	0.0	18.2	SURCHARGED
1.006	SWMHA2.12	68.797	0.686	0.000	0.24	0.0	18.7	SURCHARGED
5.000	SWMHA2.13	68.800	0.000	0.000	0.12	0.0	11.8	OK
1.007	SWMHA2.14	68.785	0.649	0.000	0.26	0.0	31.8	SURCHARGED
1.008	SWMHA2.15	68.772	0.686	0.000	0.24	0.0	31.6	SURCHARGED
6.000	SWMHA2.16	68.940	-0.010	0.000	0.03	0.0	5.4	OK
6.001	SWMHA2.17	68.937	0.170	0.000	0.13	0.0	21.9	SURCHARGED
6.002	SWMHA2.18	68.925	0.313	0.000	0.24	0.0	29.0	SURCHARGED
7.000	SWMHA2.19	69.061	-0.239	0.000	0.09	0.0	5.6	OK
7.001	SWMHA2.20	68.930	0.130	0.000	0.16	0.0	8.3	SURCHARGED
6.003	SWMHA2.21	68.919	0.334	0.000	0.28	0.0	39.1	SURCHARGED
8.000	SWMHA2.22	68.928	0.128	0.000	0.21	0.0	15.3	SURCHARGED
6.004	SWMHA2.23	68.905	0.294	0.000	0.38	0.0	56.1	SURCHARGED
6.005	SWMHA2.24	68.890	0.318	0.000	0.29	0.0	56.0	SURCHARGED
1.009	SWMHA2.25	67.760	0.535	0.000	0.00	0.0	0.0	SURCHARGED

Summary of Results for 1440 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA2.1	68.803	0.403	0.000	0.00	0.0	0.3	FLOOD RISK
1.001	SWMHA2.2	68.803	0.551	0.000	0.05	0.0	2.0	SURCHARGED
2.000	SWMHA2.3	68.804	0.079	0.000	0.04	0.0	1.2	SURCHARGED
1.002	SWMHA2.4	68.801	0.590	0.000	0.11	0.0	4.7	SURCHARGED
3.000	SWMHA2.5	68.799	0.074	0.000	0.05	0.0	1.6	SURCHARGED
1.003	SWMHA2.6	68.795	0.640	0.000	0.18	0.0	7.5	SURCHARGED
4.000	SWMHA2.7	68.791	0.066	0.000	0.06	0.0	1.9	SURCHARGED
1.004	SWMHA2.8	68.787	0.602	0.000	0.18	0.0	10.7	SURCHARGED
1.005	SWMHA2.9	68.781	0.630	0.000	0.17	0.0	11.1	SURCHARGED
1.006	SWMHA2.12	68.774	0.664	0.000	0.15	0.0	11.4	SURCHARGED
5.000	SWMHA2.13	68.776	-0.024	0.000	0.07	0.0	7.2	OK
1.007	SWMHA2.14	68.767	0.631	0.000	0.16	0.0	19.4	SURCHARGED
1.008	SWMHA2.15	68.759	0.674	0.000	0.15	0.0	19.4	SURCHARGED
6.000	SWMHA2.16	68.904	-0.046	0.000	0.02	0.0	3.3	OK
6.001	SWMHA2.17	68.902	0.135	0.000	0.08	0.0	13.3	SURCHARGED
6.002	SWMHA2.18	68.895	0.283	0.000	0.15	0.0	17.7	SURCHARGED
7.000	SWMHA2.19	69.045	-0.255	0.000	0.06	0.0	3.4	OK
7.001	SWMHA2.20	68.898	0.098	0.000	0.10	0.0	5.1	SURCHARGED
6.003	SWMHA2.21	68.891	0.306	0.000	0.17	0.0	23.8	SURCHARGED
8.000	SWMHA2.22	68.897	0.097	0.000	0.13	0.0	9.3	SURCHARGED
6.004	SWMHA2.23	68.883	0.272	0.000	0.23	0.0	34.2	SURCHARGED
6.005	SWMHA2.24	68.874	0.302	0.000	0.18	0.0	34.2	SURCHARGED
1.009	SWMHA2.25	67.976	0.751	0.000	0.00	0.0	0.0	SURCHARGED

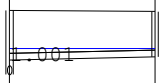
Summary of Results for 2880 minute 100 year Winter (Storm)

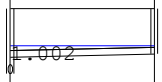
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

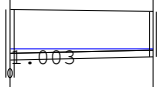
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA2.1	68.775	0.375	0.000	0.00	0.0	0.2	SURCHARGED
1.001	SWMHA2.2	68.775	0.524	0.000	0.03	0.0	1.3	SURCHARGED
2.000	SWMHA2.3	68.776	0.051	0.000	0.02	0.0	0.7	SURCHARGED
1.002	SWMHA2.4	68.774	0.563	0.000	0.07	0.0	2.8	SURCHARGED
3.000	SWMHA2.5	68.773	0.048	0.000	0.03	0.0	1.0	SURCHARGED
1.003	SWMHA2.6	68.771	0.616	0.000	0.11	0.0	4.6	SURCHARGED
4.000	SWMHA2.7	68.768	0.043	0.000	0.03	0.0	1.2	SURCHARGED
1.004	SWMHA2.8	68.766	0.581	0.000	0.11	0.0	6.6	SURCHARGED
1.005	SWMHA2.9	68.762	0.611	0.000	0.10	0.0	6.8	SURCHARGED
1.006	SWMHA2.12	68.758	0.647	0.000	0.09	0.0	7.0	SURCHARGED
5.000	SWMHA2.13	68.759	-0.041	0.000	0.04	0.0	4.4	OK
1.007	SWMHA2.14	68.753	0.618	0.000	0.10	0.0	11.8	SURCHARGED
1.008	SWMHA2.15	68.748	0.663	0.000	0.09	0.0	11.8	SURCHARGED
6.000	SWMHA2.16	68.879	-0.071	0.000	0.01	0.0	2.0	OK
6.001	SWMHA2.17	68.878	0.111	0.000	0.05	0.0	8.1	SURCHARGED
6.002	SWMHA2.18	68.874	0.262	0.000	0.09	0.0	10.8	SURCHARGED
7.000	SWMHA2.19	69.036	-0.264	0.000	0.03	0.0	2.1	OK
7.001	SWMHA2.20	68.875	0.075	0.000	0.06	0.0	3.1	SURCHARGED
6.003	SWMHA2.21	68.871	0.287	0.000	0.10	0.0	14.5	SURCHARGED
8.000	SWMHA2.22	68.875	0.075	0.000	0.08	0.0	5.7	SURCHARGED
6.004	SWMHA2.23	68.866	0.255	0.000	0.14	0.0	20.9	SURCHARGED
6.005	SWMHA2.24	68.861	0.289	0.000	0.11	0.0	20.9	SURCHARGED
1.009	SWMHA2.25	68.232	1.007	0.000	0.15	0.0	4.7	SURCHARGED

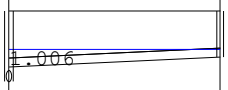
MH Name	SWMHA2.12	SWMHA2.9	SWMHA2.8	SWMHA2.6	SWMHA2.4	SWMHA2.2	SWMHA2.1	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000				4.000	3.000	2.000		
PN		1.005	1.004	1.003	1.002	1.001	1.000	
Dia (mm)		375	375	300	300	300	300	
Slope (1:X)		500.0	500.0	500.0	571.9	403.3	198.7	
Cover Level (m)	70.200	70.007	70.071	70.004	70.036	69.997	69.100	
Invert Level (m)		67.736	67.776	67.810	67.855	67.911	67.952	68.100
Length (m)		19.847	17.256	22.438	32.201	16.350	29.443	

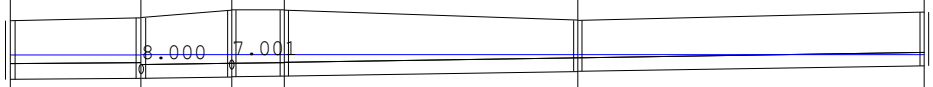
MH Name	OUTFALL 2		SWMHA2.15	SWMHA2.14	SWMHA2.12	
Hor Scale 1200 Ver Scale 250 Datum (m) 60.000			6.005		5.000	
PN			1.008	1.007	1.006	
Dia (mm)			450	450	375	
Slope (1:X)			500.0	500.0	500.7	
Cover Level (m)	70.000	70.000	70.000	70.021	70.200	
Invert Level (m)		66.933	67.000	67.502	67.635	67.635	67.686	67.686	67.736
Length (m)			66.500	25.185	25.095	

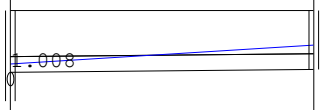
MH Name	SWMHA2.4	SWMHA2.3	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000			
PN		2.000	
Dia (mm)		225	
Slope (1:X)		200.6	
Cover Level (m)	70.036	70.000	
Invert Level (m)	68.385	68.500	
Length (m)		23.096	

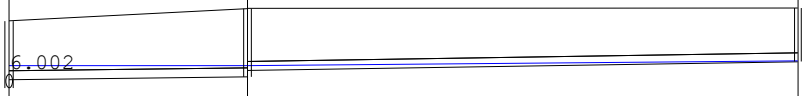
MH Name	SWMHA2.6	SWMHA2.5	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000			
PN		3.000	
Dia (mm)		225	
Slope (1:X)		200.0	
Cover Level (m)	70.004	70.000	
Invert Level (m)	68.386	68.500	
Length (m)		22.877	

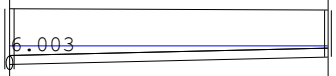
MH Name	SWMHA2.8	SWMHA2.7	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000			
PN		4.000	
Dia (mm)		225	
Slope (1:X)		200.0	
Cover Level (m)	70.071	70.000	
Invert Level (m)		68.387	68.500
Length (m)		22.683	

MH Name	SWMHA2.14	SWMHA2.13	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000			
PN		5.000	
Dia (mm)		300	
Slope (1:X)		100.0	
Cover Level (m)	70.021	70.024	
Invert Level (m)		68.165	68.500
Length (m)		33.534	

MH Name	SWMHA2.24	SWMHA2.23			SWMHA2.17	SWMHA2.16	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000							
PN		6.004			6.001	6.000	
Dia (mm)		525			450	450	
Slope (1:X)		524.0			300.6	300.0	
Cover Level (m)	70.000	70.096	70.348	70.348	70.010	70.287	
Invert Level (m)		68.047	68.087	68.087	68.135	68.162	68.162	68.317	68.317	68.500	
Length (m)		20.743			46.595	54.978	

MH Name	SWMHA2.25	SWMHA2.24	
Hor Scale 1200 Ver Scale 250 Datum (m) 60.000			
PN		6.005	
Dia (mm)		525	
Slope (1:X)		500.0	
Cover Level (m)	70.000	70.000	
Invert Level (m)	67.951	68.047	
Length (m)		48.147	

MH Name	SWMHA2.21	SWMHA2.20	SWMHA2.19	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000				
PN		7.001	7.000	
Dia (mm)		300	300	
Slope (1:X)		374.7	300.0	
Cover Level (m)	70.348	70.757	70.778	
Invert Level (m)		68.399	68.500 68.709	69.000
Length (m)		37.843	87.358	

MH Name	SWMHA2.23	SWMHA2.22	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000			
PN		8.000	
Dia (mm)		300	
Slope (1:X)		200.6	
Cover Level (m)	70.096	70.045	
Invert Level (m)		68.248	68.500
Length (m)		50.546	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	Add Flow / Climate Change (%)	0
M5-60 (mm)	17.100	Minimum Backdrop Height (m)	0.000
Ratio R	0.295	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	0.000
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500
PIMP (%)	100		

Designed with Level Inverts

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	49.449	0.197	250.8	0.108	4.00	0.0	0.600	o	225
2.000	20.205	0.081	250.2	0.231	4.00	0.0	0.600	o	300
2.001	51.496	0.206	250.0	0.000	0.00	0.0	0.600	o	300
2.002	28.565	0.115	248.0	0.262	0.00	0.0	0.600	o	300
1.001	13.588	0.088	154.8	0.252	0.00	0.0	0.600	o	375
1.002	14.254	0.029	500.0	0.000	0.00	0.0	0.600	o	450
1.003	28.996	0.116	250.0	0.000	0.00	0.0	0.600	o	450
1.004	10.161	0.041	247.8	0.000	0.00	0.0	0.600	o	225

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.00	68.734	0.108	0.0	0.0	0.0	0.82	32.6	14.6
2.000	50.00	4.34	69.000	0.231	0.0	0.0	0.0	0.99	69.9	31.3
2.001	50.00	5.21	68.919	0.231	0.0	0.0	0.0	0.99	70.0	31.3
2.002	50.00	5.69	68.713	0.494	0.0	0.0	0.0	0.99	70.3	66.8
1.001	50.00	5.84	68.537	0.853	0.0	0.0	0.0	1.45	160.6	115.5
1.002	50.00	6.11	68.449	0.853	0.0	0.0	0.0	0.90	143.5	115.5
1.003	50.00	6.48	68.000	0.853	0.0	0.0	0.0	1.28	203.8	115.5
1.004	50.00	4.21	67.880	0.000	2.0	0.0	0.0	0.83	32.8	2.0

