DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

RESIDENTIAL DEVELOPMENT, ANNABELLA, MALLOW, CO. CORK

INFRASTRUCTURE REPORT

DATE 28/05/2025

REVISION 5

JOB NO. 6334

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DOCUMENT CONTROL

PROJECT NAME: Residential Development, Annabella, Mallow, Co. Cork

PROJECT NUMBER: 6334

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Contents

1 Introduction

DOSA Consulting Engineers were engaged as Engineers for the proposed development at Annabella, Mallow, Co. Cork.

1.1 Objectives

A number of site investigations have been carried out and their findings have been incorporated to deal with solutions to:

- Surface Water Drainage Network
- Foul Drainage Network
- Water Supply

The proposals for the foul sewer & water infrastructure associated with this development were discussed with Mr. Michael Galvin, Senior Design Engineer, Southern Region, Uisce Eireann.

1.2 Site Location

The subject site (currently greenfield) is located in the townland of Annabella situated to the west of the Mallow town centre. The site lies within close proximity to several important routes including the N20 Cork-Limerick route, the N72 Cork-Killarney route and the N73 Mallow to Mitchelstown route. The subject land is bordered to the south by the Annabella Park estate, to the east by the Woodview Drive estate and by greenfield lands to the west and north. The lands are currently zoned residential in the Current Development Plan. A snapshot of the application boundary is outlined in Figure 1.2 below.

Figure 1.2 – Context Map

1.3 References

The advice provided in the report is based on:

a) Site observations undertaken during site visits and inspections undertaken by DOSA for review of existing Structural, Civil services conditions.
b) Liaison and discussions with Irish Water & Cork County Council.
c) Desktop Review of available Planning Data.

1.4 Site Topography

The topography of the site slope slopes downwards in a northerly direction. The elevation height along the perimeter on the northern boundary varies from +65.0m & +68.0m to levels of +83.50m & +95.50m along the southern boundary.

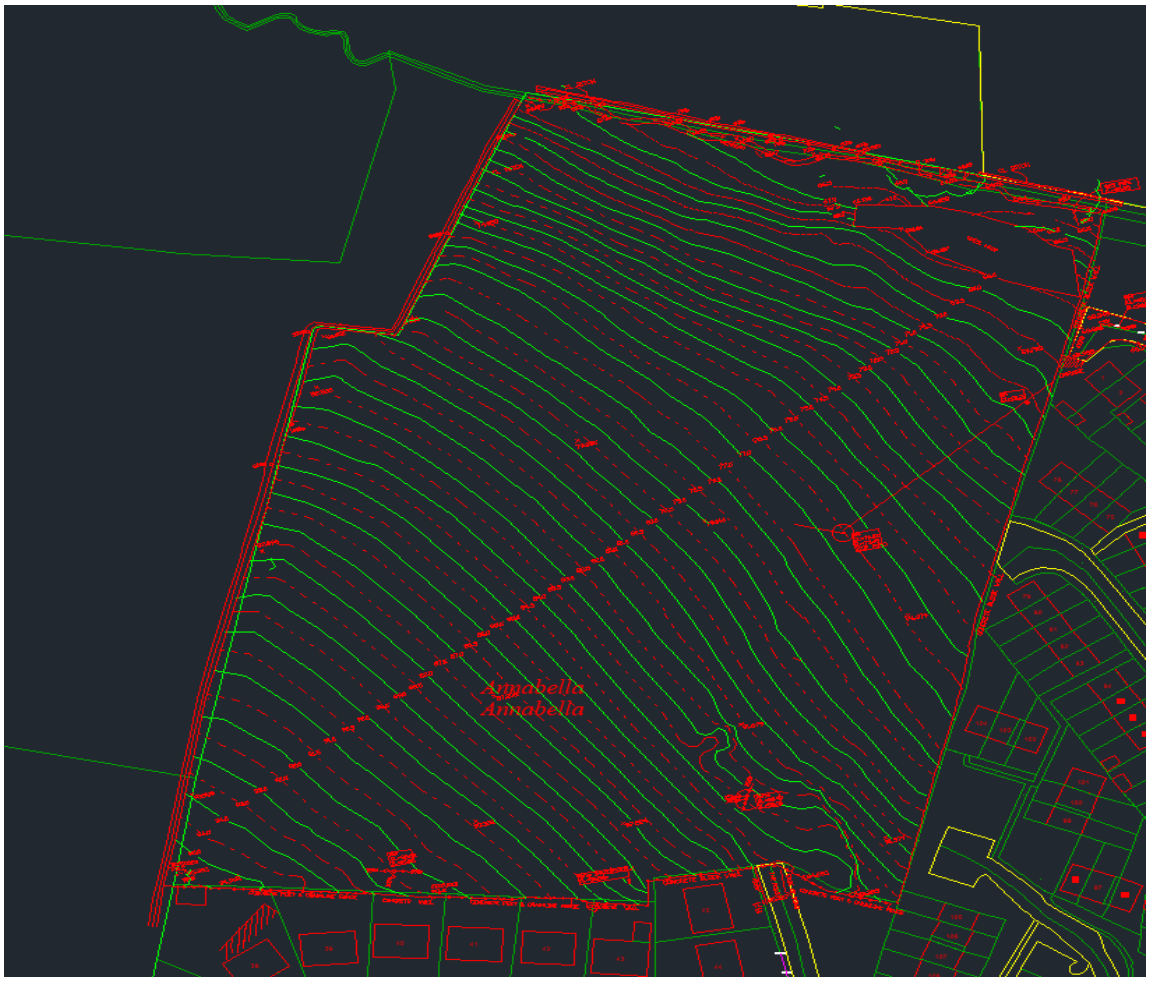


Figure 1.3 – Site Topography

1.5 Proposed Development

Sayvale 18 Limited intend to apply for a Large-Scale Residential Development (LRD) at Annabella, Mallow, Co. Cork. The proposed development consists of the construction of 102 no. residential units comprising of 36 no. three bedroom semi-detached/townhouse dwelling houses and 66 no. apartment/duplex/maisonette units, a two storey creche facility and all ancillary site development works.

The proposed 66 no. apartment/duplex/maisonette units will include 16 no. 1 bedroom units, 33 no.2-bedroom units and 17 no. 3 bedroom units to be provided in 5 no. apartment buildings ranging in height from 2-3 storeys.

Vehicular and pedestrian access to the proposed development will be provided via the estate entrance and internal road network from the Annabella Park residential development. The proposed development also facilitates pedestrian connections to the Woodview Drive residential development to the east and the residential development to the west permitted by An Bord Pleanála Reference ABP 312640-22, which is currently under construction. The proposed development also provides for public realm improvements to the internal estate road network of the Annabella Park residential development and for a landscape/amenity area to the north of the site.

Figure 1.4 – Proposed Development

2 *Storm Water Design*

2.1 Surface Water System

There is an existing stormwater outfall to the stream located along the northern boundary of the site as outlined in the Proposed Drainage Drawing 6334-4020 which is expected to a provide suitable surface water discharge point for the proposed development. This will require a new MH to be added to the existing stormwater network traversing the site which ultimately discharges into the watercourse and will not require any additional outfall works to the existing stream. This has been discussed and agreed with Mr. John Aherne, Estates Engineer, Cork County Council & Mr. Denis Beecher, Area Engineer, Cork County Council.

In order to reduce the effects of the surface runoff on potential flooding, a Stormwater Management Plan will be applied to surface water discharges into adjacent watercourses. The Stormwater Management Plan can be applied to control the rate of runoff from new development. The maximum permitted surface water outflow from the new development is to be restricted to that of the existing Greenfield site by the usage of attenuation storage.

Control of runoff by attenuation methods requires a hydraulic control to restrict the magnitude of flows passing downstream, together with an upstream storage capacity to contain the volume of runoff held back by the hydraulic control. The flows are proposed to be attenuated in the surface water system by adopting flood storage attenuation tanks along with restricted outlets as the control devise. The storage volume required has been designed using the computer aided design package Windes 10.4.

The attenuation strategy for the site is for the detention of flows in interlinked attenuation tanks.

2.2 Surface Water Drainage Network

The surface water drainage network for the proposed development was modelled using the Microdrainage software application. The surface water pipe lengths, slopes, contributing impermeable areas, upstream invert levels, upstream cover levels and pipe diameters were entered into the model using the drawings supplied.

2.3 Design Criteria:

The proposed surface water drains have been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS), the Department of the Environment's Recommendations for Site Development Works for Housing Areas, the Department of the Environment's Building Regulations "Technical Guidance Document Part H Drainage and Waste Water Disposal" and BS EN 752: 2008 Drain and Sewer Systems Outside Buildings.

- Return period for pipe work design — 2 years
- Return period for attenuation design — 100 years
- Soil Type — 2
- Allowable Outflow — 14.100 l/sec
- Time of entry — 5 minutes
- M5 – 60 — 17.600 mm

- Ratio "r" 0.250
- Pipe Friction (Ks) 0.6 mm
- Minimum Velocity (based on pipe flowing full) 1.0 m/s
- Rainfall Runoff from Roads and Footpaths 100%
- Rainfall Runoff from Roofs 80%
- Rainfall Runoff from Driveways 80%
- Rainfall Runoff from Green Areas 20%
- Rainfall Depth Factored for Climate Change (as per GDSDS) 20%

(in accordance with GDSDS Volume 2, Chapter 6, Table 6.2 – see below)

Climate Change Category	Characteristics
River flows	20% increase in flows for all return periods up to 100 years
Sea level	400+mm rise (see Climate Change policy document for sea levels as a function of return period)
Rainfall	10% increase in depth (factor all intensities by 1.1)
	Modify time series rainfall in accordance with the GDSDS climate change policy document

Table 6.2 Climate Change Factors to be Applied to Drainage Design

The global variables required for the model were the M5-60 and Rainfall Ratio. These two factors may be read from maps contained in the Wallingford procedure. They enable the program to calculate the intensity, duration and frequency characteristics of storms.

M5-60 is the rainfall depth based on a 60-minute storm of 5 years return period. Ratio R is the ratio of the 60-minute storm to the 2-day storm for the 5-year return period events. These values are as follows:

- M5-60 = 17.600mm
- Ratio R = 0.250

Microdrainage generates design storms using the principles set out in the Flood Studies Report (NERC 1975).

A summer rainfall profile was used for the design of the pipework and a winter rainfall profile was used for the design of the storm water attenuation to give the critical design. A summer profile gives higher rainfall intensities and results in higher runoff rates and is used to determine the required capacity of the pipework. A winter rainfall profile gives a flatter more sustained profile and results in higher runoff volumes and is used to determine the attenuation/storage requirements.

The surface water drainage network was assessed for compliance with maximum and minimum velocities, pipe length etc. The network was designed to ensure velocities in the network and pipe gradients did not exceed the maximum velocity of 4.0m/s. The minimum velocity allowed was 1.00m/s.

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

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

2.3.1 Pre-Development Conditions

The catchment area of this proposed development is 3.84 hectares (ha). For this development, the permissible outflow is calculated using the estimation method contained in the Institute of Hydrology Report No. 124: Flood estimation for small catchments.

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

QBAR = The Mean Annual Peak Flow (Permissible outflow in m3.sec

AREA = Area of the Catchment (site) in km^2

SAAR = Standard Annual Average Rainfall

SOIL = Soil index

As the development is smaller than 50 ha, the analysis for determining the permissible outflow uses 50 ha in the formula and linearly interpolates the flow rate value based on the ratio of the development to 50 ha. This is a statistical based method within the Microdrainage Software utilizing the Regional Flood Frequency by Catchment Characteristics to give the Index Flood (QBAR)

Design summary sheets for the QBAR value are contained in Appendix B.

The Mean Annual Peak Flow (permissible outflow) was calculated for the particular design development areas.

The allowable runoff estimation method utilises IH 124 and the Soil Index value taken from the Micrcodrainage Design Package mapping system gives a Soil Index of 0.3.

2.3.2 Post-Development Conditions

The stormwater management plan adopted for the particular development involves the usage of an attenuation tank/basin located in the green area to the northern section of the site.

All surface water runoff arising from the paved development will be drained away from the site. The attenuation tank will be designed for a 100-year storm event. The maximum discharge from the tank will be limited to calculated permissible runoff (QBAR) for the catchment area.

Based on the proposed development design there will be a change in the land surface. Therefore, due to this proposed change a corresponding increase in the peak rate of surface runoff from the site will arise during times of high rainfall.

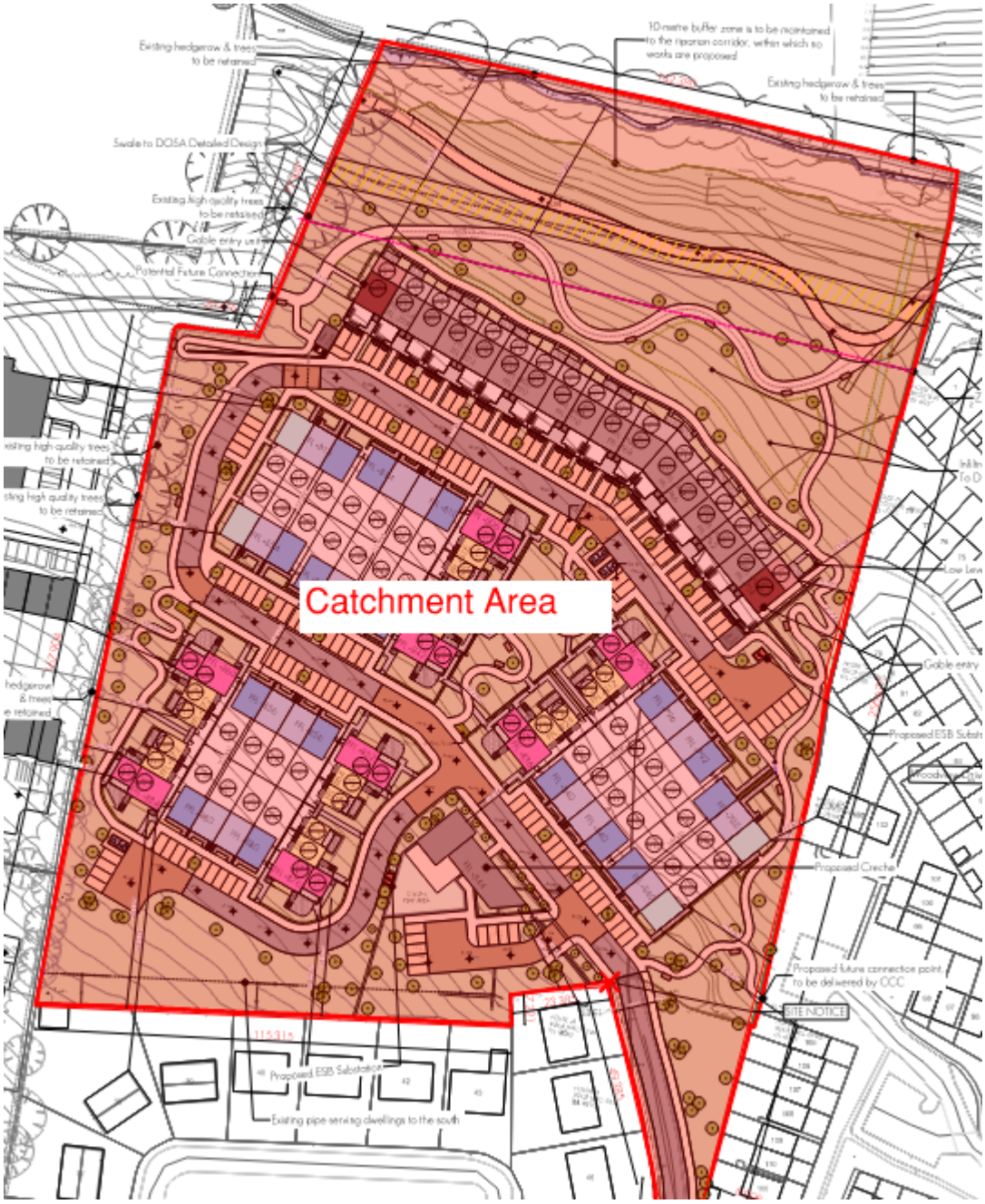


Fig 2.2 Proposed Development

Contributing Area	Permissible Outflow (l/sec)
Catchment Area	14.100 l/sec

The flood peak runoff rates from the post-development grassy permeable area (Q_p grass) and the post-development impervious area (Q_p imp.) using the Rational Method (100% impermeability of hard surfaces) are calculated using Windes 10.4. The Sources Control Module of the Microdrainage

Software was used to design the attenuation tank capacities. This module also provides the critical storm duration for the attenuation tank during the design process.

