DOSA

DENIS O'SULLIVAN & ASSOCIATES

CONSULTING ENGINEERS

RESIDENTIAL DEVELOPMENT AT CASTLEPARK, MALLOW, CO. CORK

INFRASTRUCTURE REPORT

DATE 17/10/2024

REVISION 3

JOB NO. 6621

Joyce House, Barrack Square, Ballincollig, Co. Cork

T 021 4871781 E info@dosa.ie W www.dosa.ie

DOCUMENT CONTROL

PROJECT NAME: Residential Development at Castlepark, Mallow, Co. Cork

PROJECT NUMBER: 6621

REVISION	DATE	FILE NAME: Residential Development at Castlepark, Mallow, Co. Cork			
3	17.10.2024	DESCRIPTION: Infrastructure Report			
			PREPARED	CHECKED	APPROVED
		INITIAL	SO'G	LO'T	SO'G
		DATE	17.10.2024	17.10.2024	17.10.2024
#	Insert Date	FILE NAME:			
		DESCRIPTION:			
			PREPARED	CHECKED	APPROVED
		INITIAL			
		DATE			
#	Insert Date	FILE NAME:			
		DESCRIPTION:			
			PREPARED	CHECKED	APPROVED
		INITIAL	SO'G	LO'T	SO'G
		DATE	27.06.2018	27.06.2018	27.06.2018
#	Insert Date	FILE NAME:			
		DESCRIPTION:			
			PREPARED	CHECKED	APPROVED
		INITIAL			
		DATE			
#	Insert Date	FILE NAME:			
		DESCRIPTION:			
			PREPARED	CHECKED	APPROVED
		INITIAL			
		DATE			

Contents

1 Introduction

DOSA Consulting Engineers were engaged as Engineers for the proposed development at Castlepark, 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:

- Storm Water Drainage Network
- Foul Drainage Network
- Water Supply

1.2 Site Location

The subject site which is currently undeveloped is located on the southeast of Mallow town. The site is a greenfield site characterised by its undulating topography and its steep slope rising from the southern & end. The Blackwater River runs along the site's southern edge, with the L-1220-0/St, Joseph's Road & Scoil Aonghusa CNS to the north, farmland and stand-alone detached farmhouse to the east and the existing Castle Park Village estate to the west. A snapshot of the proposed site is outlined in Figure 1.1 below.

Figure 1.1 – 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 slopes southwards towards the River Blackwater. It comprises one large single plot across which the levels vary from +87.5m O.D. along the boundary with the L-1220-0/St Joseph's Road to +43m O.D. at its most elevated southern extremity.

Figure 1.2 – Site Topography

1.5 Site History

The Castle Park site was broken into the phases detailed in Table 1.4 below.

Phase	Planning Reference	Development Details	Status
1	05/55093	157 dwellings and creche	Fully developed.
2	06/55035 Amended by: 07/55057 07/55085 08/55085	Permission for 141 residential units. Amendments reduced residential units to 130.	Commenced and 2 units constructed. Permission expired.
4	07/55076	38 dwellings	Not commenced. Permission expired.
Total	**325 permitted dwellings; 155 developed (153 + 2)**		
1 A & B	07/55077 & 07/55078	Mainly commercial with 18 residential units	Not commenced
3	-	No permitted development.	5 acres sold to DOE and 3.15 acres with Bankruptcy (as of Feb. 2018)

Table 1.4– Castle Park Lands, Phasing & Status

1.6 Proposed Development

The development will consist of the construction of 469 no. residential units (comprising a mix of 1, 2, 3, and 4 bed semi-detached, townhouse, and duplex/apartment units), creche, and all associated ancillary site development works including vehicular access, parking, footpaths, drainage, amenity areas, and a wastewater treatment plant at Castlepark, Castlelands (townland), St Jospeh's Road, Mallow, Co. Cork.

Figure 1.6 – Proposed Development

2 *Storm Water Design*

2.1 Surface Water System

The subject lands are drained naturally and have the benefit of direct access to the public stormwater network in the existing estate. The lands directly abut a stormwater network already laid within the existing estate along Kingsfort Avenue, Maple Square and Maple Avenue which outfalls directly into the River Blackwater as outlined in Figure 2.1 below.

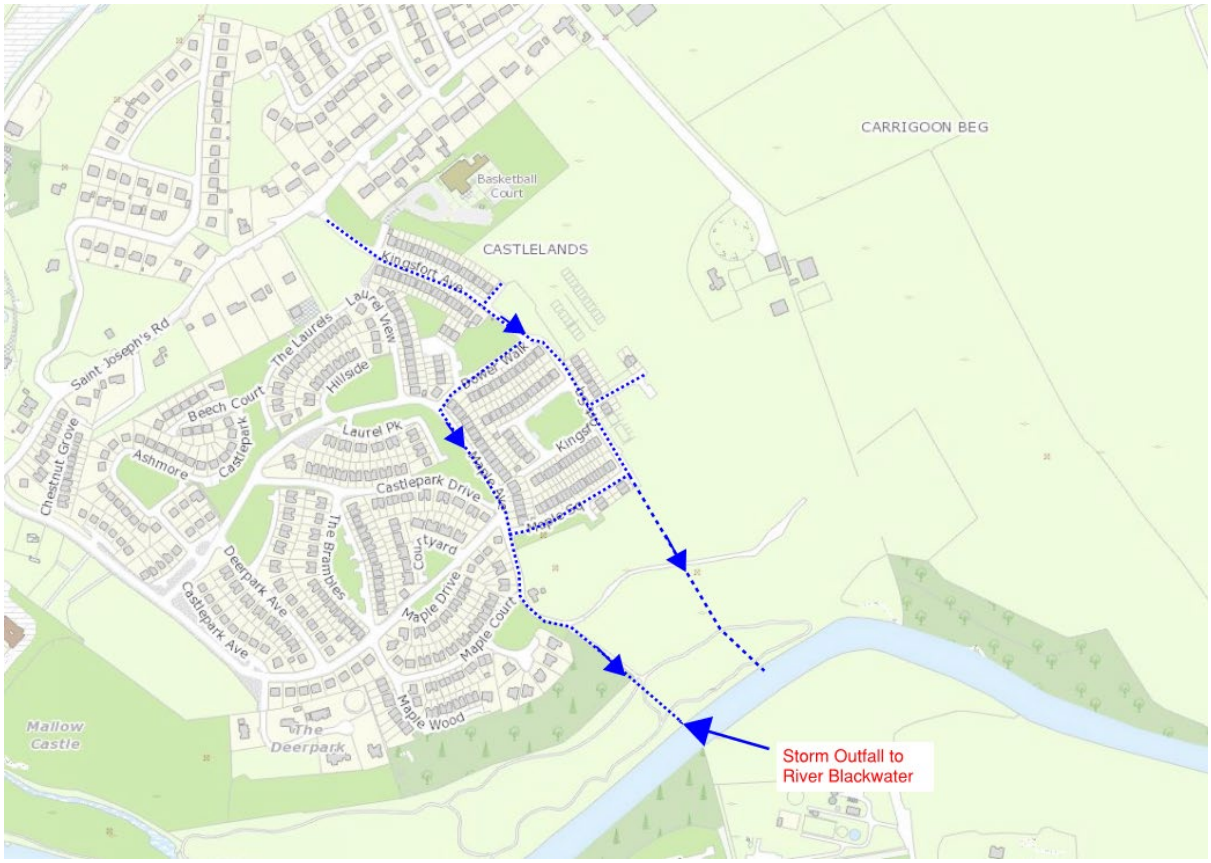


Figure 2.1 – Stormwater Outfall

Surface water discharge rates from the proposed surface water drainage network will be controlled by a vortex flow control devices (Hydrobrakes or equivalent) and associated detention basins. Surface water discharge will also pass via a full retention fuel / oil separators (sized in accordance with permitted discharge from the site).

The proposed surface water drainage network will collect surface water runoff from the site via a piped network prior to discharging off site via the detention basins, flow control devices and separator arrangement as noted above. Surface water runoff from the site's road network will be directed to the proposed pipe network/ constructed swales in green areas via conventional road gullies with additional surface water runoff from driveways and roofs also routed to the proposed surface water pipe network.

2.2 Surface Water Drainage Network

The existing public stormwater network is located in the existing adjacent estate road in the Castle Park estate. Refer to DOSA Drawing No.'s 6621-2020, 6621-2021 & 6621-2022 for details of the proposed surface water outfall. Surface water discharge rates from the proposed surface water drainage network will be controlled by a vortex flow control devices (Hydrobrakes or equivalent) and associated detention basins. Surface water discharge will also pass via a full retention fuel / oil separators (sized in accordance with permitted discharge from the site).

The proposed surface water drainage network will collect surface water runoff from the site via a piped network prior to discharging off site via the detention basins, flow control devices and separator arrangement as noted above. Surface water runoff from the site's road network will be directed to the proposed pipe network/ constructed swales in green areas via conventional road gullies with additional surface water runoff from driveways and roofs also routed to the proposed surface water pipe network.

2.3 Compliance with GDSDS Surface Water Drainage Policy

The site's surface water management infrastructure has been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS). The GDSDS (Vol. 2, Chapter 6.3.4) requires that the following design criteria are applied to all sites:

Criterion 1: River Water Quality Protection

Satisfied by providing stormwater detention basins and treatment of surface water run-off by SUDS features such full retention fuel/oil separators at surface water discharge points.

Criterion 2: River Regime Protection

Satisfied by attenuating surface water run-off in association with flow control devices prior to discharge off site at Greenfield runoff rate. Site critical duration storm used to assess attenuation volume.

Criterion 3: Level of Service (Flooding) for the Site

Satisfied by reviewing available flood hazard information (e.g. Lee CFRAM Study as outlined in Appendix C) relating to the site's proximity to tidal and fluvial flood plains (up to 1 in 100-year flood event).

Criterion 4: River Flood Protection

Satisfied by attenuating surface water discharge to greenfield runoff rates, addressing flood risk associated with the 1 in 100-year storm and avoiding development in flood plains.

Following a comprehensive review of the design of the storm water drainage system we considered all options under the SuDS guidance policies referred to in the Greater Dublin Drainage Strategy. A preliminary feasibility of the applicable SuDS Techniques was carried out using the facility on the website of Irishsuds.ie (Guidance and Tools). The preliminary analysis indicated that the following techniques were possibly suitable Attenuation Tanks, Basins, Permeable Paving, Soakaways, Swales and Rainwater Harvesting.

Each proposal was examined and evaluated on its merits / suitability under site specific constraints for use in the proposed development site. Our design approach summary is as follows:

2.4 SuDS Appraisal

The SUDS selection process used for this site is in accordance with SUDS selection flow chart, Volume 3, Section 6.5, Figure 48 of the GDSDS. The characteristics of the site are utilised to select the various SUDS techniques that would be applicable.

The following methodologies are being implemented as part of a SuDS treatment train approach:

2.4.1 Permeable Pavement

Permeable pavement reduces the overall impermeable area of the hard-standing area, which will reduce the impact of the discharge and improve the quality of the effluent from the proposed development.

2.4.2 Rainwater Harvesting

In relation to rainwater harvesting an option is to provide a water butt with each individual dwelling. This will be located to the rear of each unit. This water butt will only have the ability to catch the rear sloping side of the dwelling and the reuse would be for watering plants.

2.4.3 Filter Drain

Trenches filled with permeable material and a perforated collection pipe at the invert with an optional permeable 'sandy' topsoil at surface. These can treat, convey and attenuate runoff at source, and can infiltrate to the ground where the subgrade is suitable. These systems will allow some form of storage for small rainfall events and can result in water evaporation and adsorption in small quantities, therefore there will be less run-off from these areas in small rainfall events thus mimicking the natural response for this catchment. These will be located along the proposed pedestrian/cycle pathways and will allow groundwater to recharge to its natural state.

2.4.4 Tree Pits

Trees can be planted within a range of infiltration SuDS components to improve their performance, as root growth and decomposition increase soil infiltration capacity. Alternatively, they can be used as standalone within soil-filled tree pits, tree planters or structural soils, collecting and storing runoff and providing treatment via filtration and phytoremediation. Tree pits and planters will be designed to collect and attenuate runoff by providing additional storage within the underlying structure. The soils around trees can also be used to filter out pollutants from runoff directly. Tree pits are proposed to be in green space areas to treat and control runoff, while at the same time providing amenity value to adjacent pedestrian, and residential zones. It is also proposed, where possible to fit tree pits along the estate road to drain and treat surface water runoff from the road network. This will allow for treatment of first flush and low flows while high flows will discharge into the surface water network during extreme rainfall events. Rain water gullies will still be provided downstream of any tree pit to drain runoff during an extreme rainfall event.

2.4.5 Detention Basin

The proposed attenuation system will provide treatment to the storm water before it passes to the local drainage network. The basin has been designed to be 'off-line' which provides treatment even in low flow conditions This minimises maintenance requirements and maintenance costs.

The system attenuates surface water to restrict the outflow to the equivalent of the existing agricultural runoff. This ensures the development will not give rise to any impact downstream of the site.

2.4.6 Flow Control Device

It is proposed to provide a hydrobrake, or similar approved, at the outfall of the surface water catchment to restrict the outflow of water from the subject site. The hydro-brakes will be fitted with a pull cord bypass and a penstock valve installed on the inlet to the manhole for maintenance purposes.

2.4.7 Petrol Interceptor

It is proposed to provide a petrol interceptor upstream of the detention basins to ensure that any remaining hydro-carbons or pollutants within the runoff from trafficked areas are treated prior to outfall to the existing watercourse. It is proposed to provide a Conder Bypass Separator Types or similar approved.

In conclusion the water quality from this catchment should be of a high quality due to the above-mentioned measures, which are applied in a treatment train to treat the water before discharge at a restricted rate to the local network.

The above measures ensure a suitable management train is provided.

2.4.8 Swales

Broad, shallow drainage channels covered in grass which can treat, convey and attenuate runoff, at source, and can infiltrate to the ground where the subgrade is suitable. Swales can also promote biodiversity. This will be located adjacent to roads and hard-standing areas on the southern portion of the site receiving water from the adjoining roads and footpaths. The swales will allow for an element of infiltration but ultimately have a connection to the attenuation system.

2.4.9 Management Train

The management train commences with source control through the provision of permeable paving where possible and rain water butts in the rear gardens. This will also reduce the water consumption required of each housing unit. This employment of these source controls along with the usage of localised tree pts will aid to reduce the peak runoff rate, placing less stress on the facilities downstream.

The second stage of the management train, site control, is provided by the introduction of the hydrocarbon interceptors and swales in open areas which provide a degree of treatment before discharging to the attenuation system.

The detention basins and detention basins offer a third stage of treatment, regional control, by slowing the storm water discharge down and removing additional silts which may remain in the storm water.

2.5 Maintenance Regime for SuDS Devices

The SuDS features proposed above for the site will require the following maintenance:

2.5.1 Wet Swales:

Requires regular inspection of inlets and outlets, vegetation, mulching and the removal of nuisance plants and rubbish as necessary. Trees and vegetation should be trimmed every 2 years. Swale surface should be spiked, scarified and removed of 'thatch' every 3 years with regular inspection of surface infiltration to avoid areas of ponding. Repair erosion at inlets and outlets and re-turf surfacing as required. Wet swales will be maintained from adjacent access roads.

2.5.2 Detention Basins

The detention basins will require regular maintenance to ensure continuing operation to design performance standards. This will be relatively straightforward for landscape contractors and does not generally require any additional works above what is necessary for a standard public open space.

2.5.3 Tree Pits

Maintenance of trees will be greatest in the first few years, which will include regular inspection of tree condition including inlets and outlets, removal of invasive vegetation and possibly irrigation during long dry periods.

2.5.4 Filter Drains

Inspection of the system should be carried out monthly on the inlet / outlet pipework and any control systems for blockages. Inspection of pre-treatment systems including should be carried out every 6 months for catch pits manholes prior to the filter drain with removal of silt or other build-ups. Removal of silt build-up may be required more frequent. Annual cleaning of roof runoff gutters etc should be part of the generally maintenance of the drainage system to ensure debris is removed prior to entering the network. Perforated pipework should be cleared of blockage if required.

2.5.5 Hydrobrake Manhole:

Normally little maintenance is required as there are no moving parts within a hydrobrake, however, after installation, hydrobrakes should be inspected to ensure the hydrobrake orifice is not blocked on a monthly basis for three months and thereafter at six monthly intervals and hosed down if required. Remove rubbish or debris from hydrobrake if present. Hydro-Brake Flow Controls are fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.

2.5.6 Petrol Interceptor:

Systems should be visually inspected for every rainfall event for 30 days after installation and the amount of sediment measured to give the operator an idea of the expected rate of deposition. Systems should then be inspected every 6 months to verify the appropriate level of maintenance. Floating debris and solids should be removed and the sump cleaned with a conventional sump

vacuum cleaner. Filter media should be replaced and sediments, oils and grease should be removed where required.

The permeable paving has a design life equivalent to standard block paving. The surface blocks require routine maintenance. There are four levels of cleaning that can be carried out on a paved area:

1. General dirt should be removed by regular dry brushing.
2. Where the paving has become dull, showing a loss of colour, a wet wash with a stiff bristle brush and garden hose can be adequate.
3. For more stubborn areas a power washer can be used, taking care not to remove the jointing materials (sand or mortar). The washer should be on a medium pressure setting or lower, and should not be aimed directly at the paving surface, but at an angle of 30° approximately.

Cleaning detergents can be used; however, some detergents are acidic and overuse can damage some paving products. It is advisable to follow the manufacturer's instructions and rinse the areas fully. The resulting runoff should be carefully channelled to either drainage points or containers from where it can be safely disposed. Replace any washed-out jointing sand with new dried sand once the paving has dried.

The detention basins will require regular maintenance to ensure continuing operation to design performance standards.

2.6 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.

2.7 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 — 44.50 l/sec
- Time of entry — 5 minutes
- M5 – 60 — 18.80 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 = 18.80mm
- 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.

2.7.1 Pre-Development Conditions

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

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

QBAR = 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)

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.

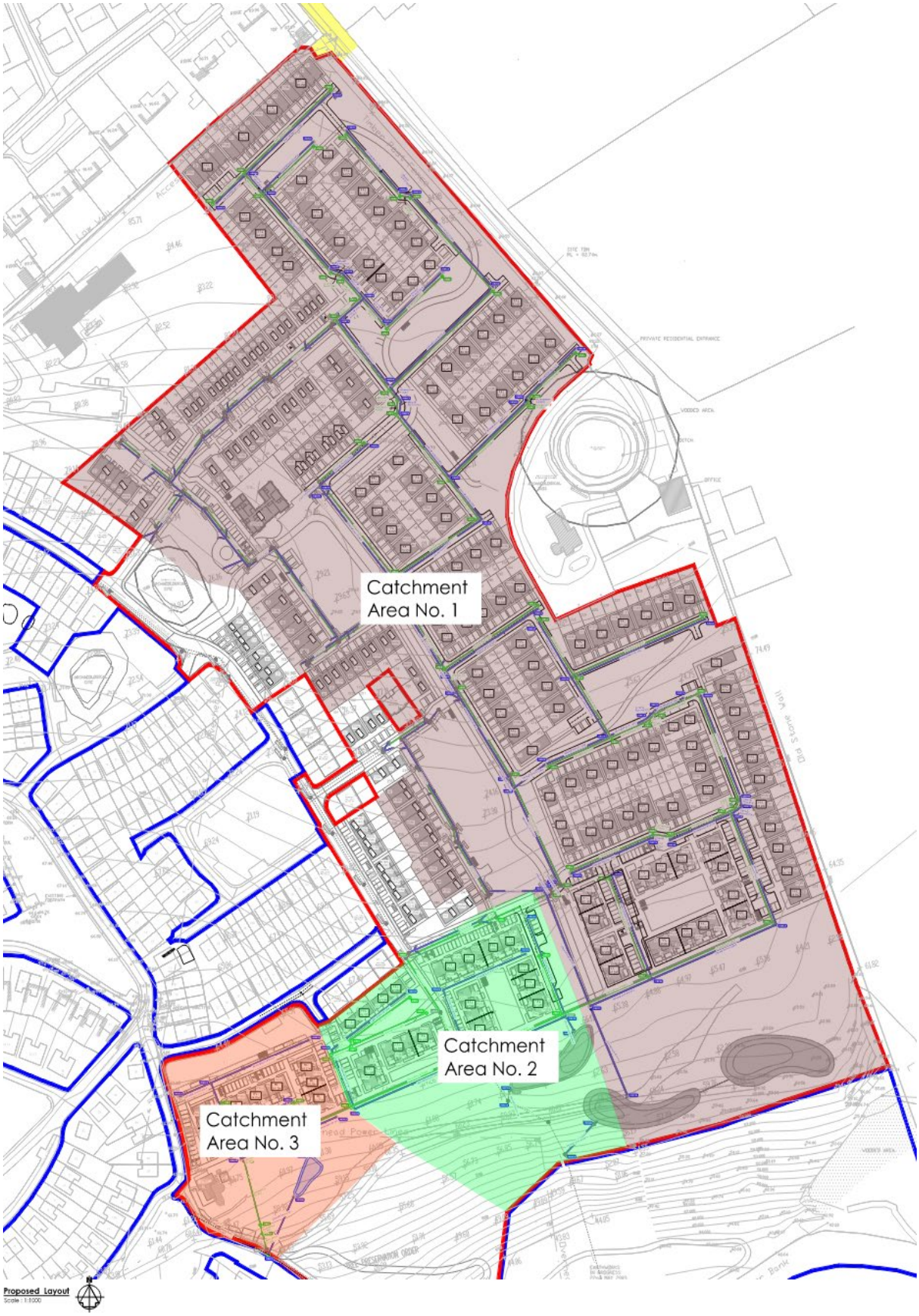


Figure 2.7 – Catchment Areas of Development

Contributing Area	Permissible Outflow (l/sec)
Catchment Area No. 1	35.30 l/sec
Catchment Area No. 2	5.70 l/sec
Catchment Area No. 3	3.50 l/sec

2.7.2 Post-Development Conditions

The stormwater management plan adopted for the particular development involves using detention basins located in the green areas of the site.