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SWMHA3.4	70.665	1.931	Open Manhole	1200	1.000	68.734	225				
SWMHA3.5	70.723	1.723	Open Manhole	1050	2.000	69.000	300				
SWMHA3.6	70.800	1.881	Open Manhole	1200	2.001	68.919	300	2.000	68.919	300	
SWMHA3.8	70.670	1.957	Open Manhole	1200	2.002	68.713	300	2.001	68.713	300	
SWMHA3.9	70.769	2.232	Open Manhole	1350	1.001	68.537	375	1.000	68.537	225	
								2.002	68.598	300	
SWMHA3.10	70.000	1.551	Open Manhole	1350	1.002	68.449	450	1.001	68.449	375	
SWMHA3.11	70.000	2.000	Open Manhole	1350	1.003	68.000	450	1.002	68.420	450	420
SWMHA3.12	70.000	2.120	Open Manhole	1350	1.004	67.880	225	1.003	67.884	450	229
OUTFALL 3	69.000	1.161	Open Manhole	0		OUTFALL		1.004	67.839	225	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	SWMHA3.4	70.665	68.734	1.706	Open Manhole	1200
2.000	o	300	SWMHA3.5	70.723	69.000	1.423	Open Manhole	1050
2.001	o	300	SWMHA3.6	70.800	68.919	1.581	Open Manhole	1200
2.002	o	300	SWMHA3.8	70.670	68.713	1.657	Open Manhole	1200
1.001	o	375	SWMHA3.9	70.769	68.537	1.857	Open Manhole	1350
1.002	o	450	SWMHA3.10	70.000	68.449	1.101	Open Manhole	1350
1.003	o	450	SWMHA3.11	70.000	68.000	1.550	Open Manhole	1350
1.004	o	225	SWMHA3.12	70.000	67.880	1.895	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	49.449	250.8	SWMHA3.9	70.769	68.537	2.007	Open Manhole	1350
2.000	20.205	250.2	SWMHA3.6	70.800	68.919	1.581	Open Manhole	1200
2.001	51.496	250.0	SWMHA3.8	70.670	68.713	1.657	Open Manhole	1200
2.002	28.565	248.0	SWMHA3.9	70.769	68.598	1.871	Open Manhole	1350
1.001	13.588	154.8	SWMHA3.10	70.000	68.449	1.176	Open Manhole	1350
1.002	14.254	500.0	SWMHA3.11	70.000	68.420	1.130	Open Manhole	1350
1.003	28.996	250.0	SWMHA3.12	70.000	67.884	1.666	Open Manhole	1350
1.004	10.161	247.8	OUTFALL 3	69.000	67.839	0.936	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.017	0.017	0.017
	User	-	100	0.013	0.013	0.030
	User	-	100	0.078	0.078	0.108
2.000	User	-	100	0.231	0.231	0.231
2.001	-	-	100	0.000	0.000	0.000
2.002	User	-	100	0.262	0.262	0.262
1.001	User	-	100	0.252	0.252	0.252
1.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.853	0.853	0.853

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	OUTFALL 3	69.000	67.839	67.700	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	10.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	1.000
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	5760
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	24

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.100	Storm Duration (mins)	2880
Ratio R	0.295		

Online Controls for Storm

Weir Manhole: SWMHA3.11, DS/PN: 1.003, Volume (m³): 4.9

Discharge Coef 0.544 Width (m) 1.350 Invert Level (m) 69.000

Depth/Flow Relationship Manhole: SWMHA3.12, DS/PN: 1.004, Volume (m³): 7.4

Invert Level (m) 67.880

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	2.0000	1.400	2.0000	2.600	2.0000	3.800	2.0000	5.000	2.0000
0.400	2.0000	1.600	2.0000	2.800	2.0000	4.000	2.0000	5.200	2.0000
0.600	2.0000	1.800	2.0000	3.000	2.0000	4.200	2.0000	5.400	2.0000
0.800	2.0000	2.000	2.0000	3.200	2.0000	4.400	2.0000	5.600	2.0000
1.000	2.0000	2.200	2.0000	3.400	2.0000	4.600	2.0000	5.800	2.0000
1.200	2.0000	2.400	2.0000	3.600	2.0000	4.800	2.0000	6.000	2.0000

Storage Structures for Storm

Infiltration Basin Manhole: SWMHA3.11, DS/PN: 1.003

Invert Level (m) 68.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	63.0	1.200	0.0	2.400	0.0	3.600	0.0	4.800	0.0
0.200	89.2	1.400	0.0	2.600	0.0	3.800	0.0	5.000	0.0
0.400	115.4	1.600	0.0	2.800	0.0	4.000	0.0		
0.600	141.6	1.800	0.0	3.000	0.0	4.200	0.0		
0.800	167.8	2.000	0.0	3.200	0.0	4.400	0.0		
1.000	194.0	2.200	0.0	3.400	0.0	4.600	0.0		

Tank or Pond Manhole: SWMHA3.12, DS/PN: 1.004

Invert Level (m) 67.942

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	806.0	1.200	0.0	2.400	0.0	3.600	0.0	4.800	0.0
0.200	806.0	1.400	0.0	2.600	0.0	3.800	0.0	5.000	0.0
0.400	806.0	1.600	0.0	2.800	0.0	4.000	0.0		
0.600	806.0	1.800	0.0	3.000	0.0	4.200	0.0		
0.800	806.0	2.000	0.0	3.200	0.0	4.400	0.0		
1.000	806.0	2.200	0.0	3.400	0.0	4.600	0.0		

Summary of Results for 15 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA3.4	69.733	0.774	0.000	1.17	0.0	36.5	SURCHARGED
2.000	SWMHA3.5	70.488	1.188	0.000	1.21	0.0	73.8	FLOOD RISK
2.001	SWMHA3.6	70.367	1.147	0.000	1.11	0.0	73.5	SURCHARGED
2.002	SWMHA3.8	70.111	1.098	0.000	2.38	0.0	151.2	SURCHARGED
1.001	SWMHA3.9	69.438	0.527	0.000	2.14	0.0	269.5	SURCHARGED
1.002	SWMHA3.10	69.030	0.131	0.000	3.17	0.0	267.3	SURCHARGED
1.003	SWMHA3.11	69.028	0.578	0.000	0.02	0.0	3.1	SURCHARGED
1.004	SWMHA3.12	67.946	-0.159	0.000	0.00	0.0	0.0	OK

Summary of Results for 30 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA3.4	69.507	0.549	0.000	1.00	0.0	31.3	SURCHARGED
2.000	SWMHA3.5	70.111	0.811	0.000	1.06	0.0	64.9	SURCHARGED
2.001	SWMHA3.6	70.020	0.801	0.000	0.97	0.0	64.1	SURCHARGED
2.002	SWMHA3.8	69.822	0.809	0.000	2.12	0.0	134.7	SURCHARGED
1.001	SWMHA3.9	69.301	0.389	0.000	1.88	0.0	237.2	SURCHARGED
1.002	SWMHA3.10	69.164	0.265	0.000	2.81	0.0	236.7	SURCHARGED
1.003	SWMHA3.11	69.130	0.680	0.000	0.60	0.0	105.3	SURCHARGED
1.004	SWMHA3.12	68.012	-0.093	0.000	0.00	0.0	0.0	OK

Summary of Results for 45 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA3.4	69.372	0.413	0.000	0.82	0.0	25.6	SURCHARGED
2.000	SWMHA3.5	69.776	0.476	0.000	0.89	0.0	54.0	SURCHARGED
2.001	SWMHA3.6	69.714	0.494	0.000	0.80	0.0	52.5	SURCHARGED
2.002	SWMHA3.8	69.585	0.571	0.000	1.77	0.0	112.5	SURCHARGED
1.001	SWMHA3.9	69.313	0.402	0.000	1.57	0.0	197.5	SURCHARGED
1.002	SWMHA3.10	69.193	0.294	0.000	2.33	0.0	196.6	SURCHARGED
1.003	SWMHA3.11	69.146	0.696	0.000	0.72	0.0	125.1	SURCHARGED
1.004	SWMHA3.12	68.054	-0.051	0.000	0.00	0.0	0.0	OK

Summary of Results for 60 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA3.4	69.358	0.399	0.000	0.68	0.0	21.3	SURCHARGED
2.000	SWMHA3.5	69.618	0.318	0.000	0.74	0.0	45.3	SURCHARGED
2.001	SWMHA3.6	69.576	0.357	0.000	0.67	0.0	44.6	SURCHARGED
2.002	SWMHA3.8	69.501	0.488	0.000	1.50	0.0	95.6	SURCHARGED
1.001	SWMHA3.9	69.301	0.389	0.000	1.31	0.0	165.5	SURCHARGED
1.002	SWMHA3.10	69.198	0.299	0.000	1.95	0.0	164.2	SURCHARGED
1.003	SWMHA3.11	69.151	0.701	0.000	0.76	0.0	132.7	SURCHARGED
1.004	SWMHA3.12	68.085	-0.020	0.000	0.00	0.0	0.0	OK

Summary of Results for 90 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA3.4	69.308	0.349	0.000	0.51	0.0	15.9	SURCHARGED
2.000	SWMHA3.5	69.490	0.190	0.000	0.57	0.0	34.6	SURCHARGED
2.001	SWMHA3.6	69.455	0.236	0.000	0.50	0.0	32.9	SURCHARGED
2.002	SWMHA3.8	69.403	0.390	0.000	1.12	0.0	70.9	SURCHARGED
1.001	SWMHA3.9	69.258	0.346	0.000	0.98	0.0	123.8	SURCHARGED
1.002	SWMHA3.10	69.178	0.279	0.000	1.46	0.0	122.6	SURCHARGED
1.003	SWMHA3.11	69.138	0.688	0.000	0.67	0.0	116.5	SURCHARGED
1.004	SWMHA3.12	68.132	0.027	0.000	0.00	0.0	0.0	SURCHARGED

Summary of Results for 120 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA3.4	69.270	0.311	0.000	0.43	0.0	13.4	SURCHARGED
2.000	SWMHA3.5	69.414	0.114	0.000	0.47	0.0	28.6	SURCHARGED
2.001	SWMHA3.6	69.383	0.164	0.000	0.44	0.0	28.8	SURCHARGED
2.002	SWMHA3.8	69.338	0.325	0.000	0.96	0.0	61.2	SURCHARGED
1.001	SWMHA3.9	69.226	0.314	0.000	0.84	0.0	105.5	SURCHARGED
1.002	SWMHA3.10	69.163	0.264	0.000	1.26	0.0	105.8	SURCHARGED
1.003	SWMHA3.11	69.128	0.678	0.000	0.60	0.0	104.1	SURCHARGED
1.004	SWMHA3.12	68.167	0.062	0.000	0.00	0.0	0.0	SURCHARGED

Summary of Results for 180 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA3.4	69.216	0.257	0.000	0.34	0.0	10.7	SURCHARGED
2.000	SWMHA3.5	69.310	0.010	0.000	0.38	0.0	23.0	SURCHARGED
2.001	SWMHA3.6	69.286	0.066	0.000	0.35	0.0	23.0	SURCHARGED
2.002	SWMHA3.8	69.250	0.237	0.000	0.77	0.0	49.1	SURCHARGED
1.001	SWMHA3.9	69.182	0.270	0.000	0.67	0.0	84.9	SURCHARGED
1.002	SWMHA3.10	69.139	0.240	0.000	1.01	0.0	84.9	SURCHARGED
1.003	SWMHA3.11	69.111	0.661	0.000	0.48	0.0	84.3	SURCHARGED
1.004	SWMHA3.12	68.219	0.114	0.000	0.00	0.0	0.0	SURCHARGED

Summary of Results for 240 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA3.4	69.187	0.228	0.000	0.29	0.0	8.9	SURCHARGED
2.000	SWMHA3.5	69.256	-0.044	0.000	0.31	0.0	19.2	OK
2.001	SWMHA3.6	69.237	0.017	0.000	0.29	0.0	19.1	SURCHARGED
2.002	SWMHA3.8	69.207	0.194	0.000	0.64	0.0	40.8	SURCHARGED
1.001	SWMHA3.9	69.158	0.246	0.000	0.56	0.0	70.6	SURCHARGED
1.002	SWMHA3.10	69.123	0.224	0.000	0.84	0.0	70.6	SURCHARGED
1.003	SWMHA3.11	69.099	0.649	0.000	0.40	0.0	70.3	SURCHARGED
1.004	SWMHA3.12	68.260	0.155	0.000	0.00	0.0	0.0	SURCHARGED

Summary of Results for 360 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA3.4	69.154	0.195	0.000	0.21	0.0	6.7	SURCHARGED
2.000	SWMHA3.5	69.206	-0.094	0.000	0.24	0.0	14.4	OK
2.001	SWMHA3.6	69.191	-0.028	0.000	0.22	0.0	14.4	OK
2.002	SWMHA3.8	69.169	0.156	0.000	0.48	0.0	30.7	SURCHARGED
1.001	SWMHA3.9	69.133	0.221	0.000	0.42	0.0	53.0	SURCHARGED
1.002	SWMHA3.10	69.106	0.207	0.000	0.63	0.0	53.0	SURCHARGED
1.003	SWMHA3.11	69.088	0.638	0.000	0.30	0.0	52.9	SURCHARGED
1.004	SWMHA3.12	68.322	0.217	0.000	0.00	0.0	0.0	SURCHARGED

Summary of Results for 720 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA3.4	69.112	0.153	0.000	0.13	0.0	4.1	SURCHARGED
2.000	SWMHA3.5	69.144	-0.156	0.000	0.14	0.0	8.7	OK
2.001	SWMHA3.6	69.135	-0.084	0.000	0.13	0.0	8.7	OK
2.002	SWMHA3.8	69.121	0.108	0.000	0.29	0.0	18.6	SURCHARGED
1.001	SWMHA3.9	69.099	0.187	0.000	0.26	0.0	32.2	SURCHARGED
1.002	SWMHA3.10	69.083	0.184	0.000	0.38	0.0	32.2	SURCHARGED
1.003	SWMHA3.11	69.072	0.622	0.000	0.18	0.0	32.2	SURCHARGED
1.004	SWMHA3.12	68.444	0.339	0.000	0.00	0.0	0.0	SURCHARGED

Summary of Results for 1440 minute 100 year Winter (Storm)

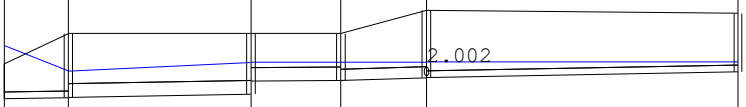
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

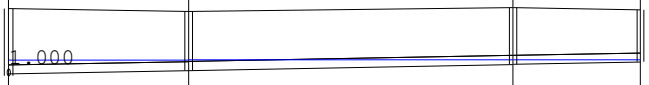
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA3.4	69.083	0.124	0.000	0.08	0.0	2.5	SURCHARGED
2.000	SWMHA3.5	69.104	-0.196	0.000	0.09	0.0	5.3	OK
2.001	SWMHA3.6	69.097	-0.122	0.000	0.08	0.0	5.3	OK
2.002	SWMHA3.8	69.089	0.076	0.000	0.18	0.0	11.3	SURCHARGED
1.001	SWMHA3.9	69.075	0.164	0.000	0.15	0.0	19.5	SURCHARGED
1.002	SWMHA3.10	69.066	0.167	0.000	0.23	0.0	19.5	SURCHARGED
1.003	SWMHA3.11	69.059	0.609	0.000	0.11	0.0	19.5	SURCHARGED
1.004	SWMHA3.12	68.588	0.483	0.000	0.00	0.0	0.0	SURCHARGED