It should be noted that climate change has been accounted for in the design. As per volume 5 of the GDSDS a factor of 20% has been incorporated into the design.

2.4 Attenuation Tank/Basin

2.4.1 Volume of Attenuation Tank/Basin

The capacity of the attenuation tank/basin is designed to cater for the capacity required for a 1 in 100-year ARI event. These capacities are summarised as follows:

Tank/Basin	Capacity (m^3)	Restricted Outlet (l/sec)
1	835.00	14.100 l/sec

2.5 Hydrocarbon Treatment

A petrol interceptor is a trap used to filter out hydrocarbon pollutants from rainwater runoff. It is used in construction to prevent fuel contamination of streams carrying away the runoff.

Petrol interceptors work on the premise that some hydrocarbons such as petroleum and diesel float on the top of water. The contaminated water enters the interceptor typically after flowing off roads or hardstanding areas before being deposited into the first tank inside the interceptor.

The first tank builds up a layer of the hydrocarbon as well as other scum. Typically, petrol interceptors have 3 separate tanks each connected with a dip pipe, as more liquid enters the interceptor the water enters into the second tank leaving the majority of the hydrocarbon behind as it cannot enter the dip pipe, whose opening into the second tank is below the surface.

However, some of the contaminants may by chance enter the second tank. This second tank will not build up as much of the hydrocarbon on its surface. As before, the water is pushed into the third tank and more water enters the second.

The third tank should be practically clear of any hydrocarbon floating on its surface. As a precaution, the outlet pipe is also a dip pipe. When the water leaves the third tank via the outlet pipe it should be contaminant free.

In this project there are a number of catchment areas and attenuation tanks that eventually discharge to the adjoining public network.

A summary of the proposed interceptor is as per the table below.

Table 2.4 – Petrol Interceptor Details

Catchment Reference	Petrol Interceptor Make & Model	Oil Storage Capacity (l)
Catchment Area	1 No. Conder CNSB30s	450.0 litres

2.6 Silt Control

The proposed petrol interceptor from Conder Environmental also includes a silt storage capacity in addition to the oil storage capacity that allow silt to be collected in the interceptor prior to discharge to the proposed detention basins. This silt build-up can then be removed from the interceptor. The amount of silt storage from the proposed petrol interceptor is outlined in Table 2.5 below.

Table 2.5 – Petrol Interceptor Silt Storage Details

Catchment Reference	Petrol Interceptor Make & Model	Silt Storage Capacity (l)
Catchment Area	1 No. Conder CNSB30s	3000.0 litres

2.7 Construction & Operational Stage Run-Off

Both construction and operational phase surface-water drainage from the proposed development site will ultimately discharge into the adjacent stormwater watercourses. Where surface-water run-off occurs at the site during the construction phase, it will be managed and controlled prior to discharge into the environment by implementing standard environmental controls. Temporary banks shall be in place to ensure that runoff is directed to a temporary detention pond which shall be provided to reduce the amount of silt in the run-off. The location of these banks and temporary detention ponds will be indicated and confirmed in a Construction Stage Construction & Environmental Management Plan. The development will also include the construction of a gravity surface-water drainage network throughout the site. The surface-water drainage network will include the installation of dedicated attenuation facilities upstream of proposed outfall to the public network, to attenuate discharges to the undeveloped Greenfield run-off rates with the operation of proprietary hydro-brake flow-control devices. The attenuation facility is sized on the basis of a design storm with a 100-year return period and an additional 20% allowance for the effect of climate change.

The attenuation facilities will be in the form of a detention basin. They will be an off-line component of the drainage network into which runoff is diverted once flows reach a specified threshold.

3 *Foul Sewer System*

3.1 Foul Sewer Design

A Pre-Connection Enquiry was submitted to Irish Water. The Irish Water Reference Number for this enquiry is CDS24009688. The response to this Enquiry was issued by Irish Water on 25th April 2025. This confirmed that, subject to a valid connection agreement being put in place, the proposed connection to the Irish Water network could be facilitated.

- **Wastewater Connection**
  - Feasible without infrastructure upgrade by Uisce Éireann
  - The proposed Development indicates that Uisce Eireann assets are present on the site. The Developer has to demonstrate that proposed structures and works will not inhibit access for maintenance or endanger structural or functional integrity of the assets during and after the works. Drawings (showing clearance distances, changing to ground levels) and Method Statements should be included in the Detailed Design of the Development. A wayleave in favour of Uisce Eireann will be required over the assets that are not located within the Public Space. For design submissions and queries related to diversion/build near or over, please contact UE Diversion Team via email address diversions@water.ie

Fig 3.0 Extract From Irish Water COF

The Confirmation of Feasibility document is included in Appendix A.

The foul sewer has been designed using the System 1 and Simulation Modules of the Micro-drainage package. The foul network design addresses present day design issues and can view velocities at Full Bore, Proportional Depth and 1/3 flow.

A model of the proposed foul drainage network was built using the micro-drainage software applications. The model was analysed and amended until the results met with the design criteria specified.

The network has been designed to achieve self-cleansing velocities at 1/3 flow whilst maintaining minimum gradients. Design summary sheets are contained in Appendix E.

3.1.1 Development Breakdown

Application 102 No. Dwellings

Section 3.6 of The Irish Water Code of Practice Wastewater Infrastructure states that for the gravity sewers shall be designed to carry a minimum wastewater volume of 6 times the dry weather flow (6DWF) which is to be taken as 446 litres per dwelling

Loading = (102) (446) / (24) (60) (60) = 0.527 litres/second

6DWF = 3.162 litres/second

57-Child Creche

Assume 30 No. Staff & 57 No. Children

From the EPA Code of Practice for Small Communities, Business, Leisure Centres and Hotels Loading = 60 L/Person/day

Loading = (87) (60) / (24) (60) (60) = 0.060 litres/second

6DWF = 0.360 litres/second

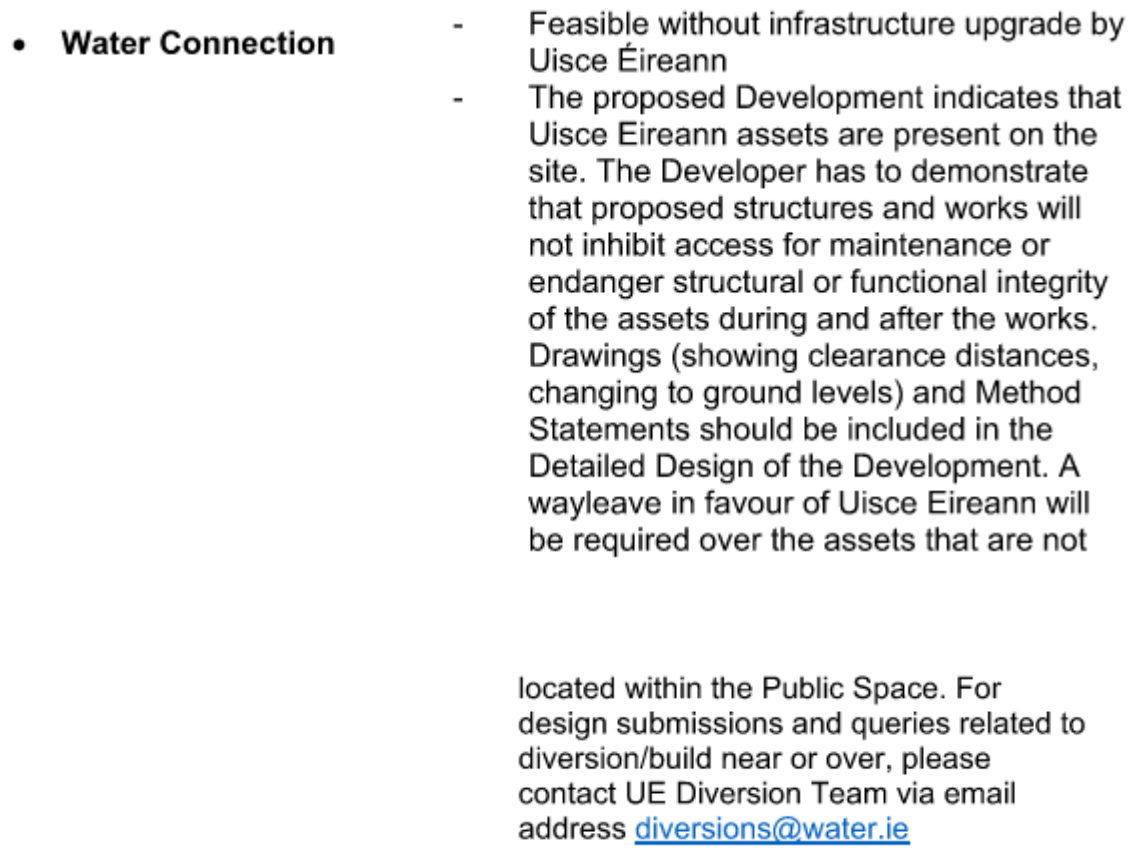
The overall quantity of wastewater for the proposed development is estimated at 50.71m^3 per day.

This is based on the unit schedule submitted by the architect. The foul waste within the development will be collected via an internal gravity network and will discharge to the public foul sewer via a gravity connection.

All works will be in accordance with Irish Water Code of Practice for Wastewater Supply & the Wastewater Infrastructure Standard Details Document Number: IW-CDS-5030-01.

4 Water Supply

As with the drainage network, a Pre-Connection Enquiry was submitted to Irish Water under Reference No. CDS24009688. This confirmed that, subject to a valid connection agreement being put in place, the proposed connection to the Irish Water network could be facilitated.



- **Water Connection**
  - Feasible without infrastructure upgrade by Uisce Éireann
  - The proposed Development indicates that Uisce Eireann assets are present on the site. The Developer has to demonstrate that proposed structures and works will not inhibit access for maintenance or endanger structural or functional integrity of the assets during and after the works. Drawings (showing clearance distances, changing to ground levels) and Method Statements should be included in the Detailed Design of the Development. A wayleave in favour of Uisce Eireann will be required over the assets that are not

located within the Public Space. For design submissions and queries related to diversion/build near or over, please contact UE Diversion Team via email address diversions@water.ie

Fig 4.0 Extract From Irish Water COF

It is proposed to provide a 100mm internal diameter HDPE connection to tie into the existing 100mm public main located to the south of the site in the adjoining estate with associated valves and metering requirements. Internally within the development it is proposed to have a series of 100mm Ø branches and 80mm loops with associated hydrants, valves and metering requirements. There is an existing watermain traversing the site which will be removed upon completion of the estate.

Water distribution supply to each building will be sized to cater for the requirements of those particular uses. Metered connections will be made to the main in accordance with Irish Water specifications and details.

The layout of the proposed watermain network is shown on the Proposed Watermain Layout Plan 6334-4030.

All works will be in accordance with Irish Water Code of Practice for Water Supply & the Water Infrastructure Standard Details Document Number: IW-CDS-5020-01.

5 *Summary of Results*

The storm water network was built and analysed using the Microdrainage Software application and were assessed for a 1 in 2 year storm & 1 in 100 year storm. A summary of the results is shown in Tables 5.1 below and in the Microdrainage outputs in the Appendices.

The global variables, pipeline and manhole schedules for both the surface water network and foul network were printed and are included in the Appendices. These show the basic pipe details such as pipe length, diameter, roughness coefficient, upstream invert, velocity, etc.

Table 5.1 Summary of Surcharge and Flooding

Detention Basin Reference	Storm Event	Results
Attenuation Tank	1 in 2 year	No surcharge of the stormwater network
	1 in 100 year	Surcharge

The stormwater system is designed to ensure no surcharge occurs during a 1 in 2-year return period event.

No flooding was predicted to occur for the 1 in 100-year return period event. Surcharging and flood risk occurred for a number of critical storm events but this is allowed and does not compromise the network.

Table 5.2 Outlet Control Summary

Attenuation Reference	Hydrobrake Reference	Limiting Discharge (l/s)	Design Head (m)	Hydrobrake Diameter (mm)
Attenuation Tank	MD4	14.10 l/sec	2.087	112

Table 5.3: Storage Tank Summary

Basin No.	Storage Type	Capacity (m^3)	Invert Level (m)	Maximum Storage Level (m)
Attenuation Tank	Stormtech System	835.0	69.990	71.990

The foul water network model was built and analysed using the Micro-drainage Software application and was assessed to ensure velocities maintained a self-cleansing velocity. The system will consist of an internal gravity network discharging to the existing Irish Water asset.

Appendix A –Irish Water Confirmation of Feasibility

CONFIRMATION OF FEASIBILITY

Stephen O'Grady

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PO Box 448
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Cork City

www.water.ie

28 March 2025

Our Ref: CDS24009688 Pre-Connection Enquiry
Annabella, Mallow, Co., Cork

Dear Applicant/Agent,

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

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 103 unit(s) at Annabella, Mallow, Co., Cork, (the **Development)**.

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

- **Water Connection**
  - Feasible without infrastructure upgrade by Uisce Éireann
  - The proposed Development indicates that Uisce Eireann assets are present on the site. The Developer has to demonstrate that proposed structures and works will not inhibit access for maintenance or endanger structural or functional integrity of the assets during and after the works. Drawings (showing clearance distances, changing to ground levels) and Method Statements should be included in the Detailed Design of the Development. A wayleave in favour of Uisce Eireann will be required over the assets that are not

	located within the Public Space. For design submissions and queries related to diversion/build near or over, please contact UE Diversion Team via email address diversions@water.ie
• **Wastewater Connection**	- Feasible without infrastructure upgrade by Uisce Éireann - The proposed Development indicates that Uisce Eireann assets are present on the site. The Developer has to demonstrate that proposed structures and works will not inhibit access for maintenance or endanger structural or functional integrity of the assets during and after the works. Drawings (showing clearance distances, changing to ground levels) and Method Statements should be included in the Detailed Design of the Development. A wayleave in favour of Uisce Eireann will be required over the assets that are not located within the Public Space. For design submissions and queries related to diversion/build near or over, please contact UE Diversion Team via email address diversions@water.ie

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

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

Where can you find more information?

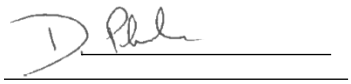
- **Section A -** What is important to know?
- **Section B -** Details of Uisce Éireann's Network(s)

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Uisce Éireann's network(s). This is not

a connection offer and capacity in Uisce Éireann's network(s) may only be secured by entering into a connection agreement with Uisce Éireann.