All surface water runoff arising from the paved development will be drained away from the site. The detention basins will be designed for a 100-year storm event. The maximum discharge from the tanks 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 rainfall. 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 and detention basin capacities. This module also provides the critical storm duration for the attenuation tank detention basins during the design process.

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

2.8 Detention Basins

2.8.1 Volume of Detention Basins

The capacity of the detention basins are designed to cater for the capacity required for a 1 in 100-year ARI event. These capacities are summarised as follows:

Tank/Basin No.	Capacity (m^3)	Restricted Outlet (l/sec)
1	2100.0	35.0 l/sec
2	240.0	5.70 l/sec
3	140.0	3.50 l/sec

2.9 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 detention basins that eventually discharge to the adjoining public network.

Table 2.9 – Petrol Interceptor Details

Catchment Reference	Petrol Interceptor Make & Model	Oil Storage Capacity (l)
Catchment Area No. 1	1 No. Conder CSNB135s	1875.0 litres
Catchment Area No. 2	1 No. Conder CSNB15s	225.0 litres
Catchment Area No. 3	1 No. Conder CSNB8s	120.0 litres

2.10 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 tanks. The interceptors will be specified at detailed design stage.

Table 2.10 – Petrol Interceptor Silt Storage Details

Catchment Reference	Petrol Interceptor Make & Model	Silt Storage Capacity (l)
Catchment Area No. 1	1 No. Conder CSNB135s	13,500.0 litres
Catchment Area No. 2	1 No. Conder CSNB15s	1500.0 litres
Catchment Area No. 3	1 No. Conder CSNB8s	800.0 litres

2.11 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 series of interlinked detention basins . 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 CDS22002703. The response to this Enquiry was issued by Irish Water on 25th September 2024. 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:

  Please note that it will be necessary to connect to the Uisce Éireann sewer network via existing privately owned infrastructure within the existing Castlepark estate. The arterial route of the private sewer network, between your connection point and the Uisce Éireann

infrastructure will be required to be taken in charge by Uisce Éireann at connection application stage. It will be necessary for the Applicant to obtain all necessary quality assurances, wayleaves, easements, confirmation of capacity and permissions from the owner of this infrastructure to connect.

Fig 3.0 Extract From Irish Water COF

The Confirmation of Feasibility document is included in Appendix A. The existing Castlelands estate has not yet been taken in charge and the applicant is the owner of all roads, common areas and service networks within the existing Castlelands estate

The Applicant has the relevant control and authority to undertake any infrastructure upgrades which may be identified by Uisce Eireann as part of the connection application. The Applicant is in a position to obtain all necessary quality assurances, wayleaves, easements, confirmation of capacity and permissions with regard to infrastructure connections to the development.

The foul sewer will be 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 will be built using the micro-drainage software applications. The model will be analysed and amended until the results met with the design criteria specified.

The network will be designed to achieve self-cleansing velocities at 1/3 flow whilst maintaining minimum gradients.

3.1.1 Development Breakdown

469 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 = (469) (446) / (24) (60) (60) = 2.420 litres/second

6DWF = 14.525 litres/second

122-Child Creche

Assume 60 No. Staff & 122 No. Children

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

Loading = (182) (60) / (24) (60) (60) = 0.126 litres/second

6DWF = 0.756 litres/second

The overall quantity of wastewater for the proposed development is estimated at 78.25m^3 per day.

The overall quantity of wastewater for the proposed development is estimated at 44.15m^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 existing foul sewer in the adjoining Castlepark estate.

All works will be in accordance with Irish Water specifications and requirements.

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. CDS22002703. 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:

  Please note that it will be necessary to connect to the Uisce Éireann water network via existing privately owned infrastructure within the existing Castlepark estate. The arterial route of the private watermain network, between your connection point and the Uisce Éireann public infrastructure will be required to be taken in charge by Uisce Éireann at connection application stage. It will be necessary for the Applicant to obtain all necessary quality assurances, wayleaves, easements, confirmation of capacity and permissions from the owner of this infrastructure to connect.

The Confirmation of Feasibility document is included in Appendix A. As with the foul sewer, the Applicant has the relevant control and authority to undertake any infrastructure upgrades which may be identified by Uisce Eireann as part of the connection application. The Applicant is in a position to obtain all necessary quality assurances, wayleaves, easements, confirmation of capacity and permissions with regard to infrastructure connections to the development.

It is proposed to provide a new 100mm/150mm (internal diameter) HDPE connection to the public watermain on the adjacent Castlepark estate Road with associated valves and metering requirements. Internally within the development it is proposed to have a series of 100mm Ø branches and loops with associated hydrants, valves, and metering requirements.

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 DOSA Drawing No.'s 6621-2030, 6621-2031 & 6621-2032.

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

Attenuation Tank Reference	Storm Event	Results
Detention Basin No. 1	1 in 2 year	No surcharge of the stormwater network
	1 in 100 year	Surcharge
Detention Basin No. 2	1 in 2 year	No surcharge of the stormwater network
	1 in 100 year	Surcharge
Detention Basin No. 3	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 Tank Reference	Hydrobrake Reference	Limiting Discharge (l/s)	Design Head (m)	Hydrobrake Diameter (mm)
Detention Basin Tank No. 1	MD4	35.30 l/sec	0.60	237
Detention Basin Tank No. 2	MD4	5.7 l/sec	0.50	113
Detention Basin Tank No. 3	MD4	3.50 l/sec	0.50	58

Table 5.3: Storage Tank Summary

Tank No.	Storage Type	Capacity (m^3)	Invert Level (m)	Maximum Storage Level (m)
Detention Basin No. 1	Grassed Slope	2655.0	58.234	58.834
Detention Basin No. 2	Grassed Slope	348.0	62.408	62.908
Detention Basin No. 3	Grassed Slope	196.0	58.100	58.600

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

DOSA
Joyce House
Barrack Square
Ballincollig
Co. Cork
P31 KP84

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

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

25 September 2024

Our Ref: CDS23009311 Pre-Connection Enquiry
Castle Park, 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 469 unit(s) at Castle Park, 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:

  Please note that it will be necessary to connect to the Uisce Éireann water network via existing privately owned infrastructure within the existing Castlepark estate. The arterial route of the private watermain network, between your connection point and the Uisce Éireann public infrastructure will be required to be taken in charge by Uisce Éireann at connection application stage. It will be necessary for the Applicant to obtain all necessary quality assurances, wayleaves, easements, confirmation of capacity and permissions from the owner of this infrastructure to connect.

- **Wastewater Connection** - Feasible without infrastructure upgrade by Uisce Éireann:

  Please note that it will be necessary to connect to the Uisce Éireann sewer network via existing privately owned infrastructure within the existing Castlepark estate. The arterial route of the private sewer network, between your connection point and the Uisce Éireann

infrastructure will be required to be taken in charge by Uisce Éireann at connection application stage. It will be necessary for the Applicant to obtain all necessary quality assurances, wayleaves, easements, confirmation of capacity and permissions from the owner of this infrastructure to connect.

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/

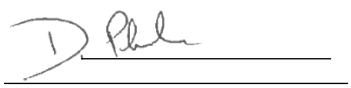
Where can you find more information?

- **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

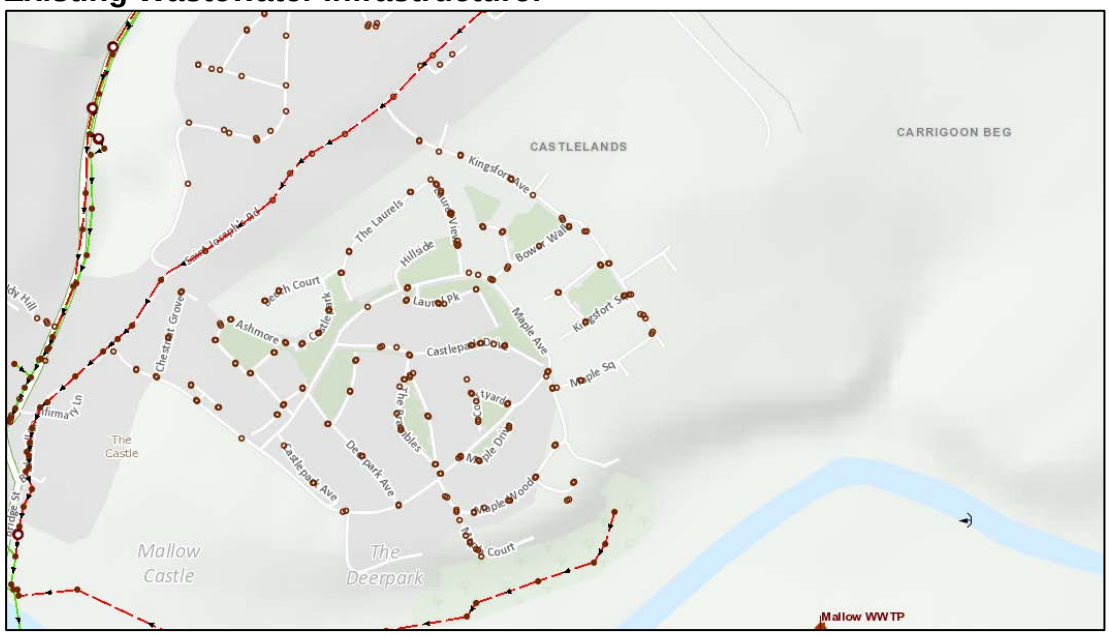
What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice,*** available 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

Existing Water Infrastructure:

Existing Wastewater Infrastructure:



Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

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

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

Appendix B –Irish Water Statement of Design Acceptance

Dennis Hennigan
Green Banks
Ballyvolane
Co. Cork
T23AV6W

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

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

17 October 2024

Re: Design Submission for Site at, Ballincrossig, Glanmire, Cork (the "Development") (the "Design Submission") / Connection Reference No: CDS24003661

Dear Dennis Hennigan,

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: Kyle Jackson
Email: kyle.jackson@water.ie

Yours sincerely,

Dermot Phelan
Connections Delivery Manager

Appendix A

Document Title & Revision

- [6621-2020-E]
- [6621-2021-F]
- [6621-2022-E]
- [6621-2023-D]
- [6621-2030-D]
- [6621-2031-E]
- [6621-2032-D]
- [6621-2060-C]
- [6621-2061-B]
- [6621-2062-B]
- [6621-2063-B]
- [6621-2064-B]

Standard Details/Code of Practice Exemption:

Not applicable

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.

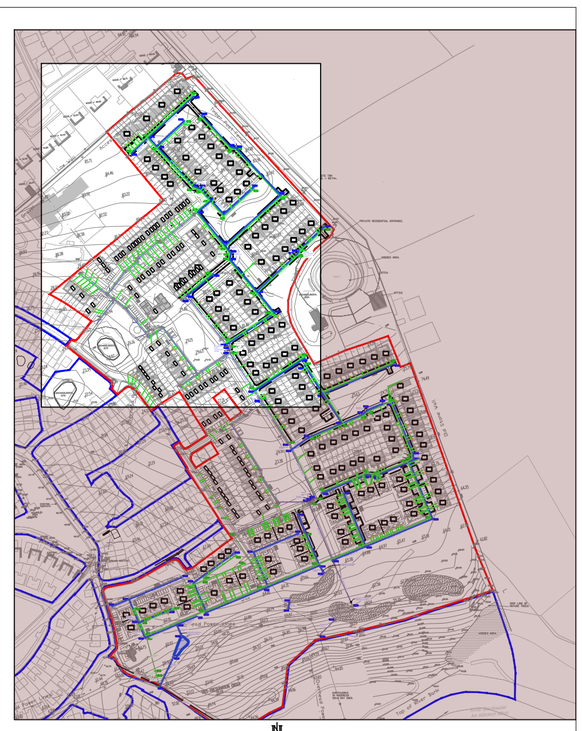
Legend:

Wastewater Details:	
	Denotes Foul Pipe
F.001	Denotes Foul Manhole
IC051	Denotes Inspection Chamber
	Denotes Foul Pipe Concrete encased
	Denotes Ex. Foul Sewer
Storm Water Details:	
	Denotes Connection Pipe
	Denotes Storm Pipe
S.001	Denotes Storm Manhole
GB	Road Gully
	Denotes Ex. Storm Sewer

Document No. IW-CDS-5030-01	
Waste Water Service Connection Responsibility :	STD-WW-01
Typical Layout for Sewer within New Developments	STD-WW-02
Drain & Service Connection Pipework :	STD-WW-03
Typical Sewer / Service pipe Connection :	STD-WW-04
STD-WW-06 Existing Planting	STD-WW-06
Restrictions on new planting adjacent to sewers	STD-WW-06A
Trench Backfill & Bearing :	STD-WW-07
Concrete Bed, Haunch & Surround to Waste Water :	STD-WW-08
Pre-cast Concrete Manhole :	STD-WW-10
Backdrop manholes:	STD-WW-12
Private Side Inspection Chamber :	STD-WW-13

Note:
Refer to Irish Water Standard Details Drawings Document No. IW-CDS-5030-01
Pipe materials shall comply with Section 3.9 of Irish Water's Code of Practice.
All works to be constructed to conform with Irish Water's Code of Practice for Wastewater Infrastructure Document No. IW-CDS-5030-03.

1. All Foul pipes must be in compliance with Code of Practice for Wastewater Infrastructure - Section 3.13
2. Foul pipe to be 'WavSpec SN8' shall be structure wall construction Type A manufactured in accordance with EN13476-2, and comprising PVC-U smooth internal and external layers with either a foamed or a recycled PVC-U core
3. 'WavSpec SN8' shall be manufactured in accordance with Quality Management system IS EN ISO 9001: 2008 and Environmental Quality System IS EN ISO 14001:2004
4. Separation distances must be in compliance with Standard details & Code of Practice for Wastewater Infrastructure
5. Manhole covers, where located in grass areas, shall be surrounded by a concrete plinth, 200mm all round and 100mm deep formed with C20/25 concrete
6. All new trees/shrubs planting will comply with minimum planting distances as per standard detail STD-WW-06A
7. Stormwater pipe will be a JFC Corripipe twin wall SN6/SN8 polyethylene drainage pipe. Corripipe is a twin wall polyethylene drainage pipe manufactured from a black high density polyethylene by a twin extrusion process.



Site Layout - Key Plan
Scale : 1:5000

Proposed Drainage Layout 1 of 3
Scale : 1:500

DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS
Joyce House
Barrack Square
Ballincollig
Cork
P31 KP84
021 4871781
info@dosa.ie
www.dosa.ie

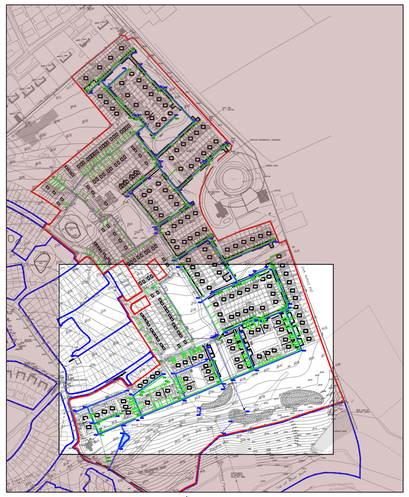
REV.	DRAWN	CHKD	APPRVD	DATE	DETAILS
E	K.M.	S.O'G	S.O'G	16.10.'24	Issued for LRD Application

CLIENT: Reside (Castlepark) Ltd.

PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: LRD Proposed Drainage Layout 1 of 3

SHEET: A1 | SCALE: 1:500 | PROJECT NO.: 6621 | DRAWING NO.: 2020 | STATUS/ISSUE: E



Site Layout - Key Plan
Scale : 1:5000

Legend:

Wastewater Details:		Document No. IW-CDS-5030-01	
	Denotes Foul Pipe	Waste Water Service Connection Responsibility :	STD-WW-01
F001	Denotes Foul Manhole	Typical Layout for Sewer within New Developments	STD-WW-02
	Denotes Inspection Chamber	Drain & Service Connection Pipework :	STD-WW-03
IC F001	Denotes Foul Pipe Concrete encased	Typical Sewer / Service pipe Connection :	STD-WW-04
	Denotes Ex. Foul Sewer	STD-WW-06 Existing Planting.	STD-WW-06
		Restrictions on new planting adjacent to sewers	STD-WW-06A
Storm Water Details:		Trench Backfill & Bedding :	STD-WW-07
	Denotes Connection Pipe	Concrete Bed, Haunch & Surround to Waste Water :	STD-WW-08
	Denotes Storm Pipe	Pre-cast Concrete Manhole :	STD-WW-10
S001	Denotes Storm Manhole	Backdrop manholes:	STD-WW-12
	Road Gully	Private Side Inspection Chamber :	STD-WW-13
	Denotes Ex. Storm Sewer		

Note:
Refer to Irish Water Standard Details Drawings Document No. IW-CDS-5030-01
Pipe materials shall comply with Section 3.9 of Irish Water's Code of Practice.
All works to be constructed to conform with Irish Water's Code of Practice for Wastewater Infrastructure Document No. IW-CDS-5030-03.

1. All Foul pipes must be in compliance with Code of Practice for Wastewater Infrastructure - Section 3.13
2. Foul pipe to be 'WavSpec SN8' shall be structure wall construction Type A manufactured in accordance with EN13476-2, and comprising PVC-U smooth internal and external layers with either a foamed or a recycled PVC-U core.
3. 'WavSpec SN8' shall be manufactured in accordance with Quality Management system IS EN ISO 9001: 2008 and Environmental Quality System IS EN ISO 14001:2004
4. Separation distances must be in compliance with Standard details & Code of Practice for Wastewater Infrastructure
5. Manhole covers, where located in grass areas, shall be surrounded by a concrete plinth, 200mm all round and 100mm deep formed with C20/25 concrete
6. All new trees/shrubs planting will comply with minimum planting distances as per standard detail STD-WW-06A
7. Stormwater pipe will be a JFC Conlpipe twin wall SN4/SN8 polyethylene drainage pipe. Conlpipe is a twin wall polyethylene drainage pipe manufactured from a black high density polyethylene by a twin extrusion process.

Proposed Drainage Layout 3 of 3
Scale : 1:500

DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

Joyce House
Barrack Square
Ballincollig
Cork
P31 KP84

021 4871781
info@dosa.ie
www.dosa.ie

REV.	DRAWN	CHKD	APPRVD	DATE	DETAILS
F	K.M.	S.O'G	S.O'G	01.10.24	Revised & Issued for LRD Application

CLIENT: Reside (Castlepark) Ltd.

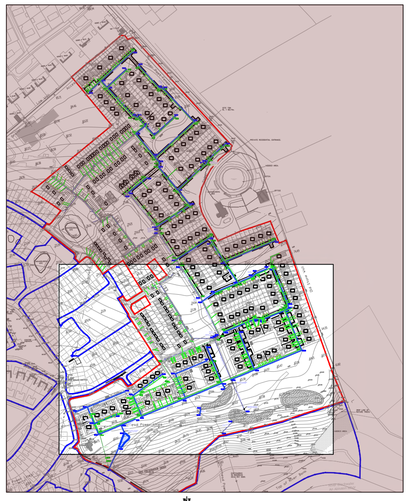
PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: LRD Proposed Drainage Layout 2 of 3

SHEET: A1

SCALE: 1:500

PROJECT NO. 6621 | DRAWING NO. 2021 | STATUS/ISSUE F



Site Layout - Key Plan
Scale : 1:5000

Proposed Drainage Layout 3 of 3
Scale : 1:500

Legend:

Wastewater Details:	Document No. IW-CDS-5030-01	
Denotes Foul Pipe	Waste Water Service Connection Responsibility :	STD-WW-01
Denotes Foul Manhole	Typical Layout for Sewer within New Developments :	STD-WW-02
Denotes Inspection Chamber	Drain & Service Connection Pipework :	STD-WW-03
Denotes Foul Pipe Concrete encased	Typical Sewer / Service pipe Connection :	STD-WW-04
Denotes Ex. Foul Sewer	STD-WW-06 Existing Planting :	STD-WW-06
	Restrictions on new planting adjacent to sewers :	STD-WW-06A
Storm Water Details:	Trench Backfill & Bearing :	STD-WW-07
Denotes Connection Pipe	Concrete Bed, Haunch & Surround to Waste Water :	STD-WW-08
	Pre-cast Concrete Manhole :	STD-WW-10
Denotes Storm Pipe	Backdrop manholes:	STD-WW-12
Denotes Storm Manhole	Private Side Inspection Chamber :	STD-WW-13
Road Gully		
Denotes Ex. Storm Sewer		

Note:
Refer to Irish Water Standard Details Drawings Document No. IW-CDS-5030-01
Pipe materials shall comply with Section 3.9 of Irish Water's Code of Practice.
All works to be constructed to conform with Irish Water's Code of Practice for Wastewater Infrastructure Document No. IW-CDS-5030-03.