Summary of Results for 2880 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA3.4	69.063	0.104	0.000	0.05	0.0	1.5	SURCHARGED
2.000	SWMHA3.5	69.079	-0.221	0.000	0.05	0.0	3.2	OK
2.001	SWMHA3.6	69.071	-0.148	0.000	0.05	0.0	3.2	OK
2.002	SWMHA3.8	69.067	0.053	0.000	0.11	0.0	6.9	SURCHARGED
1.001	SWMHA3.9	69.058	0.147	0.000	0.09	0.0	11.8	SURCHARGED
1.002	SWMHA3.10	69.052	0.153	0.000	0.14	0.0	11.8	SURCHARGED
1.003	SWMHA3.11	69.048	0.598	0.000	0.07	0.0	11.8	SURCHARGED
1.004	SWMHA3.12	68.758	0.653	0.000	0.07	0.0	2.0	SURCHARGED

MH Name	OUTFALL 3		SWMHA3.11			SWMHA3.4	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000							
PN			1.003			1.000	
Dia (mm)			450			225	
Slope (1:X)			250.0			250.8	
Cover Level (m)	69.000	70.000	70.000	70.000	70.769	70.665	
Invert Level (m)		67.839 67.880	67.884 68.000	68.420 68.449	68.449 68.537	68.537 68.734	
Length (m)			28.996			49.449	

MH Name	SWMHA3.9	SWMHA3.8	SWMHA3.6	SWMHA3.5	
Hor Scale 1200 Ver Scale 250 Datum (m) 61.000					
PN		2.002	2.001	2.000	
Dia (mm)		300	300	300	
Slope (1:X)		248.0	250.0	250.2	
Cover Level (m)	70.769	70.670	70.800	70.723	
Invert Level (m)		68.598 68.713	68.713 68.919	68.919 69.000	
Length (m)		28.565	51.496	20.205	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	Add Flow / Climate Change (%)	0
M5-60 (mm)	16.300	Minimum Backdrop Height (m)	0.000
Ratio R	0.276	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	0.000
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500
PIMP (%)	100		

Designed with Level Inverts

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	55.017	0.916	60.0	0.082	4.00	0.0	0.600	o	225
1.001	61.951	1.015	61.0	0.061	0.00	0.0	0.600	o	225
1.002	45.608	0.182	250.0	0.045	0.00	0.0	0.600	o	225
1.003	10.646	0.175	60.8	0.000	0.00	0.0	0.600	o	300
1.004	24.687	0.123	200.0	0.050	0.00	0.0	0.600	o	300
2.000	28.761	0.144	200.0	0.103	4.00	0.0	0.600	o	225
1.005	62.897	0.210	299.5	0.238	0.00	0.0	0.600	o	450
1.006	66.017	0.220	300.0	0.121	0.00	0.0	0.600	o	450
1.007	52.390	0.105	500.0	0.267	0.00	0.0	0.600	o	450
1.008	49.448	0.099	500.0	0.032	0.00	0.0	0.600	o	450
1.009	37.701	0.038	1000.0	0.000	0.00	0.0	0.600	o	525
1.010	14.621	0.073	200.3	0.000	0.00	0.0	0.600	o	450

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.54	72.500	0.082	0.0	0.0	0.0	1.69	67.2	11.1
1.001	50.00	5.16	71.584	0.142	0.0	0.0	0.0	1.68	66.7	19.3
1.002	50.00	6.08	70.100	0.188	0.0	0.0	0.0	0.82	32.7	25.4
1.003	50.00	6.17	69.918	0.188	0.0	0.0	0.0	2.02	142.7	25.4
1.004	50.00	6.54	69.743	0.238	0.0	0.0	0.0	1.11	78.3	32.2
2.000	50.00	4.52	69.600	0.103	0.0	0.0	0.0	0.92	36.6	13.9
1.005	50.00	7.44	69.456	0.578	0.0	0.0	0.0	1.17	186.0	78.3
1.006	49.57	8.38	69.246	0.699	0.0	0.0	0.0	1.17	185.8	93.9
1.007	47.17	9.35	69.026	0.967	0.0	0.0	0.0	0.90	143.5	123.5
1.008	45.15	10.26	68.921	0.999	0.0	0.0	0.0	0.90	143.5	123.5
1.009	43.36	11.16	68.822	0.999	0.0	0.0	0.0	0.70	151.5	123.5
1.010	50.00	4.17	68.785	0.000	2.0	0.0	0.0	1.43	227.9	2.0

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SWMHA4.1	74.707	2.207	Open Manhole	1200	1.000	72.500	225				
SWMHA4.2	73.081	1.497	Open Manhole	1050	1.001	71.584	225	1.000	71.584	225	
SWMHA4.3	71.812	1.712	Open Manhole	1050	1.002	70.100	225	1.001	70.569	225	469
SWMHA4.4	70.900	0.982	Open Manhole	1050	1.003	69.918	300	1.002	69.918	225	
SWMHA4.5	70.809	1.066	Open Manhole	1050	1.004	69.743	300	1.003	69.743	300	
SWMHA4.6	70.792	1.192	Open Manhole	1050	2.000	69.600	225				
SWMHA4.7	70.571	1.115	Open Manhole	1350	1.005	69.456	450	1.004	69.619	300	13
								2.000	69.456	225	
SWMHA4.8	70.792	1.546	Open Manhole	1350	1.006	69.246	450	1.005	69.246	450	
SWMHA4.9	70.571	1.545	Open Manhole	1350	1.007	69.026	450	1.006	69.026	450	
SWMHA4.10	70.776	1.855	Open Manhole	1350	1.008	68.921	450	1.007	68.921	450	
SWMHA4.11	71.000	2.178	Open Manhole	1500	1.009	68.822	525	1.008	68.822	450	
SWMHA4.12	70.200	1.415	Open Manhole	1500	1.010	68.785	450	1.009	68.785	525	
	70.000	1.288	Open Manhole	0		OUTFALL		1.010	68.712	450	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	SWMHA4.1	74.707	72.500	1.982	Open Manhole	1200
1.001	o	225	SWMHA4.2	73.081	71.584	1.272	Open Manhole	1050
1.002	o	225	SWMHA4.3	71.812	70.100	1.487	Open Manhole	1050
1.003	o	300	SWMHA4.4	70.900	69.918	0.682	Open Manhole	1050
1.004	o	300	SWMHA4.5	70.809	69.743	0.766	Open Manhole	1050
2.000	o	225	SWMHA4.6	70.792	69.600	0.967	Open Manhole	1050
1.005	o	450	SWMHA4.7	70.571	69.456	0.665	Open Manhole	1350
1.006	o	450	SWMHA4.8	70.792	69.246	1.096	Open Manhole	1350
1.007	o	450	SWMHA4.9	70.571	69.026	1.095	Open Manhole	1350
1.008	o	450	SWMHA4.10	70.776	68.921	1.405	Open Manhole	1350
1.009	o	525	SWMHA4.11	71.000	68.822	1.653	Open Manhole	1500
1.010	o	450	SWMHA4.12	70.200	68.785	0.965	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	55.017	60.0	SWMHA4.2	73.081	71.584	1.272	Open Manhole	1050
1.001	61.951	61.0	SWMHA4.3	71.812	70.569	1.018	Open Manhole	1050
1.002	45.608	250.0	SWMHA4.4	70.900	69.918	0.757	Open Manhole	1050
1.003	10.646	60.8	SWMHA4.5	70.809	69.743	0.766	Open Manhole	1050
1.004	24.687	200.0	SWMHA4.7	70.571	69.619	0.652	Open Manhole	1350
2.000	28.761	200.0	SWMHA4.7	70.571	69.456	0.890	Open Manhole	1350
1.005	62.897	299.5	SWMHA4.8	70.792	69.246	1.096	Open Manhole	1350
1.006	66.017	300.0	SWMHA4.9	70.571	69.026	1.095	Open Manhole	1350
1.007	52.390	500.0	SWMHA4.10	70.776	68.921	1.405	Open Manhole	1350
1.008	49.448	500.0	SWMHA4.11	71.000	68.822	1.728	Open Manhole	1500
1.009	37.701	1000.0	SWMHA4.12	70.200	68.785	0.890	Open Manhole	1500
1.010	14.621	200.3		70.000	68.712	0.838	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.082	0.082	0.082
1.001	User	-	100	0.061	0.061	0.061
1.002	User	-	100	0.045	0.045	0.045
1.003	-	-	100	0.000	0.000	0.000
1.004	User	-	100	0.050	0.050	0.050
2.000	User	-	100	0.103	0.103	0.103
1.005	User	-	100	0.034	0.034	0.034
	User	-	100	0.204	0.204	0.238
1.006	User	-	100	0.121	0.121	0.121
1.007	User	-	100	0.267	0.267	0.267
1.008	User	-	100	0.032	0.032	0.032
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.999	0.999	0.999

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.010		70.000	68.712	68.600	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	10.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	1.000
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	5760
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	24

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.300	Storm Duration (mins)	2880
Ratio R	0.276		

Online Controls for Storm

Weir Manhole: SWMHA4.11, DS/PN: 1.009, Volume (m³): 11.5

Discharge Coef 0.544 Width (m) 1.350 Invert Level (m) 69.900

Depth/Flow Relationship Manhole: SWMHA4.12, DS/PN: 1.010, Volume (m³): 10.3

Invert Level (m) 68.785

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	2.0000	1.400	2.0000	2.600	2.0000	3.800	2.0000	5.000	2.0000
0.400	2.0000	1.600	2.0000	2.800	2.0000	4.000	2.0000	5.200	2.0000
0.600	2.0000	1.800	2.0000	3.000	2.0000	4.200	2.0000	5.400	2.0000
0.800	2.0000	2.000	2.0000	3.200	2.0000	4.400	2.0000	5.600	2.0000
1.000	2.0000	2.200	2.0000	3.400	2.0000	4.600	2.0000	5.800	2.0000
1.200	2.0000	2.400	2.0000	3.600	2.0000	4.800	2.0000	6.000	2.0000

Storage Structures for Storm

Infiltration Basin Manhole: SWMHA4.11, DS/PN: 1.009

Invert Level (m) 68.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	239.6	0.600	411.2	1.200	0.0	1.800	0.0	2.400	0.0
0.100	268.2	0.700	439.8	1.300	0.0	1.900	0.0	2.500	0.0
0.200	296.8	0.800	468.4	1.400	0.0	2.000	0.0		
0.300	325.4	0.900	497.0	1.500	0.0	2.100	0.0		
0.400	354.0	1.000	0.0	1.600	0.0	2.200	0.0		
0.500	382.6	1.100	0.0	1.700	0.0	2.300	0.0		

Tank or Pond Manhole: SWMHA4.12, DS/PN: 1.010

Invert Level (m) 68.821

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	943.0	1.200	0.0	2.400	0.0	3.600	0.0	4.800	0.0
0.200	943.0	1.400	0.0	2.600	0.0	3.800	0.0	5.000	0.0
0.400	943.0	1.600	0.0	2.800	0.0	4.000	0.0		
0.600	943.0	1.800	0.0	3.000	0.0	4.200	0.0		
0.800	943.0	2.000	0.0	3.200	0.0	4.400	0.0		
1.000	943.0	2.200	0.0	3.400	0.0	4.600	0.0		

Summary of Results for 15 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA4.1	72.609	-0.116	0.000	0.47	0.0	30.4	OK
1.001	SWMHA4.2	71.741	-0.068	0.000	0.79	0.0	51.2	OK
1.002	SWMHA4.3	70.916	0.591	0.000	1.93	0.0	60.4	SURCHARGED
1.003	SWMHA4.4	70.310	0.092	0.000	0.54	0.0	60.5	SURCHARGED
1.004	SWMHA4.5	70.267	0.224	0.000	1.00	0.0	70.0	SURCHARGED
2.000	SWMHA4.6	70.212	0.387	0.000	0.99	0.0	33.8	SURCHARGED
1.005	SWMHA4.7	70.154	0.248	0.000	0.86	0.0	148.4	SURCHARGED
1.006	SWMHA4.8	70.020	0.324	0.000	0.94	0.0	162.2	SURCHARGED
1.007	SWMHA4.9	69.822	0.346	0.000	1.61	0.0	210.7	SURCHARGED
1.008	SWMHA4.10	69.523	0.151	0.000	1.61	0.0	209.2	SURCHARGED
1.009	SWMHA4.11	69.274	-0.073	0.000	0.00	0.0	0.0	OK
1.010	SWMHA4.12	68.790	-0.445	0.000	0.00	0.0	0.0	OK

Summary of Results for 30 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA4.1	72.596	-0.129	0.000	0.37	0.0	24.2	OK
1.001	SWMHA4.2	71.717	-0.091	0.000	0.65	0.0	42.0	OK
1.002	SWMHA4.3	70.693	0.368	0.000	1.71	0.0	53.5	SURCHARGED
1.003	SWMHA4.4	70.210	-0.008	0.000	0.46	0.0	51.9	OK
1.004	SWMHA4.5	70.177	0.135	0.000	0.89	0.0	62.2	SURCHARGED
2.000	SWMHA4.6	70.154	0.329	0.000	0.81	0.0	27.5	SURCHARGED
1.005	SWMHA4.7	70.093	0.187	0.000	0.78	0.0	134.2	SURCHARGED
1.006	SWMHA4.8	69.972	0.275	0.000	0.89	0.0	154.3	SURCHARGED
1.007	SWMHA4.9	69.792	0.316	0.000	1.58	0.0	207.3	SURCHARGED
1.008	SWMHA4.10	69.515	0.144	0.000	1.61	0.0	210.1	SURCHARGED
1.009	SWMHA4.11	69.411	0.064	0.000	0.00	0.0	0.0	SURCHARGED
1.010	SWMHA4.12	68.790	-0.445	0.000	0.00	0.0	0.0	OK

Summary of Results for 45 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA4.1	72.585	-0.140	0.000	0.30	0.0	19.3	OK
1.001	SWMHA4.2	71.700	-0.108	0.000	0.52	0.0	33.8	OK
1.002	SWMHA4.3	70.506	0.181	0.000	1.41	0.0	43.9	SURCHARGED
1.003	SWMHA4.4	70.048	-0.170	0.000	0.39	0.0	43.6	OK
1.004	SWMHA4.5	69.997	-0.046	0.000	0.78	0.0	54.2	OK
2.000	SWMHA4.6	69.979	0.154	0.000	0.67	0.0	23.0	SURCHARGED
1.005	SWMHA4.7	69.930	0.024	0.000	0.70	0.0	119.9	SURCHARGED
1.006	SWMHA4.8	69.833	0.137	0.000	0.81	0.0	139.3	SURCHARGED
1.007	SWMHA4.9	69.690	0.214	0.000	1.42	0.0	185.8	SURCHARGED
1.008	SWMHA4.10	69.492	0.120	0.000	1.46	0.0	190.5	SURCHARGED
1.009	SWMHA4.11	69.491	0.144	0.000	0.00	0.0	0.0	SURCHARGED
1.010	SWMHA4.12	68.787	-0.447	0.000	0.00	0.0	0.0	OK