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

Yours sincerely,



Dermot Phelan
Connections Delivery Manager

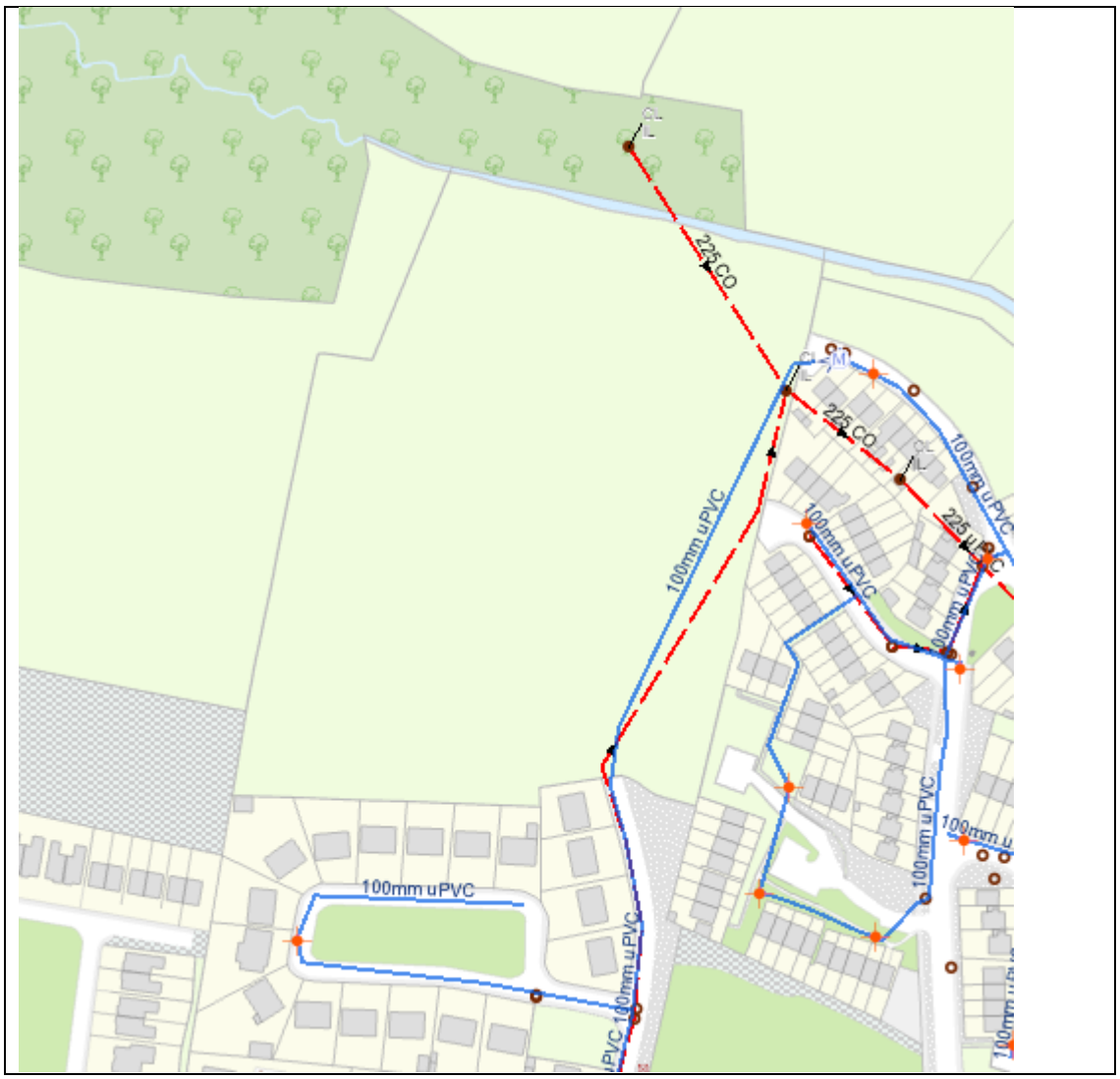
Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • **What to do?** - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Uisce Éireann's network(s)?	• Requests for maps showing Uisce Éireann's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

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

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



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

Whilst every care has been taken in respect of the information on Uisce Éireann's network(s), Uisce Éireann assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information

should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Uisce Éireann’s underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Uisce Éireann’s underground network(s) is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

Appendix B –Irish Water Statement of Design Acceptance

Stephen O'Grady
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Uisce Éireann
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South City
Delivery Office
Cork City

www.water.ie

26 May 2025

Re: Design Submission for Annabella, Mallow, Co., Cork (the "Development") (the "Design Submission") / Connection Reference No: CDS24009688

Dear Stephen O'Grady,

Many thanks for your recent Design Submission.

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

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

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

If you have any further questions, please contact your Uisce Éireann representative:
Name: Stephen Gill
Phone: 00874799473
Email: Stephen.gill@water.ie

Yours sincerely,

Dermot Phelan
Connections Delivery Manager

Appendix A

Document Title & Revision

- 6334-4020 Proposed Drainage Layout
- 6334-4021 Proposed Drainage Schedules & Bypass Separator
- 6334-4025 Proposed Wastewater Details (1 of 2)
- 6334-4026 Proposed Wastewater Details (2 of 2)
- 6334-4030 Proposed Watermain Layout
- 6334-4035 Proposed Watermain Details (1 of 2)
- 6334-4036 Proposed Watermain Details (2 of 2)
- 6334-4060 Proposed Foul Sewer Longitudinal Sections (1 of 2)
- 6334-4061 Proposed Foul Sewer Longitudinal Sections (2 of 2)
- Infrastructure Report

Standard Details/Code of Practice Exemption:

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

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

Appendix C – Allowable Runoff QBAR Values

IH 124 Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	3.842	Urban	0.000
SAAR (mm)	1000	Region Number	Ireland South

Results l/s

QBAR Rural	14.1
QBAR Urban	14.1
Q100 years	25.9
Q1 year	12.0
Q2 years	13.5
Q5 years	16.8
Q10 years	19.0
Q20 years	21.2
Q25 years	21.8
Q30 years	22.4
Q50 years	24.0
Q100 years	25.9
Q200 years	28.0
Q250 years	n/a
Q1000 years	n/a

WARNING: Irish growth curves are not defined above 200 years.

Appendix D – 1 in 2 Year Design Sheets

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)	100	Add Flow / Climate Change (%)	20
M5-60 (mm)	17.600	Minimum Backdrop Height (m)	0.200
Ratio R	0.250	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
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

Designed with Level Inverts

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.036	4-8	0.933	8-12	0.012

Total Area Contributing (ha) = 1.981

Total Pipe Volume (m³) = 61.730

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
S1.000	38.050	0.900	42.3	0.127	5.00	0.0	0.600	o	225
S1.001	8.425	0.150	56.2	0.050	0.00	0.0	0.600	o	225
S1.002	9.520	0.500	19.0	0.050	0.00	0.0	0.600	o	225
S1.003	7.380	0.250	29.5	0.050	0.00	0.0	0.600	o	225
S1.004	18.145	0.850	21.3	0.050	0.00	0.0	0.600	o	225
S1.005	5.135	0.350	14.7	0.005	0.00	0.0	0.600	o	225

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.31	86.850	0.127	0.0	0.0	3.4	2.02	80.2	20.6
S1.001	50.00	5.39	85.950	0.177	0.0	0.0	4.8	1.75	69.5	28.8
S1.002	50.00	5.45	85.800	0.227	0.0	0.0	6.1	3.01	119.8	36.9
S1.003	50.00	5.50	85.300	0.277	0.0	0.0	7.5	2.42	96.1	45.0
S1.004	50.00	5.60	85.050	0.327	0.0	0.0	8.9	2.84	113.1	53.1
S1.005	50.00	5.63	84.200	0.332	0.0	0.0	9.0	3.43	136.5	53.9

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
S1.006	18.940	1.050	18.0	0.005	0.00	0.0	0.600	o	225
S2.000	20.725	0.138	150.0	0.035	5.00	0.0	0.600	o	225
S2.001	14.890	0.125	119.1	0.035	0.00	0.0	0.600	o	225
S3.000	9.180	0.563	16.3	0.035	5.00	0.0	0.600	o	225
S2.002	45.965	0.275	167.0	0.172	0.00	0.0	0.600	o	300
S1.007	14.614	0.099	147.6	0.021	0.00	0.0	0.600	o	375
S1.008	64.650	0.388	166.6	0.219	0.00	0.0	0.600	o	375
S4.000	50.700	2.750	18.4	0.074	5.00	0.0	0.600	o	225
S1.009	6.302	0.087	72.4	0.025	0.00	0.0	0.600	o	375
S1.010	29.015	0.363	80.0	0.061	0.00	0.0	0.600	o	375
S1.011	21.405	0.614	34.9	0.066	0.00	0.0	0.600	o	375
S1.012	5.815	0.186	31.3	0.020	0.00	0.0	0.600	o	375
S1.013	19.985	0.850	23.5	0.073	0.00	0.0	0.600	o	375
S1.014	69.215	1.500	46.1	0.238	0.00	0.0	0.600	o	375

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.006	50.00	5.73	83.850	0.337	0.0	0.0	9.1	3.10	123.1	54.8
S2.000	50.00	5.32	82.950	0.035	0.0	0.0	0.9	1.07	42.4	5.7
S2.001	50.00	5.53	82.812	0.070	0.0	0.0	1.9	1.20	47.6	11.4
S3.000	50.00	5.05	83.250	0.035	0.0	0.0	0.9	3.26	129.5	5.7
S2.002	50.00	6.16	82.687	0.277	0.0	0.0	7.5	1.21	85.8	45.0
S1.007	50.00	6.33	82.412	0.635	0.0	0.0	17.2	1.49	164.5	103.2
S1.008	50.00	7.10	82.313	0.854	0.0	0.0	23.1	1.40	154.7	138.8
S4.000	50.00	5.28	86.500	0.074	0.0	0.0	2.0	3.06	121.7	12.0
S1.009	50.00	7.14	81.925	0.953	0.0	0.0	25.8	2.13	235.4	154.9
S1.010	50.00	7.38	81.838	1.014	0.0	0.0	27.5	2.03	223.9	164.8
S1.011	50.00	7.50	81.475	1.080	0.0	0.0	29.2	3.08	339.9	175.5
S1.012	50.00	7.53	80.861	1.100	0.0	0.0	29.8	3.25	359.0	178.7
S1.013	50.00	7.62	80.675	1.173	0.0	0.0	31.8	3.75	414.2	190.6
S1.014	50.00	8.05	79.825	1.411	0.0	0.0	38.2	2.67	295.3	229.3

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
S1.015	14.775	0.350	42.2	0.067	0.00	0.0	0.600	o	375
S5.000	48.240	4.020	12.0	0.128	5.00	0.0	0.600	o	225
S1.016	37.610	0.650	57.9	0.140	0.00	0.0	0.600	o	450
S1.017	23.555	1.812	13.0	0.075	0.00	0.0	0.600	o	450
S1.018	12.035	0.926	13.0	0.000	0.00	0.0	0.600	o	450
S1.019	5.600	0.431	13.0	0.000	0.00	0.0	0.600	o	450
S6.000	82.050	1.000	82.1	0.090	5.00	0.0	0.600	o	225
S6.001	44.990	1.000	45.0	0.070	0.00	0.0	0.600	o	225
S6.002	3.515	0.270	13.0	0.000	0.00	0.0	0.600	o	225
S1.020	18.720	0.769	24.3	0.000	0.00	0.0	0.600	o	450
S1.021	1.000	0.010	100.0	0.000	0.00	0.0	0.600	o	450
S1.022	14.155	0.490	28.9	0.000	0.00	0.0	0.600	o	225

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.015	50.00	8.14	78.325	1.478	0.0	0.0	40.0	2.80	308.8	240.2
S5.000	50.00	5.21	82.170	0.128	0.0	0.0	3.5	3.80	151.0	20.8
S1.016	50.00	8.37	77.975	1.746	0.0	0.0	47.3	2.68	425.7	283.7
S1.017	50.00	8.44	77.325	1.821	0.0	0.0	49.3	5.66	900.5	295.9
S1.018	50.00	8.48	74.276	1.821	0.0	0.0	49.3	5.66	900.6	295.9
S1.019	50.00	8.49	73.350	1.821	0.0	0.0	49.3	5.66	900.5	295.9
S6.000	50.00	5.95	75.500	0.090	0.0	0.0	2.4	1.44	57.4	14.6
S6.001	50.00	6.33	74.500	0.160	0.0	0.0	4.3	1.96	77.8	26.0
S6.002	50.00	6.35	73.500	0.160	0.0	0.0	4.3	3.65	145.0	26.0
S1.020	50.00	8.57	72.919	1.981	0.0	0.0	53.7	4.13	657.5	321.9
S1.021	50.00	8.58	70.000	1.981	0.0	0.0	53.7	2.03	323.4	321.9
S1.022	50.00	5.10	69.990	0.000	14.1	0.0	2.4	2.44	97.2	14.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SSW.022	88.350	1.500	1050	S1.000	86.850	225				
SSW.021	87.450	1.500	1050	S1.001	85.950	225	S1.000	85.950	225	
SSW.020	87.300	1.500	1050	S1.002	85.800	225	S1.001	85.800	225	
SSW.019	86.800	1.500	1050	S1.003	85.300	225	S1.002	85.300	225	
SSW.018	86.550	1.500	1050	S1.004	85.050	225	S1.003	85.050	225	
SSW.017	85.700	1.500	1050	S1.005	84.200	225	S1.004	84.200	225	
SSW.016	85.350	1.500	1050	S1.006	83.850	225	S1.005	83.850	225	
SSW.025	84.450	1.500	1050	S2.000	82.950	225				
SSW.024	84.350	1.538	1050	S2.001	82.812	225	S2.000	82.812	225	
SSW.026	84.750	1.500	1050	S3.000	83.250	225				
SSW.023	84.250	1.563	1050	S2.002	82.687	300	S2.001	82.687	225	
							S3.000	82.687	225	
SSW.015	84.300	1.888	1350	S1.007	82.412	375	S1.006	82.800	225	238
							S2.002	82.412	300	
SSW.014	84.600	2.287	1350	S1.008	82.313	375	S1.007	82.313	375	
SSW.027	88.000	1.500	1050	S4.000	86.500	225				
SSW.013	85.250	3.325	1350	S1.009	81.925	375	S1.008	81.925	375	
							S4.000	83.750	225	1675
SSW.012	85.000	3.162	1350	S1.010	81.838	375	S1.009	81.838	375	
SSW.011	83.500	2.025	1350	S1.011	81.475	375	S1.010	81.475	375	
SSW.010	82.500	1.639	1350	S1.012	80.861	375	S1.011	80.861	375	
SSW.009	82.250	1.575	1350	S1.013	80.675	375	S1.012	80.675	375	
SSW.008	81.400	1.575	1350	S1.014	79.825	375	S1.013	79.825	375	
SSW.007	79.900	1.575	1350	S1.015	78.325	375	S1.014	78.325	375	
SSW.028	83.900	1.730	1200	S5.000	82.170	225				
SSW.006	79.650	1.675	1350	S1.016	77.975	450	S1.015	77.975	375	
							S5.000	78.150	225	
SSW.005	79.000	1.675	1350	S1.017	77.325	450	S1.016	77.325	450	
SSW.004	77.000	2.724	1350	S1.018	74.276	450	S1.017	75.513	450	1237
SSW.003	75.000	1.650	1350	S1.019	73.350	450	S1.018	73.350	450	
SSW.031	77.000	1.500	1050	S6.000	75.500	225				
SSW.030	76.000	1.500	1050	S6.001	74.500	225	S6.000	74.500	225	
SSW.029	75.000	1.500	1050	S6.002	73.500	225	S6.001	73.500	225	
SSW.002	74.600	1.681	1350	S1.020	72.919	450	S1.019	72.919	450	
							S6.002	73.230	225	86
SSW.001	73.500	3.500	1350	S1.021	70.000	450	S1.020	72.150	450	2150
SSW.032	73.500	3.510	1350	S1.022	69.990	225	S1.021	69.990	450	
SSW.033	71.000	1.500	0		OUTFALL		S1.022	69.500	225	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.000	o	225	SSW.022	88.350	86.850	1.275	1050
S1.001	o	225	SSW.021	87.450	85.950	1.275	1050
S1.002	o	225	SSW.020	87.300	85.800	1.275	1050
S1.003	o	225	SSW.019	86.800	85.300	1.275	1050
S1.004	o	225	SSW.018	86.550	85.050	1.275	1050
S1.005	o	225	SSW.017	85.700	84.200	1.275	1050
S1.006	o	225	SSW.016	85.350	83.850	1.275	1050
S2.000	o	225	SSW.025	84.450	82.950	1.275	1050
S2.001	o	225	SSW.024	84.350	82.812	1.313	1050
S3.000	o	225	SSW.026	84.750	83.250	1.275	1050
S2.002	o	300	SSW.023	84.250	82.687	1.263	1050
S1.007	o	375	SSW.015	84.300	82.412	1.513	1350
S1.008	o	375	SSW.014	84.600	82.313	1.912	1350
S4.000	o	225	SSW.027	88.000	86.500	1.275	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.000	38.050	42.3	SSW.021	87.450	85.950	1.275	1050
S1.001	8.425	56.2	SSW.020	87.300	85.800	1.275	1050
S1.002	9.520	19.0	SSW.019	86.800	85.300	1.275	1050
S1.003	7.380	29.5	SSW.018	86.550	85.050	1.275	1050
S1.004	18.145	21.3	SSW.017	85.700	84.200	1.275	1050
S1.005	5.135	14.7	SSW.016	85.350	83.850	1.275	1050
S1.006	18.940	18.0	SSW.015	84.300	82.800	1.275	1350
S2.000	20.725	150.0	SSW.024	84.350	82.812	1.313	1050
S2.001	14.890	119.1	SSW.023	84.250	82.687	1.338	1050
S3.000	9.180	16.3	SSW.023	84.250	82.687	1.338	1050
S2.002	45.965	167.0	SSW.015	84.300	82.412	1.588	1350
S1.007	14.614	147.6	SSW.014	84.600	82.313	1.912	1350
S1.008	64.650	166.6	SSW.013	85.250	81.925	2.950	1350
S4.000	50.700	18.4	SSW.013	85.250	83.750	1.275	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.009	o	375	SSW.013	85.250	81.925	2.950	1350
S1.010	o	375	SSW.012	85.000	81.838	2.787	1350
S1.011	o	375	SSW.011	83.500	81.475	1.650	1350
S1.012	o	375	SSW.010	82.500	80.861	1.264	1350
S1.013	o	375	SSW.009	82.250	80.675	1.200	1350
S1.014	o	375	SSW.008	81.400	79.825	1.200	1350
S1.015	o	375	SSW.007	79.900	78.325	1.200	1350
S5.000	o	225	SSW.028	83.900	82.170	1.505	1200
S1.016	o	450	SSW.006	79.650	77.975	1.225	1350
S1.017	o	450	SSW.005	79.000	77.325	1.225	1350
S1.018	o	450	SSW.004	77.000	74.276	2.274	1350
S1.019	o	450	SSW.003	75.000	73.350	1.200	1350
S6.000	o	225	SSW.031	77.000	75.500	1.275	1050
S6.001	o	225	SSW.030	76.000	74.500	1.275	1050
S6.002	o	225	SSW.029	75.000	73.500	1.275	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.009	6.302	72.4	SSW.012	85.000	81.838	2.787	1350
S1.010	29.015	80.0	SSW.011	83.500	81.475	1.650	1350
S1.011	21.405	34.9	SSW.010	82.500	80.861	1.264	1350
S1.012	5.815	31.3	SSW.009	82.250	80.675	1.200	1350
S1.013	19.985	23.5	SSW.008	81.400	79.825	1.200	1350
S1.014	69.215	46.1	SSW.007	79.900	78.325	1.200	1350
S1.015	14.775	42.2	SSW.006	79.650	77.975	1.300	1350
S5.000	48.240	12.0	SSW.006	79.650	78.150	1.275	1350
S1.016	37.610	57.9	SSW.005	79.000	77.325	1.225	1350
S1.017	23.555	13.0	SSW.004	77.000	75.513	1.037	1350
S1.018	12.035	13.0	SSW.003	75.000	73.350	1.200	1350
S1.019	5.600	13.0	SSW.002	74.600	72.919	1.231	1350
S6.000	82.050	82.1	SSW.030	76.000	74.500	1.275	1050
S6.001	44.990	45.0	SSW.029	75.000	73.500	1.275	1050
S6.002	3.515	13.0	SSW.002	74.600	73.230	1.145	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.020	o	450	SSW.002	74.600	72.919	1.231	1350
S1.021	o	450	SSW.001	73.500	70.000	3.050	1350
S1.022	o	225	SSW.032	73.500	69.990	3.285	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.020	18.720	24.3	SSW.001	73.500	72.150	0.900	1350
S1.021	1.000	100.0	SSW.032	73.500	69.990	3.060	1350
S1.022	14.155	28.9	SSW.033	71.000	69.500	1.275	0