1. All Foul pipes must be in compliance with Code of Practice for Wastewater Infrastructure - Section 3.13
2. Foul pipe to be 'WrapSpec SN8' shall be structure wall construction Type A manufactured in accordance with EN 13476-2, and comprising PVC-U smooth internal and external layers with either a foamed or a recycled PVC-U core.
3. 'WrapSpec SN8' shall be manufactured in accordance with Quality Management system IS EN ISO 9001: 2008 and Environmental Quality System IS EN ISO 14001:2004
4. Separation distances must be in compliance with Standard details & Code of Practice for Wastewater Infrastructure
5. Manhole covers, where located in grass areas, shall be surrounded by a concrete plinth, 200mm all round and 100mm deep formed with C20/25 concrete
6. All new trees/shrubs planting will comply with minimum planting distances as per standard detail STD-WW-06A
7. Stormwater pipe will be a JFC Coripipe twin wall SN6/SN8 polyethylene drainage pipe. Coripipe is a twin wall polyethylene drainage pipe manufactured from a black high density polyethylene by a twin extrusion process.

DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

Joyce House
Barrack Square
Ballincollig
Cork
P31 KP84

021 4871781
info@dosa.ie
www.dosa.ie

REV.	DRAWN	CHKD	APPRVD	DATE	DETAILS
E	K.M.	S.O'G	S.O'G	16.10.24	Issued for LRD Application

CLIENT: Reside (Castlepark) Ltd.

PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: LRD Proposed Drainage Layout 3 of 3

SHEET: A1

SCALE: 1:500

PROJECT NO. 6621 _ DRAWING NO. 2022 _ STATUS/ISSUE E

US/MH Name	Pipe Length (m)	Fall (m)	Slope (1:X)	US/IL (m)	DS/IL (m)	Pipe DIA (mm)
F2.129	73.270	1.221	60.0	83.150	81.929	150
F2.130	25.825	1.021	25.3	82.950	81.929	150
F2.128	17.075	0.114	149.8	81.929	81.815	225
F2.131	42.945	0.716	60.0	83.000	82.284	150
F2.127	62.450	0.416	150.1	81.815	81.399	225
F2.126	5.170	0.034	152.1	81.399	81.365	225
F2.125	18.830	0.465	40.5	81.365	80.900	225
F2.133	46.605	0.777	60.0	82.300	81.523	150
F2.132	23.315	0.623	37.4	81.523	80.900	150
F2.124	19.030	0.250	76.1	80.900	80.650	225
F2.123	53.125	0.300	177.1	80.650	80.350	225
F2.137	49.610	0.827	60.0	82.850	82.023	150
F2.136	6.505	0.108	60.2	82.023	81.915	150
F2.135	74.525	1.165	64.0	81.915	80.750	150
F2.134	85.135	1.703	50.0	80.750	79.047	225
F2.122	8.575	0.057	150.4	79.047	78.990	225
F2.121	8.295	0.055	150.8	78.990	78.935	225
F2.120	48.930	0.328	149.3	78.935	78.607	225
F2.140	38.370	0.640	60.0	80.450	79.810	150
F2.139	4.485	0.075	59.8	79.810	79.735	150
F2.138	66.765	1.128	59.2	79.735	78.607	150
F2.119	29.910	0.150	199.4	78.607	78.457	225
F2.118	61.485	2.008	30.6	78.457	76.449	225
F2.117	5.905	0.150	39.4	76.449	76.299	225
F2.116	7.825	0.150	52.2	76.299	76.149	225
F2.115	49.375	0.329	150.1	73.460	73.131	225
F2.141	68.495	2.900	23.6	77.350	74.450	150
F2.114	13.385	0.089	150.4	73.131	73.042	225
F2.113	60.704	1.642	37.0	73.042	71.400	225
F2.111	72.220	3.250	22.2	71.400	68.150	225
F2.110	7.845	0.150	52.3	68.150	68.000	225
F2.109	36.705	0.500	73.4	68.000	67.500	225
F2.108	61.130	0.850	71.9	67.500	66.650	225
F2.107	38.358	0.950	40.4	66.650	65.700	225
F2.106	28.170	1.050	26.8	65.700	64.650	225
F2.154	38.155	1.750	21.8	76.650	74.900	150
F2.155	87.145	1.452	60.0	75.550	74.098	150
F2.153	43.415	1.809	24.0	72.787	70.978	225
F2.152	43.325	0.722	60.0	71.700	70.978	150
F2.151	25.755	0.129	199.7	70.978	70.849	225
F2.150	5.810	0.029	200.3	70.849	70.820	225
F2.149	28.475	0.654	43.5	70.820	70.166	225
F2.148	67.060	2.794	24.0	70.166	67.372	225
F2.147	5.336	0.222	24.0	67.372	67.150	225
F2.146	4.515	0.023	196.3	67.150	67.127	225
F2.158	54.485	0.908	60.0	68.100	67.192	150
F2.157	10.625	0.071	149.6	67.192	67.121	150
F2.156	39.705	0.265	149.8	67.121	66.856	225
F2.145	68.055	2.856	23.8	66.856	64.000	225
F2.144	83.800	0.419	200.0	64.000	63.581	225
F2.159	88.345	3.250	27.2	67.400	64.150	150
F2.143	68.915	0.345	200.0	63.581	63.236	225
F2.160	35.265	1.350	26.1	66.500	65.150	150
F2.142	68.915	0.345	200.0	63.236	62.892	225
F2.105	72.305	0.362	200.0	62.892	62.530	225
F2.163	50.730	0.800	63.4	64.750	63.950	150
F2.165	44.620	1.550	28.8	65.750	64.200	150
F2.164	6.065	0.400	15.2	64.200	63.800	150
F2.162	13.437	0.200	67.2	63.800	63.600	150
F2.161	28.165	0.952	29.6	63.600	62.648	225
F2.104	73.250	0.366	200.0	62.530	62.164	225
F2.167	41.465	1.250	33.2	63.250	62.000	150
F2.168	17.145	0.286	59.9	61.400	61.114	150
F2.166	13.950	0.093	150.0	61.114	61.021	150
F2.103	5.640	0.235	24.0	61.021	60.786	225
F2.102	37.015	1.542	24.0	59.042	57.500	225
F2.101	5.301	0.221	24.0	54.721	54.500	225
F2.100	9.405	0.392	24.0	52.562	52.170	225

Foul Sewer Pipe Schedule

US/MH Name	US/CL (m)	US/IL (m)	Depth (m)
F2.100	56.000	52.562	3.438
F2.101	59.000	54.721	4.279
F2.102	62.500	59.042	3.458
F2.103	63.000	61.021	1.979
F2.104	64.500	62.530	1.970
F2.105	66.500	62.892	3.608
F2.106	67.550	65.700	1.850
F2.107	68.500	66.650	1.850
F2.108	69.350	67.500	1.850
F2.109	69.850	68.000	1.850
F2.110	70.000	68.150	1.850
F2.111	73.250	71.400	1.850
F2.113	75.750	73.042	2.708
F2.114	76.300	73.131	3.169
F2.115	78.000	73.460	4.540
F2.116	78.150	76.299	1.851
F2.117	78.300	76.449	1.851
F2.118	81.350	78.457	2.893
F2.119	81.750	78.607	3.143
F2.120	81.700	78.935	2.765
F2.121	82.000	78.990	3.010
F2.122	82.200	79.047	3.153
F2.123	82.500	80.650	1.850
F2.124	82.750	80.900	1.850
F2.125	83.450	81.365	2.085
F2.126	83.550	81.399	2.151
F2.127	84.400	81.815	2.585
F2.128	84.650	81.929	2.721
F2.129	85.000	83.150	1.850
F2.130	84.800	82.950	1.850
F2.131	84.350	83.000	1.350
F2.132	82.600	81.523	1.077
F2.133	83.350	82.300	1.050
F2.134	82.600	80.750	1.850
F2.135	84.100	81.915	2.185
F2.136	84.200	82.023	2.177
F2.137	84.700	82.850	1.850
F2.138	82.050	79.735	2.315
F2.139	82.100	79.810	2.290
F2.140	82.300	80.450	1.850
F2.141	79.200	77.350	1.850
F2.142	67.000	63.236	3.764
F2.143	66.000	63.581	2.419
F2.144	65.500	64.000	1.500
F2.145	69.050	66.856	2.194
F2.146	69.000	67.150	1.850
F2.147	69.300	67.372	1.928
F2.148	72.500	70.166	2.334
F2.149	73.450	70.820	2.630
F2.150	73.400	70.849	2.551
F2.151	73.275	70.978	2.297
F2.152	73.050	71.700	1.350
F2.153	76.750	72.787	3.963
F2.154	78.500	76.650	1.850
F2.155	77.400	75.550	1.850
F2.156	69.400	67.121	2.279
F2.157	69.500	67.192	2.308
F2.158	69.950	68.100	1.850
F2.159	69.250	67.400	1.850
F2.160	68.350	66.500	1.850
F2.161	65.450	63.600	1.850
F2.162	65.300	63.800	1.500
F2.163	66.100	64.750	1.350
F2.164	65.700	64.200	1.500
F2.165	67.250	65.750	1.500
F2.166	63.500	61.114	2.386
F2.167	64.600	63.250	1.350
F2.168	63.250	61.400	1.850

Foul Sewer Manhole Schedule

S2.111	32.885	1.804	30.0	73.479	72.423	525
S2.138	68.925	2.700	25.5	77.500	74.800	225
S2.110	13.200	0.264	50.0	72.423	72.159	525
S2.109	59.880	0.709	84.5	72.159	71.450	600
S2.108	7.300	0.250	29.2	71.450	71.200	600
S2.143	38.590	1.750	22.1	77.000	75.250	225
S2.142	89.845	0.898	100.1	75.900	75.002	225
S2.141	40.825	3.252	12.6	75.002	71.750	225
S2.146	18.955	0.114	166.3	71.500	71.386	225
S2.145	8.030	0.048	167.3	71.386	71.338	225
S2.144	25.270	0.151	167.4	71.338	71.187	225
S2.140	42.189	0.253	166.8	71.187	70.934	300
S2.139	23.800	0.143	166.4	70.934	70.791	375
S2.107	96.615	2.692	35.9	70.791	68.099	600
S2.106	5.855	0.146	40.1	68.099	67.953	600
S2.105	3.500	0.088	39.8	67.953	67.865	600
S2.104	96.945	3.166	30.6	67.865	64.699	600
S2.152	63.950	3.100	20.6	71.000	67.900	225
S2.151	6.513	0.300	21.7	67.900	67.600	225
S2.150	6.230	0.050	124.6	67.600	67.550	225
S2.155	54.675	0.500	109.4	68.500	68.000	225
S2.154	11.285	0.100	112.9	68.000	67.900	225
S2.153	41.595	0.350	118.8	67.900	67.550	225
S2.149	68.520	3.050	22.5	67.550	64.500	225
S2.148	83.280	0.416	200.2	64.500	64.084	375
S2.156	66.295	3.250	20.4	67.750	64.500	225
S2.147	76.350	0.382	199.9	64.084	63.702	375
S2.103	85.715	5.202	16.5	63.702	58.500	600
S2.102	26.630	0.266	100.1	58.500	58.234	675
S2.101	25.090	0.251	100.0	58.234	57.983	300

Storm Sewer Pipe Schedule - Catchment Area 01

US/MH Name	US/CL (m)	US/IL (m)	Depth (m)
S2.201	64.000	62.398	1.602
S2.202	65.500	62.408	3.092
S2.203	67.000	62.440	4.560
S2.204	69.250	67.750	1.500
S2.205	65.500	62.742	2.758
S2.206	64.500	63.000	1.500
S2.207	65.500	64.000	1.500
S2.208	67.500	66.000	1.500
S2.209	68.000	66.500	1.500
S2.210	68.750	67.250	1.500

Storm Sewer Manhole Schedule - Catchment Area 01

US/MH Name	Pipe Length (m)	Fall (m)	Slope (1:X)	US/IL (m)	DS/IL (m)	Pipe DIA (mm)
S2.208	56.660	2.000	28.3	66.000	64.000	225
S2.207	37.400	1.000	37.4	64.000	63.000	225
S2.206	77.280	0.258	300.0	63.000	62.742	300
S2.210	84.575	0.750	112.8	67.250	66.500	225
S2.209	41.415	2.500	16.6	66.500	64.000	225
S2.205	90.650	0.302	300.0	62.742	62.440	300
S2.204	64.500	2.250	28.7	67.750	65.500	225
S2.203	9.645	0.032	301.4	62.440	62.408	375
S2.202	3.000	0.010	300.0	62.408	62.398	375
S2.201	6.575	1.000	6.6	62.398	61.398	300

Storm Sewer Pipe Schedule - Catchment Area 02

US/MH Name	US/CL (m)	US/IL (m)	Depth (m)
S3.101	59.000	58.050	0.950
S3.102	59.500	58.100	1.400
S3.103	63.000	59.402	3.598
S3.104	64.000	62.500	1.500
S3.105	62.500	61.000	1.500
S3.106	63.000	61.451	1.549
S3.107	64.300	62.800	1.500
S3.108	63.800	61.625	2.175
S3.109	63.250	61.750	1.500
S3.110	63.650	62.150	1.500

Storm Sewer Manhole Schedule - Catchment Area 02

US/MH Name	Pipe Length (m)	Fall (m)	Slope (1:X)	US/IL (m)	DS/IL (m)	Pipe DIA (mm)
S3.110	65.550	0.525	124.9	62.150	61.625	225
S3.109	20.950	0.125	167.6	61.750	61.625	225
S3.108	29.075	0.174	167.1	61.625	61.451	225
S3.107	39.745	1.300	30.6	62.800	61.500	225
S3.106	19.050	0.451	42.2	61.451	61.000	225
S3.105	39.820	0.199	200.0	61.000	60.801	300
S3.104	24.345	1.000	24.3	62.500	61.500	225
S3.103	15.620	1.302	12.0	59.402	58.100	300
S3.102	5.000	0.050	100.0	58.100	58.050	300
S3.101	37.350	5.883	6.3	58.050	52.167	225

Storm Sewer Pipe Schedule - Catchment Area 03

Storm Sewer Manhole Schedule - Catchment Area 03

DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

Joyce House
Barrack Square
Ballincollig
Cork
P31 KP84

021 4871781
info@dosa.ie
www.dosa.ie

REV.	DRAWN	CHKD	APPRVD	DATE	DETAILS
D	A.G.	S.O'G	S.O'G	17.10.24	Issued for LRD Application
C	K.M.	S.O'G	S.O'G	27.09.24	Issued for LRD Application
B	G.S.	S.O'G	S.O'G	13.12.23	Issued for Section 32B Application
A	G.S.	S.O'G	L.OT	05.12.23	Issued for Pre Planning Application

CLIENT: Reside (Castlepark) Ltd.

PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: Proposed Storm & Fouls Pipe & Manhole Schedules

SHEET: A1

SCALE: NTS

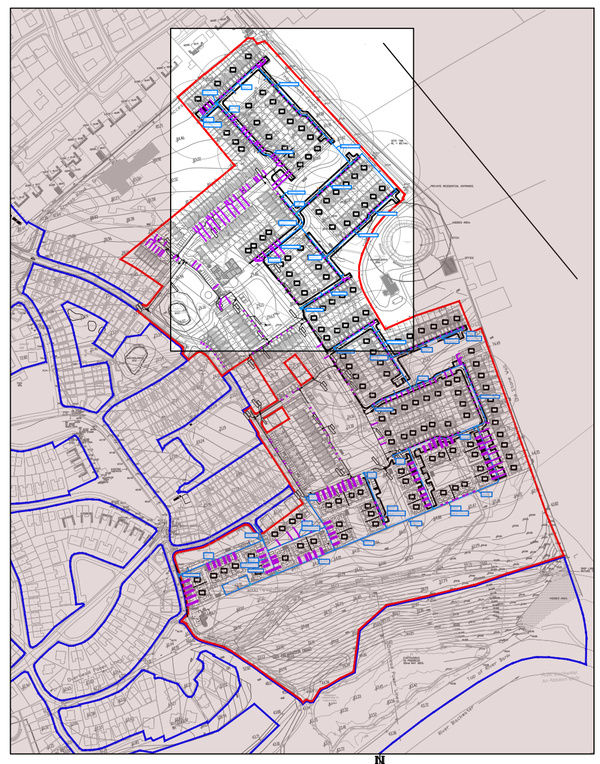
PROJECT NO. 6621 _ DRAWING NO. 2023 _ STATUS/ISSUE D

Legend:

Watermain Details:		Document No. IW-CDS-5020-01	
BB200	Denotes Connection Pipe (25mm O.D. PE Pipe)	Water Service Connection Responsibility :	STD-W-01
BB051	Denotes Connection Pipe (32mm O.D. PE Pipe)	Customer Connection & Boundary Box :	STD-W-03
		Marker Posts & Plates :	STD-W-27
	Denotes 110/125mm O.D. HDPE Watermain	General Pipe Connections :	STD-W-04
	Denotes 80mm O.D. HDPE Watermain loop	General Pipe Connections :	STD-W-05
	Denotes 150mm Ø (I.D.) - HDPE Watermain	General Pipe Connections :	STD-W-07
		Trench Backfill and Bedding :	STD-W-13
		Watermain Thrust & Support Blocks :	STD-W-28
SV001	Denotes Sluice Valve	Sluice Valve :	STD-W-15
		Marker Posts & Plates :	STD-W-27
WO	Denotes Washout Hydrant	Washout Hydrant :	STD-W-30A
NRV	Denotes Non-Return Valve	On Line Hydrant :	STD-W-18
FH003	Denotes Fire Hydrant	Off Line Hydrant :	STD-W-19
		Marker Posts & Plates :	STD-W-27
AV001	Denotes Air Valve	Air Valve :	STD-W-22
Meter Chamber	Denotes Water Meter	Meter Chamber :	STD-W-26/26A
		Marker Posts & Plates :	STD-W-27
	Denotes Existing Public Watermain		

Note: Refer to Irish Water Standard Details Drawings Document No. IW-CDS-5020-01

1. Mains should extend no more than 1.2m beyond the final Service Connection to mitigate dead-end Mains (Code of Practice for Water Infrastructure - Section 3.5)
2. Service connection pipes should be a minimum of 25mm ouside diameter, 20mm inside diameter, and should be provided with appropriately sized fittings. (Code of Practice for Water Infrastructure - Section 3.8)
3. Separation distances must be in compliance with Standard details & Code of Practice for Water Infrastructure
4. All meters in the manifold shall be tagged to indicate which property is supplied and any unused outlets are to be blanked off.



Proposed Site Layout - Key Plan

Scale : 1:5000

N

Proposed Watermain Layout 1 of 3

Scale : 1:5000

DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

Joyce House
Barrack Square
Ballincollig
Cork
P31 KP84

021 4871781
info@dosa.ie
www.dosa.ie

REV.	DRAWN	CHKD	APPRVD	DATE	DETAILS
D	K.M.	S.O'G	S.O'G	16.10.24	Issued for LRD Application

CLIENT: Reside (Castlepark) Ltd.