Summary of Results for 60 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA4.1	72.577	-0.148	0.000	0.25	0.0	16.5	OK
1.001	SWMHA4.2	71.689	-0.119	0.000	0.44	0.0	28.4	OK
1.002	SWMHA4.3	70.403	0.078	0.000	1.20	0.0	37.6	SURCHARGED
1.003	SWMHA4.4	70.036	-0.181	0.000	0.33	0.0	37.5	OK
1.004	SWMHA4.5	69.924	-0.119	0.000	0.67	0.0	47.1	OK
2.000	SWMHA4.6	69.834	0.009	0.000	0.59	0.0	20.2	SURCHARGED
1.005	SWMHA4.7	69.790	-0.116	0.000	0.63	0.0	109.1	OK
1.006	SWMHA4.8	69.714	0.018	0.000	0.72	0.0	124.3	SURCHARGED
1.007	SWMHA4.9	69.600	0.124	0.000	1.28	0.0	167.1	SURCHARGED
1.008	SWMHA4.10	69.549	0.178	0.000	1.32	0.0	171.5	SURCHARGED
1.009	SWMHA4.11	69.549	0.201	0.000	0.00	0.0	0.0	SURCHARGED
1.010	SWMHA4.12	68.790	-0.445	0.000	0.00	0.0	0.0	OK

Summary of Results for 90 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA4.1	72.568	-0.157	0.000	0.20	0.0	12.7	OK
1.001	SWMHA4.2	71.675	-0.134	0.000	0.34	0.0	22.1	OK
1.002	SWMHA4.3	70.272	-0.053	0.000	0.93	0.0	29.0	OK
1.003	SWMHA4.4	70.021	-0.197	0.000	0.26	0.0	28.8	OK
1.004	SWMHA4.5	69.898	-0.145	0.000	0.52	0.0	36.4	OK
2.000	SWMHA4.6	69.727	-0.098	0.000	0.47	0.0	15.9	OK
1.005	SWMHA4.7	69.687	-0.219	0.000	0.51	0.0	88.2	OK
1.006	SWMHA4.8	69.648	-0.049	0.000	0.58	0.0	100.7	OK
1.007	SWMHA4.9	69.639	0.163	0.000	1.02	0.0	133.8	SURCHARGED
1.008	SWMHA4.10	69.633	0.261	0.000	1.02	0.0	132.9	SURCHARGED
1.009	SWMHA4.11	69.633	0.285	0.000	0.00	0.0	0.0	SURCHARGED
1.010	SWMHA4.12	68.787	-0.448	0.000	0.00	0.0	0.0	OK

Summary of Results for 120 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA4.1	72.560	-0.165	0.000	0.16	0.0	10.5	OK
1.001	SWMHA4.2	71.665	-0.143	0.000	0.28	0.0	18.3	OK
1.002	SWMHA4.3	70.249	-0.076	0.000	0.77	0.0	24.2	OK
1.003	SWMHA4.4	70.011	-0.206	0.000	0.21	0.0	24.2	OK
1.004	SWMHA4.5	69.881	-0.161	0.000	0.44	0.0	30.6	OK
2.000	SWMHA4.6	69.718	-0.107	0.000	0.39	0.0	13.2	OK
1.005	SWMHA4.7	69.714	-0.193	0.000	0.43	0.0	74.3	OK
1.006	SWMHA4.8	69.708	0.012	0.000	0.50	0.0	85.9	SURCHARGED
1.007	SWMHA4.9	69.701	0.225	0.000	0.85	0.0	111.5	SURCHARGED
1.008	SWMHA4.10	69.695	0.324	0.000	0.85	0.0	111.1	SURCHARGED
1.009	SWMHA4.11	69.695	0.348	0.000	0.00	0.0	0.0	SURCHARGED
1.010	SWMHA4.12	68.789	-0.446	0.000	0.00	0.0	0.0	OK

Summary of Results for 180 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA4.1	72.553	-0.172	0.000	0.12	0.0	8.1	OK
1.001	SWMHA4.2	71.655	-0.154	0.000	0.22	0.0	14.1	OK
1.002	SWMHA4.3	70.225	-0.100	0.000	0.59	0.0	18.5	OK
1.003	SWMHA4.4	69.999	-0.219	0.000	0.16	0.0	18.5	OK
1.004	SWMHA4.5	69.982	-0.061	0.000	0.33	0.0	23.4	OK
2.000	SWMHA4.6	69.981	0.156	0.000	0.30	0.0	10.1	SURCHARGED
1.005	SWMHA4.7	69.978	0.071	0.000	0.33	0.0	56.8	SURCHARGED
1.006	SWMHA4.8	69.973	0.276	0.000	0.38	0.0	65.3	SURCHARGED
1.007	SWMHA4.9	69.966	0.490	0.000	0.65	0.0	85.2	SURCHARGED
1.008	SWMHA4.10	69.959	0.587	0.000	0.66	0.0	85.8	SURCHARGED
1.009	SWMHA4.11	69.951	0.604	0.000	0.12	0.0	13.7	SURCHARGED
1.010	SWMHA4.12	68.837	-0.398	0.000	0.00	0.0	0.0	OK

Summary of Results for 240 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA4.1	72.548	-0.177	0.000	0.10	0.0	6.6	OK
1.001	SWMHA4.2	71.647	-0.161	0.000	0.18	0.0	11.6	OK
1.002	SWMHA4.3	70.211	-0.114	0.000	0.49	0.0	15.2	OK
1.003	SWMHA4.4	69.996	-0.222	0.000	0.14	0.0	15.2	OK
1.004	SWMHA4.5	69.993	-0.049	0.000	0.28	0.0	19.3	OK
2.000	SWMHA4.6	69.993	0.168	0.000	0.24	0.0	8.3	SURCHARGED
1.005	SWMHA4.7	69.989	0.083	0.000	0.27	0.0	46.8	SURCHARGED
1.006	SWMHA4.8	69.983	0.287	0.000	0.31	0.0	52.8	SURCHARGED
1.007	SWMHA4.9	69.975	0.499	0.000	0.53	0.0	69.6	SURCHARGED
1.008	SWMHA4.10	69.966	0.595	0.000	0.54	0.0	70.7	SURCHARGED
1.009	SWMHA4.11	69.957	0.609	0.000	0.15	0.0	17.3	SURCHARGED
1.010	SWMHA4.12	68.879	-0.356	0.000	0.00	0.0	0.0	OK

Summary of Results for 360 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA4.1	72.541	-0.184	0.000	0.08	0.0	5.0	OK
1.001	SWMHA4.2	71.638	-0.170	0.000	0.14	0.0	8.7	OK
1.002	SWMHA4.3	70.194	-0.131	0.000	0.37	0.0	11.5	OK
1.003	SWMHA4.4	70.036	-0.182	0.000	0.10	0.0	11.5	OK
1.004	SWMHA4.5	70.032	-0.011	0.000	0.21	0.0	14.5	OK
2.000	SWMHA4.6	70.032	0.207	0.000	0.18	0.0	6.3	SURCHARGED
1.005	SWMHA4.7	70.024	0.118	0.000	0.20	0.0	34.8	SURCHARGED
1.006	SWMHA4.8	70.014	0.318	0.000	0.22	0.0	38.7	SURCHARGED
1.007	SWMHA4.9	70.001	0.525	0.000	0.40	0.0	52.1	SURCHARGED
1.008	SWMHA4.10	69.985	0.614	0.000	0.41	0.0	53.9	SURCHARGED
1.009	SWMHA4.11	69.969	0.622	0.000	0.25	0.0	28.8	SURCHARGED
1.010	SWMHA4.12	68.942	-0.293	0.000	0.00	0.0	0.0	OK

Summary of Results for 720 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA4.1	72.531	-0.194	0.000	0.05	0.0	3.1	OK
1.001	SWMHA4.2	71.627	-0.182	0.000	0.08	0.0	5.3	OK
1.002	SWMHA4.3	70.172	-0.153	0.000	0.23	0.0	7.1	OK
1.003	SWMHA4.4	70.040	-0.178	0.000	0.06	0.0	7.1	OK
1.004	SWMHA4.5	70.036	-0.007	0.000	0.13	0.0	8.9	OK
2.000	SWMHA4.6	70.035	0.210	0.000	0.11	0.0	3.8	SURCHARGED
1.005	SWMHA4.7	70.027	0.121	0.000	0.12	0.0	21.0	SURCHARGED
1.006	SWMHA4.8	70.017	0.321	0.000	0.13	0.0	23.3	SURCHARGED
1.007	SWMHA4.9	70.004	0.528	0.000	0.25	0.0	32.6	SURCHARGED
1.008	SWMHA4.10	69.987	0.616	0.000	0.26	0.0	33.6	SURCHARGED
1.009	SWMHA4.11	69.971	0.623	0.000	0.26	0.0	29.6	SURCHARGED
1.010	SWMHA4.12	69.067	-0.167	0.000	0.00	0.0	0.0	OK

Summary of Results for 1440 minute 100 year Winter (Storm)

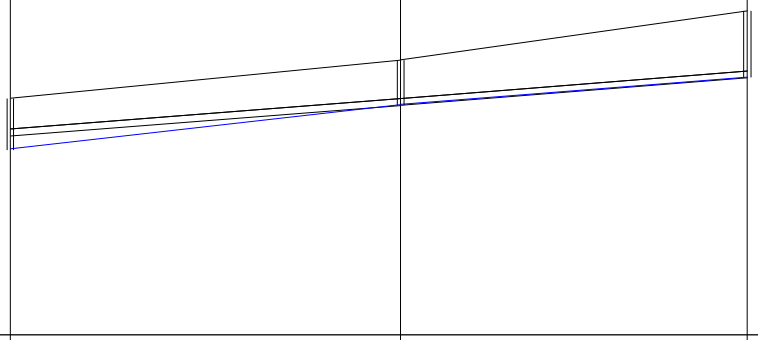
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

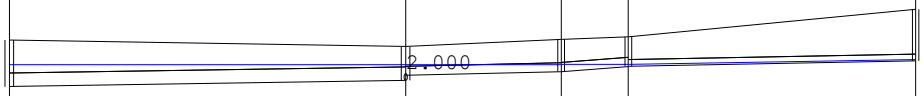
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA4.1	72.525	-0.200	0.000	0.03	0.0	1.9	OK
1.001	SWMHA4.2	71.616	-0.193	0.000	0.05	0.0	3.3	OK
1.002	SWMHA4.3	70.155	-0.170	0.000	0.14	0.0	4.3	OK
1.003	SWMHA4.4	70.012	-0.205	0.000	0.04	0.0	4.3	OK
1.004	SWMHA4.5	70.009	-0.033	0.000	0.08	0.0	5.4	OK
2.000	SWMHA4.6	70.009	0.184	0.000	0.07	0.0	2.3	SURCHARGED
1.005	SWMHA4.7	70.003	0.097	0.000	0.08	0.0	12.9	SURCHARGED
1.006	SWMHA4.8	69.996	0.300	0.000	0.09	0.0	15.6	SURCHARGED
1.007	SWMHA4.9	69.986	0.510	0.000	0.16	0.0	21.6	SURCHARGED
1.008	SWMHA4.10	69.974	0.603	0.000	0.17	0.0	22.3	SURCHARGED
1.009	SWMHA4.11	69.962	0.615	0.000	0.20	0.0	22.3	SURCHARGED
1.010	SWMHA4.12	69.220	-0.015	0.000	0.01	0.0	2.0	OK

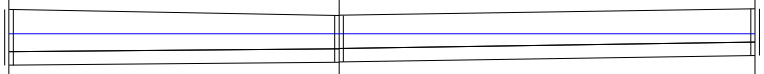
Summary of Results for 2880 minute 100 year Winter (Storm)

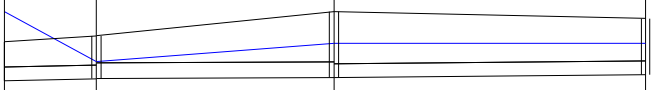
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

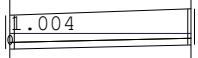
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	SWMHA4.1	72.519	-0.206	0.000	0.02	0.0	1.2	OK
1.001	SWMHA4.2	71.609	-0.199	0.000	0.03	0.0	2.0	OK
1.002	SWMHA4.3	70.144	-0.181	0.000	0.08	0.0	2.6	OK
1.003	SWMHA4.4	69.983	-0.234	0.000	0.02	0.0	2.6	OK
1.004	SWMHA4.5	69.982	-0.061	0.000	0.05	0.0	3.4	OK
2.000	SWMHA4.6	69.981	0.156	0.000	0.04	0.0	1.4	SURCHARGED
1.005	SWMHA4.7	69.978	0.072	0.000	0.05	0.0	8.2	SURCHARGED
1.006	SWMHA4.8	69.973	0.277	0.000	0.06	0.0	9.9	SURCHARGED
1.007	SWMHA4.9	69.967	0.491	0.000	0.10	0.0	13.6	SURCHARGED
1.008	SWMHA4.10	69.959	0.588	0.000	0.11	0.0	14.1	SURCHARGED
1.009	SWMHA4.11	69.952	0.604	0.000	0.12	0.0	14.1	SURCHARGED
1.010	SWMHA4.12	69.346	0.111	0.000	0.01	0.0	2.0	SURCHARGED

MH Name	SWMHA4.3	SWMHA4.2	SWMHA4.1	
Hor Scale 1200 Ver Scale 250 Datum (m) 64.000				
PN		1.001	1.000	
Dia (mm)		225	225	
Slope (1:X)		61.0	60.0	
Cover Level (m)	71.812	73.081	74.707	
Invert Level (m)		70.569 / 71.584	71.584 / 72.500	
Length (m)		61.951	55.017	

MH Name	SWMHA4.8	SWMHA4.7	SWMHA4.5		SWMHA4.3	
Hor Scale 1200 Ver Scale 250 Datum (m) 62.000						
PN		1.005	1.004		1.002	
Dia (mm)		450	300		225	
Slope (1:X)		299.5	200.0		250.0	
Cover Level (m)	70.792	70.571	70.809	70.900	71.812	
Invert Level (m)		69.246 / 69.456	69.619 / 69.743	69.743 / 69.918	69.918 / 70.100	
Length (m)		62.897	24.687		45.608	

MH Name	SWMHA4.10	SWMHA4.9	SWMHA4.8	
				
Hor Scale 1200 Ver Scale 250 Datum (m) 62.000				
PN		1.007	1.006	
Dia (mm)		450	450	
Slope (1:X)		500.0	300.0	
Cover Level (m)	70.776	70.571	70.792	
Invert Level (m)		68.921 / 69.026	69.026 / 69.246	
Length (m)		52.390	66.017	

MH Name	SWMHA4.12	SWMHA4.11	SWMHA4.10	
				
Hor Scale 1200 Ver Scale 250 Datum (m) 62.000				
PN	1.010	1.009	1.008	
Dia (mm)	450	525	450	
Slope (1:X)	200.3	1000.0	500.0	
Cover Level (m)	70.000 / 70.200	71.000	70.776	
Invert Level (m)	68.712 / 68.785	68.785 / 68.822	68.822 / 68.921	
Length (m)	14.621	37.701	49.448	

MH Name	SWMHA4.7	SWMHA4.6	
Hor Scale 1200 Ver Scale 250 Datum (m) 62.000			
PN		2.000	
Dia (mm)		225	
Slope (1:X)		200.0	
Cover Level (m)	70.571	70.792	
Invert Level (m)	69.456	69.600	
Length (m)		28.761	

Appendix D:

RPS overland Flow Flooding Report

GRANGECASTLE FLOOD STUDY

Additional Hydraulic Modelling Report

MDW0856 Grangecastle
Flood Study
Additional Modelling
A02
24 February 2020

rpsgroup.com

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
A01	For Information	VMcA	MD	MD	07/02/2020
A02	For Information	VMcA	MD	MD	24/02/2020

Approval for issue

Mesfin Desta		7 February 2020

Prepared by:

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Contents

Tables

Figures

Appendices

1 INTRODUCTION

RPS was commissioned by Cronin & Sutton Consulting Engineers and completed a Flood Study Report for a proposed development site in Grangecastle, Co. Dublin. That Report contained recommended mitigation measures necessary to alleviate flooding within the site without increasing flood risk elsewhere. RPS was again requested to undertake additional hydraulic modelling to:

- establish whether the proposed solutions to alleviate out-of-bank flooding from the south within the proposed development site was adequate,
- assess whether the proposed development within the site increases the flood risk to the Baldonnell Stream,
- assess Flood Compensatory Storage for the Baldonnell Stream to reduce peak water levels within the Baldonnell Stream adjacent to the proposed development site.