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)
S1.022	SSW.033	71.000	69.500	69.500	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
PIMP (% impervious)	100	Additional Flow - % of Total Flow	20.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Run Time (mins)	60
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0		

Synthetic Rainfall Details

Rainfall Model		FSR	Profile Type Summer
Return Period (years)		100	Cv (Summer) 0.750
Region	Scotland and Ireland		Cv (Winter) 0.840
M5-60 (mm)		17.600	Storm Duration (mins) 30
Ratio R		0.250	

Online Controls for Storm

Hydro-Brake® Manhole: SSW.032, DS/PN: S1.022, Volume (m³): 5.0

Design Head (m) 2.088 Hydro-Brake® Type Md4 Invert Level (m) 69.990
Design Flow (l/s) 14.1 Diameter (mm) 112

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	10.7	3.000	16.9	7.000	25.9
0.200	8.0	1.400	11.6	3.500	18.3	7.500	26.8
0.300	7.8	1.600	12.4	4.000	19.6	8.000	27.6
0.400	6.9	1.800	13.1	4.500	20.7	8.500	28.5
0.500	7.1	2.000	13.8	5.000	21.9	9.000	29.3
0.600	7.6	2.200	14.5	5.500	22.9	9.500	30.1
0.800	8.7	2.400	15.1	6.000	23.9		
1.000	9.8	2.600	15.8	6.500	24.9		

Storage Structures for Storm

Tank or Pond Manhole: SSW.032, DS/PN: S1.022

Invert Level (m) 69.990

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	400.0	2.087	400.0

Summary of Critical Results by Maximum Level (Rank 1) for Storm

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2
Climate Change (%) 0

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	2	0%					
S1.001	15 Winter	2	0%					
S1.002	15 Winter	2	0%					
S1.003	15 Winter	2	0%					
S1.004	15 Winter	2	0%					
S1.005	15 Winter	2	0%					
S1.006	15 Winter	2	0%					
S2.000	15 Winter	2	0%					
S2.001	15 Winter	2	0%					
S3.000	15 Winter	2	0%					
S2.002	15 Winter	2	0%					
S1.007	15 Winter	2	0%					
S1.008	15 Winter	2	0%					
S4.000	15 Winter	2	0%					
S1.009	15 Winter	2	0%	2/15 Winter				
S1.010	15 Winter	2	0%					
S1.011	15 Winter	2	0%					
S1.012	15 Winter	2	0%					
S1.013	15 Winter	2	0%					
S1.014	15 Winter	2	0%					
S1.015	15 Winter	2	0%					
S5.000	15 Winter	2	0%					
S1.016	15 Winter	2	0%					
S1.017	15 Winter	2	0%					
S1.018	15 Winter	2	0%					
S1.019	15 Winter	2	0%					
S6.000	15 Winter	2	0%					
S6.001	15 Winter	2	0%					
S6.002	15 Winter	2	0%					
S1.020	15 Winter	2	0%					
S1.021	960 Winter	2	0%	2/15 Summer				
S1.022	960 Winter	2	0%	2/15 Summer				

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	SSW.022	86.932	-0.143	0.000	0.28	0.0	21.1	OK
S1.001	SSW.021	86.067	-0.108	0.000	0.52	0.0	28.3	OK
S1.002	SSW.020	85.894	-0.131	0.000	0.36	0.0	35.5	OK
S1.003	SSW.019	85.427	-0.098	0.000	0.61	0.0	42.7	OK
S1.004	SSW.018	85.162	-0.113	0.000	0.49	0.0	49.8	OK
S1.005	SSW.017	84.326	-0.099	0.000	0.60	0.0	50.4	OK
S1.006	SSW.016	83.957	-0.118	0.000	0.46	0.0	50.9	OK
S2.000	SSW.025	83.009	-0.166	0.000	0.15	0.0	5.8	OK
S2.001	SSW.024	82.890	-0.147	0.000	0.26	0.0	10.8	OK
S3.000	SSW.026	83.284	-0.191	0.000	0.06	0.0	5.9	OK
S2.002	SSW.023	82.840	-0.147	0.000	0.50	0.0	40.6	OK
S1.007	SSW.015	82.660	-0.127	0.000	0.76	0.0	94.1	OK
S1.008	SSW.014	82.580	-0.108	0.000	0.82	0.0	119.9	OK
S4.000	SSW.027	86.549	-0.176	0.000	0.11	0.0	12.4	OK
S1.009	SSW.013	82.308	0.008	0.000	1.14	0.0	131.3	SURCHARGED
S1.010	SSW.012	82.070	-0.143	0.000	0.69	0.0	136.4	OK
S1.011	SSW.011	81.665	-0.185	0.000	0.49	0.0	142.3	OK
S1.012	SSW.010	81.136	-0.100	0.000	0.87	0.0	146.7	OK
S1.013	SSW.009	80.851	-0.198	0.000	0.44	0.0	154.5	OK
S1.014	SSW.008	80.043	-0.157	0.000	0.63	0.0	176.1	OK
S1.015	SSW.007	78.578	-0.121	0.000	0.78	0.0	181.3	OK
S5.000	SSW.028	82.228	-0.167	0.000	0.15	0.0	21.6	OK
S1.016	SSW.006	78.220	-0.205	0.000	0.56	0.0	211.5	OK
S1.017	SSW.005	77.493	-0.282	0.000	0.30	0.0	221.4	OK
S1.018	SSW.004	74.477	-0.249	0.000	0.41	0.0	222.2	OK
S1.019	SSW.003	73.602	-0.198	0.000	0.60	0.0	222.4	OK
S6.000	SSW.031	75.580	-0.145	0.000	0.26	0.0	14.6	OK
S6.001	SSW.030	74.589	-0.136	0.000	0.33	0.0	24.3	OK
S6.002	SSW.029	73.589	-0.136	0.000	0.33	0.0	24.1	OK
S1.020	SSW.002	73.142	-0.227	0.000	0.49	0.0	244.2	OK
S1.021	SSW.001	71.212	0.762	0.000	0.28	0.0	37.8	SURCHARGED
S1.022	SSW.032	71.212	0.997	0.000	0.13	0.0	10.8	SURCHARGED

Appendix E – 1 in 100 Year Design Sheets

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)	100	Add Flow / Climate Change (%)	20
M5-60 (mm)	17.600	Minimum Backdrop Height (m)	0.200
Ratio R	0.250	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
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

Designed with Level Inverts

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.036	4-8	0.933	8-12	0.012

Total Area Contributing (ha) = 1.981

Total Pipe Volume (m³) = 61.730

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
S1.000	38.050	0.900	42.3	0.127	5.00	0.0	0.600	o	225
S1.001	8.425	0.150	56.2	0.050	0.00	0.0	0.600	o	225
S1.002	9.520	0.500	19.0	0.050	0.00	0.0	0.600	o	225
S1.003	7.380	0.250	29.5	0.050	0.00	0.0	0.600	o	225
S1.004	18.145	0.850	21.3	0.050	0.00	0.0	0.600	o	225
S1.005	5.135	0.350	14.7	0.005	0.00	0.0	0.600	o	225

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.31	86.850	0.127	0.0	0.0	3.4	2.02	80.2	20.6
S1.001	50.00	5.39	85.950	0.177	0.0	0.0	4.8	1.75	69.5	28.8
S1.002	50.00	5.45	85.800	0.227	0.0	0.0	6.1	3.01	119.8	36.9
S1.003	50.00	5.50	85.300	0.277	0.0	0.0	7.5	2.42	96.1	45.0
S1.004	50.00	5.60	85.050	0.327	0.0	0.0	8.9	2.84	113.1	53.1
S1.005	50.00	5.63	84.200	0.332	0.0	0.0	9.0	3.43	136.5	53.9

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
S1.006	18.940	1.050	18.0	0.005	0.00	0.0	0.600	o	225
S2.000	20.725	0.138	150.0	0.035	5.00	0.0	0.600	o	225
S2.001	14.890	0.125	119.1	0.035	0.00	0.0	0.600	o	225
S3.000	9.180	0.563	16.3	0.035	5.00	0.0	0.600	o	225
S2.002	45.965	0.275	167.0	0.172	0.00	0.0	0.600	o	300
S1.007	14.614	0.099	147.6	0.021	0.00	0.0	0.600	o	375
S1.008	64.650	0.388	166.6	0.219	0.00	0.0	0.600	o	375
S4.000	50.700	2.750	18.4	0.074	5.00	0.0	0.600	o	225
S1.009	6.302	0.087	72.4	0.025	0.00	0.0	0.600	o	375
S1.010	29.015	0.363	80.0	0.061	0.00	0.0	0.600	o	375
S1.011	21.405	0.614	34.9	0.066	0.00	0.0	0.600	o	375
S1.012	5.815	0.186	31.3	0.020	0.00	0.0	0.600	o	375
S1.013	19.985	0.850	23.5	0.073	0.00	0.0	0.600	o	375
S1.014	69.215	1.500	46.1	0.238	0.00	0.0	0.600	o	375

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.006	50.00	5.73	83.850	0.337	0.0	0.0	9.1	3.10	123.1	54.8
S2.000	50.00	5.32	82.950	0.035	0.0	0.0	0.9	1.07	42.4	5.7
S2.001	50.00	5.53	82.812	0.070	0.0	0.0	1.9	1.20	47.6	11.4
S3.000	50.00	5.05	83.250	0.035	0.0	0.0	0.9	3.26	129.5	5.7
S2.002	50.00	6.16	82.687	0.277	0.0	0.0	7.5	1.21	85.8	45.0
S1.007	50.00	6.33	82.412	0.635	0.0	0.0	17.2	1.49	164.5	103.2
S1.008	50.00	7.10	82.313	0.854	0.0	0.0	23.1	1.40	154.7	138.8
S4.000	50.00	5.28	86.500	0.074	0.0	0.0	2.0	3.06	121.7	12.0
S1.009	50.00	7.14	81.925	0.953	0.0	0.0	25.8	2.13	235.4	154.9
S1.010	50.00	7.38	81.838	1.014	0.0	0.0	27.5	2.03	223.9	164.8
S1.011	50.00	7.50	81.475	1.080	0.0	0.0	29.2	3.08	339.9	175.5
S1.012	50.00	7.53	80.861	1.100	0.0	0.0	29.8	3.25	359.0	178.7
S1.013	50.00	7.62	80.675	1.173	0.0	0.0	31.8	3.75	414.2	190.6
S1.014	50.00	8.05	79.825	1.411	0.0	0.0	38.2	2.67	295.3	229.3

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
S1.015	14.775	0.350	42.2	0.067	0.00	0.0	0.600	o	375
S5.000	48.240	4.020	12.0	0.128	5.00	0.0	0.600	o	225
S1.016	37.610	0.650	57.9	0.140	0.00	0.0	0.600	o	450
S1.017	23.555	1.812	13.0	0.075	0.00	0.0	0.600	o	450
S1.018	12.035	0.926	13.0	0.000	0.00	0.0	0.600	o	450
S1.019	5.600	0.431	13.0	0.000	0.00	0.0	0.600	o	450
S6.000	82.050	1.000	82.1	0.090	5.00	0.0	0.600	o	225
S6.001	44.990	1.000	45.0	0.070	0.00	0.0	0.600	o	225
S6.002	3.515	0.270	13.0	0.000	0.00	0.0	0.600	o	225
S1.020	18.720	0.769	24.3	0.000	0.00	0.0	0.600	o	450
S1.021	1.000	0.010	100.0	0.000	0.00	0.0	0.600	o	450
S1.022	14.155	0.490	28.9	0.000	0.00	0.0	0.600	o	225