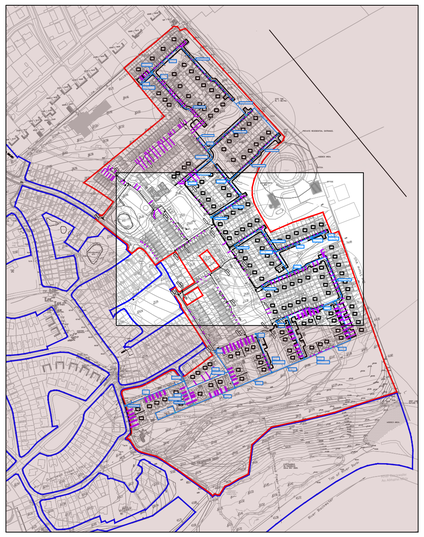
PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: Proposed Drainage Layout 1 of 3

SHEET: A1

SCALE: 1:500

PROJECT NO.: 6621 _ DRAWING NO.: 2030 _ STATUS/ISSUE: D



Site Layout - Key Plan
Scale : 1:5000

Legend:

Watermain Details:		Document No. IW-CDS-5020-01
BSDC	Denotes Connection Pipe (25mm O.D. PE Pipe)	Water Service Connection Responsibility : STD-W-01
BSDC	Denotes Connection Pipe (32mm O.D. PE Pipe)	Customer Connection & Boundary Box : STD-W-03
		Marker Posts & Plates : STD-W-27
	Denotes 110/125mm O.D. HDPE Watermain	General Pipe Connections : STD-W-04
	Denotes 80mm O.D. HDPE Watermain loop	General Pipe Connections : STD-W-05
	Denotes 150mm Ø (O.D.) HDPE Watermain	General Pipe Connections : STD-W-07
		Trench Backfill and Bedding : STD-W-13
		Watermain Thrust & Support Blocks : STD-W-28
SV001	Denotes Sluice Valve	Sluice Valve : STD-W-15
		Marker Posts & Plates : STD-W-27
WO1	Denotes Washout Hydrant	Washout Hydrant : STD-W-30A
NRV	Denotes Non-Return Valve	On Line Hydrant : STD-W-18
FH003	Denotes Fire Hydrant	Off Line Hydrant : STD-W-19
		Marker Posts & Plates : STD-W-27
AV001	Denotes Air Valve	Air Valve : STD-W-22
Meter Chamber	Denotes Water Meter	Meter Chamber : STD-W-26/30A
		Marker Posts & Plates : STD-W-27
	Denotes Existing Public Watermain	

Note: Refer to Irish Water Standard Details Drawings Document No. IW-CDS-5020-01

1. Mains should extend no more than 1.2m beyond the final Service Connection to mitigate dead-end Mains (Code of Practice for Water Infrastructure - Section 3.5)
2. Service connection pipes should be a minimum of 25mm ouside diameter, 20mm inside diameter, and should be provided with appropriately sized fittings. (Code of Practice for Water Infrastructure - Section 3.8)
3. Separation distances must be in compliance with Standard details & Code of Practice for Water Infrastructure
4. All meters in the manifold shall be tagged to indicate which property is supplied and any unused outlets are to be blanked off.

Proposed Watermain Layout 3 of 3
Scale : 1:500

DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

Joyce House
Barrack Square
Ballincollig
Cork
P31 KP84

021 4871781
info@dosa.ie
www.dosa.ie

REV.	DRAWN	CHKD	APPRVD	DATE	DETAILS
E	K.M.	S.O'G	S.O'G	16.10.24	Revised & Issued for LRD Application

CLIENT: Reside (Castlepark) Ltd.

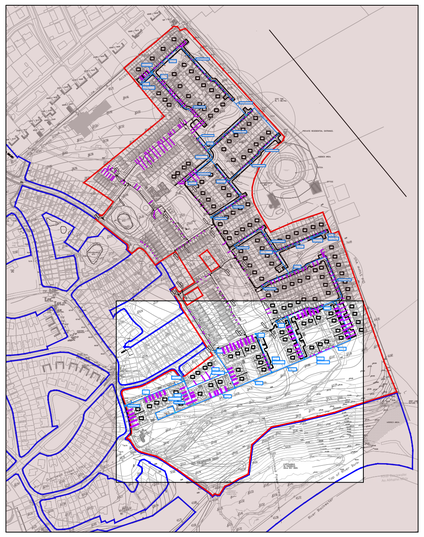
PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: Proposed Watermain Layout 2 of 3

SHEET: A1

SCALE: 1:500

PROJECT NO. 6621 _ DRAWING NO. 2031 _ STATUS/ISSUE E



Site Layout - Key Plan
Scale : 1:5000

Proposed Watermain Layout 3 of 3
Scale : 1:500

Proposed Connection point to Phase 01 Watermain
Proposed Connection point to existing watermain
100mmØ PE 100 - SDR 17 Watermain
Trench Backfill & Bedding Detail (STD-W-13)
Marker Posts/ Plates Detail (STD-W-27)
Off-line hydrant for Polyethylene (P.E.) Pipe Detail (STD-W-19)
Sluice Valve for Polyethylene (P.E.) Pipe Detail (STD-W-15)
Overhead Power Lines
KINGSFORT SQUARE
MAPLE SQ
HARDCORE
RIVERBANK WALK
PRESERVATION ORDER
EXISTING DWELLINGS FFL=70.43
EXISTING DWELLINGS FFL=69.10
EXISTING DWELLINGS FFL=67.93
EXISTING DWELLINGS FFL=67.00

Legend:

Watermain Details:		Document No. IW-CDS-5020-01	
88045	Denotes Connection Pipe (25mm O.D. PE Pipe)	Water Service Connection Responsibility :	STD-W-01
88051	Denotes Connection Pipe (32mm O.D. PE Pipe)	Customer Connection & Boundary Box :	STD-W-03
		Marker Posts & Plates :	STD-W-27
	Denotes 110/125mm O.D. HDPE Watermain	General Pipe Connections :	STD-W-04
		General Pipe Connections :	STD-W-05
	Denotes 80mm O.D. HDPE Watermain loop	General Pipe Connections :	STD-W-07
	Denotes 150mm Ø (I.D.) - HDPE Watermain	Trench Backfill and Bedding :	STD-W-13
		Watermain Thrust & Support Blocks :	STD-W-28
SV001	Denotes Sluice Valve	Sluice Valve :	STD-W-15
		Marker Posts & Plates :	STD-W-27
WO	Denotes Washout Hydrant	Washout Hydrant :	STD-W-30A
NRV	Denotes Non-Return Valve	On Line Hydrant :	STD-W-18
		Off Line Hydrant :	STD-W-19
FH003	Denotes Fire Hydrant	Marker Posts & Plates :	STD-W-27
AV001	Denotes Air Valve	Air Valve :	STD-W-22
Meter Chamber	Denotes Water Meter	Meter Chamber :	STD-W-26/26A
		Marker Posts & Plates :	STD-W-27
	Denotes Existing Public Watermain		

Note: Refer to Irish Water Standard Details Drawings Document No. IW-CDS-5020-01

1. Mains should extend no more than 1.2m beyond the final Service Connection to mitigate dead-end Mains (Code of Practice for Water Infrastructure - Section 3.5)
2. Service connection pipes should be a minimum of 20mm ouside diameter, 20mm inside diameter, and should be provided with appropriately sized fittings. (Code of Practice for Water Infrastructure - Section 3.8)
3. Separation distances must be in compliance with Standard details & Code of Practice for Water Infrastructure
4. All meters in the manifold shall be tagged to indicate which property is supplied and any unused outlets are to be blanked off.

DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

Joyce House
Barrack Square
Ballincollig
Cork
P31 KP84

021 4871781
info@dosa.ie
www.dosa.ie

REV.	DRAWN	CHKD	APPRVD	DATE	DETAILS
D	K.M.	S.O'G	S.O'G	16.10.24	Issued for LRD Application

CLIENT: Reside (Castlepark) Ltd.

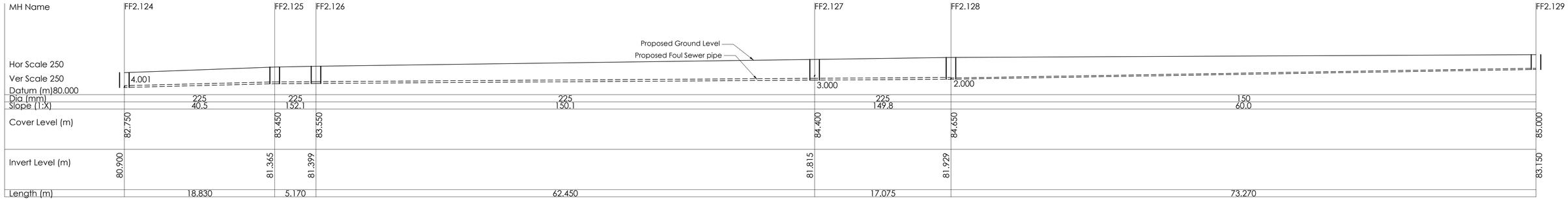
PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: Proposed Watermain Layout 3 of 3

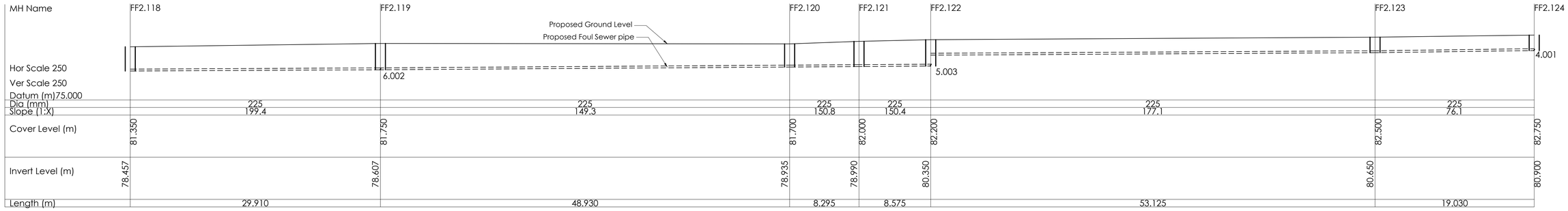
SHEET: A1

SCALE: 1:500

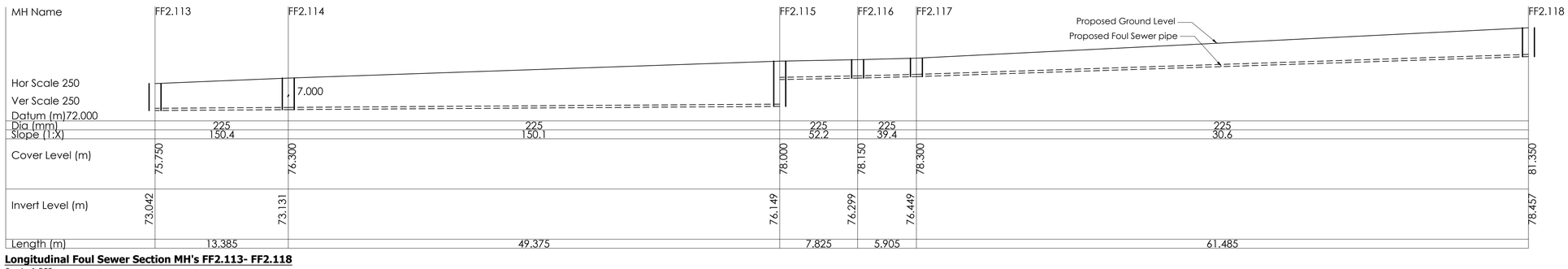
PROJECT NO. 6621 _ DRAWING NO. 2032 _ STATUS/ISSUE D



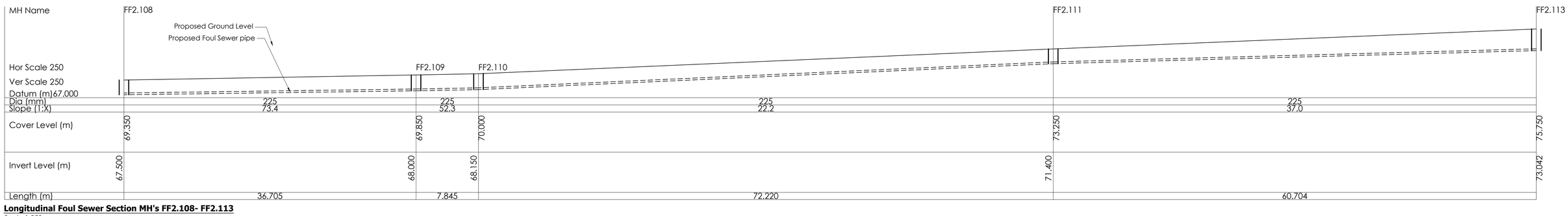
Longitudinal Foul Sewer Section MH's FF2.124- FF2.129
Scale 1:250



Longitudinal Foul Sewer Section MH's FF2.118- FF2.124
Scale 1:250



Longitudinal Foul Sewer Section MH's FF2.113- FF2.118
Scale 1:250



Longitudinal Foul Sewer Section MH's FF2.108- FF2.113
Scale 1:250

DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

Joyce House
Barrack Square
Ballincollig
Cork
P31 KP84

021 4871781
info@dosa.ie
www.dosa.ie

REV.	DRAWN	CHKD	APPRVD	DATE	DETAILS
C	A.G.	S.O'G	S.O'G	17.10.24	Issued for LRD Application
B	D.O'S	S.O'G	L.O'T	27.09.24	Issued For LRD Planning application

CLIENT: Reside (Castlepark) Ltd.

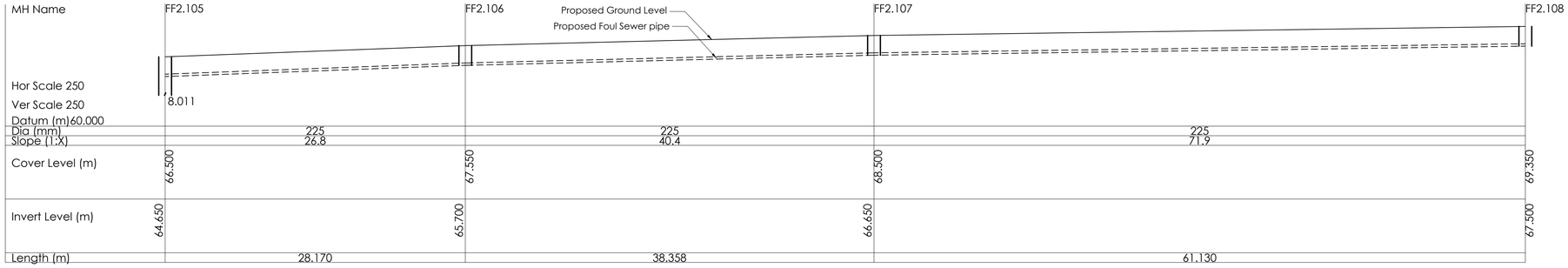
PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: Proposed Foul Sewer Longitudinal Sections (1 of 5)

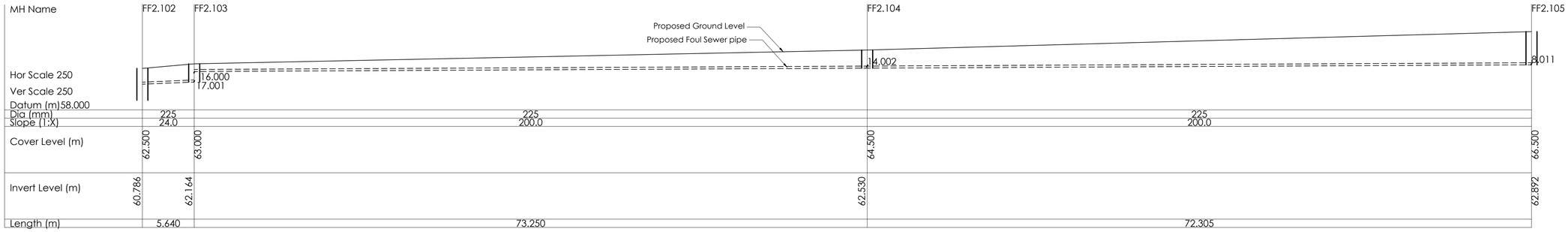
SHEET: A1

SCALE: 1:250

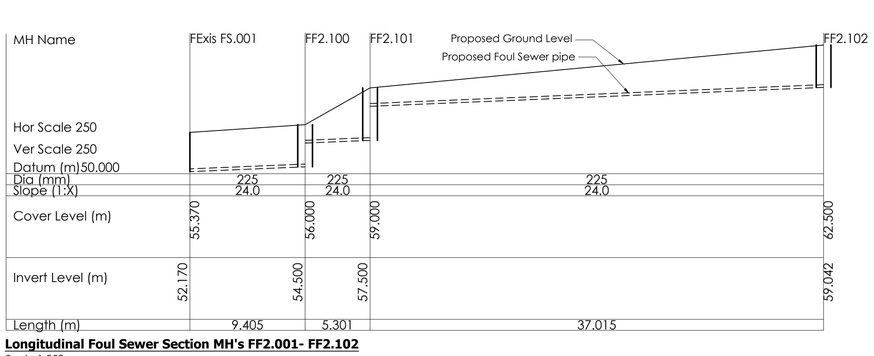
PROJECT NO.: 6621 _ DRAWING NO.: 2060 _ STATUS/ISSUE: C



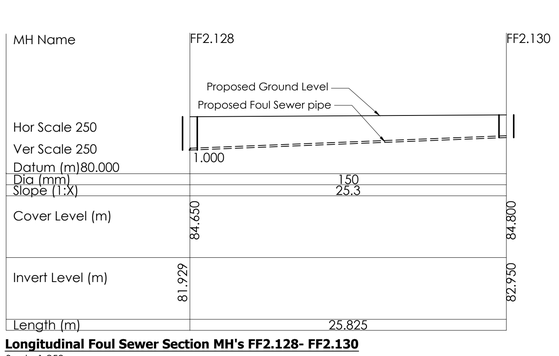
Longitudinal Foul Sewer Section MH's FF2.105- FF2.108
Scale 1:250



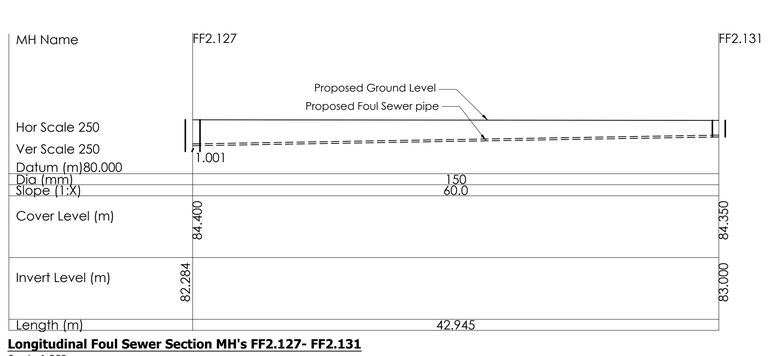
Longitudinal Foul Sewer Section MH's FF2.102- FF2.105
Scale 1:250



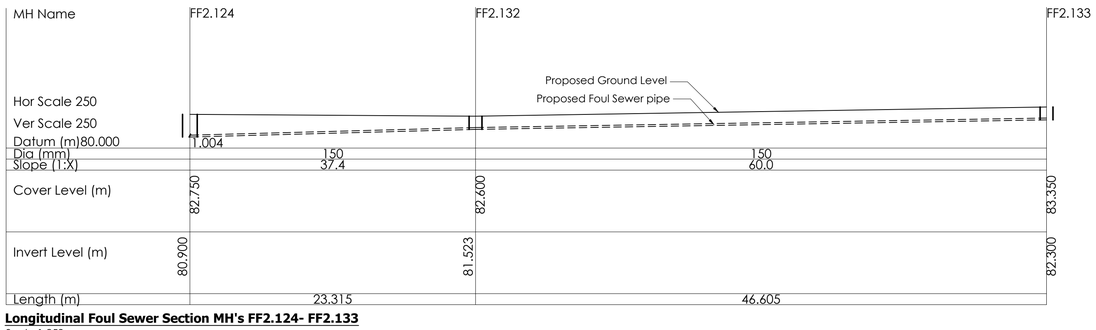
Longitudinal Foul Sewer Section MH's FF2.001- FF2.102
Scale 1:250



Longitudinal Foul Sewer Section MH's FF2.128- FF2.130
Scale 1:250



Longitudinal Foul Sewer Section MH's FF2.127- FF2.131
Scale 1:250



Longitudinal Foul Sewer Section MH's FF2.124- FF2.133
Scale 1:250

DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

Joyce House
Barrack Square
Ballincollig
Cork
P31 KP84

021 4871781
info@dosa.ie
www.dosa.ie

REV.	DRAWN	CHKD	APPRVD	DATE	DETAILS
B	D.O'S	S.O'G	L.O'T	27.09.24	Issued For LRD Planning application

CLIENT: Reside (Castlepark) Ltd.