2 PROPOSED FLOOD ALLEVIATION MEASURES

The proposed measures to alleviate flooding within the development site consisted of a 450mm diameter pipe (total length – approximately 315m) to intercept out-of-bank flooding from the south and discharge directly to the Baldonnell Stream. The ground within the inlet, to the proposed 450mm diameter pipe, is to be profiled to intercept and contain the out-of-bank flooding for discharge to the Baldonnell Stream. The layout of the proposed 450mm diameter pipe is shown in **Figure 1** (in red).

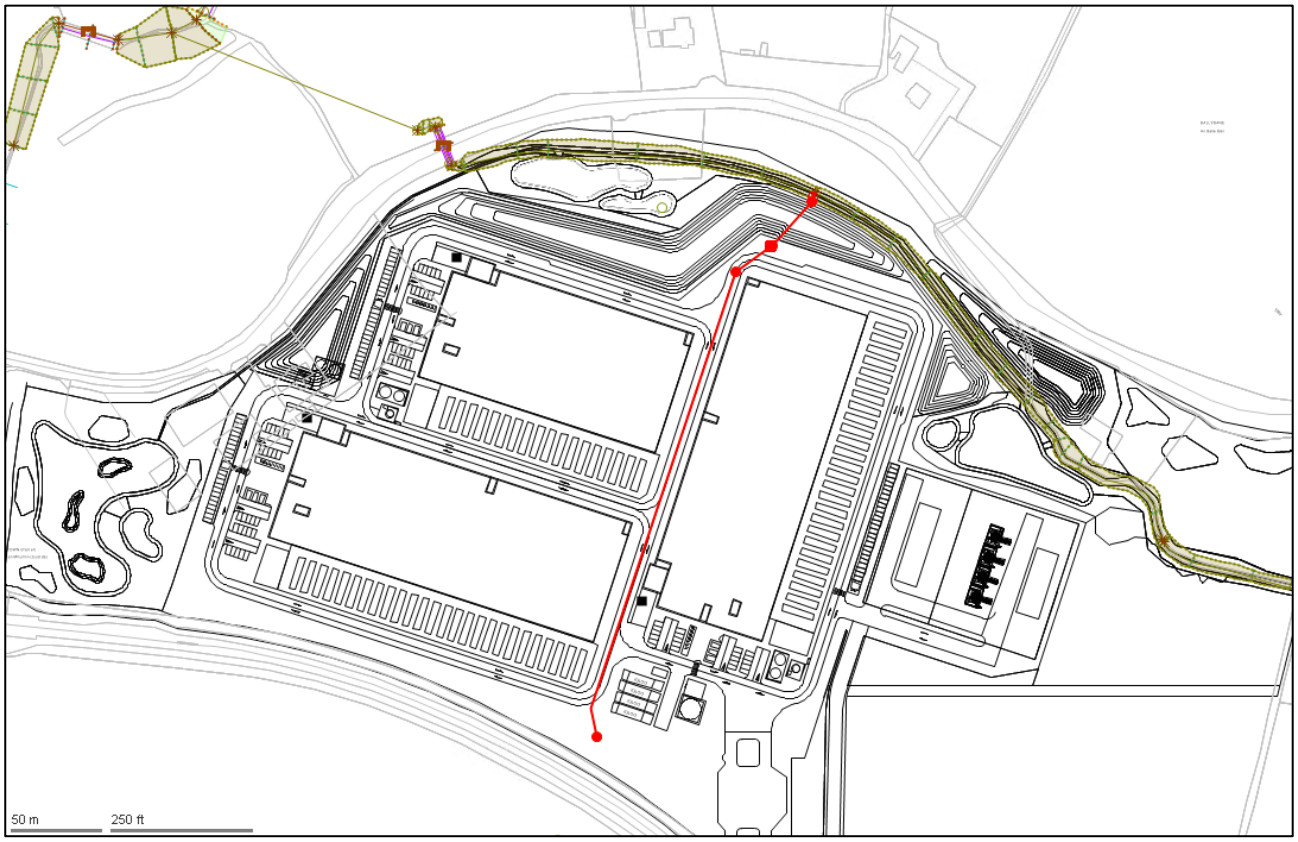


Figure 1: Proposed Solution

3 HYDRAULIC MODELLING UPDATE

The Flood Studies Update (FSU) and Institute of Hydrology no.124 (IoH 124) methods were used to calculate the 1% and 0.1% AEP peak flows for the watercourses within the Griffeen and Camac Catchments in the vicinity of the proposed development site. InfoWorks Integrated Catchment Modelling (ICM) software was used to create a combined 1D/2D hydraulic model. A channel survey and topographical/LiDAR data was collected to represent the river and the surrounding terrain. The model was calibrated and verified based on existing information used in the CFRAM. A sensitivity analysis was carried out to assess the impact on potential flooding from variations in channel roughness, floodplain roughness, bridge/ culvert head losses and peak flow.

Flood extents under the existing condition within the proposed development site were established for both the 1% and 0.1% AEP events. The flooding extent for the 0.1% AEP event within the proposed development site is shown in **Figure 2** and Drawing No. QG0011 which is included in Appendix A of this report.

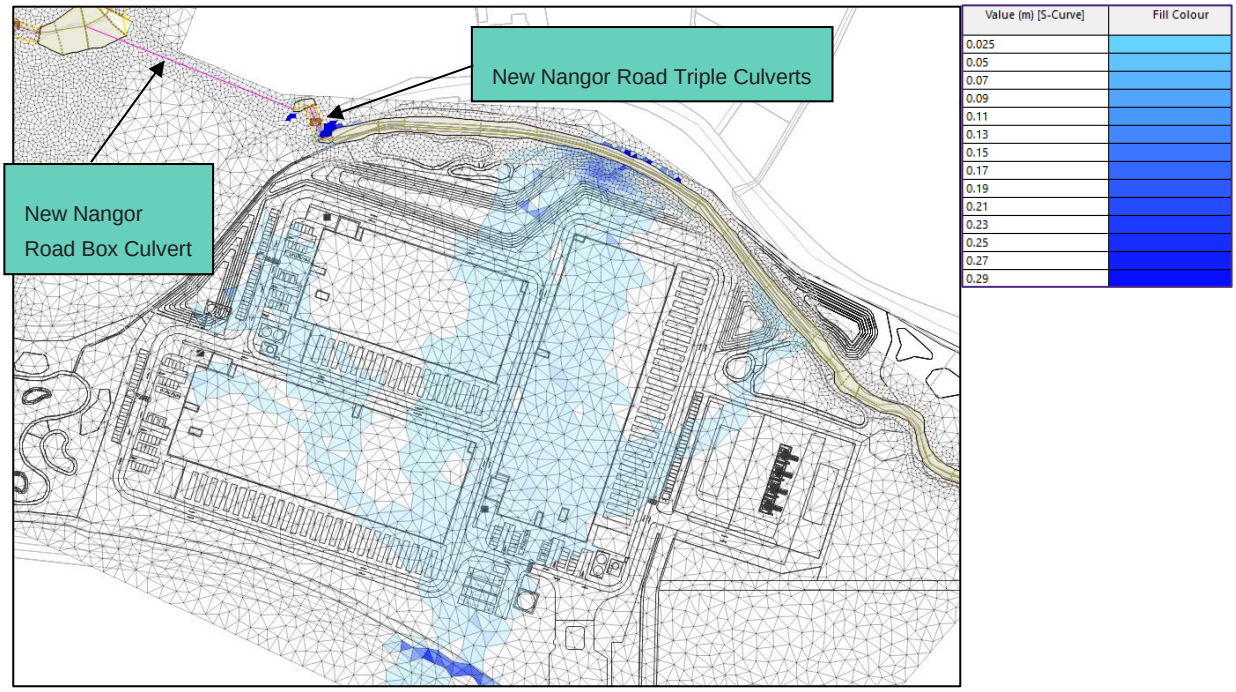


Figure 2: Existing 0.1% AEP Flood Extents at the Proposed Development Site

Flooding within the proposed development site was mainly caused by out-of-bank flooding from the River Camac. No out-of-bank flooding was observed the Baldonnell Stream for the 1% AEP event. However, there were some localised flooding at three locations from for the 0.1% AEP event, one of which was at New Nangor Road Trip Culverts as indicated in **Figure 2**. Flooding at these locations were found to have been caused by the New Nangor Road Box Culvert and Triple Culverts surcharging. It is reasoned that the flow from the south of the proposed development site in the Baldonnell Stream may have increased the flow to these Culverts resulting in surcharging.

The 2D section of the hydraulic model was updated to include the proposed re-profiling and assess the impact on out-of-bank flooding from the south and the Baldonnell River located along the northern boundary. Further adjustments were made to the proposed ground levels at the inlet location to intercept the out-of-bank flow from south and discharge to the Baldonnell Stream adjacent to the development site.

4 HYDRAULIC MODEL RESULTS

The hydraulic model was run for the 1% AEP event including climate change effects. The results, as shown in **Figure 3** and Drawing No. QG0012 included in Appendix A of the report, indicated that the proposed measures were adequate to alleviate flooding for the 1% AEP event taking account of climate change.

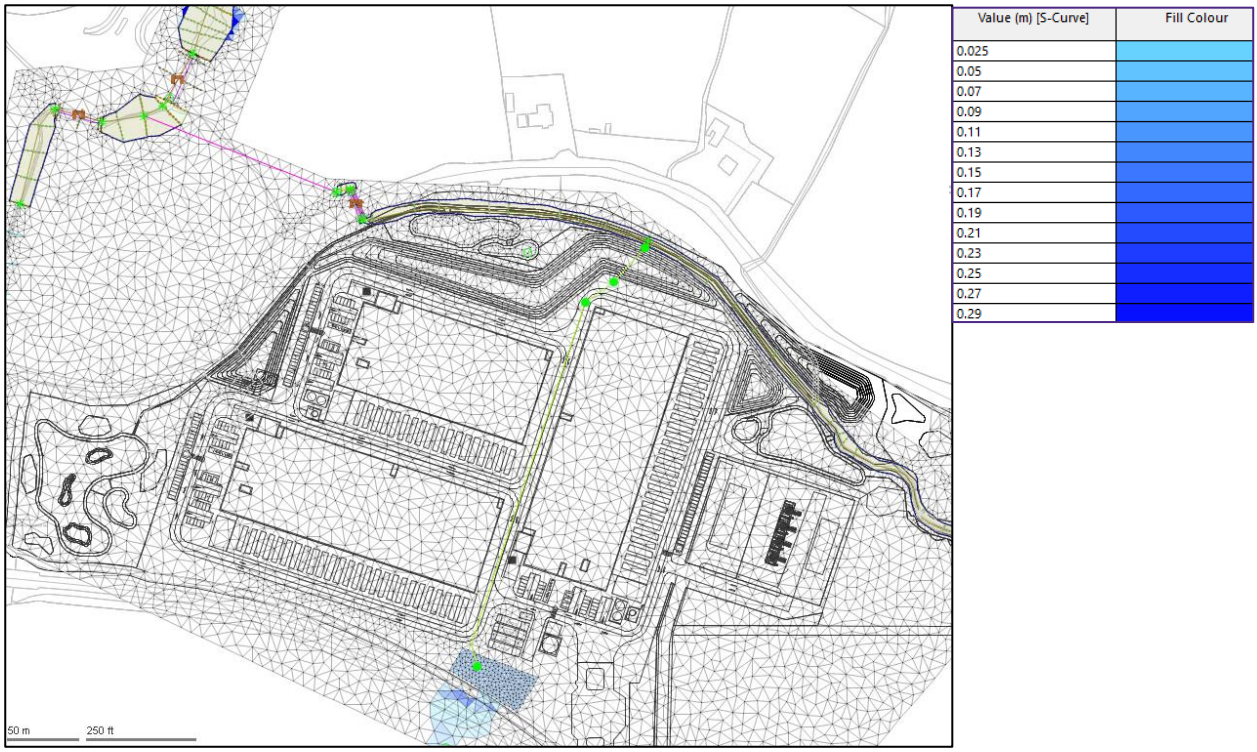


Figure 3: 1% AEP Predicted Flood Extents within Proposed Development Site

The hydraulic model was also run for the 0.1% AEP event to assess the impact of the proposed development site on flood levels within the Baldonnell River. The existing and proposed 0.1% AEP water levels are listed in **Table 1**. The locations for the river sections are shown in **Figure 4** and Drawing No. QG0013 included in Appendix A of this report.