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.015	50.00	8.14	78.325	1.478	0.0	0.0	40.0	2.80	308.8	240.2
S5.000	50.00	5.21	82.170	0.128	0.0	0.0	3.5	3.80	151.0	20.8
S1.016	50.00	8.37	77.975	1.746	0.0	0.0	47.3	2.68	425.7	283.7
S1.017	50.00	8.44	77.325	1.821	0.0	0.0	49.3	5.66	900.5	295.9
S1.018	50.00	8.48	74.276	1.821	0.0	0.0	49.3	5.66	900.6	295.9
S1.019	50.00	8.49	73.350	1.821	0.0	0.0	49.3	5.66	900.5	295.9
S6.000	50.00	5.95	75.500	0.090	0.0	0.0	2.4	1.44	57.4	14.6
S6.001	50.00	6.33	74.500	0.160	0.0	0.0	4.3	1.96	77.8	26.0
S6.002	50.00	6.35	73.500	0.160	0.0	0.0	4.3	3.65	145.0	26.0
S1.020	50.00	8.57	72.919	1.981	0.0	0.0	53.7	4.13	657.5	321.9
S1.021	50.00	8.58	70.000	1.981	0.0	0.0	53.7	2.03	323.4	321.9
S1.022	50.00	5.10	69.990	0.000	14.1	0.0	2.4	2.44	97.2	14.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SSW.022	88.350	1.500	1050	S1.000	86.850	225				
SSW.021	87.450	1.500	1050	S1.001	85.950	225	S1.000	85.950	225	
SSW.020	87.300	1.500	1050	S1.002	85.800	225	S1.001	85.800	225	
SSW.019	86.800	1.500	1050	S1.003	85.300	225	S1.002	85.300	225	
SSW.018	86.550	1.500	1050	S1.004	85.050	225	S1.003	85.050	225	
SSW.017	85.700	1.500	1050	S1.005	84.200	225	S1.004	84.200	225	
SSW.016	85.350	1.500	1050	S1.006	83.850	225	S1.005	83.850	225	
SSW.025	84.450	1.500	1050	S2.000	82.950	225				
SSW.024	84.350	1.538	1050	S2.001	82.812	225	S2.000	82.812	225	
SSW.026	84.750	1.500	1050	S3.000	83.250	225				
SSW.023	84.250	1.563	1050	S2.002	82.687	300	S2.001	82.687	225	
							S3.000	82.687	225	
SSW.015	84.300	1.888	1350	S1.007	82.412	375	S1.006	82.800	225	238
							S2.002	82.412	300	
SSW.014	84.600	2.287	1350	S1.008	82.313	375	S1.007	82.313	375	
SSW.027	88.000	1.500	1050	S4.000	86.500	225				
SSW.013	85.250	3.325	1350	S1.009	81.925	375	S1.008	81.925	375	
							S4.000	83.750	225	1675
SSW.012	85.000	3.162	1350	S1.010	81.838	375	S1.009	81.838	375	
SSW.011	83.500	2.025	1350	S1.011	81.475	375	S1.010	81.475	375	
SSW.010	82.500	1.639	1350	S1.012	80.861	375	S1.011	80.861	375	
SSW.009	82.250	1.575	1350	S1.013	80.675	375	S1.012	80.675	375	
SSW.008	81.400	1.575	1350	S1.014	79.825	375	S1.013	79.825	375	
SSW.007	79.900	1.575	1350	S1.015	78.325	375	S1.014	78.325	375	
SSW.028	83.900	1.730	1200	S5.000	82.170	225				
SSW.006	79.650	1.675	1350	S1.016	77.975	450	S1.015	77.975	375	
							S5.000	78.150	225	
SSW.005	79.000	1.675	1350	S1.017	77.325	450	S1.016	77.325	450	
SSW.004	77.000	2.724	1350	S1.018	74.276	450	S1.017	75.513	450	1237
SSW.003	75.000	1.650	1350	S1.019	73.350	450	S1.018	73.350	450	
SSW.031	77.000	1.500	1050	S6.000	75.500	225				
SSW.030	76.000	1.500	1050	S6.001	74.500	225	S6.000	74.500	225	
SSW.029	75.000	1.500	1050	S6.002	73.500	225	S6.001	73.500	225	
SSW.002	74.600	1.681	1350	S1.020	72.919	450	S1.019	72.919	450	
							S6.002	73.230	225	86
SSW.001	73.500	3.500	1350	S1.021	70.000	450	S1.020	72.150	450	2150
SSW.032	73.500	3.510	1350	S1.022	69.990	225	S1.021	69.990	450	
SSW.033	71.000	1.500	0		OUTFALL		S1.022	69.500	225	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.000	o	225	SSW.022	88.350	86.850	1.275	1050
S1.001	o	225	SSW.021	87.450	85.950	1.275	1050
S1.002	o	225	SSW.020	87.300	85.800	1.275	1050
S1.003	o	225	SSW.019	86.800	85.300	1.275	1050
S1.004	o	225	SSW.018	86.550	85.050	1.275	1050
S1.005	o	225	SSW.017	85.700	84.200	1.275	1050
S1.006	o	225	SSW.016	85.350	83.850	1.275	1050
S2.000	o	225	SSW.025	84.450	82.950	1.275	1050
S2.001	o	225	SSW.024	84.350	82.812	1.313	1050
S3.000	o	225	SSW.026	84.750	83.250	1.275	1050
S2.002	o	300	SSW.023	84.250	82.687	1.263	1050
S1.007	o	375	SSW.015	84.300	82.412	1.513	1350
S1.008	o	375	SSW.014	84.600	82.313	1.912	1350
S4.000	o	225	SSW.027	88.000	86.500	1.275	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.000	38.050	42.3	SSW.021	87.450	85.950	1.275	1050
S1.001	8.425	56.2	SSW.020	87.300	85.800	1.275	1050
S1.002	9.520	19.0	SSW.019	86.800	85.300	1.275	1050
S1.003	7.380	29.5	SSW.018	86.550	85.050	1.275	1050
S1.004	18.145	21.3	SSW.017	85.700	84.200	1.275	1050
S1.005	5.135	14.7	SSW.016	85.350	83.850	1.275	1050
S1.006	18.940	18.0	SSW.015	84.300	82.800	1.275	1350
S2.000	20.725	150.0	SSW.024	84.350	82.812	1.313	1050
S2.001	14.890	119.1	SSW.023	84.250	82.687	1.338	1050
S3.000	9.180	16.3	SSW.023	84.250	82.687	1.338	1050
S2.002	45.965	167.0	SSW.015	84.300	82.412	1.588	1350
S1.007	14.614	147.6	SSW.014	84.600	82.313	1.912	1350
S1.008	64.650	166.6	SSW.013	85.250	81.925	2.950	1350
S4.000	50.700	18.4	SSW.013	85.250	83.750	1.275	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.009	o	375	SSW.013	85.250	81.925	2.950	1350
S1.010	o	375	SSW.012	85.000	81.838	2.787	1350
S1.011	o	375	SSW.011	83.500	81.475	1.650	1350
S1.012	o	375	SSW.010	82.500	80.861	1.264	1350
S1.013	o	375	SSW.009	82.250	80.675	1.200	1350
S1.014	o	375	SSW.008	81.400	79.825	1.200	1350
S1.015	o	375	SSW.007	79.900	78.325	1.200	1350
S5.000	o	225	SSW.028	83.900	82.170	1.505	1200
S1.016	o	450	SSW.006	79.650	77.975	1.225	1350
S1.017	o	450	SSW.005	79.000	77.325	1.225	1350
S1.018	o	450	SSW.004	77.000	74.276	2.274	1350
S1.019	o	450	SSW.003	75.000	73.350	1.200	1350
S6.000	o	225	SSW.031	77.000	75.500	1.275	1050
S6.001	o	225	SSW.030	76.000	74.500	1.275	1050
S6.002	o	225	SSW.029	75.000	73.500	1.275	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.009	6.302	72.4	SSW.012	85.000	81.838	2.787	1350
S1.010	29.015	80.0	SSW.011	83.500	81.475	1.650	1350
S1.011	21.405	34.9	SSW.010	82.500	80.861	1.264	1350
S1.012	5.815	31.3	SSW.009	82.250	80.675	1.200	1350
S1.013	19.985	23.5	SSW.008	81.400	79.825	1.200	1350
S1.014	69.215	46.1	SSW.007	79.900	78.325	1.200	1350
S1.015	14.775	42.2	SSW.006	79.650	77.975	1.300	1350
S5.000	48.240	12.0	SSW.006	79.650	78.150	1.275	1350
S1.016	37.610	57.9	SSW.005	79.000	77.325	1.225	1350
S1.017	23.555	13.0	SSW.004	77.000	75.513	1.037	1350
S1.018	12.035	13.0	SSW.003	75.000	73.350	1.200	1350
S1.019	5.600	13.0	SSW.002	74.600	72.919	1.231	1350
S6.000	82.050	82.1	SSW.030	76.000	74.500	1.275	1050
S6.001	44.990	45.0	SSW.029	75.000	73.500	1.275	1050
S6.002	3.515	13.0	SSW.002	74.600	73.230	1.145	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.020	o	450	SSW.002	74.600	72.919	1.231	1350
S1.021	o	450	SSW.001	73.500	70.000	3.050	1350
S1.022	o	225	SSW.032	73.500	69.990	3.285	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.020	18.720	24.3	SSW.001	73.500	72.150	0.900	1350
S1.021	1.000	100.0	SSW.032	73.500	69.990	3.060	1350
S1.022	14.155	28.9	SSW.033	71.000	69.500	1.275	0

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)
S1.022	SSW.033	71.000	69.500	69.500	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
PIMP (% impervious)	100	Additional Flow - % of Total Flow	20.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Run Time (mins)	60
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0		

Synthetic Rainfall Details

Rainfall Model		FSR	Profile Type Summer
Return Period (years)		100	Cv (Summer) 0.750
Region	Scotland and Ireland		Cv (Winter) 0.840
M5-60 (mm)		17.600	Storm Duration (mins) 30
Ratio R		0.250	

Online Controls for Storm

Hydro-Brake® Manhole: SSW.032, DS/PN: S1.022, Volume (m³): 5.0

Design Head (m) 2.088 Hydro-Brake® Type Md4 Invert Level (m) 69.990
Design Flow (l/s) 14.1 Diameter (mm) 112

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	10.7	3.000	16.9	7.000	25.9
0.200	8.0	1.400	11.6	3.500	18.3	7.500	26.8
0.300	7.8	1.600	12.4	4.000	19.6	8.000	27.6
0.400	6.9	1.800	13.1	4.500	20.7	8.500	28.5
0.500	7.1	2.000	13.8	5.000	21.9	9.000	29.3
0.600	7.6	2.200	14.5	5.500	22.9	9.500	30.1
0.800	8.7	2.400	15.1	6.000	23.9		
1.000	9.8	2.600	15.8	6.500	24.9		

Storage Structures for Storm

Tank or Pond Manhole: SSW.032, DS/PN: S1.022

Invert Level (m) 69.990

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	400.0	2.087	400.0

Summary of Critical Results by Maximum Level (Rank 1) for Storm

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 100
Climate Change (%) 0

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	100	0%					
S1.001	15 Winter	100	0%	100/15 Summer				
S1.002	15 Winter	100	0%	100/15 Summer				
S1.003	15 Winter	100	0%	100/15 Summer				
S1.004	15 Winter	100	0%	100/15 Summer				
S1.005	15 Winter	100	0%	100/15 Summer				
S1.006	15 Winter	100	0%	100/15 Summer				
S2.000	15 Winter	100	0%	100/15 Summer				
S2.001	15 Winter	100	0%	100/15 Summer				
S3.000	15 Winter	100	0%	100/15 Summer				
S2.002	15 Winter	100	0%	100/15 Summer	100/15 Winter			3
S1.007	15 Winter	100	0%	100/15 Summer				
S1.008	15 Winter	100	0%	100/15 Summer				
S4.000	15 Winter	100	0%					
S1.009	15 Winter	100	0%	100/15 Summer				
S1.010	15 Winter	100	0%	100/15 Summer				
S1.011	15 Winter	100	0%	100/15 Summer				
S1.012	15 Winter	100	0%	100/15 Summer				
S1.013	15 Winter	100	0%	100/15 Summer				
S1.014	15 Winter	100	0%	100/15 Summer				
S1.015	15 Winter	100	0%	100/15 Summer				
S5.000	15 Winter	100	0%					
S1.016	15 Winter	100	0%	100/15 Summer				
S1.017	15 Winter	100	0%					
S1.018	15 Winter	100	0%					
S1.019	15 Winter	100	0%	100/15 Summer				
S6.000	15 Winter	100	0%					
S6.001	15 Winter	100	0%					
S6.002	15 Winter	100	0%					
S1.020	15 Winter	100	0%					
S1.021	960 Winter	100	0%	100/15 Summer				
S1.022	960 Winter	100	0%	100/15 Summer				

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	SSW.022	87.021	-0.054	0.000	0.67	0.0	50.5	OK
S1.001	SSW.021	86.750	0.575	0.000	1.09	0.0	59.2	SURCHARGED
S1.002	SSW.020	86.610	0.585	0.000	0.73	0.0	72.6	SURCHARGED
S1.003	SSW.019	86.388	0.863	0.000	1.22	0.0	85.7	SURCHARGED
S1.004	SSW.018	86.076	0.801	0.000	0.98	0.0	99.5	SURCHARGED
S1.005	SSW.017	85.390	0.965	0.000	1.14	0.0	94.6	SURCHARGED
S1.006	SSW.016	84.963	0.888	0.000	0.86	0.0	94.9	SURCHARGED
S2.000	SSW.025	84.322	1.147	0.000	0.32	0.0	12.3	FLOOD RISK
S2.001	SSW.024	84.294	1.257	0.000	0.67	0.0	28.0	FLOOD RISK
S3.000	SSW.026	84.269	0.794	0.000	0.11	0.0	12.1	SURCHARGED
S2.002	SSW.023	84.255	1.268	4.588	0.94	0.0	75.3	FLOOD
S1.007	SSW.015	84.221	1.435	0.000	1.44	0.0	177.6	FLOOD RISK
S1.008	SSW.014	84.116	1.428	0.000	1.44	0.0	210.3	SURCHARGED
S4.000	SSW.027	86.577	-0.148	0.000	0.25	0.0	29.6	OK
S1.009	SSW.013	83.459	1.159	0.000	2.07	0.0	239.2	SURCHARGED
S1.010	SSW.012	83.126	0.913	0.000	1.27	0.0	250.4	SURCHARGED
S1.011	SSW.011	82.587	0.737	0.000	0.88	0.0	252.8	SURCHARGED
S1.012	SSW.010	82.108	0.872	0.000	1.52	0.0	256.9	SURCHARGED
S1.013	SSW.009	81.681	0.631	0.000	0.78	0.0	271.3	SURCHARGED
S1.014	SSW.008	81.175	0.975	0.000	1.14	0.0	316.4	FLOOD RISK
S1.015	SSW.007	79.219	0.519	0.000	1.44	0.0	333.8	SURCHARGED
S5.000	SSW.028	82.263	-0.132	0.000	0.36	0.0	51.6	OK
S1.016	SSW.006	78.545	0.120	0.000	1.09	0.0	409.5	SURCHARGED
S1.017	SSW.005	77.573	-0.201	0.000	0.58	0.0	432.3	OK
S1.018	SSW.004	74.584	-0.142	0.000	0.80	0.0	433.3	OK
S1.019	SSW.003	73.942	0.142	0.000	1.17	0.0	434.7	SURCHARGED
S6.000	SSW.031	75.633	-0.092	0.000	0.62	0.0	34.9	OK
S6.001	SSW.030	74.663	-0.062	0.000	0.84	0.0	62.1	OK
S6.002	SSW.029	73.662	-0.063	0.000	0.85	0.0	62.5	OK
S1.020	SSW.002	73.280	-0.090	0.000	1.00	0.0	493.8	OK
S1.021	SSW.001	72.795	2.345	0.000	0.56	0.0	74.9	SURCHARGED
S1.022	SSW.032	72.794	2.579	0.000	0.19	0.0	16.4	SURCHARGED

Appendix F – Foul Sewer Design Sheets

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)	0.200
Flow Per Person (l/per/day)	446.00	Maximum Backdrop Height (m)	1.500
Persons per House	1.00	Min Design Depth for Optimisation (m)	1.200
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 Inverts