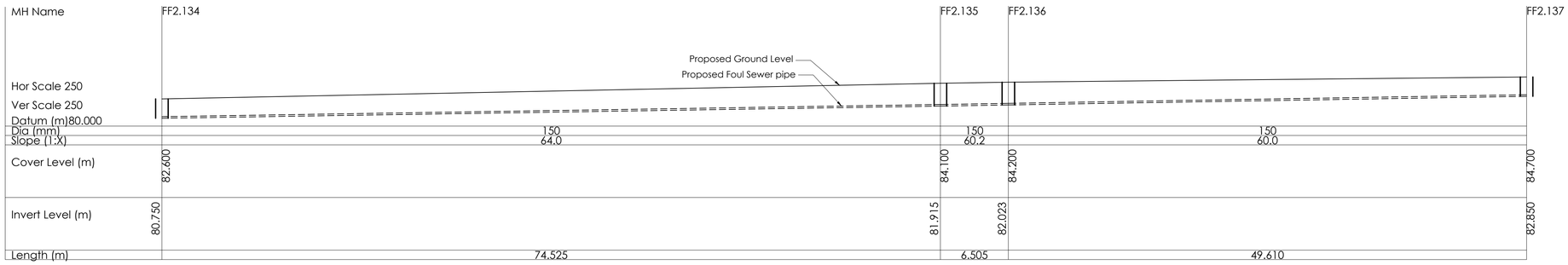
PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: Proposed Foul Sewer Longitudinal Sections (2 of 5)

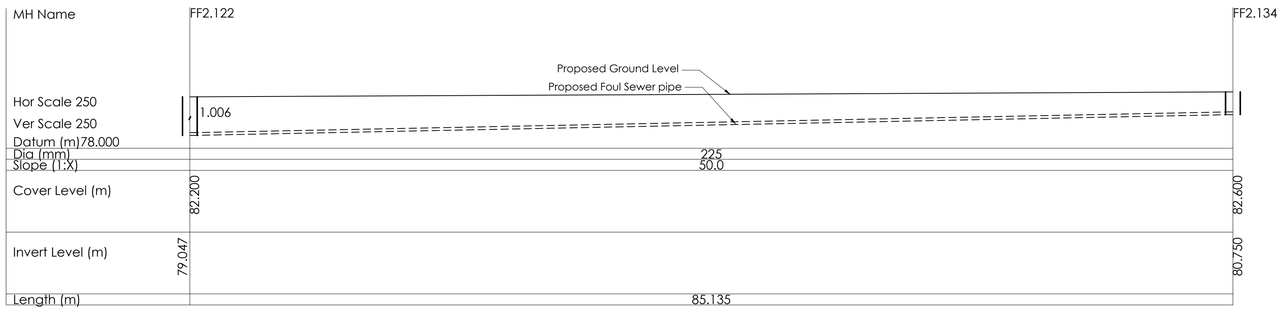
SHEET: A1

SCALE: 1:250

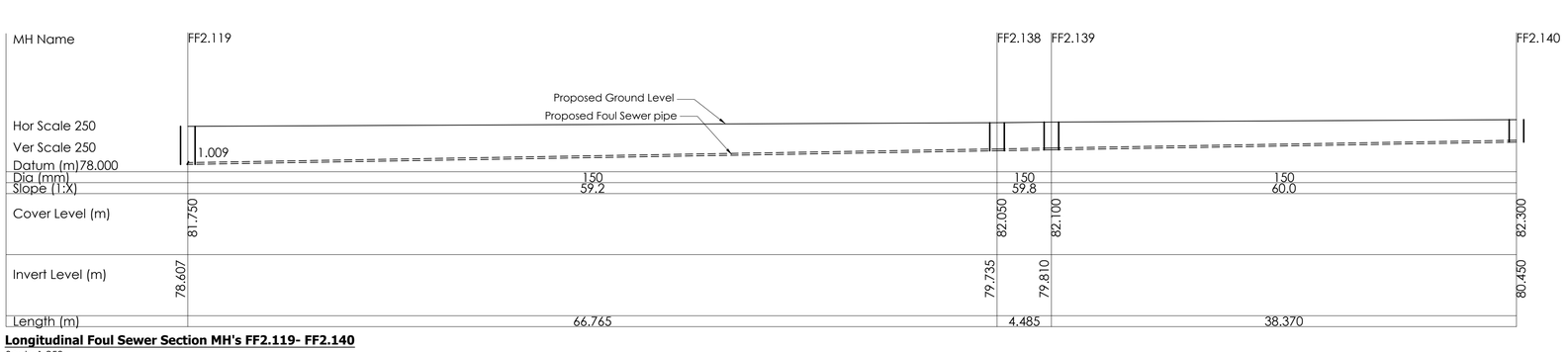
PROJECT NO. 6621 _ DRAWING NO. 2061 _ STATUS/ISSUE B



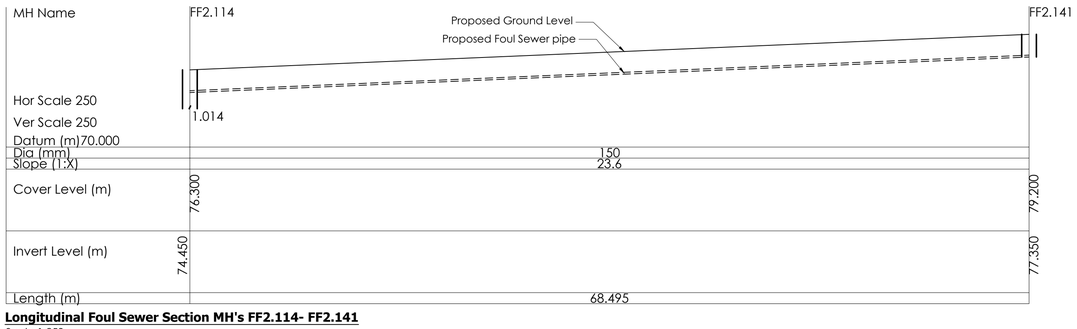
Longitudinal Foul Sewer Section MH's FF2.134- FF2.137
Scale 1:250



Longitudinal Foul Sewer Section MH's FF2.122- FF2.134
Scale 1:250



Longitudinal Foul Sewer Section MH's FF2.119- FF2.140
Scale 1:250



Longitudinal Foul Sewer Section MH's FF2.114- FF2.141
Scale 1:250

DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

Joyce House
Barrack Square
Ballincollig
Cork
P31 KP84

021 4871781
info@dosa.ie
www.dosa.ie

REV.	DRAWN	CHKD	APPRVD	DATE	DETAILS
B	D.O'S	S.O'G	L.O'T	27.09.24	Issued For LRD Planning application

CLIENT: Reside (Castlepark) Ltd.

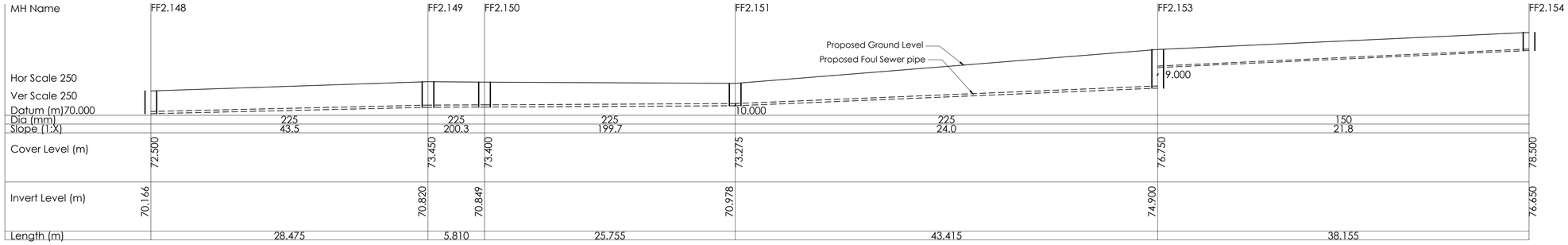
PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: Proposed Foul Sewer Longitudinal Sections (3 of 5)

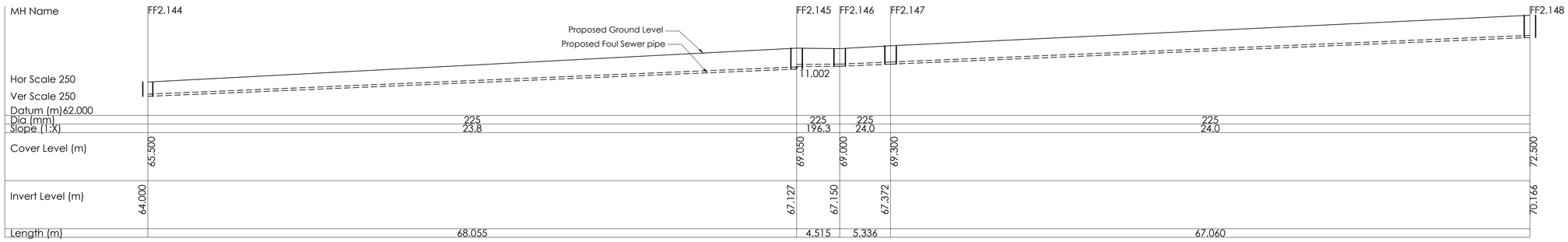
SHEET: A1

SCALE: 1:250

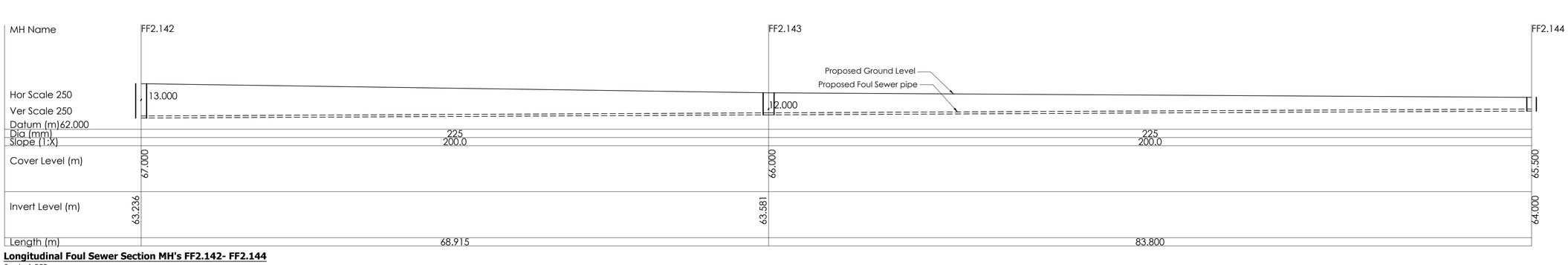
PROJECT NO. 6621 _ DRAWING NO. 2062 _ STATUS/ISSUE B



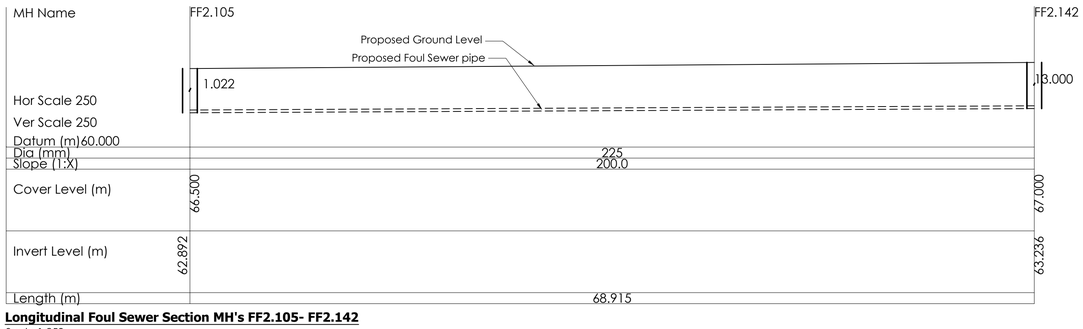
Longitudinal Foul Sewer Section MH's FF2.148- FF2.154
Scale 1:250



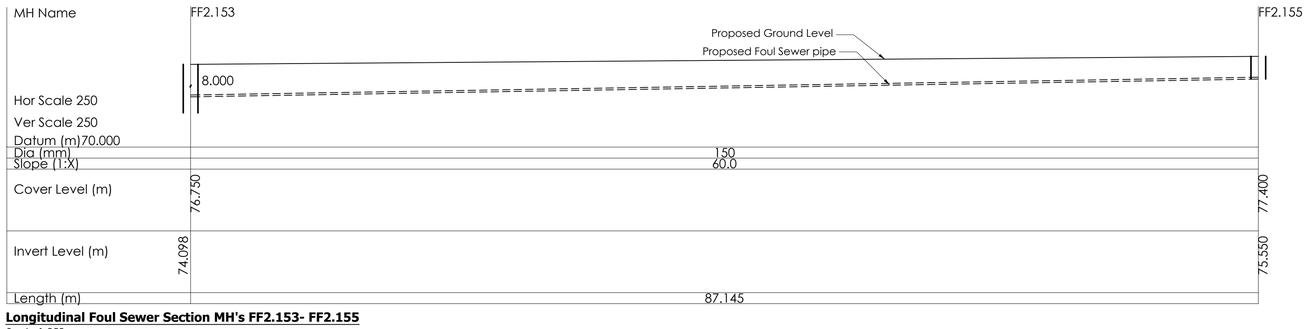
Longitudinal Foul Sewer Section MH's FF2.144- FF2.148
Scale 1:250



Longitudinal Foul Sewer Section MH's FF2.142- FF2.144
Scale 1:250



Longitudinal Foul Sewer Section MH's FF2.105- FF2.142
Scale 1:250



Longitudinal Foul Sewer Section MH's FF2.153- FF2.155
Scale 1:250

DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

Joyce House
Barrack Square
Ballincollig
Cork
P31 KP84

021 4871781
info@dosa.ie
www.dosa.ie

REV.	DRAWN	CHKD	APPRVD	DATE	DETAILS
B	D.O'S	S.O'G	L.O'T	27.09.24	Issued For LRD Planning application

CLIENT: Reside (Castlepark) Ltd.

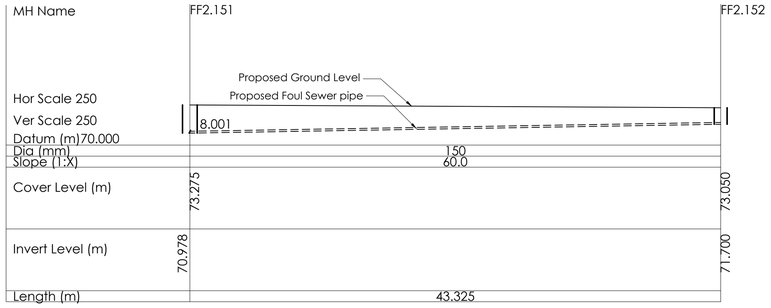
PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: Proposed Foul Sewer Longitudinal Sections (4 of 5)

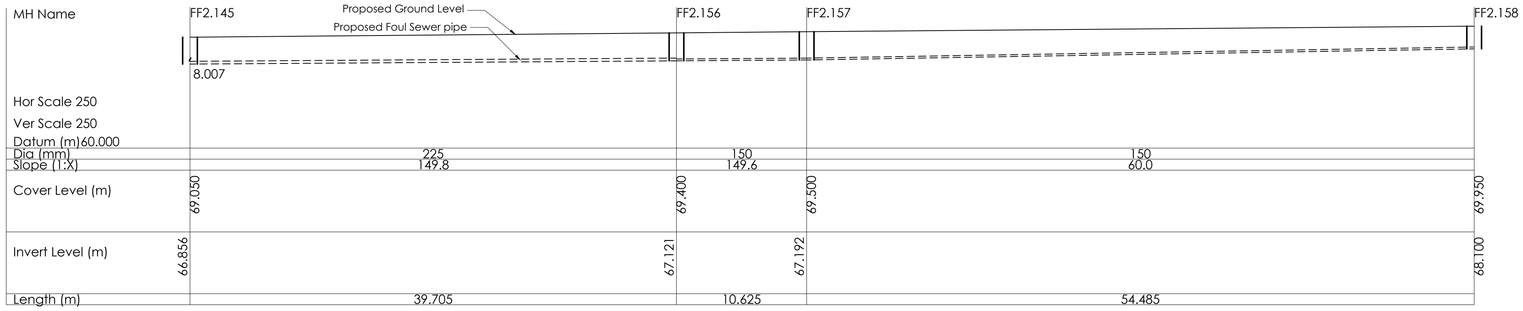
SHEET: A1

SCALE: 1:250

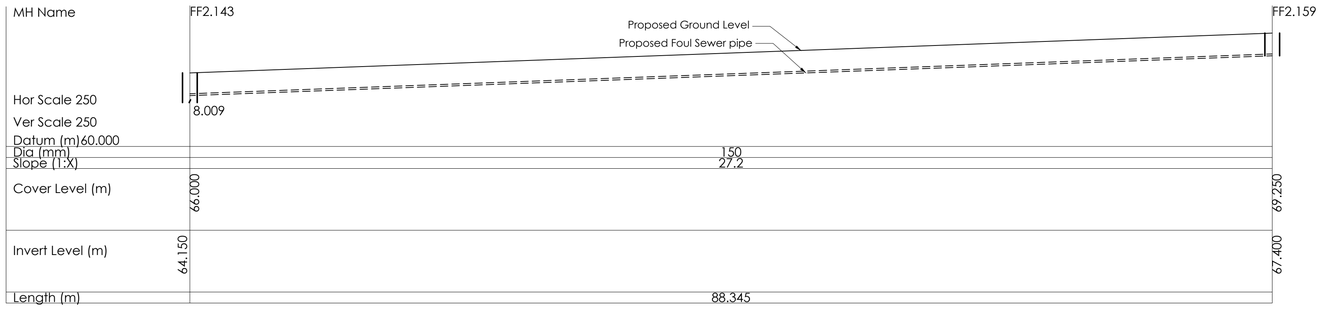
PROJECT NO. 6621 _ DRAWING NO. 2063 _ STATUS/ISSUE B



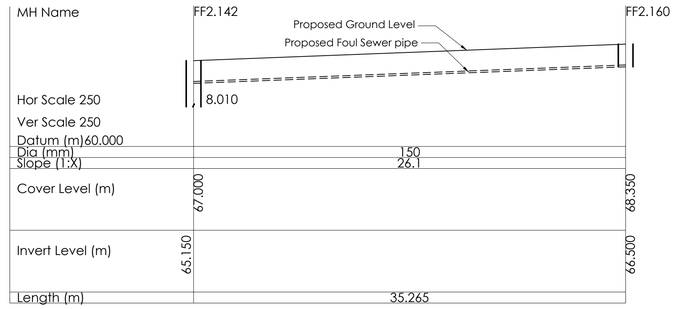
Longitudinal Foul Sewer Section MH's FF2.151- FF2.152
Scale 1:250



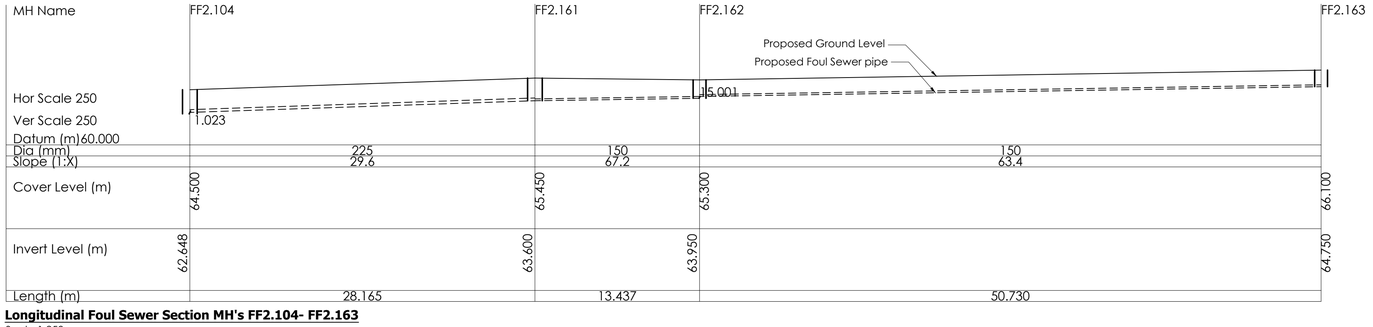
Longitudinal Foul Sewer Section MH's FF2.145- FF2.158
Scale 1:250



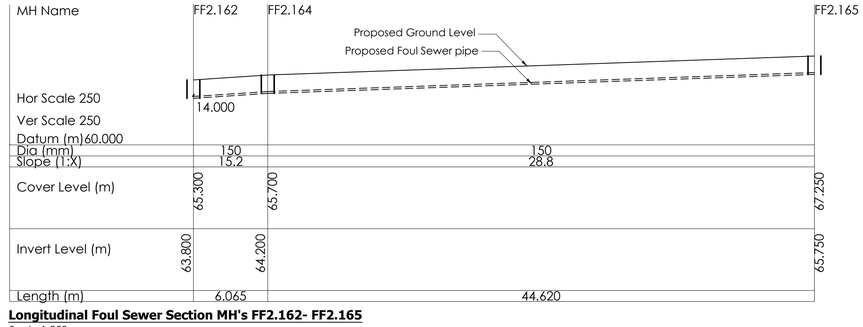
Longitudinal Foul Sewer Section MH's FF2.133- FF2.159
Scale 1:250



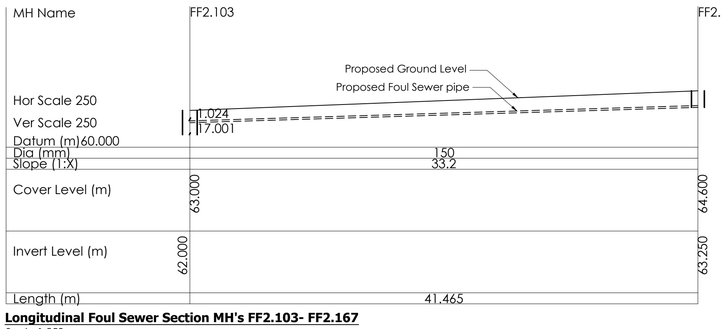
Longitudinal Foul Sewer Section MH's FF2.142- FF2.160
Scale 1:250



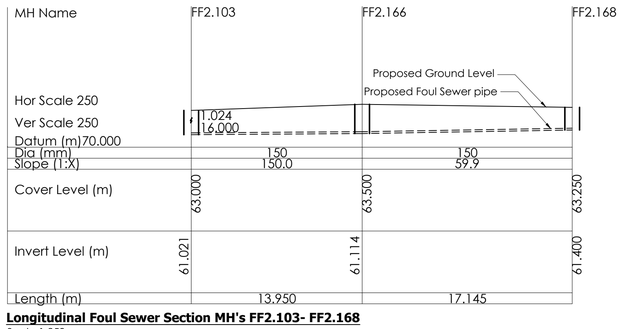
Longitudinal Foul Sewer Section MH's FF2.104- FF2.163
Scale 1:250



Longitudinal Foul Sewer Section MH's FF2.162- FF2.165
Scale 1:250



Longitudinal Foul Sewer Section MH's FF2.103- FF2.167
Scale 1:250



Longitudinal Foul Sewer Section MH's FF2.103- FF2.168
Scale 1:250

DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

Joyce House
Barrack Square
Ballincollig
Cork
P31 KP84

021 4871781
info@dosa.ie
www.dosa.ie

REV.	DRAWN	CHKD	APPRVD	DATE	DETAILS
B	D.O'S	S.O'G	L.O'T	27.09.24	Issued For LRD Planning application

CLIENT: Reside (Castlepark) Ltd.

PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: Proposed Foul Sewer Longitudinal Sections (5 of 5)

SHEET: A1

SCALE: 1:250

PROJECT NO. 6621 _ DRAWING NO. 2064 _ STATUS/ISSUE B

Appendix C – Allowable Runoff QBAR Values

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	12.777	Urban	0.000
SAAR (mm)	1000	Region Number	Ireland South

Results l/s

QBAR Rural	35.3
QBAR Urban	35.3
Q100 years	65.0
Q1 year	30.0
Q30 years	56.2
Q100 years	65.0

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	2.061	Urban	0.000
SAAR (mm)	1000	Region Number	Ireland South

Results l/s

QBAR Rural	5.7
QBAR Urban	5.7
Q100 years	10.5
Q1 year	4.8
Q30 years	9.1
Q100 years	10.5

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	1.257	Urban	0.000
SAAR (mm)	1000	Region Number	Ireland South

Results l/s

QBAR Rural	3.5
QBAR Urban	3.5
Q100 years	6.4
Q1 year	3.0
Q30 years	5.5
Q100 years	6.4

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 (%)	0
M5-60 (mm)	18.800	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	2.181	4-8	4.090	8-12	0.490

Total Area Contributing (ha) = 6.762

Total Pipe Volume (m³) = 249.959

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	69.590	0.350	198.8	0.200	5.00	0.0	0.600	o	225
S2.000	26.185	0.150	174.6	0.080	5.00	0.0	0.600	o	225
S1.001	13.900	0.200	69.5	0.035	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	6.26	83.500	0.200	0.0	0.0	0.0	0.92	36.7	27.1
S2.000	50.00	5.44	83.300	0.080	0.0	0.0	0.0	0.99	39.2	10.8
S1.001	50.00	6.40	83.150	0.315	0.0	0.0	0.0	1.57	62.5	42.7

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)
S3.000	56.765	0.340	167.0	0.054	5.00	0.0	0.600	o	225
S1.002	62.105	0.460	135.0	0.229	0.00	0.0	0.600	o	300
S1.003	8.034	0.250	32.1	0.020	0.00	0.0	0.600	o	300
S1.004	19.490	0.826	23.6	0.049	0.00	0.0	0.600	o	300
S4.000	46.320	0.750	61.8	0.048	5.00	0.0	0.600	o	225
S4.001	21.120	0.126	167.6	0.019	0.00	0.0	0.600	o	225
S1.005	20.480	0.123	166.5	0.025	0.00	0.0	0.600	o	375
S1.006	50.120	0.300	167.1	0.130	0.00	0.0	0.600	o	450
S5.000	49.250	0.500	98.5	0.135	5.00	0.0	0.600	o	225
S5.001	6.315	0.100	63.2	0.001	0.00	0.0	0.600	o	225
S5.002	74.945	1.500	50.0	0.095	0.00	0.0	0.600	o	225
S5.003	86.440	0.549	157.4	0.226	0.00	0.0	0.600	o	300
S1.007	10.750	0.064	168.0	0.005	0.00	0.0	0.600	o	450
S1.008	7.405	0.201	36.8	0.005	0.00	0.0	0.600	o	450
S1.009	48.415	0.484	100.0	0.079	0.00	0.0	0.600	o	450

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)
S3.000	50.00	5.94	82.850	0.054	0.0	0.0	0.0	1.01	40.1	7.3
S1.002	50.00	7.17	82.510	0.598	0.0	0.0	0.0	1.35	95.5	81.0
S1.003	50.00	7.22	82.050	0.618	0.0	0.0	0.0	2.78	196.7	83.7
S1.004	50.00	7.32	81.800	0.667	0.0	0.0	0.0	3.25	229.8	90.3
S4.000	50.00	5.46	81.850	0.048	0.0	0.0	0.0	1.67	66.3	6.5
S4.001	50.00	5.81	81.100	0.067	0.0	0.0	0.0	1.01	40.0	9.1
S1.005	50.00	7.56	80.974	0.759	0.0	0.0	0.0	1.40	154.8	102.8
S1.006	50.00	8.09	80.851	0.889	0.0	0.0	0.0	1.57	249.7	120.4
S5.000	50.00	5.62	83.200	0.135	0.0	0.0	0.0	1.32	52.4	18.3
S5.001	50.00	5.69	82.700	0.136	0.0	0.0	0.0	1.65	65.5	18.4
S5.002	50.00	6.36	82.600	0.231	0.0	0.0	0.0	1.85	73.8	31.3
S5.003	50.00	7.51	81.100	0.457	0.0	0.0	0.0	1.25	88.4	61.9
S1.007	50.00	8.21	80.551	1.351	0.0	0.0	0.0	1.57	249.0	182.9
S1.008	50.00	8.24	80.487	1.356	0.0	0.0	0.0	3.36	534.1	183.6
S1.009	50.00	8.64	80.286	1.435	0.0	0.0	0.0	2.03	323.3	194.3

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)
S6.000	41.695	0.250	166.8	0.105	5.00	0.0	0.600	o	225
S6.001	3.440	0.021	163.8	0.005	0.00	0.0	0.600	o	225
S6.002	63.845	0.382	167.1	0.121	0.00	0.0	0.600	o	225
S1.010	32.155	0.322	99.9	0.072	0.00	0.0	0.600	o	450
S1.011	65.870	2.830	23.3	0.163	0.00	0.0	0.600	o	450
S7.000	38.995	1.543	25.3	0.104	5.00	0.0	0.600	o	225
S8.000	7.155	0.043	166.4	0.050	5.00	0.0	0.600	o	225
S7.001	71.700	1.057	67.8	0.141	0.00	0.0	0.600	o	300
S1.012	5.450	0.200	27.3	0.001	0.00	0.0	0.600	o	450
S1.013	5.450	0.150	36.3	0.001	0.00	0.0	0.600	o	450
S1.014	52.685	1.054	50.0	2.179	0.00	0.0	0.600	o	525
S9.000	68.925	2.700	25.5	0.165	5.00	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)
S6.000	50.00	5.69	80.800	0.105	0.0	0.0	0.0	1.01	40.1	14.2
S6.001	50.00	5.74	80.550	0.110	0.0	0.0	0.0	1.02	40.5	14.9
S6.002	50.00	6.80	80.529	0.231	0.0	0.0	0.0	1.01	40.1	31.3
S1.010	50.00	8.90	79.802	1.738	0.0	0.0	0.0	2.03	323.6	235.3
S1.011	50.00	9.16	79.480	1.901	0.0	0.0	0.0	4.23	672.4	257.4
S7.000	50.00	5.25	79.250	0.104	0.0	0.0	0.0	2.61	103.9	14.1
S8.000	50.00	5.12	77.750	0.050	0.0	0.0	0.0	1.01	40.2	6.8
S7.001	50.00	5.87	77.707	0.295	0.0	0.0	0.0	1.91	135.1	39.9
S1.012	50.00	9.19	76.650	2.197	0.0	0.0	0.0	3.91	621.3	297.5
S1.013	50.00	9.21	76.450	2.198	0.0	0.0	0.0	3.38	537.8	297.6
S1.014	50.00	9.49	73.477	4.377	0.0	0.0	0.0	3.17	687.0	592.7
S9.000	50.00	5.44	77.500	0.165	0.0	0.0	0.0	2.60	103.4	22.3

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	13.200	0.264	50.0	0.005	0.00	0.0	0.600	o	525
S1.016	59.880	0.709	84.5	0.169	0.00	0.0	0.600	o	600
S1.017	7.300	0.250	29.2	0.000	0.00	0.0	0.600	o	600
S10.000	38.590	1.750	22.1	0.095	5.00	0.0	0.600	o	225
S11.000	89.845	0.898	100.1	0.222	5.00	0.0	0.600	o	225
S10.001	40.825	3.252	12.6	0.078	0.00	0.0	0.600	o	225
S12.000	18.955	0.114	166.3	0.046	5.00	0.0	0.600	o	225
S12.001	8.030	0.048	167.3	0.005	0.00	0.0	0.600	o	225
S12.002	25.270	0.151	167.4	0.056	0.00	0.0	0.600	o	225
S10.002	42.189	0.253	166.8	0.107	0.00	0.0	0.600	o	300
S10.003	23.800	0.143	166.4	0.050	0.00	0.0	0.600	o	375
S1.018	96.615	2.692	35.9	0.005	0.00	0.0	0.600	o	600
S1.019	5.855	0.146	40.1	0.005	0.00	0.0	0.600	o	600
S1.020	3.500	0.088	39.8	0.000	0.00	0.0	0.600	o	600

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	9.56	72.423	4.547	0.0	0.0	0.0	3.17	686.9	615.7
S1.016	50.00	9.94	72.159	4.716	0.0	0.0	0.0	2.65	749.6	638.6
S1.017	50.00	9.96	71.450	4.716	0.0	0.0	0.0	4.52	1277.4	638.6
S10.000	50.00	5.23	77.000	0.095	0.0	0.0	0.0	2.80	111.3	12.9
S11.000	50.00	6.15	75.900	0.222	0.0	0.0	0.0	1.31	52.0	30.1
S10.001	50.00	6.33	75.002	0.395	0.0	0.0	0.0	3.71	147.6	53.5
S12.000	50.00	5.31	71.500	0.046	0.0	0.0	0.0	1.01	40.2	6.2
S12.001	50.00	5.45	71.386	0.051	0.0	0.0	0.0	1.01	40.1	6.9
S12.002	50.00	5.86	71.338	0.107	0.0	0.0	0.0	1.01	40.1	14.5
S10.002	50.00	6.91	71.187	0.609	0.0	0.0	0.0	1.21	85.9	82.5
S10.003	50.00	7.19	70.934	0.659	0.0	0.0	0.0	1.40	154.8	89.2
S1.018	50.00	10.36	70.791	5.380	0.0	0.0	0.0	4.07	1151.9	728.5
S1.019	50.00	10.38	68.099	5.385	0.0	0.0	0.0	3.85	1089.5	729.2
S1.020	50.00	10.40	67.953	5.385	0.0	0.0	0.0	3.87	1094.0	729.2

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)
S1.021	96.945	3.166	30.6	0.395	0.00	0.0	0.600	o	600
S13.000	63.950	3.100	20.6	0.204	5.00	0.0	0.600	o	225
S13.001	6.513	0.300	21.7	0.005	0.00	0.0	0.600	o	225
S13.002	6.230	0.050	124.6	0.001	0.00	0.0	0.600	o	225
S14.000	54.675	0.500	109.4	0.130	5.00	0.0	0.600	o	225
S14.001	11.285	0.100	112.9	0.045	0.00	0.0	0.600	o	225
S14.002	41.595	0.350	118.8	0.089	0.00	0.0	0.600	o	225
S13.003	68.520	3.050	22.5	0.230	0.00	0.0	0.600	o	225
S13.004	83.280	0.416	200.2	0.093	0.00	0.0	0.600	o	375
S15.000	66.295	3.250	20.4	0.185	5.00	0.0	0.600	o	225
S13.005	76.350	0.382	199.9	0.000	0.00	0.0	0.600	o	375
S1.022	85.715	5.202	16.5	0.000	0.00	0.0	0.600	o	600
S1.023	26.630	0.266	100.1	0.000	0.00	0.0	0.600	o	675
S1.024	25.090	4.234	5.9	0.000	0.00	0.0	0.600	o	300

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)
S1.021	50.00	10.77	67.865	5.780	0.0	0.0	0.0	4.41	1247.3	782.7
S13.000	50.00	5.37	71.000	0.204	0.0	0.0	0.0	2.89	115.1	27.6
S13.001	50.00	5.41	67.900	0.209	0.0	0.0	0.0	2.82	112.2	28.3
S13.002	50.00	5.50	67.600	0.210	0.0	0.0	0.0	1.17	46.5	28.4
S14.000	50.00	5.73	68.500	0.130	0.0	0.0	0.0	1.25	49.7	17.6
S14.001	50.00	5.88	68.000	0.175	0.0	0.0	0.0	1.23	48.9	23.7
S14.002	50.00	6.46	67.900	0.264	0.0	0.0	0.0	1.20	47.6	35.7
S13.003	50.00	6.87	67.550	0.704	0.0	0.0	0.0	2.77	110.2	95.3
S13.004	50.00	7.96	64.500	0.797	0.0	0.0	0.0	1.28	141.0	107.9
S15.000	50.00	5.38	67.750	0.185	0.0	0.0	0.0	2.91	115.7	25.1
S13.005	50.00	8.96	64.084	0.982	0.0	0.0	0.0	1.28	141.1	133.0
S1.022	50.00	11.00	63.702	6.762	0.0	0.0	0.0	6.02	1701.7	915.7
S1.023	50.00	11.17	58.500	6.762	0.0	0.0	0.0	2.62	937.4	915.7
S1.024	50.00	5.06	58.234	0.000	35.3	0.0	0.0	6.50	459.4	35.3

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)
SS2.124	85.000	1.500	1050	S1.000	83.500	225				
SS2.125	84.800	1.500	1050	S2.000	83.300	225				
SS2.123	84.650	1.500	1050	S1.001	83.150	225	S1.000	83.150	225	
							S2.000	83.150	225	
SS2.126	84.350	1.500	1050	S3.000	82.850	225				
SS2.122	84.400	1.890	1200	S1.002	82.510	300	S1.001	82.950	225	365
							S3.000	82.510	225	
SS2.121	83.550	1.500	1050	S1.003	82.050	300	S1.002	82.050	300	
SS2.120	83.300	1.500	1050	S1.004	81.800	300	S1.003	81.800	300	
SS2.128	83.350	1.500	1050	S4.000	81.850	225				
SS2.127	82.600	1.500	1050	S4.001	81.100	225	S4.000	81.100	225	
SS2.119	82.750	1.776	1350	S1.005	80.974	375	S1.004	80.974	300	
							S4.001	80.974	225	
SS2.118	82.500	1.649	1350	S1.006	80.851	450	S1.005	80.851	375	
SS2.132	84.700	1.500	1050	S5.000	83.200	225				
SS2.131	84.200	1.500	1050	S5.001	82.700	225	S5.000	82.700	225	
SS2.130	84.100	1.500	1050	S5.002	82.600	225	S5.001	82.600	225	
SS2.129	82.600	1.500	1050	S5.003	81.100	300	S5.002	81.100	225	
SS2.117	82.200	1.649	1350	S1.007	80.551	450	S1.006	80.551	450	
							S5.003	80.551	300	
SS2.116	82.000	1.513	1350	S1.008	80.487	450	S1.007	80.487	450	
SS2.115	81.800	1.514	1350	S1.009	80.286	450	S1.008	80.286	450	
SS2.135	82.300	1.500	1050	S6.000	80.800	225				
SS2.134	82.100	1.550	1050	S6.001	80.550	225	S6.000	80.550	225	
SS2.133	82.050	1.521	1050	S6.002	80.529	225	S6.001	80.529	225	
SS2.114	81.750	1.948	1350	S1.010	79.802	450	S1.009	79.802	450	
							S6.002	80.147	225	120
SS2.113	81.350	1.870	1350	S1.011	79.480	450	S1.010	79.480	450	
SS2.137	80.750	1.500	1050	S7.000	79.250	225				
SS2.136	79.250	1.500	1050	S8.000	77.750	225				
SS2.135	79.500	1.793	1050	S7.001	77.707	300	S7.000	77.707	225	
							S8.000	77.707	225	
SS2.112	78.300	1.650	1350	S1.012	76.650	450	S1.011	76.650	450	
							S7.001	76.650	300	
SS2.111A	78.150	1.700	1350	S1.013	76.450	450	S1.012	76.450	450	
SS2.111	78.000	4.523	1500	S1.014	73.477	525	S1.013	76.300	450	2748
SS2.138	79.000	1.500	1050	S9.000	77.500	225				
SS2.110	76.300	3.877	1500	S1.015	72.423	525	S1.014	72.423	525	
							S9.000	74.800	225	2077
SS2.109	75.750	3.591	1500	S1.016	72.159	600	S1.015	72.159	525	
SS2.108	73.250	1.800	1500	S1.017	71.450	600	S1.016	71.450	600	
SS2.143	78.500	1.500	1050	S10.000	77.000	225				
SS2.142	77.400	1.500	1050	S11.000	75.900	225				
SS2.141	76.750	1.748	1200	S10.001	75.002	225	S10.000	75.250	225	248
							S11.000	75.002	225	
SS2.146	73.000	1.500	1050	S12.000	71.500	225				

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)
SS2.145	73.450	2.064	1200	S12.001	71.386	225	S12.000	71.386	225	
SS2.144	73.400	2.062	1200	S12.002	71.338	225	S12.001	71.338	225	
SS2.140	73.300	2.113	1200	S10.002	71.187	300	S10.001	71.750	225	488
							S12.002	71.187	225	
SS2.139	73.050	2.116	1350	S10.003	70.934	375	S10.002	70.934	300	
SS2.107	73.000	2.209	1500	S1.018	70.791	600	S1.017	71.200	600	409
							S10.003	70.791	375	
SS2.106	69.900	1.801	1500	S1.019	68.099	600	S1.018	68.099	600	
SS2.105	69.850	1.897	1500	S1.020	67.953	600	S1.019	67.953	600	
SS2.104	69.400	1.535	1500	S1.021	67.865	600	S1.020	67.865	600	
SS2.152	72.500	1.500	1050	S13.000	71.000	225				
SS2.151	69.400	1.500	1050	S13.001	67.900	225	S13.000	67.900	225	
SS2.150	69.100	1.500	1050	S13.002	67.600	225	S13.001	67.600	225	
SS2.155	70.000	1.500	1050	S14.000	68.500	225				
SS2.154	69.500	1.500	1050	S14.001	68.000	225	S14.000	68.000	225	
SS2.153	69.400	1.500	1050	S14.002	67.900	225	S14.001	67.900	225	
SS2.149	69.050	1.500	1050	S13.003	67.550	225	S13.002	67.550	225	
							S14.002	67.550	225	
SS2.148	66.000	1.500	1350	S13.004	64.500	375	S13.003	64.500	225	
SS2.156	69.250	1.500	1050	S15.000	67.750	225				
SS2.147	66.000	1.916	1350	S13.005	64.084	375	S13.004	64.084	375	
							S15.000	64.500	225	266
SS2.103	66.500	2.798	1500	S1.022	63.702	600	S1.021	64.699	600	997
							S13.005	63.702	375	
SS2.102	60.000	1.500	1500	S1.023	58.500	675	S1.022	58.500	600	
SS2.101	59.500	1.266	1500	S1.024	58.234	300	S1.023	58.234	675	
SS2.100	55.000	1.000	0		OUTFALL		S1.024	54.000	300	