Table 1: Baldonnell Stream 0.1% AEP Predicted Peak Water Levels adjacent to Proposed Development Site

Chainage	Existing 0.1% AEP Section level (m AD)	Proposed 0.1% AEP Section level (m AD)	Difference (mm) (Prop-Exist)
Ch.0.0	70.260	70.115	-145
Ch.21.183	70.008	69.850	-158
Ch.53.791	69.672	69.649	-23
Ch.74.117	69.534	69.535	1
Ch.89.207	69.395	69.397	2
Ch.153.154	68.991	68.989	-2
Ch.164.28	68.923	68.923	0
Ch.183.802	68.843	68.843	0
Ch.212.37	68.729	68.728	-1
Ch.257.56	68.538	68.537	-1

Chainage	Existing 0.1% AEP Section level (m AD)	Proposed 0.1% AEP Section level (m AD)	Difference (mm) (Prop-Exist)
Ch.652.423	68.363	68.361	-2
Ch.808.511	68.357	68.355	-2
Ch.989.156	68.340	68.337	-3
Ch.1193.84	68.334	68.333	-1
Ch.1428.517	68.323	68.323	0
Ch.1695.132	68.314	68.315	1
Ch.1996.974	68.310	68.311	1
Ch.2345.808	68.303	68.304	1
Ch.2710.956	68.301	68.302	1
Ch.2740.056	68.303	68.304	1
Ch.2769.901	68.299	68.301	2
Ch.2806.084	68.302	68.304	2
New Nangor Road Triple Culverts			
Ch.2827.084	68.017	68.019	2
Ch.2830.457	68.014	68.016	2
Ch.2837.514	68.016	68.017	1
Ch.2847.733	68.011	68.013	2

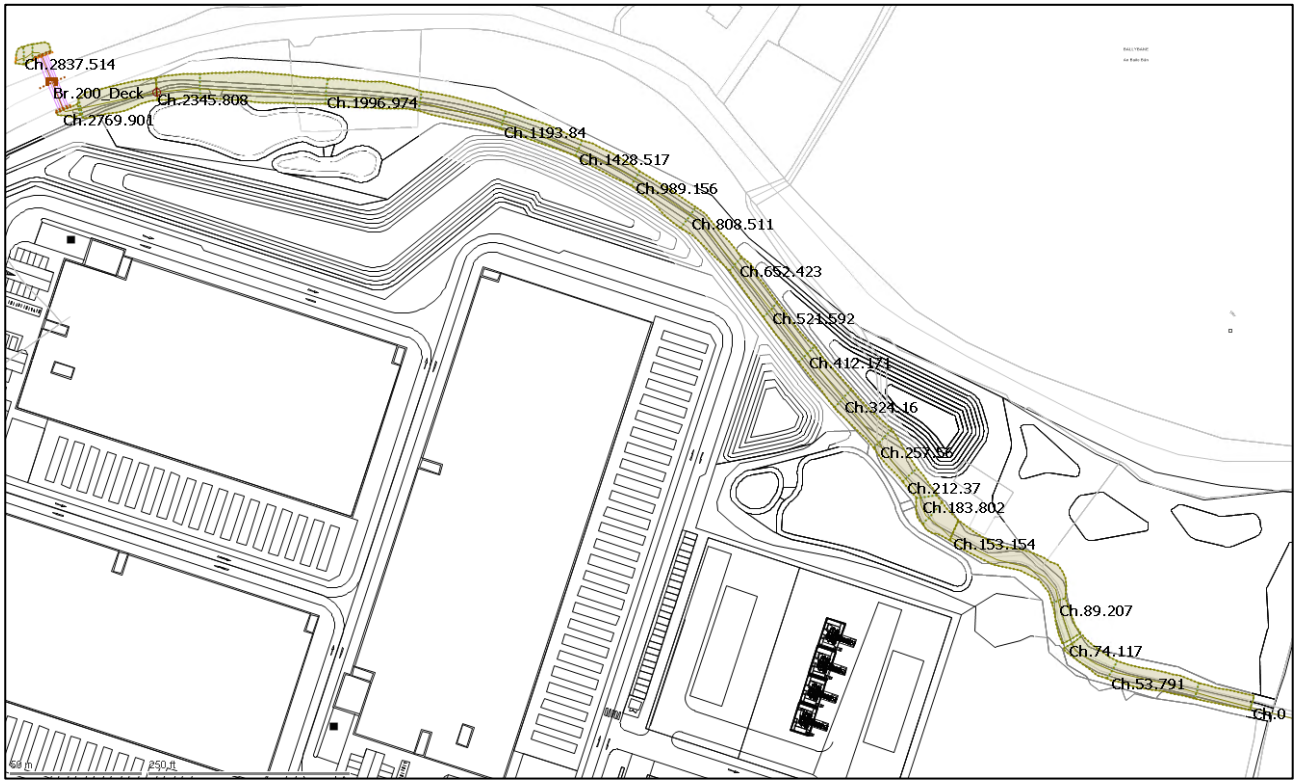


Figure 4: Baldonnell River – Chainages for Cross Section Locations

The results indicated that there was a maximum decrease of 158mm for the 0.1% AEP water level at location upstream of the New Nangor Box Culvert within the Baldonnell Stream. There was a marginal increase of 1

or 2mm at upstream and downstream locations of New Nangor Road Triple Culverts which may be attributed to the diversion of the out of bank discharge from the south, to Baldonnell Stream to the 450mm diameter pipe outfall.

Although this was not considered significant, further hydraulic modelling was carried out by including a flood storage upstream of the proposed development site to mitigate against these increase at the location indicated in **Figure 5**.

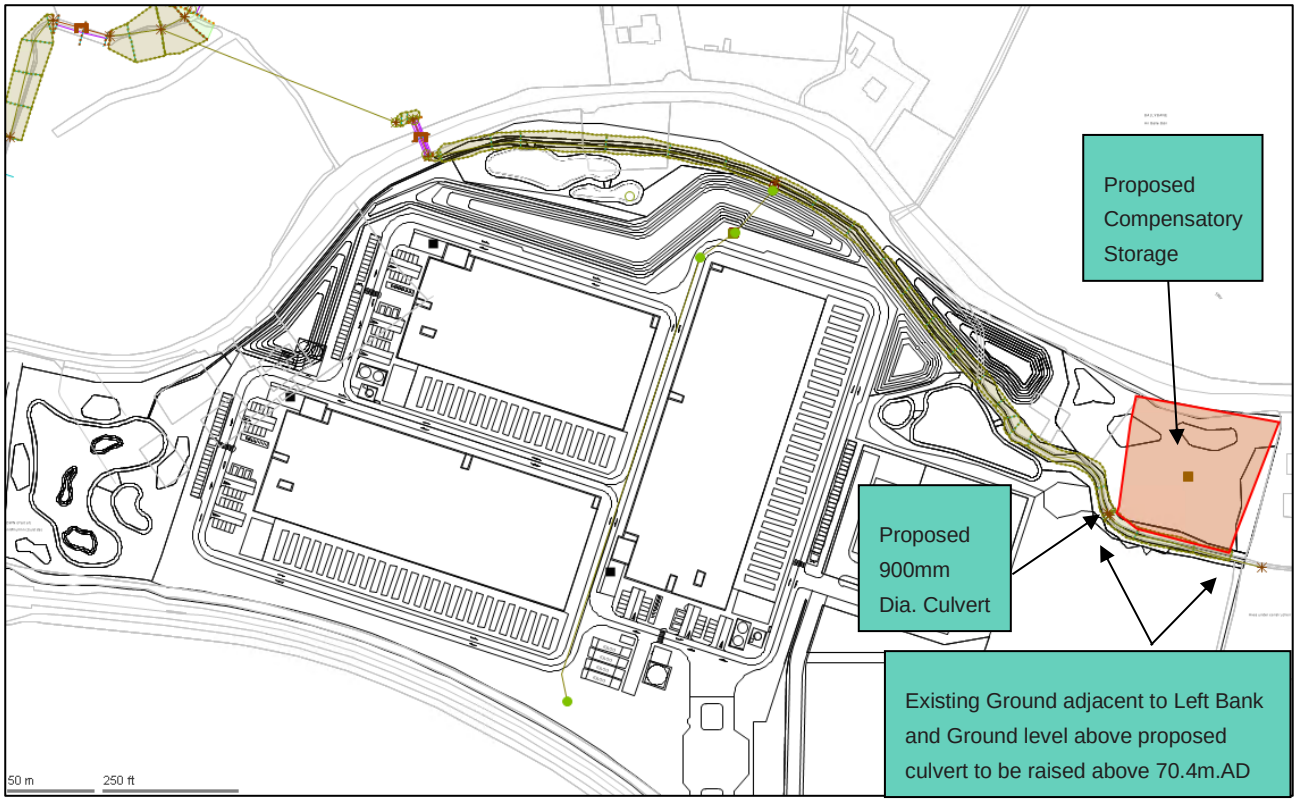


Figure 5: Proposed Flood Compensatory Storage

The right bank of the Baldonnell Stream, facing downstream towards the Griffeen River, between Ch.21.183 and Ch.72.517 was lowered by approximately 1.0m (to storage area bed level – 69.5m.AD) to allow for spillage into the storage area during the 0.1% AEP event. A 900mm diameter culvert was added to the Baldonnell River immediately downstream of the storage area to restrict the peak 0.1% AEP flow. The existing ground adjacent to left bank and deck level above proposed culvert was set above 70.4m.AD. The result of the hydraulic model simulation for the 0.1% AEP event taking account of the proposed flood compensatory storage upstream of the proposed development site is listed in **Table 2**.

Table 2: Baldonnell River 0.1% AEP Predicted Peak Water Levels adjacent to Proposed Development Site (incl. proposed flood compensatory storage)

Chainage	Existing 0.1% AEP Section level (m AD)	Proposed 0.1% AEP Section level (m AD)	Difference (mm) (Prop-Exist)
Ch.0.0	70.260	70.092	-168
Ch.21.183	70.008	70.057	49
Ch.53.791	69.672	70.054	382
Ch.74.117	69.534	69.534	0
Ch.89.207	69.395	69.395	0
Ch.153.154	68.991	68.988	-3
Ch.164.28	68.923	68.922	-1

Chainage	Existing 0.1% AEP Section level (m AD)	Proposed 0.1% AEP Section level (m AD)	Difference (mm) (Prop-Exist)
Ch.183.802	68.843	68.842	-1
Ch.212.37	68.729	68.727	-2
Ch.257.56	68.538	68.536	-2
Ch.652.423	68.363	68.358	-5
Ch.808.511	68.357	68.352	-5
Ch.989.156	68.340	68.334	-6
Ch.1193.84	68.334	68.330	-4
Ch.1428.517	68.323	68.320	-3
Ch.1695.132	68.314	68.311	-3
Ch.1996.974	68.310	68.308	-2
Ch.2345.808	68.303	68.300	-3
Ch.2710.956	68.301	68.298	-3
Ch.2740.056	68.303	68.301	-2
Ch.2769.901	68.299	68.298	-1
Ch.2806.084	68.302	68.301	-1
New Nangor Road Triple Culverts			
Ch.2827.084	68.017	68.016	-1
Ch.2830.457	68.014	68.013	-1
Ch.2837.514	68.016	68.014	-2

It can be seen that the proposed attenuation has eliminated any increase in the flood level upstream and downstream of the specified culvert location. It is noted that there was a maximum increase of 382mm in 0.1% AEP peak water level at the storage area which is directly attributed to the level retention of floodwaters. This increase is not expected to propagate upstream as the level is higher as noted in Chainage 0.0. The total storage volume storage retained was calculated to be approximately 2,785m^3 over an area of 5,500m^2.

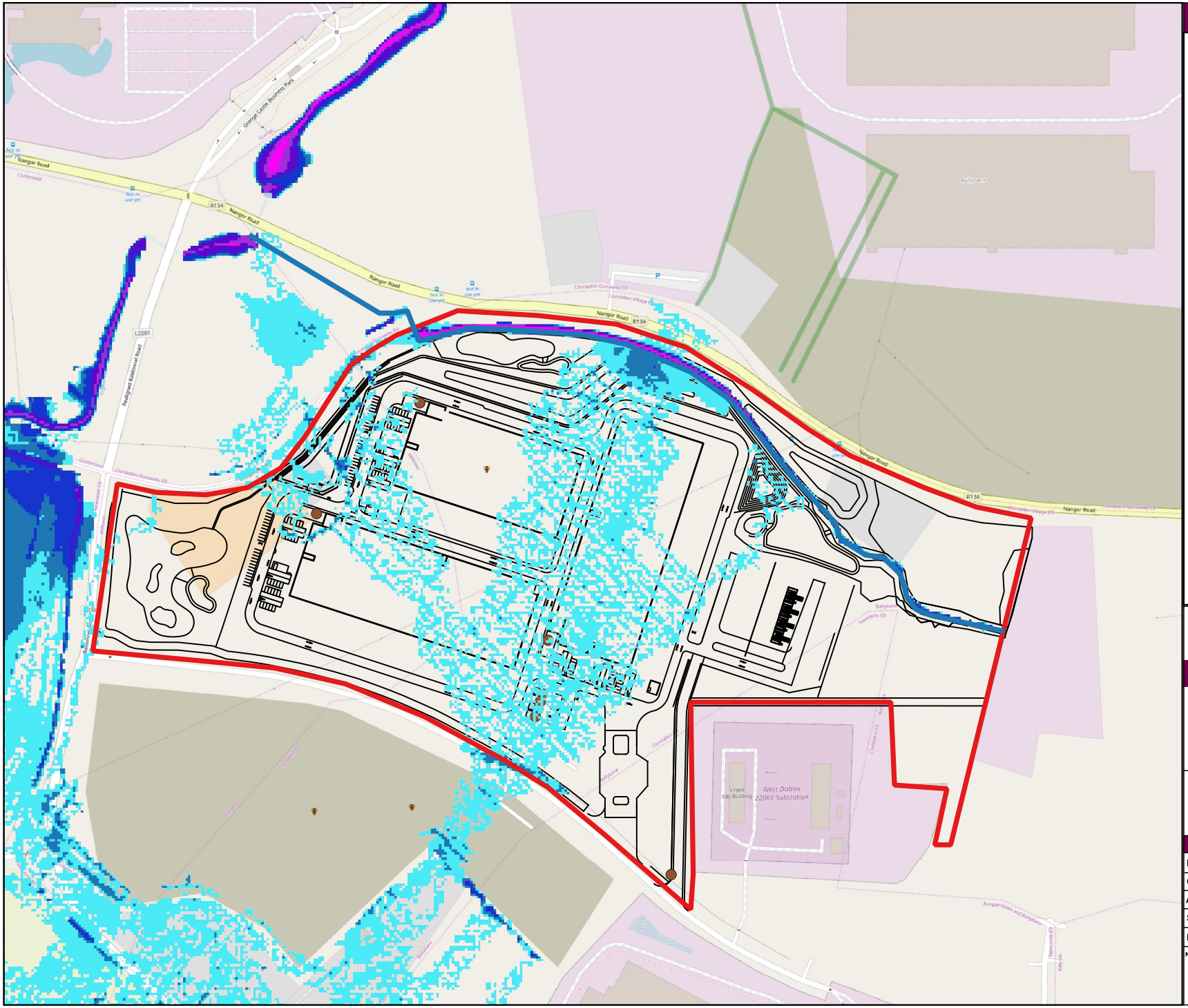
5 CONCLUSION

This additional hydraulic modelling exercise was completed to establish whether the proposed solutions in the Grangecastle Flood Study report were adequate to alleviate out-of-bank flooding from the development site without increasing flood risk elsewhere. The proposed solutions were simulated using Infoworks ICM for the 1% and 0.1% AEP events including climate change effects.