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
F1.000	38.175	0.900	42.4	0.000	6	0.0	1.500	o	150
F1.001	8.580	0.200	42.9	0.000	0	0.0	1.500	o	150
F1.002	9.503	0.500	19.0	0.000	0	0.0	1.500	o	150
F1.003	7.453	0.350	21.3	0.000	0	0.0	1.500	o	150
F1.004	16.025	0.650	24.7	0.000	0	0.0	1.500	o	150
F1.005	5.415	0.300	18.1	0.000	0	0.0	1.500	o	150
F1.006	21.365	1.050	20.3	0.000	0	0.0	1.500	o	150
F2.000	12.235	0.500	24.5	0.000	0	0.0	1.500	o	225
F3.000	9.425	0.157	60.0	0.000	6	0.0	1.500	o	225
F3.001	14.235	0.237	60.0	0.000	0	0.0	1.500	o	225

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ DWF (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	86.550	0.000	0.0	6	0.0	10	0.38	1.35	23.8	0.2
F1.001	85.650	0.000	0.0	6	0.0	10	0.38	1.34	23.7	0.2
F1.002	85.450	0.000	0.0	6	0.0	8	0.50	2.02	35.6	0.2
F1.003	84.950	0.000	0.0	6	0.0	8	0.48	1.90	33.6	0.2
F1.004	84.600	0.000	0.0	6	0.0	9	0.46	1.77	31.3	0.2
F1.005	83.950	0.000	0.0	6	0.0	8	0.51	2.07	36.6	0.2
F1.006	83.650	0.000	0.0	6	0.0	8	0.49	1.95	34.4	0.2
F2.000	82.900	0.000	0.0	0	0.0	0	0.00	2.33	92.5	0.0
F3.000	82.500	0.000	0.0	6	0.0	10	0.32	1.48	59.0	0.2
F3.001	82.343	0.000	0.0	6	0.0	10	0.32	1.48	59.0	0.2

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
F2.001	46.120	0.307	150.0	0.000	0	0.0	1.500	o	225
F1.007	14.550	0.097	150.0	0.000	0	0.0	1.500	o	225
F1.008	62.415	0.416	150.0	0.000	4	0.0	1.500	o	225
F4.000	52.960	2.750	19.3	0.000	8	0.0	1.500	o	150
F1.009	6.145	0.041	150.0	0.000	0	0.0	1.500	o	225
F1.010	29.040	0.194	150.0	0.000	0	0.0	1.500	o	225
F1.011	18.570	0.477	38.9	0.000	0	0.0	1.500	o	225
F1.012	6.875	0.286	24.0	0.000	0	0.0	1.500	o	225
F1.013	17.675	0.736	24.0	0.000	0	0.0	1.500	o	225
F1.014	67.790	1.401	48.4	0.000	0	0.0	1.500	o	225
F1.015	17.377	0.350	49.6	0.000	0	0.0	1.500	o	225
F5.000	47.855	3.680	13.0	0.000	0	0.0	1.500	o	150
F1.016	37.765	1.574	24.0	0.000	0	0.0	1.500	o	225
F1.017	28.035	1.168	24.0	0.000	0	0.0	1.500	o	225

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F2.001	82.106	0.000	0.0	6	0.0	12	0.23	0.94	37.2	0.2
F1.007	81.798	0.000	0.0	12	0.0	16	0.29	0.94	37.2	0.4
F1.008	81.701	0.000	0.0	16	0.0	18	0.32	0.94	37.2	0.5
F4.000	86.150	0.000	0.0	8	0.0	9	0.55	2.00	35.4	0.2
F1.009	81.285	0.000	0.0	24	0.0	22	0.36	0.94	37.2	0.7
F1.010	81.244	0.000	0.0	24	0.0	22	0.36	0.94	37.2	0.7
F1.011	81.051	0.000	0.0	24	0.0	16	0.58	1.84	73.3	0.7
F1.012	80.574	0.000	0.0	24	0.0	15	0.68	2.35	93.4	0.7
F1.013	80.287	0.000	0.0	24	0.0	15	0.68	2.35	93.4	0.7
F1.014	79.551	0.000	0.0	24	0.0	17	0.54	1.65	65.7	0.7
F1.015	78.150	0.000	0.0	24	0.0	17	0.53	1.63	64.9	0.7
F5.000	81.480	0.000	0.0	0	0.0	0	0.00	2.44	43.1	0.0
F1.016	77.800	0.000	0.0	24	0.0	15	0.68	2.35	93.4	0.7
F1.017	75.189	0.000	0.0	24	0.0	15	0.68	2.35	93.4	0.7

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
F1.018	18.600	0.775	24.0	0.000	0	0.0	1.500	o	225
F6.000	83.308	1.388	60.0	0.000	0	0.0	1.500	o	225
F6.001	37.640	1.020	36.9	0.000	0	0.0	1.500	o	225
F6.002	15.890	0.662	24.0	0.000	0	0.0	1.500	o	225
F1.019	33.445	1.394	24.0	0.000	0	0.0	1.500	o	225

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.018	72.845	0.000	0.0	24	0.0	15	0.68	2.35	93.4	0.7
F6.000	75.150	0.000	0.0	0	0.0	0	0.00	1.48	59.0	0.0
F6.001	73.762	0.000	0.0	0	0.0	0	0.00	1.89	75.3	0.0
F6.002	72.742	0.000	0.0	0	0.0	0	0.00	2.35	93.4	0.0
F1.019	70.904	0.000	0.0	24	0.0	15	0.68	2.35	93.4	0.7

Manhole Schedules for Foul - Main

MH Name	MH CL (m)	MH Depth (m)	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
FFS.020	88.400	1.850	1200	F1.000	86.550	150				
FFS.019	87.500	1.850	1200	F1.001	85.650	150	F1.000	85.650	150	
FFS.018	87.300	1.850	1200	F1.002	85.450	150	F1.001	85.450	150	
FFS.017	86.800	1.850	1200	F1.003	84.950	150	F1.002	84.950	150	
FFS.016	86.450	1.850	1200	F1.004	84.600	150	F1.003	84.600	150	
FFS.015	85.650	1.700	1200	F1.005	83.950	150	F1.004	83.950	150	
FFS.014	85.350	1.700	1200	F1.006	83.650	150	F1.005	83.650	150	
FFS.024	84.750	1.850	1200	F2.000	82.900	225				
FFS.023	84.350	1.850	1200	F3.000	82.500	225				
FFS.022	84.300	1.957	1200	F3.001	82.343	225	F3.000	82.343	225	
FFS.021	84.250	2.144	1200	F2.001	82.106	225	F2.000	82.400	225	294
							F3.001	82.106	225	
FFS.013	84.300	2.502	1200	F1.007	81.798	225	F1.006	82.600	150	727
							F2.001	81.798	225	
FFS.012	84.585	2.884	1200	F1.008	81.701	225	F1.007	81.701	225	
FFS.025	88.000	1.850	1200	F4.000	86.150	150				
FFS.011	85.250	3.965	1200	F1.009	81.285	225	F1.008	81.285	225	
							F4.000	83.400	150	2040
FFS.010	85.000	3.756	1200	F1.010	81.244	225	F1.009	81.244	225	
FFS.009	83.500	2.449	1200	F1.011	81.051	225	F1.010	81.051	225	
FFS.008	82.600	2.026	1200	F1.012	80.574	225	F1.011	80.574	225	
FFS.007	82.300	2.013	1200	F1.013	80.287	225	F1.012	80.287	225	
FFS.006	81.400	1.849	1200	F1.014	79.551	225	F1.013	79.551	225	
FFS.005	79.950	1.800	1200	F1.015	78.150	225	F1.014	78.150	225	
FFS.026	83.900	2.420	1200	F5.000	81.480	150				
FFS.004	79.650	1.850	1200	F1.016	77.800	225	F1.015	77.800	225	
							F5.000	77.800	150	
FFS.003	79.000	3.811	1200	F1.017	75.189	225	F1.016	76.226	225	1037
FFS.002	75.000	2.155	1200	F1.018	72.845	225	F1.017	74.021	225	1176
FFS.029	77.000	1.850	1200	F6.000	75.150	225				
FFS.028	76.000	2.238	1200	F6.001	73.762	225	F6.000	73.762	225	
FFS.027	75.500	2.758	1200	F6.002	72.742	225	F6.001	72.742	225	
FFS.001	73.500	2.596	1200	F1.019	70.904	225	F1.018	72.070	225	1166
							F6.002	72.079	225	1175
FExis FS	70.770	1.260	0		OUTFALL		F1.019	69.510	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 DIAM., L*W (mm)
F1.000	o	150	FFS.020	88.400	86.550	1.700	1200
F1.001	o	150	FFS.019	87.500	85.650	1.700	1200
F1.002	o	150	FFS.018	87.300	85.450	1.700	1200
F1.003	o	150	FFS.017	86.800	84.950	1.700	1200
F1.004	o	150	FFS.016	86.450	84.600	1.700	1200
F1.005	o	150	FFS.015	85.650	83.950	1.550	1200
F1.006	o	150	FFS.014	85.350	83.650	1.550	1200
F2.000	o	225	FFS.024	84.750	82.900	1.625	1200
F3.000	o	225	FFS.023	84.350	82.500	1.625	1200
F3.001	o	225	FFS.022	84.300	82.343	1.732	1200
F2.001	o	225	FFS.021	84.250	82.106	1.919	1200
F1.007	o	225	FFS.013	84.300	81.798	2.277	1200
F1.008	o	225	FFS.012	84.585	81.701	2.659	1200
F4.000	o	150	FFS.025	88.000	86.150	1.700	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
F1.000	38.175	42.4	FFS.019	87.500	85.650	1.700	1200
F1.001	8.580	42.9	FFS.018	87.300	85.450	1.700	1200
F1.002	9.503	19.0	FFS.017	86.800	84.950	1.700	1200
F1.003	7.453	21.3	FFS.016	86.450	84.600	1.700	1200
F1.004	16.025	24.7	FFS.015	85.650	83.950	1.550	1200
F1.005	5.415	18.1	FFS.014	85.350	83.650	1.550	1200
F1.006	21.365	20.3	FFS.013	84.300	82.600	1.550	1200
F2.000	12.235	24.5	FFS.021	84.250	82.400	1.625	1200
F3.000	9.425	60.0	FFS.022	84.300	82.343	1.732	1200
F3.001	14.235	60.0	FFS.021	84.250	82.106	1.919	1200
F2.001	46.120	150.0	FFS.013	84.300	81.798	2.277	1200
F1.007	14.550	150.0	FFS.012	84.585	81.701	2.659	1200
F1.008	62.415	150.0	FFS.011	85.250	81.285	3.740	1200
F4.000	52.960	19.3	FFS.011	85.250	83.400	1.700	1200

PIPELINE SCHEDULES for Foul - Main

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
F1.009	o	225	FFS.011	85.250	81.285	3.740	1200
F1.010	o	225	FFS.010	85.000	81.244	3.531	1200
F1.011	o	225	FFS.009	83.500	81.051	2.224	1200
F1.012	o	225	FFS.008	82.600	80.574	1.801	1200
F1.013	o	225	FFS.007	82.300	80.287	1.788	1200
F1.014	o	225	FFS.006	81.400	79.551	1.624	1200
F1.015	o	225	FFS.005	79.950	78.150	1.575	1200
F5.000	o	150	FFS.026	83.900	81.480	2.270	1200
F1.016	o	225	FFS.004	79.650	77.800	1.625	1200
F1.017	o	225	FFS.003	79.000	75.189	3.586	1200
F1.018	o	225	FFS.002	75.000	72.845	1.930	1200
F6.000	o	225	FFS.029	77.000	75.150	1.625	1200
F6.001	o	225	FFS.028	76.000	73.762	2.013	1200
F6.002	o	225	FFS.027	75.500	72.742	2.533	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
F1.009	6.145	150.0	FFS.010	85.000	81.244	3.531	1200
F1.010	29.040	150.0	FFS.009	83.500	81.051	2.224	1200
F1.011	18.570	38.9	FFS.008	82.600	80.574	1.801	1200
F1.012	6.875	24.0	FFS.007	82.300	80.287	1.788	1200
F1.013	17.675	24.0	FFS.006	81.400	79.551	1.624	1200
F1.014	67.790	48.4	FFS.005	79.950	78.150	1.575	1200
F1.015	17.377	49.6	FFS.004	79.650	77.800	1.625	1200
F5.000	47.855	13.0	FFS.004	79.650	77.800	1.700	1200
F1.016	37.765	24.0	FFS.003	79.000	76.226	2.549	1200
F1.017	28.035	24.0	FFS.002	75.000	74.021	0.754	1200
F1.018	18.600	24.0	FFS.001	73.500	72.070	1.205	1200
F6.000	83.308	60.0	FFS.028	76.000	73.762	2.013	1200
F6.001	37.640	36.9	FFS.027	75.500	72.742	2.533	1200
F6.002	15.890	24.0	FFS.001	73.500	72.079	1.196	1200

PIPELINE SCHEDULES for Foul - Main

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
F1.019	o	225	FFS.001	73.500	70.904	2.371	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
F1.019	33.445	24.0	FExis FS	70.770	69.510	1.035	0

Free Flowing 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)
F1.019	FExis FS	70.770	69.510	69.510	0	0

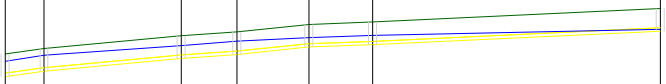
Simulation Criteria for Foul - Main

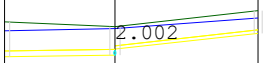
Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
PIMP (% impervious)	100	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Run Time (mins)	60
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	1

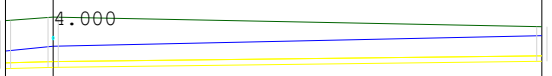
Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0		

Appendix G – Storm Water Longitudinal Sections

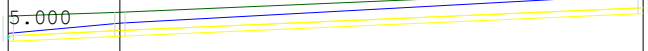
Denis O'Sullivan & Associates		Page 1
Unit 5, Joyce House Barrack Square Ballincollig, Co. Cork	Residential Development Annabella, Mallow Co. Cork	
Date 12/05/2025 File SW MODEL.MDX	Designed By S.O.'Grady Checked By	
Micro Drainage	Network W.12.4	

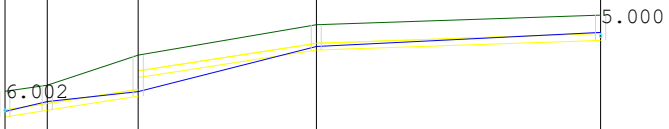
MH Name	SSW.016		SSW.018				SSW.022	
Hor Scale 1000 Ver Scale 500 Datum (m)75.000								
PN			S1.004				S1.000	
Dia (mm)			225				225	
Slope (1:X)			21.3				42.3	
Cover Level (m)	85.350	85.700	86.550	86.800	87.300	87.450	88.350	
Invert Level (m)		84.200	84.200	85.050	85.050	85.300	85.300	85.800	85.800	85.950	85.950	86.850	
Length (m)			18.145				38.050	

MH Name	SSW.014	SSW.015	SSW.016	
Hor Scale 1000 Ver Scale 500 Datum (m)72.000				
PN		S1.007	S1.006	
Dia (mm)		375	225	
Slope (1:X)		147.6	18.0	
Cover Level (m)	84.600	84.300	85.350	
Invert Level (m)		82.313	82.412	82.800	83.850	
Length (m)		14.614	18.940	

MH Name	SSW.012		SSW.014	
Hor Scale 1000 Ver Scale 500 Datum (m) 72.000				
PN			S1.008	
Dia (mm)			375	
Slope (1:X)			166.6	
Cover Level (m)	85.000	85.250	84.600	
Invert Level (m)		81.925	81.925 / 82.313	
Length (m)			64.650	

MH Name	SSW.008	SSW.009		SSW.011	SSW.012	
Hor Scale 1000 Ver Scale 500 Datum (m) 71.000						
PN		S1.013		S1.011	S1.010	
Dia (mm)		375		375	375	
Slope (1:X)		23.5		34.9	80.0	
Cover Level (m)	81.400	82.250	82.500	83.500	85.000	
Invert Level (m)		79.825 / 80.675	80.861	80.861 / 81.475	81.475 / 81.838	
Length (m)		19.985		21.405	29.015	