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	SS2.124	85.000	83.500	1.275	1050
S2.000	o	225	SS2.125	84.800	83.300	1.275	1050
S1.001	o	225	SS2.123	84.650	83.150	1.275	1050
S3.000	o	225	SS2.126	84.350	82.850	1.275	1050
S1.002	o	300	SS2.122	84.400	82.510	1.590	1200
S1.003	o	300	SS2.121	83.550	82.050	1.200	1050
S1.004	o	300	SS2.120	83.300	81.800	1.200	1050
S4.000	o	225	SS2.128	83.350	81.850	1.275	1050
S4.001	o	225	SS2.127	82.600	81.100	1.275	1050
S1.005	o	375	SS2.119	82.750	80.974	1.401	1350
S1.006	o	450	SS2.118	82.500	80.851	1.199	1350
S5.000	o	225	SS2.132	84.700	83.200	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	69.590	198.8	SS2.123	84.650	83.150	1.275	1050
S2.000	26.185	174.6	SS2.123	84.650	83.150	1.275	1050
S1.001	13.900	69.5	SS2.122	84.400	82.950	1.225	1200
S3.000	56.765	167.0	SS2.122	84.400	82.510	1.665	1200
S1.002	62.105	135.0	SS2.121	83.550	82.050	1.200	1050
S1.003	8.034	32.1	SS2.120	83.300	81.800	1.200	1050
S1.004	19.490	23.6	SS2.119	82.750	80.974	1.476	1350
S4.000	46.320	61.8	SS2.127	82.600	81.100	1.275	1050
S4.001	21.120	167.6	SS2.119	82.750	80.974	1.551	1350
S1.005	20.480	166.5	SS2.118	82.500	80.851	1.274	1350
S1.006	50.120	167.1	SS2.117	82.200	80.551	1.199	1350
S5.000	49.250	98.5	SS2.131	84.200	82.700	1.275	1050

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)
S5.001	o	225	SS2.131	84.200	82.700	1.275	1050
S5.002	o	225	SS2.130	84.100	82.600	1.275	1050
S5.003	o	300	SS2.129	82.600	81.100	1.200	1050
S1.007	o	450	SS2.117	82.200	80.551	1.199	1350
S1.008	o	450	SS2.116	82.000	80.487	1.063	1350
S1.009	o	450	SS2.115	81.800	80.286	1.064	1350
S6.000	o	225	SS2.135	82.300	80.800	1.275	1050
S6.001	o	225	SS2.134	82.100	80.550	1.325	1050
S6.002	o	225	SS2.133	82.050	80.529	1.296	1050
S1.010	o	450	SS2.114	81.750	79.802	1.498	1350
S1.011	o	450	SS2.113	81.350	79.480	1.420	1350
S7.000	o	225	SS2.137	80.750	79.250	1.275	1050
S8.000	o	225	SS2.136	79.250	77.750	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)
S5.001	6.315	63.2	SS2.130	84.100	82.600	1.275	1050
S5.002	74.945	50.0	SS2.129	82.600	81.100	1.275	1050
S5.003	86.440	157.4	SS2.117	82.200	80.551	1.349	1350
S1.007	10.750	168.0	SS2.116	82.000	80.487	1.063	1350
S1.008	7.405	36.8	SS2.115	81.800	80.286	1.064	1350
S1.009	48.415	100.0	SS2.114	81.750	79.802	1.498	1350
S6.000	41.695	166.8	SS2.134	82.100	80.550	1.325	1050
S6.001	3.440	163.8	SS2.133	82.050	80.529	1.296	1050
S6.002	63.845	167.1	SS2.114	81.750	80.147	1.378	1350
S1.010	32.155	99.9	SS2.113	81.350	79.480	1.420	1350
S1.011	65.870	23.3	SS2.112	78.300	76.650	1.200	1350
S7.000	38.995	25.3	SS2.135	79.500	77.707	1.568	1050
S8.000	7.155	166.4	SS2.135	79.500	77.707	1.568	1050

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)
S7.001	o	300	SS2.135	79.500	77.707	1.493	1050
S1.012	o	450	SS2.112	78.300	76.650	1.200	1350
S1.013	o	450	SS2.111A	78.150	76.450	1.250	1350
S1.014	o	525	SS2.111	78.000	73.477	3.998	1500
S9.000	o	225	SS2.138	79.000	77.500	1.275	1050
S1.015	o	525	SS2.110	76.300	72.423	3.352	1500
S1.016	o	600	SS2.109	75.750	72.159	2.991	1500
S1.017	o	600	SS2.108	73.250	71.450	1.200	1500
S10.000	o	225	SS2.143	78.500	77.000	1.275	1050
S11.000	o	225	SS2.142	77.400	75.900	1.275	1050
S10.001	o	225	SS2.141	76.750	75.002	1.523	1200
S12.000	o	225	SS2.146	73.000	71.500	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)
S7.001	71.700	67.8	SS2.112	78.300	76.650	1.350	1350
S1.012	5.450	27.3	SS2.111A	78.150	76.450	1.250	1350
S1.013	5.450	36.3	SS2.111	78.000	76.300	1.250	1500
S1.014	52.685	50.0	SS2.110	76.300	72.423	3.352	1500
S9.000	68.925	25.5	SS2.110	76.300	74.800	1.275	1500
S1.015	13.200	50.0	SS2.109	75.750	72.159	3.066	1500
S1.016	59.880	84.5	SS2.108	73.250	71.450	1.200	1500
S1.017	7.300	29.2	SS2.107	73.000	71.200	1.200	1500
S10.000	38.590	22.1	SS2.141	76.750	75.250	1.275	1200
S11.000	89.845	100.1	SS2.141	76.750	75.002	1.523	1200
S10.001	40.825	12.6	SS2.140	73.300	71.750	1.325	1200
S12.000	18.955	166.3	SS2.145	73.450	71.386	1.839	1200

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)
S12.001	o	225	SS2.145	73.450	71.386	1.839	1200
S12.002	o	225	SS2.144	73.400	71.338	1.837	1200
S10.002	o	300	SS2.140	73.300	71.187	1.813	1200
S10.003	o	375	SS2.139	73.050	70.934	1.741	1350
S1.018	o	600	SS2.107	73.000	70.791	1.609	1500
S1.019	o	600	SS2.106	69.900	68.099	1.201	1500
S1.020	o	600	SS2.105	69.850	67.953	1.297	1500
S1.021	o	600	SS2.104	69.400	67.865	0.935	1500
S13.000	o	225	SS2.152	72.500	71.000	1.275	1050
S13.001	o	225	SS2.151	69.400	67.900	1.275	1050
S13.002	o	225	SS2.150	69.100	67.600	1.275	1050
S14.000	o	225	SS2.155	70.000	68.500	1.275	1050
S14.001	o	225	SS2.154	69.500	68.000	1.275	1050
S14.002	o	225	SS2.153	69.400	67.900	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)
S12.001	8.030	167.3	SS2.144	73.400	71.338	1.837	1200
S12.002	25.270	167.4	SS2.140	73.300	71.187	1.888	1200
S10.002	42.189	166.8	SS2.139	73.050	70.934	1.816	1350
S10.003	23.800	166.4	SS2.107	73.000	70.791	1.834	1500
S1.018	96.615	35.9	SS2.106	69.900	68.099	1.201	1500
S1.019	5.855	40.1	SS2.105	69.850	67.953	1.297	1500
S1.020	3.500	39.8	SS2.104	69.400	67.865	0.935	1500
S1.021	96.945	30.6	SS2.103	66.500	64.699	1.201	1500
S13.000	63.950	20.6	SS2.151	69.400	67.900	1.275	1050
S13.001	6.513	21.7	SS2.150	69.100	67.600	1.275	1050
S13.002	6.230	124.6	SS2.149	69.050	67.550	1.275	1050
S14.000	54.675	109.4	SS2.154	69.500	68.000	1.275	1050
S14.001	11.285	112.9	SS2.153	69.400	67.900	1.275	1050
S14.002	41.595	118.8	SS2.149	69.050	67.550	1.275	1050

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)
S13.003	o	225	SS2.149	69.050	67.550	1.275	1050
S13.004	o	375	SS2.148	66.000	64.500	1.125	1350
S15.000	o	225	SS2.156	69.250	67.750	1.275	1050
S13.005	o	375	SS2.147	66.000	64.084	1.541	1350
S1.022	o	600	SS2.103	66.500	63.702	2.198	1500
S1.023	o	675	SS2.102	60.000	58.500	0.825	1500
S1.024	o	300	SS2.101	59.500	58.234	0.966	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S13.003	68.520	22.5	SS2.148	66.000	64.500	1.275	1350
S13.004	83.280	200.2	SS2.147	66.000	64.084	1.541	1350
S15.000	66.295	20.4	SS2.147	66.000	64.500	1.275	1350
S13.005	76.350	199.9	SS2.103	66.500	63.702	2.423	1500
S1.022	85.715	16.5	SS2.102	60.000	58.500	0.900	1500
S1.023	26.630	100.1	SS2.101	59.500	58.234	0.591	1500
S1.024	25.090	5.9	SS2.100	55.000	54.000	0.700	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)
S1.024	SS2.100	55.000	54.000	54.000	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	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	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)	18.800	Storm Duration (mins)	30
Ratio R	0.250		

Online Controls for Storm

Hydro-Brake® Manhole: SS2.101, DS/PN: S1.024, Volume (m³): 11.2

Design Head (m) 1.000 Diameter (mm) 237
Design Flow (l/s) 35.3 Invert Level (m) 58.234
Hydro-Brake® Type Md5 SW Only

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.5	1.200	37.7	3.000	58.6	7.000	89.4
0.200	20.9	1.400	40.3	3.500	63.2	7.500	92.6
0.300	29.8	1.600	42.9	4.000	67.6	8.000	95.6
0.400	33.4	1.800	45.4	4.500	71.7	8.500	98.6
0.500	34.3	2.000	47.8	5.000	75.6	9.000	101.4
0.600	34.1	2.200	50.1	5.500	79.3	9.500	104.2
0.800	34.0	2.400	52.4	6.000	82.8		
1.000	35.4	2.600	54.5	6.500	86.2		

Storage Structures for Storm

Tank or Pond Manhole: SS2.101, DS/PN: S1.024

Invert Level (m) 58.234

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2655.0	1.000	2655.0

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%					
S2.000	15 Winter	2	0%					
S1.001	15 Winter	2	0%					
S3.000	15 Winter	2	0%					
S1.002	15 Winter	2	0%					
S1.003	15 Winter	2	0%					
S1.004	15 Winter	2	0%					
S4.000	15 Winter	2	0%					
S4.001	15 Winter	2	0%					
S1.005	15 Winter	2	0%					
S1.006	15 Winter	2	0%					
S5.000	15 Winter	2	0%					
S5.001	15 Winter	2	0%					
S5.002	15 Winter	2	0%					
S5.003	15 Winter	2	0%					
S1.007	15 Winter	2	0%					
S1.008	15 Winter	2	0%					
S1.009	15 Winter	2	0%					
S6.000	15 Winter	2	0%					
S6.001	15 Winter	2	0%					
S6.002	15 Winter	2	0%					
S1.010	15 Winter	2	0%					
S1.011	15 Winter	2	0%					
S7.000	15 Winter	2	0%					
S8.000	15 Winter	2	0%					
S7.001	15 Winter	2	0%					
S1.012	15 Winter	2	0%					
S1.013	15 Winter	2	0%	2/15 Winter				
S1.014	15 Winter	2	0%					
S9.000	15 Winter	2	0%					
S1.015	15 Winter	2	0%	2/15 Summer				
S1.016	15 Winter	2	0%					
S1.017	15 Winter	2	0%					
S10.000	15 Winter	2	0%					
S11.000	15 Winter	2	0%					
S10.001	15 Winter	2	0%					
S12.000	15 Winter	2	0%					
S12.001	15 Winter	2	0%					

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S12.002	15 Winter	2	0%					
S10.002	15 Winter	2	0%					
S10.003	15 Winter	2	0%					
S1.018	15 Winter	2	0%					
S1.019	15 Winter	2	0%	2/15 Summer				
S1.020	15 Winter	2	0%	2/15 Summer				
S1.021	15 Winter	2	0%					
S13.000	15 Winter	2	0%					
S13.001	15 Winter	2	0%					
S13.002	15 Winter	2	0%					
S14.000	15 Winter	2	0%					
S14.001	15 Winter	2	0%					
S14.002	15 Winter	2	0%					
S13.003	15 Winter	2	0%					
S13.004	15 Winter	2	0%					
S15.000	15 Winter	2	0%					
S13.005	15 Winter	2	0%					
S1.022	15 Winter	2	0%					
S1.023	15 Winter	2	0%	2/15 Winter				
S1.024	960 Winter	2	0%	2/60 Winter				

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	SS2.124	83.660	-0.065	0.000	0.78	0.0	27.8	OK
S2.000	SS2.125	83.390	-0.135	0.000	0.33	0.0	11.8	OK
S1.001	SS2.123	83.304	-0.071	0.000	0.80	0.0	43.4	OK
S3.000	SS2.126	82.920	-0.155	0.000	0.20	0.0	7.8	OK
S1.002	SS2.122	82.727	-0.083	0.000	0.84	0.0	76.8	OK
S1.003	SS2.121	82.224	-0.126	0.000	0.63	0.0	78.5	OK
S1.004	SS2.120	81.936	-0.164	0.000	0.42	0.0	83.8	OK
S4.000	SS2.128	81.901	-0.174	0.000	0.11	0.0	7.1	OK
S4.001	SS2.127	81.231	-0.095	0.000	0.24	0.0	8.7	OK
S1.005	SS2.119	81.214	-0.135	0.000	0.73	0.0	95.0	OK
S1.006	SS2.118	81.071	-0.230	0.000	0.47	0.0	107.8	OK
S5.000	SS2.132	83.300	-0.125	0.000	0.40	0.0	19.8	OK
S5.001	SS2.131	82.806	-0.119	0.000	0.45	0.0	20.0	OK
S5.002	SS2.130	82.705	-0.120	0.000	0.43	0.0	31.0	OK
S5.003	SS2.129	81.285	-0.115	0.000	0.66	0.0	56.1	OK
S1.007	SS2.117	80.899	-0.102	0.000	0.95	0.0	160.9	OK
S1.008	SS2.116	80.749	-0.188	0.000	0.64	0.0	161.4	OK
S1.009	SS2.115	80.531	-0.205	0.000	0.57	0.0	166.6	OK
S6.000	SS2.135	80.901	-0.124	0.000	0.40	0.0	15.4	OK
S6.001	SS2.134	80.691	-0.084	0.000	0.59	0.0	15.8	OK
S6.002	SS2.133	80.682	-0.072	0.000	0.79	0.0	30.7	OK
S1.010	SS2.114	80.083	-0.169	0.000	0.71	0.0	198.6	OK
S1.011	SS2.113	79.661	-0.269	0.000	0.34	0.0	211.1	OK
S7.000	SS2.137	79.310	-0.165	0.000	0.16	0.0	15.6	OK

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
S8.000	SS2.136	77.838	-0.137	0.000	0.25	0.0	7.4	OK
S7.001	SS2.135	77.823	-0.184	0.000	0.31	0.0	40.4	OK
S1.012	SS2.112	77.084	-0.016	0.000	0.94	0.0	236.2	OK
S1.013	SS2.111A	76.906	0.006	0.000	1.09	0.0	237.0	SURCHARGED
S1.014	SS2.111	73.824	-0.178	0.000	0.76	0.0	468.4	OK
S9.000	SS2.138	77.576	-0.149	0.000	0.24	0.0	24.4	OK
S1.015	SS2.110	73.056	0.108	0.000	1.23	0.0	485.8	SURCHARGED
S1.016	SS2.109	72.549	-0.210	0.000	0.75	0.0	499.2	OK
S1.017	SS2.108	71.930	-0.120	0.000	1.00	0.0	500.3	OK
S10.000	SS2.143	77.055	-0.170	0.000	0.14	0.0	14.3	OK
S11.000	SS2.142	76.034	-0.091	0.000	0.62	0.0	31.4	OK
S10.001	SS2.141	75.100	-0.127	0.000	0.39	0.0	54.9	OK
S12.000	SS2.146	71.567	-0.158	0.000	0.19	0.0	6.8	OK
S12.001	SS2.145	71.483	-0.128	0.000	0.23	0.0	7.1	OK
S12.002	SS2.144	71.474	-0.089	0.000	0.38	0.0	14.0	OK
S10.002	SS2.140	71.444	-0.043	0.000	1.00	0.0	79.8	OK
S10.003	SS2.139	71.163	-0.146	0.000	0.63	0.0	83.6	OK
S1.018	SS2.107	71.105	-0.286	0.000	0.54	0.0	575.6	OK
S1.019	SS2.106	69.094	0.395	0.000	1.50	0.0	572.9	SURCHARGED
S1.020	SS2.105	68.764	0.211	0.000	1.65	0.0	573.5	SURCHARGED
S1.021	SS2.104	68.173	-0.292	0.000	0.52	0.0	601.4	OK
S13.000	SS2.152	71.081	-0.144	0.000	0.27	0.0	30.1	OK
S13.001	SS2.151	68.000	-0.125	0.000	0.40	0.0	30.9	OK
S13.002	SS2.150	67.781	-0.044	0.000	0.99	0.0	31.3	OK
S14.000	SS2.155	68.601	-0.124	0.000	0.40	0.0	19.0	OK
S14.001	SS2.154	68.125	-0.100	0.000	0.60	0.0	24.7	OK
S14.002	SS2.153	68.051	-0.074	0.000	0.77	0.0	35.1	OK
S13.003	SS2.149	67.715	-0.060	0.000	0.87	0.0	93.0	OK
S13.004	SS2.148	64.751	-0.124	0.000	0.74	0.0	99.9	OK
S15.000	SS2.156	67.826	-0.149	0.000	0.24	0.0	27.4	OK
S13.005	SS2.147	64.364	-0.095	0.000	0.87	0.0	117.1	OK
S1.022	SS2.103	63.985	-0.317	0.000	0.45	0.0	711.8	OK
S1.023	SS2.102	59.187	0.012	0.000	1.09	0.0	710.7	SURCHARGED
S1.024	SS2.101	58.816	0.282	0.000	0.08	0.0	34.3	SURCHARGED

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 (%)	0
M5-60 (mm)	18.800	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	0.174	4-8	0.375	8-12	0.021

Total Area Contributing (ha) = 0.570

Total Pipe Volume (m³) = 25.046

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	56.660	2.000	28.3	0.075	5.00	0.0	0.600	o	225
S1.001	37.400	1.000	37.4	0.075	0.00	0.0	0.600	o	225
S1.002	77.280	0.258	300.0	0.050	0.00	0.0	0.600	o	300
S2.000	84.575	0.750	112.8	0.120	5.00	0.0	0.600	o	225
S2.001	41.415	2.500	16.6	0.100	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	5.38	66.000	0.075	0.0	0.0	0.0	2.47	98.1	10.2
S1.001	50.00	5.67	64.000	0.150	0.0	0.0	0.0	2.15	85.3	20.3
S1.002	50.00	7.10	63.000	0.200	0.0	0.0	0.0	0.90	63.8	27.1
S2.000	50.00	6.15	67.250	0.120	0.0	0.0	0.0	1.23	48.9	16.2
S2.001	50.00	6.36	66.500	0.220	0.0	0.0	0.0	3.23	128.5	29.8

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)
S1.003	90.650	0.302	300.0	0.050	0.00	0.0	0.600	o	300
S3.000	64.500	2.250	28.7	0.100	5.00	0.0	0.600	o	225
S1.004	9.645	0.032	301.4	0.000	0.00	0.0	0.600	o	375
S1.005	3.000	0.010	300.0	0.000	0.00	0.0	0.600	o	375
S1.006	6.575	1.000	6.6	0.000	0.00	0.0	0.600	o	300

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)
S1.003	50.00	8.77	62.742	0.470	0.0	0.0	0.0	0.90	63.8	63.6
S3.000	50.00	5.44	67.750	0.100	0.0	0.0	0.0	2.45	97.5	13.5
S1.004	50.00	8.93	62.440	0.570	0.0	0.0	0.0	1.04	114.7	77.2
S1.005	50.00	8.98	62.408	0.570	0.0	0.0	0.0	1.04	115.0	77.2
S1.006	50.00	5.02	62.398	0.000	5.7	0.0	0.0	6.17	436.1	5.7

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SS2.208	67.500	1.500	1050	S1.000	66.000	225				
SS2.207	65.500	1.500	1050	S1.001	64.000	225	S1.000	64.000	225	
SS2.206	64.500	1.500	1050	S1.002	63.000	300	S1.001	63.000	225	
SS2.210	68.750	1.500	1050	S2.000	67.250	225				
SS2.209	68.000	1.500	1050	S2.001	66.500	225	S2.000	66.500	225	
SS2.205	65.500	2.758	1200	S1.003	62.742	300	S1.002	62.742	300	
							S2.001	64.000	225	1183
SS2.204	69.250	1.500	1050	S3.000	67.750	225				
SS2.203	67.000	4.560	1350	S1.004	62.440	375	S1.003	62.440	300	
							S3.000	65.500	225	2910
SS2.202	65.500	3.092	1350	S1.005	62.408	375	S1.004	62.408	375	
SS2.201	64.000	1.602	1350	S1.006	62.398	300	S1.005	62.398	375	
SS2.200	62.760	1.362	0		OUTFALL		S1.006	61.398	300	