The results indicated that the proposed measures were adequate to alleviate flooding from the proposed development site for the 1% AEP. However, the hydraulic model show a marginal (i.e. 2mm max) increase in flood levels at the proposed development site within the Baldonnell River for the 0.1% AEP event, particularly at locations immediately upstream and downstream of the New Nangor Box Culvert. Further hydraulic modelling was carried out by incorporating a compensatory flood storage upstream of the proposed development site to mitigate against this. This resulted in the elimination of all level increases of 0.1% AEP flood event at the stated locations. The volume of storage required to achieve this was approximately 2,785m^3 over an area of 5,500m^2.

Given the magnitude of level increase (i.e. 2mm) at the stated location, which may well be down to numerical accuracy of the model, we do not recommend provision of a compensatory storage. Therefore, the proposed solution of intercepting the out-of-bank flow from the River Camac and channelling it to the River Baldonnell is adequate to provide the necessary flood protection to the development site without the need for a compensatory storage and significantly impacting the water levels Baldonnell River.

Appendix A
Drawings



Legend

Legend

- Channel
- Proposed Development Site

0.1% AEP Existing Flood Depths

- 0 - 0.25 m
- 0.25 - 0.50 m
- 0.50 - 1.00 m
- 1.00 - 1.50 m
- 1.50 - 2.00 m
- > 2.00 m

Client: Cronin & Sutton Consulting Engineers

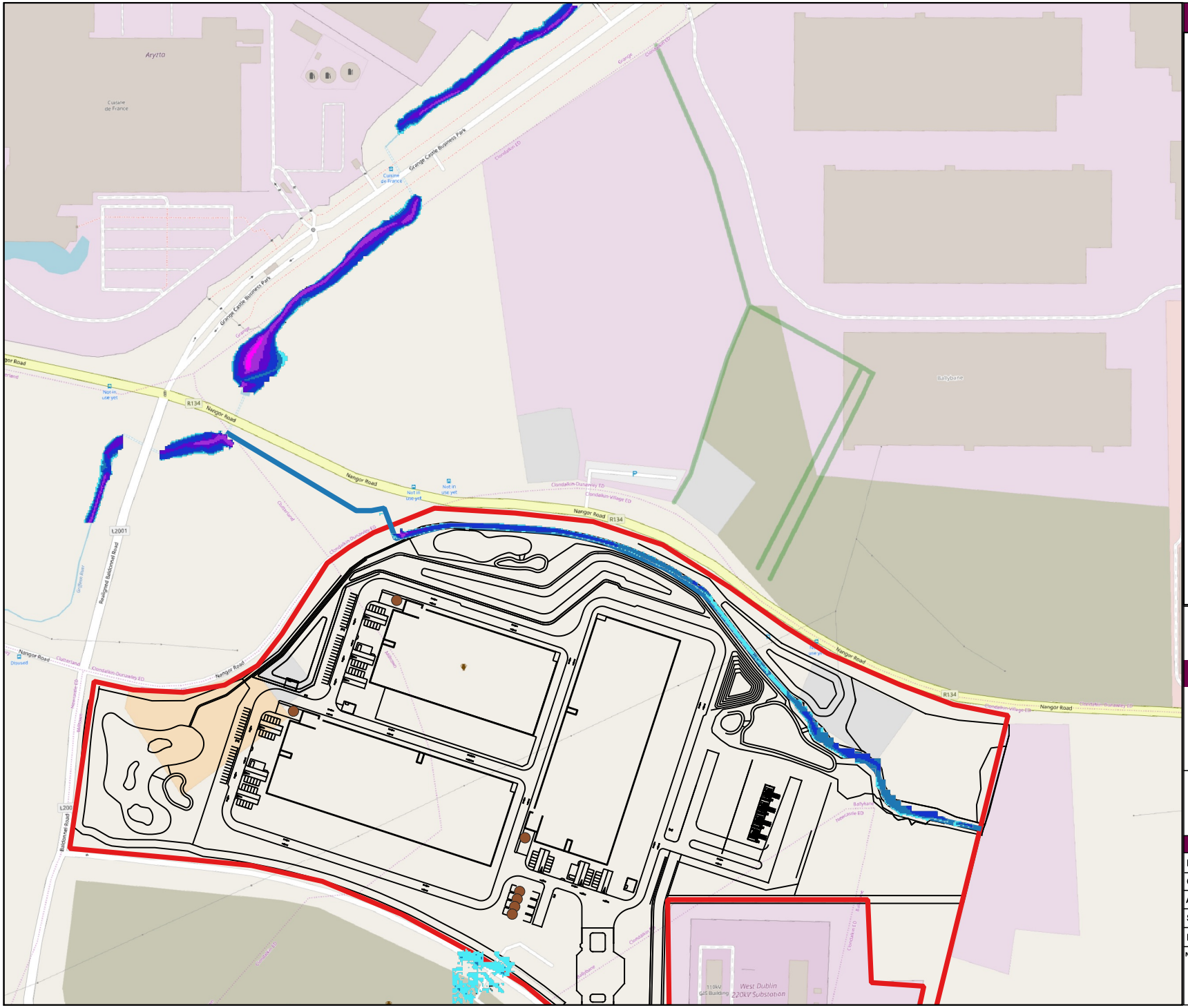
Project: [Project Name]

Title: Cross Section Locations - Baldonnell River

RPS | Consulting UK & Ireland
West Pier Business Campus
Dun Laoghaire
Co. Dublin
Tel: +353 1 488 2900

Issue Details

Drawn:	ROS	**Project:**	MDW0856
Checked:	MD	**File Ref:**	MDW0856QG0011
Approved:	VMcA		
Scale:	1:4,000 @ A4	**Projection:**	
Date:	18/02/2020		Irish Transverse Mercator / ITM



Legend

Legend

- Proposed Development Site
- 0 - 0.25 m
- 0.25 - 0.50 m
- 0.50 - 1.00 m
- 1.00 - 1.50 m
- 1.50 - 2.00 m
- > 2.00 m

Client
Cronin & Sutton Consulting Engineers

Project **[Project Name]**

Title

Proposed 1% AEP+CC Flood Depths

RPS | Consulting UK & Ireland
West Pier Business Campus
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Tel: +353 1 488 2900

Issue Details

Drawn:	ROS	**Project:**	MDW0856
Checked:	MD	**File Ref:**	MDW0856QG0012
Approved:	VMcA		
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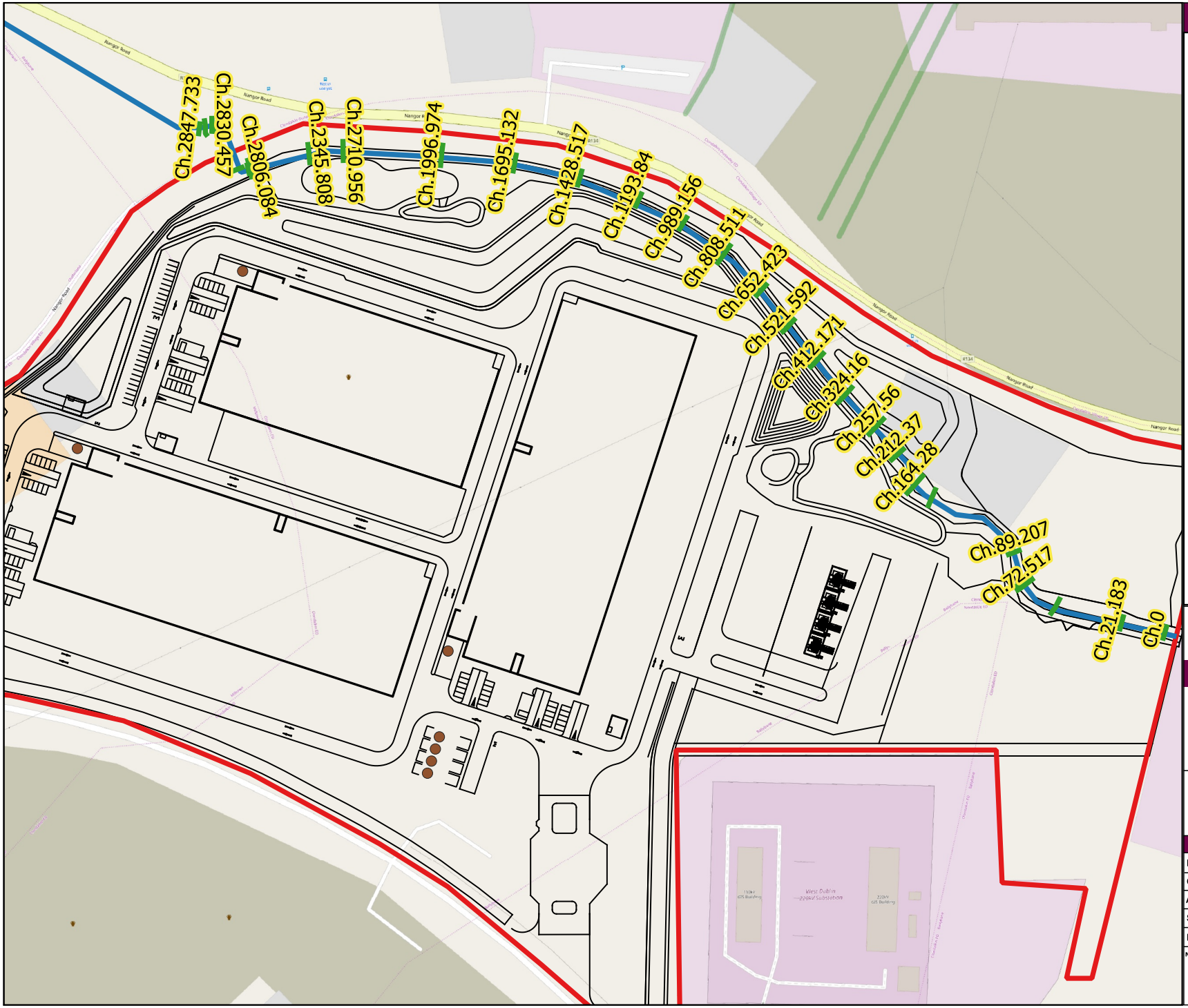

Legend

Legend

- Cross Section Locations
- Baldonnell River
- Proposed Development Site

Client: Cronin & Sutton Consulting Engineers

Project: [Project Name]

Title: Cross Section Locations - Baldonnell River

RPS | Consulting UK & Ireland
West Pier Business Campus
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Issue Details

Drawn:	ROS	**Project:**	MDW0856
Checked:	MD	**File Ref:**	MDW0856G0013
Approved:	VMcA		
Scale:	1:2,500 @ A4	**Projection:**	
Date:	24/02/2020		Irish Transverse Mercator / ITM

Appendix E:

Irish Waters Pre-reconnection Enquiry Response

Robert Fitzmaurice
CS Consulting
19-22 Dame St
Dublin 2

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

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

www.water.ie

20 May 2020

Dear Robert Fitzmaurice,

Re: Connection Reference No CDS20000724 pre-connection enquiry -
Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 6 units at Grangecastle Business Park, Co Dublin

Irish Water has reviewed your pre-connection enquiry in relation to a water and wastewater connection at Grangecastle Business Park, Co Dublin.

Based upon the details that you have provided with your pre-connection enquiry and on the capacity currently available in the networks, as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place, your proposed connection to the Irish Water networks can be facilitated subject to the following.

Water:

Connection should be to the existing 450 mm via 150 mm connection main.

On site storage is required for a capacity of the non-domestic average flow on a peak week (ADPW Non domestic – 2.25l/s) for 24 hour period. This storage must also have the ability to refill completely in a 12 hour period.

Pumping station required at site location for pressure requirements. This shall remain private infrastructure.

The connection offer will be made limiting peak flow to 4.9 l/s with an annual limit of 4959 m^3. Annual demand should not exceed 4959 m^3 without consultation with Irish Water.

4959 m^3 allows for:

- Domestic Demand (913 m^3 *3) 2739 m^3;
- Cooling and cleaning of storage including flushing (740 m^3 *3) 2220 m^3.

If the customer requires to refill their storage and, hence, going over their annual allowance, they should in the first instance contact Irish Water. If Irish Water are unable to refill the tanks, we would need to be informed of the alternative source of supply. The water mains/storage will need to be designed to ensure there is no possibility of backflow from another source of water into the Irish Water system.

It will be a requirement that a meter that can be hooked up to our telemetry system and a flow control valve are installed as part of the connection.

Wastewater:

The Development is within the Grange Castle Business Park with a private wastewater infrastructure.

A private sewer is adjacent to the site discharging into a 600 mm ID Irish Water sewer via the privately owned Grange Castle Pumping Station and associated 200 mm rising main.

A new connection to the existing network is feasible without upgrade on the condition that the Grange Castle Pumping Station does not increase maximum output flow rate of Phase 2 PS set up (55l/s).

However, should your Development trigger the Phase 3 Pumping Station set up (270 l/s), it will be necessary to carry out further detailed study and investigations to confirm the available capacity and to determine the full extent of any upgrades which may be required to be completed to Irish Water Infrastructure, prior to agreeing to the proposed connection. Should you wish to have such studies and investigations progressed by Irish Water, you will be required to enter into Project Works Service Agreement.

The proposed wastewater connection for this development connects to the Irish Water network via private infrastructure (Third Party Infrastructure). Please be advised that at connection application stage you have to provide written confirmation from the owner of the infrastructure that you have received legal permission to connect to and that the infrastructure has capacity to cater for the additional load from the Development.