MH Name	SSW.006	SSW.007	SSW.008	
Hor Scale 1000 Ver Scale 500 Datum (m) 68.000				
PN		S1.015	S1.014	
Dia (mm)		375	375	
Slope (1:X)		42.2	46.1	
Cover Level (m)	79.650	79.900	81.400	
Invert Level (m)		77.975 78.325	78.325 79.825	
Length (m)		14.775	69.215	

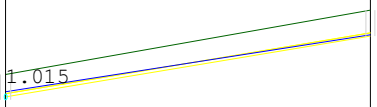
MH Name	SSW.002		SSW.004	SSW.005	SSW.006	
Hor Scale 1000 Ver Scale 500 Datum (m) 65.000						
PN			S1.018	S1.017	S1.016	
Dia (mm)			450	450	450	
Slope (1:X)			13.0	13.0	57.9	
Cover Level (m)	74.600	75.000	77.000	79.000	79.650	
Invert Level (m)		73.350 73.350	74.276 75.513	77.325 77.325	77.975	
Length (m)			12.035	23.555	37.610	

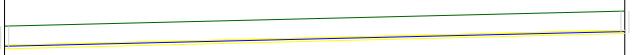
MH Name	SSW.033	SSW.032	SSW.002	
Hor Scale 1000 Ver Scale 500 Datum (m) 61.000			6.002	
PN		S1.022	S1.020	
Dia (mm)		225	450	
Slope (1:X)		28.9	24.3	
Cover Level (m)	71.000	73.500	74.600	
Invert Level (m)		69.500 / 69.990	72.150 / 72.919	
Length (m)		14.155	18.720	

MH Name	SSW.015	SSW.023	SSW.024	SSW.025	
Hor Scale 1000 Ver Scale 500 Datum (m) 72.000		1.006	3.000		
PN		S2.002	S2.001	S2.000	
Dia (mm)		300	225	225	
Slope (1:X)		167.0	119.1	150.0	
Cover Level (m)	84.300	84.250	84.350	84.450	
Invert Level (m)		82.412 / 82.687	82.687 / 82.812	82.812 / 82.950	
Length (m)		45.965	14.890	20.725	

MH Name	SSW.023		
Hor Scale 1000 Ver Scale 500 Datum (m)72.000		2.001	
PN			
Dia (mm)			
Slope (1:X)			
Cover Level (m)	84.250	84.750	
Invert Level (m)		82.687 83.250	
Length (m)			

MH Name	SSW.013	SSW.027	
Hor Scale 1000 Ver Scale 500 Datum (m)73.000		1.008	
PN		S4.000	
Dia (mm)		225	
Slope (1:X)		18.4	
Cover Level (m)	85.250	88.000	
Invert Level (m)	83.750	86.500	
Length (m)		50.700	

MH Name	SSW.006	SSW.028	
Hor Scale 1000 Ver Scale 500 Datum (m) 69.000			
PN		S5.000	
Dia (mm)		225	
Slope (1:X)		12.0	
Cover Level (m)	79.650	83.900	
Invert Level (m)		78.150	82.170
Length (m)		48.240	

MH Name	SSW.030	SSW.031	
Hor Scale 1000 Ver Scale 500 Datum (m) 64.000			
PN		S6.000	
Dia (mm)		225	
Slope (1:X)		82.1	
Cover Level (m)	76.000	77.000	
Invert Level (m)		74.500	75.500
Length (m)		82.050	

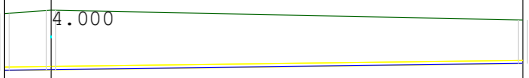
MH Name	SSW.002		SSW.030	
Hor Scale 1000 Ver Scale 500 Datum (m) 63.000			1.019	
PN			S6.001	
Dia (mm)			225	
Slope (1:X)			45.0	
Cover Level (m)	74.600		76.000	
Invert Level (m)		73.500	74.500	
Length (m)			44.990	

Appendix H – Foul Sewer Longitudinal Sections

Denis O'Sullivan & Associates		Page 1
Unit 5, Joyce House Barrack Square Ballincollig, Co. Cork	Residential Development Annabella Mallow, Co. Cork	
Date 12/05/2025 File FS Model.MDX	Designed By S.O.'Grady Checked By	
Micro Drainage	Network W.12.4	

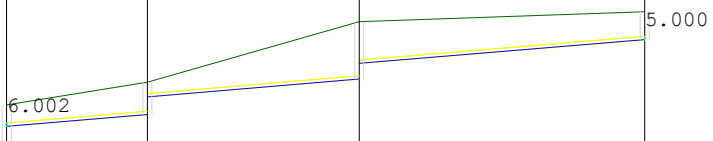
MH Name	FFS.014		FFS.016				FFS.020	
Hor Scale 1000 Ver Scale 500 Datum (m) 75.000								
PN			F1.004				F1.000	
Dia (mm)			150				150	
Slope (1:X)			24.7				42.4	
Cover Level (m)	85.350	85.650	86.450	86.800	87.300	87.500	88.400	
Invert Level (m)		83.950	83.950	84.600	84.600	84.950	84.950	85.450	85.450	85.650	85.650	86.550	
Length (m)			16.025				38.175	

MH Name	FFS.012	FFS.013	FFS.014	
Hor Scale 1000 Ver Scale 500 Datum (m) 72.000			2.001	
PN		F1.007	F1.006	
Dia (mm)		225	150	
Slope (1:X)		150.0	20.3	
Cover Level (m)	84.585	84.300	85.350	
Invert Level (m)		81.701	81.798	82.600	83.650	
Length (m)		14.550	21.365	

MH Name	FFS.010		FFS.012	
Hor Scale 1000 Ver Scale 500 Datum (m) 72.000				
PN			F1.008	
Dia (mm)			225	
Slope (1:X)			150.0	
Cover Level (m)	85.000	85.250	84.585	
Invert Level (m)		81.285	81.285 81.701	
Length (m)			62.415	

MH Name	FFS.006	FFS.007		FFS.009	FFS.010	
Hor Scale 1000 Ver Scale 500 Datum (m) 71.000						
PN		F1.013		F1.011	F1.010	
Dia (mm)		225		225	225	
Slope (1:X)		24.0		38.9	150.0	
Cover Level (m)	81.400	82.300	82.600	83.500	85.000	
Invert Level (m)		79.551	80.287 80.574	80.574 81.051	81.051 81.244	
Length (m)		17.675		18.570	29.040	

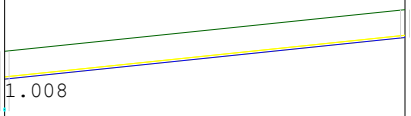
MH Name	FFS.004	FFS.005	FFS.006	
Hor Scale 1000 Ver Scale 500 Datum (m) 68.000				
PN		F1.015	F1.014	
Dia (mm)		225	225	
Slope (1:X)		49.6	48.4	
Cover Level (m)	79.650	79.950	81.400	
Invert Level (m)		77.800	78.150 78.150	79.551
Length (m)		17.377	67.790	

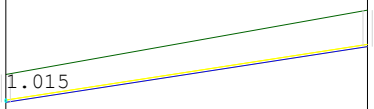
MH Name	FFS.001	FFS.002	FFS.003	FFS.004	
Hor Scale 1000 Ver Scale 500 Datum (m) 64.000					
PN		F1.018	F1.017	F1.016	
Dia (mm)		225	225	225	
Slope (1:X)		24.0	24.0	24.0	
Cover Level (m)	73.500	75.000	79.000	79.650	
Invert Level (m)		72.070 72.845	74.021 75.189	76.226	77.800
Length (m)		18.600	28.035	37.765	

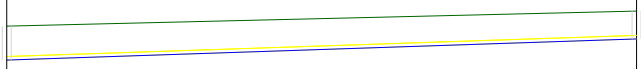
MH Name	FExis FS	FFS.001	
Hor Scale 1000 Ver Scale 500 Datum (m) 60.000		6.002	
PN		F1.019	
Dia (mm)		225	
Slope (1:X)		24.0	
Cover Level (m)	70.770	73.500	
Invert Level (m)		69.510	70.904
Length (m)		33.445	

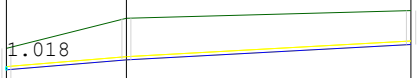
MH Name	FFS.013	FFS.021	FFS.024	
Hor Scale 1000 Ver Scale 500 Datum (m) 72.000		1.006	3.001	
PN		F2.001	F2.000	
Dia (mm)		225	225	
Slope (1:X)		150.0	24.5	
Cover Level (m)	84.300	84.250	84.750	
Invert Level (m)	81.798	82.106	82.400	82.900
Length (m)		46.120	12.235	

MH Name	FFS.021	FFS.022		
Hor Scale 1000 Ver Scale 500 Datum (m) 72.000				
PN		F3.001		
Dia (mm)		225		
Slope (1:X)		60.0		
Cover Level (m)	84.250	84.300	84.350	
Invert Level (m)		82.106	82.343 / 82.343	82.500
Length (m)		14.235		

MH Name	FFS.011	FFS.025	
Hor Scale 1000 Ver Scale 500 Datum (m) 73.000			
PN		F4.000	
Dia (mm)		150	
Slope (1:X)		19.3	
Cover Level (m)	85.250	88.000	
Invert Level (m)		83.400	86.150
Length (m)		52.960	

MH Name	FFS.004	FFS.026	
Hor Scale 1000 Ver Scale 500 Datum (m) 69.000			
PN		F5.000	
Dia (mm)		150	
Slope (1:X)		13.0	
Cover Level (m)	79.650	83.900	
Invert Level (m)		77.800	81.480
Length (m)		47.855	

MH Name	FFS.028	FFS.029	
Hor Scale 1000 Ver Scale 500 Datum (m) 64.000			
PN		F6.000	
Dia (mm)		225	
Slope (1:X)		60.0	
Cover Level (m)	76.000	77.000	
Invert Level (m)		73.762	75.150
Length (m)		83.308	

MH Name	FFS.001	FFS.027	FFS.028	
Hor Scale 1000 Ver Scale 500 Datum (m) 62.000				
PN		F6.002	F6.001	
Dia (mm)		225	225	
Slope (1:X)		24.0	36.9	
Cover Level (m)	73.500	75.500	76.000	
Invert Level (m)		72.079 72.742	72.742 73.762	
Length (m)		15.890	37.640	

Appendix J – Hydrobrake Details

Hydro-Brake® Flow Control

Modelling Guide

Unit Selection Design Guide

Overview

Hydro-Brake® Flow Controls restrict the flow in surface/storm water or foul/combined sewer systems by inducing a vortex flow pattern in the water passing through the device, having the effect of increasing back-pressure.

Their 'hydrodynamic' rather than 'physical restriction' based operation provides flow regulation whilst maintaining larger clearances than most other types of flow control, making them less susceptible to blockage. Their unique "S"-shaped head-flow characteristic also enables them to pass greater flows at lower heads, which can enable more efficient use of upstream storage facilities.

This document provides guidance relating to the selection and use of Hydro-Brake® Flow Controls for use in surface/storm water and foul/combined sewer systems.

The information provided here is intended for the purposes of general guidance only - individual application requirements may differ. If in doubt, or to enquire about new product additions, please contact HRD Technologies Ltd.

STH Range of Hydro-Brake® Flow Controls

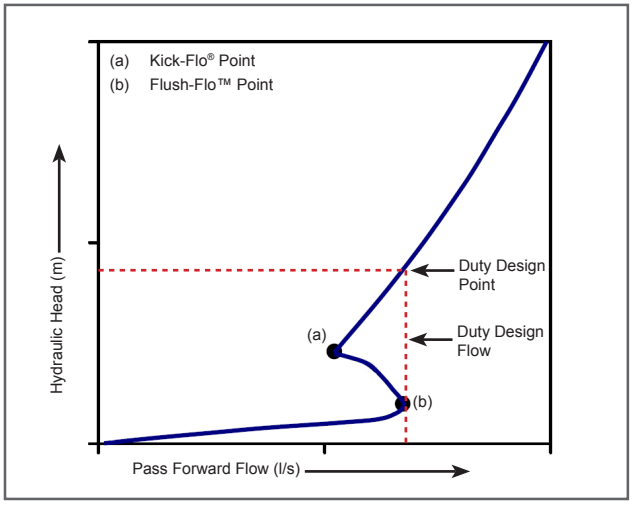
BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4599

See back cover for details.

Hydraulic Characteristics and Specification

Hydro-Brake® Flow Controls should be selected such that the duty/design flow is not exceeded at any point on the head-flow curve, see illustration right. If this is not achievable using the initially selected unit, it may be appropriate to select an alternative option (see selection guidance overleaf).

While the primary aim of a flow control is to provide a particular flow rate at a given upstream head (giving a design/duty point), it is important to note that secondary opportunities, such as potential for optimised storage use, derive from consideration of the full hydraulic characteristic. It is therefore important to ensure that the same flow control, or one confirmed to provide equivalent hydraulic performance, is implemented in any final installation.



Typical Hydro-Brake® Head Versus Flow Characteristics

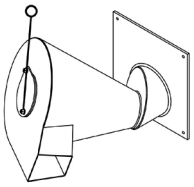
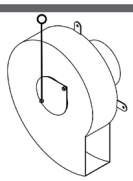
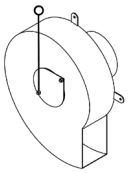
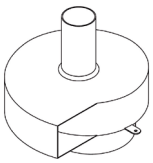
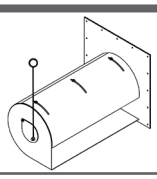
To ensure correct implementation a multiple design-point specification, defining the main hydraulic features of the selected flow control, can be provided by HRD Technologies Ltd. This should include at least the following information:

- outlet size and model of Hydro-Brake® Flow Control
- definition of the duty/design point (head and flow)
- definition of the Flush-Flo™ point (head and flow)
- definition of the Kick-Flo® point (head and flow)

To ensure that a drainage system performs as designed, it is strongly recommended that this information is reproduced on any technical specifications.

Hydro-Brake® Flow Control Models Supported in Micro Drainage

The Table below provides a summary of the Hydro-Brake® Flow Control models currently supported by the Micro Drainage programs, including details of unit styles, applications and design/installation considerations. Advice regarding unit selection is provided in subsequent sections.

WinDes® Reference Code	Style / Typical Shape	Application	Design / Installation Notes
Md1 Md2 Md4 Md14	**Conical** 	Foul / combined and surface / storm water.	With the exception of the Md14, conical units require benching into the intake (the Md14 has a piped intake). They generally require larger manholes than equivalent sump-type units.
Md5 Md6 Md7 Md12	**Sump-Type** 	Surface / storm water only.	Sump-type units require the provision of a sump to accommodate the flow control. As this will always be full of water, sump-type units are unsuitable for use in foul / combined systems.
Md13	**Sump-Type** BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE No 08/4599 STH Range of Hydro-Brake® Flow Controls 	Surface / storm water only.	The Md13 (STH) unit will always have an outlet size in excess of 75 mm and can always be fitted to a 225 mm diameter outlet pipe or larger.
Md8 Md9 Md11	**Vertical Discharge** 	Foul / combined and surface / storm water.	Vertical discharge units require a chamber design to accommodate the vertically directed outlet. They do not have S-shaped head / discharge curves and are for special applications only - please refer to HRD Technologies Ltd for advice.
Md10	**Tubular** 	Foul / combined and surface / storm water.	Tubular units require benching into the intake. They do not have S-shaped head / discharge curves and are for special applications only - please refer to HRD Technologies Ltd for advice.

Note: For system modelling using other software packages, HRD Technologies Ltd can provide individual unit head / flow characteristics in an appropriate format.

General Advice

Selection of the most appropriate Hydro-Brake® Flow Control for a particular application depends on a number of considerations, including the type of sewer system, the hydraulic characteristic of the device, device clearances and overall physical dimensions. The Micro Drainage programs provide outputs for hydraulic characteristic and outlet size.

The table opposite provides general selection guidance taking into account the considerations of type of sewer system, device clearances and overall physical dimensions. This should be considered along with other information provided here and in conjunction with the advice contained within the software design program that is being used.