In relation to the routing of ducting beneath the existing 375 mm foul sewer a 'Letter of Indemnity' is required to be signed by the applicant and Irish Water prior to commencement of works, please email diversions@water.ie to progress.

All infrastructure should be designed and installed in accordance with the Irish Water Codes of Practice and Standard Details. A design proposal for the water and/or wastewater infrastructure should be submitted to Irish Water for assessment. Prior to submitting your planning application, you are required to submit these detailed design proposals to Irish Water for review.

You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed at a later date.

A connection agreement can be applied for by completing the connection application form available at **www.water.ie/connections**. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities.

If you have any further questions, please contact Deirdre Ryan from the design team on 022 54620 or email deiryan@water.ie. For further information, visit **www.water.ie/connections.**

Yours sincerely,

Maria O'Dwyer

Connections and Developer Services

Appendix F:

Office Of Public Works Communication

Robert Fitzmaurice

From: Paul Costello <paul.costello@opw.ie>
Sent: Monday 30 March 2020 13:59
To: Frank Duggan
Cc: Owen Sullivan; Robert Fitzmaurice
Subject: RE: A093 Amazon Ducting Under Baldonnell Stream

Hi Frank,

Based on your detail provided (distance back for directional drilling, depth below channel bed and assumed natural ground) this office has no difficulty with what is being proposed.
To clarify this office has a responsibility for flood risk management and arterial drainage maintenance only.

These responsibilities become relevant when any works proposed have the potential to impact on that what we are endeavouring to marshal, in this instance conveyance and flood risk management.
Should any of the proposed works not affect the conveyance potential/capacity of the channel existing during works, nor reduce the capacity as a consequence of the works, nor exacerbate flood risk in the area generally as a consequence of the works then this office has no comment to make.

With that said I appreciate the ongoing communications and would ask that they continue as best practice.
Many thanks.

Regards,
Paul

Paul Costello CEng MIEI
Eastern Drainage Maintenance

Oifig na nOibreacha Poiblí
Office of Public Works

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From: Frank Duggan <frank.duggan@csconsulting.ie>
Sent: 27 March 2020 16:05
To: Paul Costello <paul.costello@opw.ie>
Cc: Owen Sullivan <owen.sullivan@csconsulting.ie>; Robert Fitzmaurice <robert.fitzmaurice@csconsulting.ie>
Subject: A093 Amazon Ducting Under Baldonnell Stream

Hi Paul,

Hope you are well since we last spoke.

Further to our chat recently regarding the installation of ducting under a stream in the in the south Dublin area, the area in question is the Baldonnell stream in the Grange Castle area, Dublin 22.

The proposed ducting will be installed using directional drilling or similar approved at a depth of 2.5m below the stream bed level.

From the OPW's standpoint, would you be able to confirm that OPW are accepting in principal of locating ducting (circa 8 ducts) under the stream bed, subject to the required formal technical submissions being made prior to installation.

At this time we want to give comfort to the client that this is possible.

I attach for your reference a drawing showing the proposal.

Thank you in advance for your time on this.

Kind Regards

Frank Duggan
Civil Engineer |B.Eng (Hons), Msc, MIEI, GMICE

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Appendix B – Proposed Bypass & Full Retention Separators

Bypass NSB RANGE

APPLICATION

Bypass separators are used when it is considered an acceptable risk not to provide full treatment, for very high flows, and are used, for example, where the risk of a large spillage and heavy rainfall occurring at the same time is small, e.g.

- Surface car parks.
- Roadways.
- Lightly contaminated commercial areas.

PERFORMANCE

Klargester were one of the first UK manufacturers to have separators tested to EN 858-1. Klargester have now added the NSB bypass range to their portfolio of certified and tested models. The NSB number denotes the maximum flow at which the separator treats liquids. The British Standards Institute (BSI) tested the required range of Kingspan Klargester Bypass separators and certified their performance in relation to their flow and process performance assessing the effluent qualities to the requirements of EN 858-1. Klargester bypass separator designs follow the parameters determined during the testing of the required range of bypass separators.

Each bypass separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Oil storage volume.
- Silt storage capacity.
- Coalescer.

The unit is designed to treat 10% of peak flow. The calculated drainage areas served by each separator are indicated according to the formula given by PPG3 NSB = 0.0018A(m2). Flows generated by higher rainfall rates will pass through part of the separator and bypass the main separation chamber.

Class I separators are designed to achieve a concentration of 5mg/litre of oil under standard test conditions.

FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Oil alarm system available (required by EN 858-1 and PPG3).
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size bypass separator, the following information is needed:-

- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the flow is not pumped.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

UNIT NOMINAL SIZE	FLOW (l/s)	PEAK FLOW RATE (l/s)	DRAINAGE AREA (m^2)	STORAGE CAPACITY (litres) SILT	OIL	UNIT LENGTH (mm)	UNIT DIA. (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	STANDARD FALL ACROSS (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA.
NSBP003	3	30	1670	300	45	1700	1350	600	1420	1320	100	500	160
NSBP004	4.5	45	2500	450	60	1700	1350	600	1420	1320	100	500	160
NSBP006	6	60	3335	600	90	1700	1350	600	1420	1320	100	500	160
NSBE010	10	100	5560	1000	150	2069	1220	750	1450	1350	100	700	315
NSBE015	15	150	8335	1500	225	2947	1220	750	1450	1350	100	700	315
NSBE020	20	200	11111	2000	300	3893	1220	750	1450	1350	100	700	375
NSBE025	25	250	13890	2500	375	3575	1420	750	1680	1580	100	700	375
NSBE030	30	300	16670	3000	450	4265	1420	750	1680	1580	100	700	450
NSBE040	40	400	22222	4000	600	3230	1920	600	2185	2035	150	1000	500
NSBE050	50	500	27778	5000	750	3960	1920	600	2185	2035	150	1000	600
NSBE075	75	750	41667	7500	1125	5841	1920	600	2235	2035	200	950	675
NSBE100	100	1000	55556	10000	1500	7661	1920	600	2235	2035	200	950	750
NSBE125	125	1250	69444	12500	1875	9548	1920	600	2235	2035	200	950	750

Rotomoulded chamber construction GRP chamber construction * Some units have more than one access shaft – diameter of largest shown.

Full Retention NSF RANGE

APPLICATION

Full retention separators are used in high risk spillage areas such as:

- Fuel distribution depots.
- Vehicle workshops.
- Scrap Yards

PERFORMANCE

Klargester were the first UK manufacturer to have the required range (3-30 l/sec) certified to EN 858-1 in the UK. The NSF number denotes the flow at which the separator operates.

The British Standards Institute (BSI) have witnessed the performance tests of the required range of separators and have certified their performance, in relation to their flow and process performance to ensure that they met the effluent quality requirements of EN 858-1. Larger separator designs have been determined using the formulas extrapolated from the test range.

Each full retention separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Silt storage capacity.
- Automatic closure device.
- Oil storage volume.
- Coalescer (Class I units only).

Klargester full retention separators treat the whole of the specified flow.

FEATURES

- Light and easy to install.
- Class I and Class II designs.
- 3-30 l/sec range independently tested and performance sampled, certified by the BSI.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.

- Oil alarm system available.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size full retention separator, the following information is needed:-

- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the influent is not pumped.
- The required discharge standard. This will decide whether a Class I or Class II unit is required.
- The drain invert inlet depth.
- Pipework type, size and orientation.

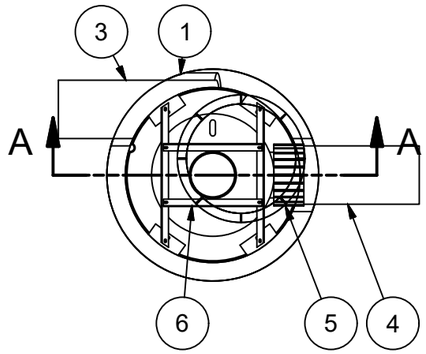
SIZES AND SPECIFICATIONS

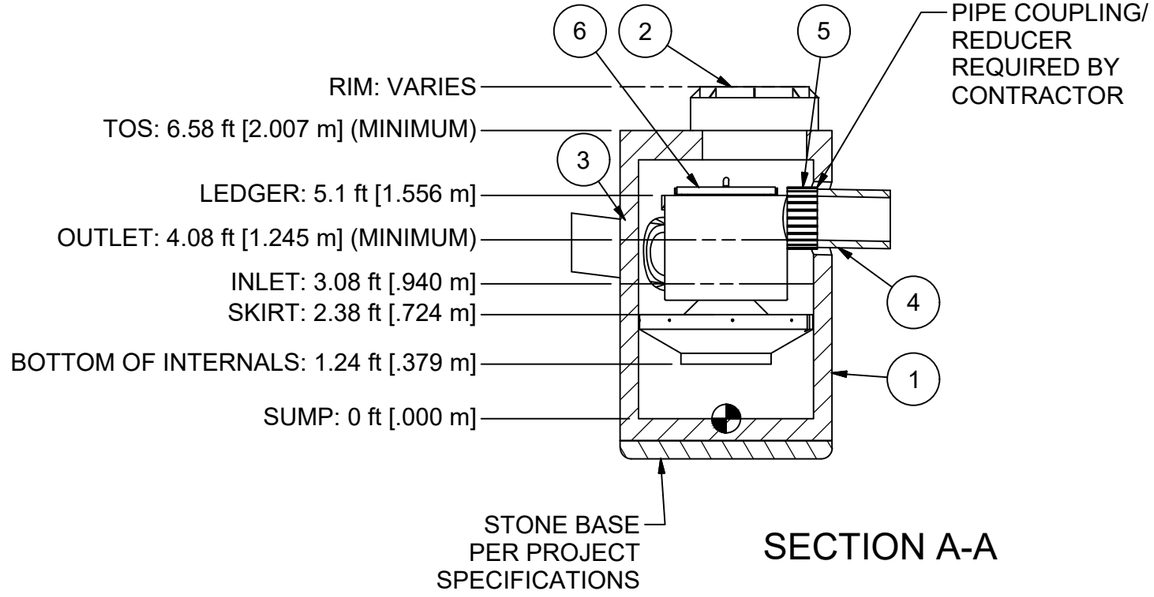
UNIT NOMINAL SIZE	FLOW (l/s)	DRAINAGE AREA (m^2) PPG-3 (0.018)	STORAGE CAPACITY (litres) SILT	OIL	UNIT LENGTH (mm)	UNIT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	MIN. INLET INLET (mm)	STANDARD PIPEWORK DIA. (mm)
NSFP003	3	170	300	30	1700	1350	1420	1345	500	160
NSFP006	6	335	600	60	1700	1350	1420	1345	500	160
NSFA010	10	555	1000	100	2610	1225	1050	1000	500	200
NSFA015	15	835	1500	150	3910	1225	1050	1000	500	200
NSFA020	20	1115	2000	200	3200	2010	1810	1760	1000	315
NSFA030	30	1670	3000	300	3915	2010	1810	1760	1000	315
NSFA040	40	2225	4000	400	4640	2010	1810	1760	1000	315
NSFA050	50	2780	5000	500	5425	2010	1810	1760	1000	315
NSFA065	65	3610	6500	650	6850	2010	1810	1760	1000	315
NSFA080	80	4445	8000	800	5744	2820	2500	2450	1000	300
NSFA100	100	5560	10000	1000	6200	2820	2500	2450	1000	400
NSFA125	125	6945	12500	1250	7365	2820	2500	2450	1000	450
NSFA150	150	8335	15000	1500	8675	2820	2550	2450	1000	525
NSFA175	175	9725	17500	1750	9975	2820	2550	2450	1000	525
NSFA200	200	11110	20000	2000	11280	2820	2550	2450	1000	600

Rotomoulded chamber construction *GRP chamber construction*

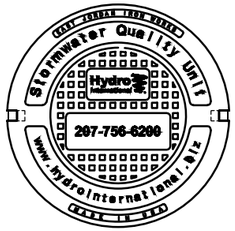
Appendix C – Proposed Downstream Defender Manhole

OUTLET STUB ID: 12" (300 mm)
OUTLET STUB OD: 12.5" (318 mm)





SECTION A-A



HYDRO FRAME AND COVER (INCLUDED)
GRADE RINGS BY OTHERS AS REQUIRED

NOTE: NOT FOR CONSTRUCTION.
CONTACT HYDRO FOR SITE SPECIFIC DETAIL

EQUIPMENT PERFORMANCE

The stormwater treatment unit shall adhere to the hydraulic parameters given in the chart below and provide the removal efficiencies and storage capacities as follows:

1. The treatment system shall use an induced vortex to separate pollutants from stormwater runoff.
2. Peak Hydraulic Capacity: 3.0 cfs (85 l/s)
3. Sediment Storage Capacity: 0.70 cu. yd. (0.53 cu. m)
4. Continuous Oil Storage Capacity: 70 gal. (265 liters)
5. Sediment shall be stored in a zone that is isolated from the main flow path and protected from reintrainment by a benching skirt.
6. For more product information including regulatory acceptances, please visit https://hydro-int.com/en/products/downstream-defender

PARTS LIST

ITEM	QTY	SIZE (in)	SIZE (mm)	DESCRIPTION
1	1	48	1200	PRECAST MANHOLE (BY HYDRO VIA PRECASTER)
2	1	30	750	FRAME AND COVER
3	1	12 (MAX)	300 (MAX)	INLET PIPE (BY OTHERS)
4	1	12 (MAX)	300 (MAX)	OUTLET PIPE (BY OTHERS)
5	1			PIPE COUPLING (BY OTHERS)
6	1			INTERNAL COMPONENTS (PRE-INSTALLED)

PROJECTION

IF IN DOUBT ASK

COMMENTS:
1. MANHOLE WALL AND SLAB THICKNESSES ARE NOT TO SCALE.
2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING DOWNSTREAM DEFENDER MANHOLE.

DATE:	SCALE:
11/8/2019	NTS

DRAWN BY:	CHECKED BY:	APPROVED BY
GW		

Title
4ft-DIAMETER DOWNSTREAM DEFENDER

Hydro International®
hydro-int.com
HYDRO INTERNATIONAL

DO NOT SCALE DRAWING
STEEL FABRICATION TOLERANCES
UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.

LINEAR
000 - 012in = ±0.04in
012 - 024in = ±0.06in
024 - 048in = ±0.08in
048 - 120in = ±0.12in
120in >>>> = ±0.20in

ANGULAR
000 - 120in = ±1°
120 - 240in = ±0.5°
240in >>>> = ±0.25°

WEIGHT:	MATERIAL:
N/A	

REFERENCE NUMBER:

DRAWING NO.:
4'GA-DWG

SHEET SIZE:	SHEET:	Rev:
B	1 OF 1	-

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