The Table should be followed from the top, using the left hand column for surface/storm water applications and the right hand column for foul/combined applications. The 'general comments' provided are relevant to both applications.

HRD Technologies Ltd offer a free design service and can assist with unit selection.

General Guidance on Unit Selection

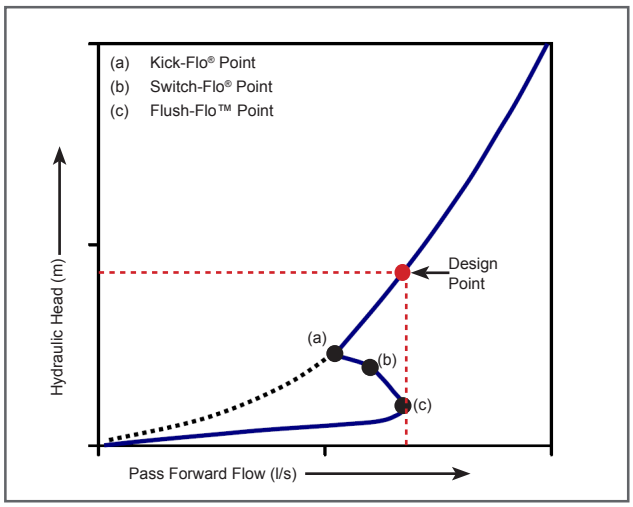
Surface / Storm Water Applications	Foul / Combined Applications
1) Select sump-type Md13 (STH) initially. This is a British Board of Agrément (BBA) approved product that is currently only available in certain sizes – if a size is not available for the specified duty/ design point go to 2) otherwise use Md13 (STH). The Md13 (STH) has a minimum outlet size in excess of 75 mm and can always be fitted to a 225 mm diameter outlet pipe (or greater).	1) Select conical-type Md4 (CX) initially provided the required outlet >150 mm. If the required manhole/ chamber size is too large go to 2) otherwise use Md4 (CX).
2) Select sump-type Md6 (SXH) initially provided the required outlet >75 mm (please seek advice if outlet <75 mm). If required outlet >200 mm go to 3) otherwise use Md6 (SXH).	2) Select conical-type Md2 (CH) provided the required outlet >150 mm. If the required manhole/chamber size is too large go to 3) otherwise use Md2 (CH).
3) Select sump-type Md5 (SH) or Md12 (SMXH) provided the required outlet >75 mm (please seek advice if outlet <75 mm). If required outlet >250 mm (Md5 - SH) or >300 mm (Md12 - SMXH) go to 4) otherwise use Md5 (SH) /Md12 (SMXH).	3) Select conical-type Md1 (C) provided the required outlet >429 mm. If the required manhole/chamber size is too large go to 4) otherwise use Md1 (C).
4) Select conical-type Md4 (CX) provided the required outlet >100 mm. This unit does not require a sump arrangement but requires benching into the intake. If the required manhole/ chamber size is too large go to 5), otherwise use Md4 (CX).	4) Vertical discharge units Md8 (SV), Md9 (SMV) and Md11 (SXV) can be considered if their outlets are >150 mm. Their physical dimensions should be considered - the Md9 (SMV) is typically used when the diameter of the Md8 (SV) and Md11 (SXV) >200 to 250 mm. If none of these units are suitable go to 5).
5) Select conical-type Md2 (CH) unit provided the required outlet >100 mm. This unit does not require a sump arrangement but requires benching into the intake. If the required manhole/ chamber size is too large go to 6), otherwise use Md2 (CH).	5) Select tubular-type Md10 (TH) provided the required outlet >333 mm. This is sometimes the only option that will meet a certain head/discharge relationship (eg. low head, low flow situations). It should only be used when there is no other alternative.
6) Select conical-type Md1 (C) provided the required outlet >285 mm. This unit does not require a sump arrangement but requires benching into the intake. If the required manhole/chamber size is too large go to 7), otherwise use Md1 (C).	For design assistance for any Hydro-Brake® Flow Control please call: **01-4013964** or **e-mail: enquiries@hrdtec.com**
7) Select sump-type Md7 (SMH) provided the required outlet >75 mm. If the required outlet >300 mm then go to 8), otherwise use Md7 (SMH).	
8) Vertical discharge units Md8 (SV), Md9 (SMV) and Md11 (SXV) can be considered provided the required outlet >75 mm. Their physical dimensions should be considered - the Md9 (SMV) is typically used when the diameter of the Md8 (SV) and Md11 (SXV) >200 to 250 mm. If none of these units are suitable go to 9).	
9) Select tubular-type Md10 (TH) provided the required outlet >222 mm. This is sometimes the only option that will meet a certain head/discharge relationship (eg. low head, low flow situations). It should only be used when there is no other alternative.	
General Comments: The minimum sizes quoted for Hydro-Brake® Flow Controls represent sizes based on experience as offering significant reduction in risk of blockage and hence maintenance and derive from general practice in flow control selection in the UK and Ireland. Sizes below the minimum recommended can be specified though it should be recognised these might incur increased risks of blockage and associated maintenance. Sizes above the maximum recommended can also be specified though may require oversized manholes/chambers. For the larger units, refer to HRD Technologies Ltd for advice.	

The information provided here is intended for the purposes of general guidance only - individual application requirements may differ. **If in doubt, please contact HRD Technologies Ltd.**

STH Type Hydro-Brake® Flow Control with BBA Approval

Now included in Win*Des*® W.12.6!

The new STH type Hydro-Brake® Flow Control range has a unique head / discharge performance curve which introduces a very important feature - the Switch-Flo® Point. This point illustrates the unique performance feature of the STH range which can lead to further savings in upstream storage, whilst also enabling increased inlet / outlet size to further reduce the risk of blockage.



Typical STH Head Versus Flow Characteristics

Kick-Flo® (a) - the point at which the vortex has initiated and at which the curve begins to return back to follow the orifice curve and reach the same design point or desired head / flow condition.

NEW Switch-Flo® (b) - marks the transition between the Kick-Flo® and Flush-Flo™, from vortex initiation to stabilisation. This point adds a new layer of resolution to the Hydro-Brake® curve that has implications to upstream storage savings.

Flush-Flo™ (c) - the point at which the vortex begins to initiate and have a throttling effect. This point on the Hydro-Brake® curve is usually much nearer to the maximum design flow (Design Point), than other vortex flow controls leading to more water passing through the unit during the earlier stages of a storm, thus reducing the amount of water that needs to be stored upstream.

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4599

STH Range of Hydro-Brake® Flow Controls

The STH Hydro-Brake® Flow Control is the only vortex flow control available today that has been given the prestigious BBA Approval Certificate. The BBA assessment procedure entails rigorous assessment of production and manufacturing standards, and confirms that the hydraulic performance of the Hydro-Brake® Flow Control matches the data given to designers by HRD Technologies with their head / discharge curves.

A worked example showing the steps to model a Hydro-Brake® Flow Control and associated Stormcell® Storage System within Micro Drainage Win*Des*® is available on our website:

www.hrdtec.com

Take a Look at Our New Stormwater Web Resource

Engineering Nature's Way™

www.engineeringnaturesway.co.uk

Engineering Nature's Way is a brand new resource for people working with Sustainable Drainage and flood management in the UK.

The site provides an opportunity to share news, opinion, information and best practice for people working in local and central Government; developers, consulting engineers and contractors. Do you have something to share? We would be delighted to receive your contributions.

turning water around ...®

HRD Technologies Ltd

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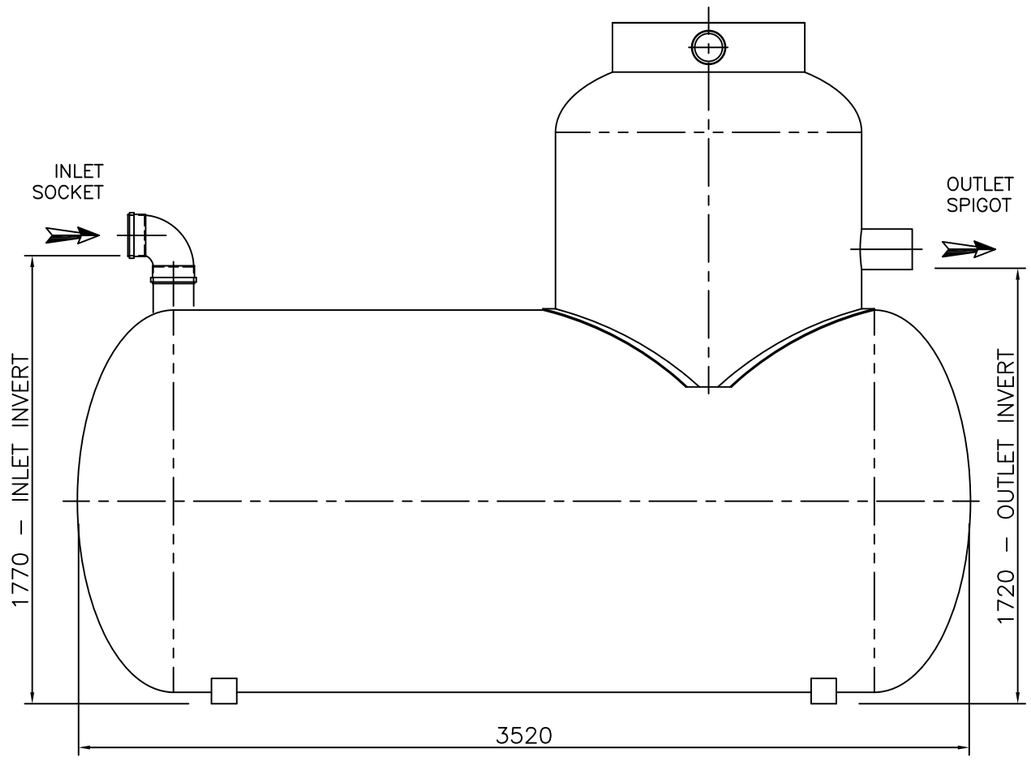
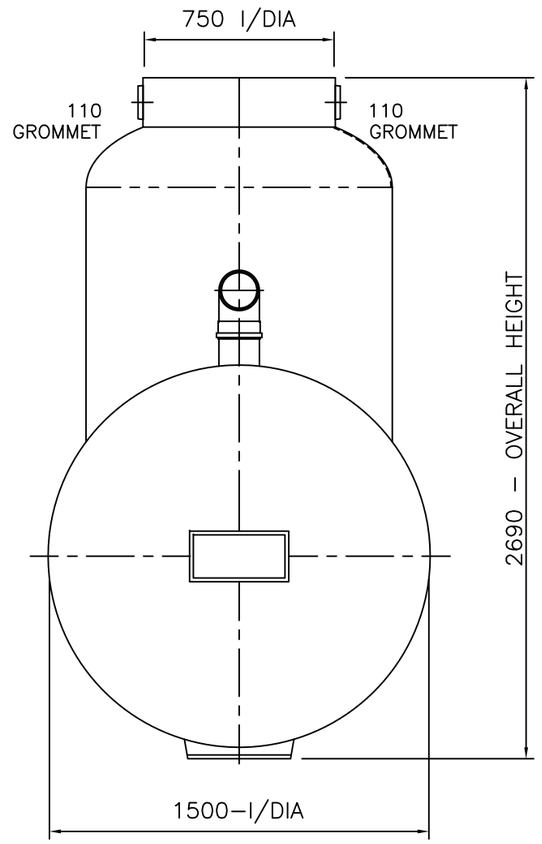
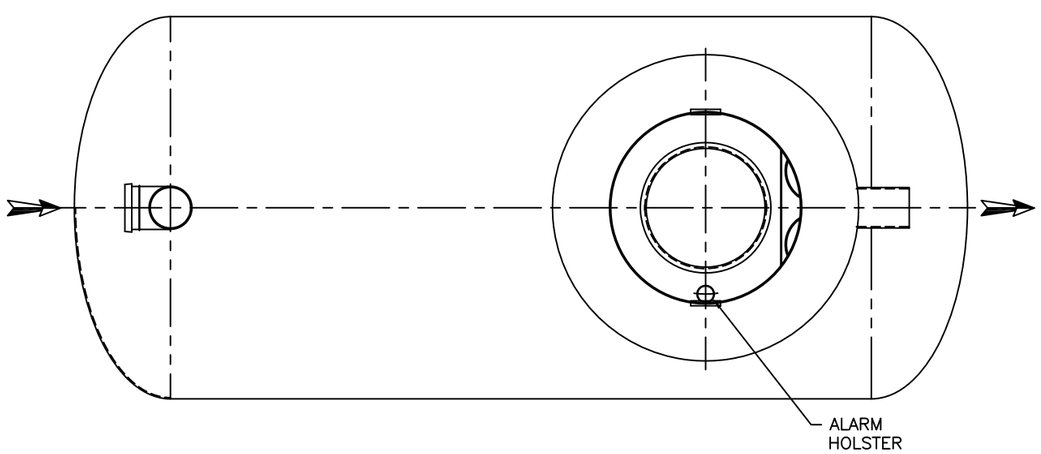
HRD Technologies Ltd is a subsidiary of Hydro International plc

Appendix K – Petrol Interceptor Details







IMPORTANT NOTE

DUE TO THE COMPACT DESIGN AND EASE OF INSTALLATION, CONDER SEPARATORS ARE NOW SUPPLIED AS STANDARD WITH AN IN LINE CONFIGURATION.

PIPE SIZE VARIANTS

100, 150, 225 PVC

300, 375, GRP

NOTES:

1. PRODUCT INFORMATION

The Conder range of light liquid separators is produced from high grade GRP. Inlets are provided as sockets and outlets as spigots, Connections may be made by steel-banded flexible couplings, nitrile seal joints, rope-seal and mortar or any other appropriate jointing method.

Ventilation specifications should be in accordance with Local Authority requirements. Vent pipework from multiple chambers must never be manifolded below ground level.

2. PERFORMANCE CHARACTERISTICS

Separators are based on the requirements stated in European Standard EN858-1 and Environment Agency guideline PPG3, in particular:-

a. The nominal size has been established from performance tests where the residual oil at the outlet is less than 5mg/l for class 1 separators and less than 100mg/l for class 2 separators.

3. MAINTENANCE AND USE

It is important to recognise that light liquid separators require regular maintenance. The period between maintenance operations can vary depending on the location and use of the separator, therefore routine inspections shall be undertaken at least every six months and a log maintained of inspection date, depth of oil, depth of silt and any cleaning that is undertaken.

A Conder Alarm should be fitted to every separator to give automatic warning that the light liquid capacity has been reached.

Access to the separator should be kept clear and not used for storage.

4. PRODUCT DEVELOPMENT

In line with our policy of constant improvement and development, we reserve the right to change specification without prior notice.

IMPORTANT INVERT LEVEL NOTE (RIBBED TANKS ONLY!):

The inlet and outlet Invert Level(IL) shown on this drawing is to internals of the shell unless otherwise stated.

For Invert level to the outside of the shell ribs, see the conversion below:

ø1.0m, 1.2m, 1.5m, 1.8m, 2.5m IL+50mm ('X')

ø3.0m,4.0m IL+75mm ('X')

TANKS SUPPLIED WITH LOOSE SHAFTS DO NOT COME SUPPLIED WITH A FIXING KIT.
THIS IS THE RESPONSIBILITY OF THE SITE CONTRACTOR.

PREMIER TECH AQUA

1ST ANGLE PROJECTION

TITLE

CNSB30S/21/SALES BYPASS SEPARATOR

REV.	DATE	BY	CHKD.	APPD.	DESCRIPTION
6	16.04.13	DG	KB	RP	PIPE VARIANTS AMENDED

A3

DO NOT SCALE
IF IN DOUBT ASK
ALL DIMENSIONS IN MM

GENERAL TOLERANCES (unless noted otherwise)

GRP FABRICATED MACHINED	LINEAR	± 5mm ± 2mm ± 0.5mm	ANGLE	±0.5° ±0.2° ±0.1°

DRAWN BY	CHKD.	APPD.	SCALE	DRAWING No.	REVISION
RU	PB	RP	NTS	CNSB30S/21 SALES	6
DATE 23.03.09	DATE 23.03.09	DATE 23.03.09			