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	SS2.208	67.500	66.000	1.275	1050
S1.001	o	225	SS2.207	65.500	64.000	1.275	1050
S1.002	o	300	SS2.206	64.500	63.000	1.200	1050
S2.000	o	225	SS2.210	68.750	67.250	1.275	1050
S2.001	o	225	SS2.209	68.000	66.500	1.275	1050
S1.003	o	300	SS2.205	65.500	62.742	2.458	1200
S3.000	o	225	SS2.204	69.250	67.750	1.275	1050
S1.004	o	375	SS2.203	67.000	62.440	4.185	1350
S1.005	o	375	SS2.202	65.500	62.408	2.717	1350
S1.006	o	300	SS2.201	64.000	62.398	1.302	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)
S1.000	56.660	28.3	SS2.207	65.500	64.000	1.275	1050
S1.001	37.400	37.4	SS2.206	64.500	63.000	1.275	1050
S1.002	77.280	300.0	SS2.205	65.500	62.742	2.458	1200
S2.000	84.575	112.8	SS2.209	68.000	66.500	1.275	1050
S2.001	41.415	16.6	SS2.205	65.500	64.000	1.275	1200
S1.003	90.650	300.0	SS2.203	67.000	62.440	4.260	1350
S3.000	64.500	28.7	SS2.203	67.000	65.500	1.275	1350
S1.004	9.645	301.4	SS2.202	65.500	62.408	2.717	1350
S1.005	3.000	300.0	SS2.201	64.000	62.398	1.227	1350
S1.006	6.575	6.6	SS2.200	62.760	61.398	1.062	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)
S1.006	SS2.200	62.760	61.398	61.000	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	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	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)	18.800	Storm Duration (mins)	30
Ratio R	0.250		

Online Controls for Storm

Hydro-Brake® Manhole: SS2.201, DS/PN: S1.006, Volume (m³): 2.5

Design Head (m)	0.500	Diameter (mm)	113
Design Flow (l/s)	5.7	Invert Level (m)	62.398
Hydro-Brake® Type	Md5 SW Only		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.5	1.200	8.4	3.000	13.3	7.000	20.3
0.200	5.3	1.400	9.1	3.500	14.4	7.500	21.0
0.300	5.3	1.600	9.7	4.000	15.4	8.000	21.7
0.400	5.4	1.800	10.3	4.500	16.3	8.500	22.4
0.500	5.6	2.000	10.9	5.000	17.2	9.000	23.1
0.600	6.0	2.200	11.4	5.500	18.0	9.500	23.7
0.800	6.9	2.400	11.9	6.000	18.8		
1.000	7.7	2.600	12.4	6.500	19.6		

Storage Structures for Storm

Tank or Pond Manhole: SS2.201, DS/PN: S1.006

Invert Level (m) 62.398

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	696.0	0.500	696.0

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%					
S2.000	15 Winter	2	0%					
S2.001	15 Winter	2	0%					
S1.003	15 Winter	2	0%					
S3.000	15 Winter	2	0%					
S1.004	15 Winter	2	0%					
S1.005	15 Winter	2	0%					
S1.006	480 Winter	2	0%					

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	SS2.208	66.052	-0.173	0.000	0.12	0.0	11.1	OK
S1.001	SS2.207	64.078	-0.147	0.000	0.26	0.0	20.6	OK
S1.002	SS2.206	63.140	-0.160	0.000	0.41	0.0	25.0	OK
S2.000	SS2.210	67.346	-0.129	0.000	0.36	0.0	17.0	OK
S2.001	SS2.209	66.575	-0.150	0.000	0.24	0.0	29.4	OK
S1.003	SS2.205	62.972	-0.070	0.000	0.88	0.0	54.0	OK
S3.000	SS2.204	67.810	-0.165	0.000	0.16	0.0	14.8	OK
S1.004	SS2.203	62.684	-0.132	0.000	0.75	0.0	62.4	OK
S1.005	SS2.202	62.652	-0.131	0.000	0.75	0.0	62.5	OK
S1.006	SS2.201	62.552	-0.146	0.000	0.02	0.0	4.9	OK

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 (%)	0
M5-60 (mm)	18.800	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)
0-4	0.179	4-8	0.171

Total Area Contributing (ha) = 0.350

Total Pipe Volume (m³) = 13.658

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	65.550	0.525	124.9	0.100	5.00	0.0	0.600	o	225
S2.000	20.950	0.125	167.6	0.050	5.00	0.0	0.600	o	225
S1.001	29.075	0.174	167.1	0.075	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	5.93	62.150	0.100	0.0	0.0	0.0	1.17	46.5	13.5
S2.000	50.00	5.35	61.750	0.050	0.0	0.0	0.0	1.01	40.0	6.8
S1.001	50.00	6.42	61.625	0.225	0.0	0.0	0.0	1.01	40.1	30.5

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)
S3.000	39.745	1.300	30.6	0.075	5.00	0.0	0.600	o	225
S1.002	19.050	0.451	42.2	0.000	0.00	0.0	0.600	o	225
S1.003	39.820	0.199	200.0	0.000	0.00	0.0	0.600	o	300
S4.000	24.345	1.000	24.3	0.050	5.00	0.0	0.600	o	225
S1.004	15.620	1.302	12.0	0.000	0.00	0.0	0.600	o	300
S1.005	5.000	0.050	100.0	0.000	0.00	0.0	0.600	o	300
S1.006	37.350	5.883	6.3	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)
S3.000	50.00	5.28	62.800	0.075	0.0	0.0	0.0	2.37	94.4	10.2
S1.002	50.00	6.57	61.451	0.300	0.0	0.0	0.0	2.02	80.3	40.6
S1.003	50.00	7.17	61.000	0.300	0.0	0.0	0.0	1.11	78.3	40.6
S4.000	50.00	5.15	62.500	0.050	0.0	0.0	0.0	2.66	105.9	6.8
S1.004	50.00	7.23	59.402	0.350	0.0	0.0	0.0	4.56	322.6	47.4
S1.005	50.00	7.28	58.100	0.350	0.0	0.0	0.0	1.57	111.1	47.4
S1.006	50.00	5.12	58.050	0.000	3.5	0.0	0.0	5.23	207.8	3.5

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SS3.110	63.650	1.500	1050	S1.000	62.150	225				
SS3.109	63.250	1.500	1050	S2.000	61.750	225				
SS3.108	63.800	2.175	1200	S1.001	61.625	225	S1.000	61.625	225	
							S2.000	61.625	225	
SS3.107	64.300	1.500	1050	S3.000	62.800	225				
SS3.106	63.000	1.549	1050	S1.002	61.451	225	S1.001	61.451	225	
							S3.000	61.500	225	49
SS3.105	62.500	1.500	1050	S1.003	61.000	300	S1.002	61.000	225	
SS3.104	64.000	1.500	1050	S4.000	62.500	225				
SS3.103	63.000	3.598	1200	S1.004	59.402	300	S1.003	60.801	300	1399
							S4.000	61.500	225	2023
SS3.102	59.500	1.400	1050	S1.005	58.100	300	S1.004	58.100	300	
SS3.101	59.000	0.950	1050	S1.006	58.050	225	S1.005	58.050	300	
SS3.100	54.500	2.333	0		OUTFALL		S1.006	52.167	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	SS3.110	63.650	62.150	1.275	1050
S2.000	o	225	SS3.109	63.250	61.750	1.275	1050
S1.001	o	225	SS3.108	63.800	61.625	1.950	1200
S3.000	o	225	SS3.107	64.300	62.800	1.275	1050
S1.002	o	225	SS3.106	63.000	61.451	1.324	1050
S1.003	o	300	SS3.105	62.500	61.000	1.200	1050
S4.000	o	225	SS3.104	64.000	62.500	1.275	1050
S1.004	o	300	SS3.103	63.000	59.402	3.298	1200
S1.005	o	300	SS3.102	59.500	58.100	1.100	1050
S1.006	o	225	SS3.101	59.000	58.050	0.725	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	65.550	124.9	SS3.108	63.800	61.625	1.950	1200
S2.000	20.950	167.6	SS3.108	63.800	61.625	1.950	1200
S1.001	29.075	167.1	SS3.106	63.000	61.451	1.324	1050
S3.000	39.745	30.6	SS3.106	63.000	61.500	1.275	1050
S1.002	19.050	42.2	SS3.105	62.500	61.000	1.275	1050
S1.003	39.820	200.0	SS3.103	63.000	60.801	1.899	1200
S4.000	24.345	24.3	SS3.103	63.000	61.500	1.275	1200
S1.004	15.620	12.0	SS3.102	59.500	58.100	1.100	1050
S1.005	5.000	100.0	SS3.101	59.000	58.050	0.650	1050
S1.006	37.350	6.3	SS3.100	54.500	52.167	2.108	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)
S1.006	SS3.100	54.500	52.167	52.167	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	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	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)	18.800	Storm Duration (mins)	30
Ratio R	0.250		

Online Controls for Storm

Hydro-Brake® Manhole: SS3.101, DS/PN: S1.006, Volume (m³): 1.1

Design Head (m) 0.600 Hydro-Brake® Type Md4 Invert Level (m) 58.050
Design Flow (l/s) 3.5 Diameter (mm) 77

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.3	1.200	5.1	3.000	8.0	7.000	12.2
0.200	3.1	1.400	5.5	3.500	8.6	7.500	12.7
0.300	2.7	1.600	5.8	4.000	9.2	8.000	13.1
0.400	2.9	1.800	6.2	4.500	9.8	8.500	13.5
0.500	3.3	2.000	6.5	5.000	10.3	9.000	13.9
0.600	3.6	2.200	6.9	5.500	10.8	9.500	14.2
0.800	4.1	2.400	7.2	6.000	11.3		
1.000	4.6	2.600	7.4	6.500	11.8		

Storage Structures for Storm

Tank or Pond Manhole: SS3.101, DS/PN: S1.006

Invert Level (m) 58.050

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	195.0	0.600	195.0

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%					
S2.000	15 Winter	2	0%					
S1.001	15 Winter	2	0%					
S3.000	15 Winter	2	0%					
S1.002	15 Winter	2	0%					
S1.003	15 Winter	2	0%					
S4.000	15 Winter	2	0%					
S1.004	15 Winter	2	0%					
S1.005	480 Winter	2	0%					
S1.006	480 Winter	2	0%	2/120 Winter				

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	SS3.110	62.240	-0.135	0.000	0.32	0.0	14.4	OK
S2.000	SS3.109	61.821	-0.154	0.000	0.20	0.0	7.3	OK
S1.001	SS3.108	61.781	-0.069	0.000	0.81	0.0	30.4	OK
S3.000	SS3.107	62.853	-0.172	0.000	0.12	0.0	11.2	OK
S1.002	SS3.106	61.573	-0.103	0.000	0.56	0.0	40.6	OK
S1.003	SS3.105	61.161	-0.139	0.000	0.56	0.0	40.7	OK
S4.000	SS3.104	62.542	-0.183	0.000	0.08	0.0	7.5	OK
S1.004	SS3.103	59.486	-0.216	0.000	0.17	0.0	46.8	OK
S1.005	SS3.102	58.342	-0.058	0.000	0.15	0.0	9.1	OK
S1.006	SS3.101	58.341	0.066	0.000	0.02	0.0	3.3	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 (%)	0
M5-60 (mm)	18.800	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	2.181	4-8	4.090	8-12	0.490

Total Area Contributing (ha) = 6.762

Total Pipe Volume (m³) = 249.959

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	69.590	0.350	198.8	0.200	5.00	0.0	0.600	o	225
S2.000	26.185	0.150	174.6	0.080	5.00	0.0	0.600	o	225
S1.001	13.900	0.200	69.5	0.035	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	6.26	83.500	0.200	0.0	0.0	0.0	0.92	36.7	27.1
S2.000	50.00	5.44	83.300	0.080	0.0	0.0	0.0	0.99	39.2	10.8
S1.001	50.00	6.40	83.150	0.315	0.0	0.0	0.0	1.57	62.5	42.7

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)
S3.000	56.765	0.340	167.0	0.054	5.00	0.0	0.600	o	225
S1.002	62.105	0.460	135.0	0.229	0.00	0.0	0.600	o	300
S1.003	8.034	0.250	32.1	0.020	0.00	0.0	0.600	o	300
S1.004	19.490	0.826	23.6	0.049	0.00	0.0	0.600	o	300
S4.000	46.320	0.750	61.8	0.048	5.00	0.0	0.600	o	225
S4.001	21.120	0.126	167.6	0.019	0.00	0.0	0.600	o	225
S1.005	20.480	0.123	166.5	0.025	0.00	0.0	0.600	o	375
S1.006	50.120	0.300	167.1	0.130	0.00	0.0	0.600	o	450
S5.000	49.250	0.500	98.5	0.135	5.00	0.0	0.600	o	225
S5.001	6.315	0.100	63.2	0.001	0.00	0.0	0.600	o	225
S5.002	74.945	1.500	50.0	0.095	0.00	0.0	0.600	o	225
S5.003	86.440	0.549	157.4	0.226	0.00	0.0	0.600	o	300
S1.007	10.750	0.064	168.0	0.005	0.00	0.0	0.600	o	450
S1.008	7.405	0.201	36.8	0.005	0.00	0.0	0.600	o	450
S1.009	48.415	0.484	100.0	0.079	0.00	0.0	0.600	o	450

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)
S3.000	50.00	5.94	82.850	0.054	0.0	0.0	0.0	1.01	40.1	7.3
S1.002	50.00	7.17	82.510	0.598	0.0	0.0	0.0	1.35	95.5	81.0
S1.003	50.00	7.22	82.050	0.618	0.0	0.0	0.0	2.78	196.7	83.7
S1.004	50.00	7.32	81.800	0.667	0.0	0.0	0.0	3.25	229.8	90.3
S4.000	50.00	5.46	81.850	0.048	0.0	0.0	0.0	1.67	66.3	6.5
S4.001	50.00	5.81	81.100	0.067	0.0	0.0	0.0	1.01	40.0	9.1
S1.005	50.00	7.56	80.974	0.759	0.0	0.0	0.0	1.40	154.8	102.8
S1.006	50.00	8.09	80.851	0.889	0.0	0.0	0.0	1.57	249.7	120.4
S5.000	50.00	5.62	83.200	0.135	0.0	0.0	0.0	1.32	52.4	18.3
S5.001	50.00	5.69	82.700	0.136	0.0	0.0	0.0	1.65	65.5	18.4
S5.002	50.00	6.36	82.600	0.231	0.0	0.0	0.0	1.85	73.8	31.3
S5.003	50.00	7.51	81.100	0.457	0.0	0.0	0.0	1.25	88.4	61.9
S1.007	50.00	8.21	80.551	1.351	0.0	0.0	0.0	1.57	249.0	182.9
S1.008	50.00	8.24	80.487	1.356	0.0	0.0	0.0	3.36	534.1	183.6
S1.009	50.00	8.64	80.286	1.435	0.0	0.0	0.0	2.03	323.3	194.3

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)
S6.000	41.695	0.250	166.8	0.105	5.00	0.0	0.600	o	225
S6.001	3.440	0.021	163.8	0.005	0.00	0.0	0.600	o	225
S6.002	63.845	0.382	167.1	0.121	0.00	0.0	0.600	o	225
S1.010	32.155	0.322	99.9	0.072	0.00	0.0	0.600	o	450
S1.011	65.870	2.830	23.3	0.163	0.00	0.0	0.600	o	450
S7.000	38.995	1.543	25.3	0.104	5.00	0.0	0.600	o	225
S8.000	7.155	0.043	166.4	0.050	5.00	0.0	0.600	o	225
S7.001	71.700	1.057	67.8	0.141	0.00	0.0	0.600	o	300
S1.012	5.450	0.200	27.3	0.001	0.00	0.0	0.600	o	450
S1.013	5.450	0.150	36.3	0.001	0.00	0.0	0.600	o	450
S1.014	52.685	1.054	50.0	2.179	0.00	0.0	0.600	o	525
S9.000	68.925	2.700	25.5	0.165	5.00	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)
S6.000	50.00	5.69	80.800	0.105	0.0	0.0	0.0	1.01	40.1	14.2
S6.001	50.00	5.74	80.550	0.110	0.0	0.0	0.0	1.02	40.5	14.9
S6.002	50.00	6.80	80.529	0.231	0.0	0.0	0.0	1.01	40.1	31.3
S1.010	50.00	8.90	79.802	1.738	0.0	0.0	0.0	2.03	323.6	235.3
S1.011	50.00	9.16	79.480	1.901	0.0	0.0	0.0	4.23	672.4	257.4
S7.000	50.00	5.25	79.250	0.104	0.0	0.0	0.0	2.61	103.9	14.1
S8.000	50.00	5.12	77.750	0.050	0.0	0.0	0.0	1.01	40.2	6.8
S7.001	50.00	5.87	77.707	0.295	0.0	0.0	0.0	1.91	135.1	39.9
S1.012	50.00	9.19	76.650	2.197	0.0	0.0	0.0	3.91	621.3	297.5
S1.013	50.00	9.21	76.450	2.198	0.0	0.0	0.0	3.38	537.8	297.6
S1.014	50.00	9.49	73.477	4.377	0.0	0.0	0.0	3.17	687.0	592.7
S9.000	50.00	5.44	77.500	0.165	0.0	0.0	0.0	2.60	103.4	22.3

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	13.200	0.264	50.0	0.005	0.00	0.0	0.600	o	525
S1.016	59.880	0.709	84.5	0.169	0.00	0.0	0.600	o	600
S1.017	7.300	0.250	29.2	0.000	0.00	0.0	0.600	o	600
S10.000	38.590	1.750	22.1	0.095	5.00	0.0	0.600	o	225
S11.000	89.845	0.898	100.1	0.222	5.00	0.0	0.600	o	225
S10.001	40.825	3.252	12.6	0.078	0.00	0.0	0.600	o	225
S12.000	18.955	0.114	166.3	0.046	5.00	0.0	0.600	o	225
S12.001	8.030	0.048	167.3	0.005	0.00	0.0	0.600	o	225
S12.002	25.270	0.151	167.4	0.056	0.00	0.0	0.600	o	225
S10.002	42.189	0.253	166.8	0.107	0.00	0.0	0.600	o	300
S10.003	23.800	0.143	166.4	0.050	0.00	0.0	0.600	o	375
S1.018	96.615	2.692	35.9	0.005	0.00	0.0	0.600	o	600
S1.019	5.855	0.146	40.1	0.005	0.00	0.0	0.600	o	600
S1.020	3.500	0.088	39.8	0.000	0.00	0.0	0.600	o	600

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	9.56	72.423	4.547	0.0	0.0	0.0	3.17	686.9	615.7
S1.016	50.00	9.94	72.159	4.716	0.0	0.0	0.0	2.65	749.6	638.6
S1.017	50.00	9.96	71.450	4.716	0.0	0.0	0.0	4.52	1277.4	638.6
S10.000	50.00	5.23	77.000	0.095	0.0	0.0	0.0	2.80	111.3	12.9
S11.000	50.00	6.15	75.900	0.222	0.0	0.0	0.0	1.31	52.0	30.1
S10.001	50.00	6.33	75.002	0.395	0.0	0.0	0.0	3.71	147.6	53.5
S12.000	50.00	5.31	71.500	0.046	0.0	0.0	0.0	1.01	40.2	6.2
S12.001	50.00	5.45	71.386	0.051	0.0	0.0	0.0	1.01	40.1	6.9
S12.002	50.00	5.86	71.338	0.107	0.0	0.0	0.0	1.01	40.1	14.5
S10.002	50.00	6.91	71.187	0.609	0.0	0.0	0.0	1.21	85.9	82.5
S10.003	50.00	7.19	70.934	0.659	0.0	0.0	0.0	1.40	154.8	89.2
S1.018	50.00	10.36	70.791	5.380	0.0	0.0	0.0	4.07	1151.9	728.5
S1.019	50.00	10.38	68.099	5.385	0.0	0.0	0.0	3.85	1089.5	729.2
S1.020	50.00	10.40	67.953	5.385	0.0	0.0	0.0	3.87	1094.0	729.2

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)
S1.021	96.945	3.166	30.6	0.395	0.00	0.0	0.600	o	600
S13.000	63.950	3.100	20.6	0.204	5.00	0.0	0.600	o	225
S13.001	6.513	0.300	21.7	0.005	0.00	0.0	0.600	o	225
S13.002	6.230	0.050	124.6	0.001	0.00	0.0	0.600	o	225
S14.000	54.675	0.500	109.4	0.130	5.00	0.0	0.600	o	225
S14.001	11.285	0.100	112.9	0.045	0.00	0.0	0.600	o	225
S14.002	41.595	0.350	118.8	0.089	0.00	0.0	0.600	o	225
S13.003	68.520	3.050	22.5	0.230	0.00	0.0	0.600	o	225
S13.004	83.280	0.416	200.2	0.093	0.00	0.0	0.600	o	375
S15.000	66.295	3.250	20.4	0.185	5.00	0.0	0.600	o	225
S13.005	76.350	0.382	199.9	0.000	0.00	0.0	0.600	o	375
S1.022	85.715	5.202	16.5	0.000	0.00	0.0	0.600	o	600
S1.023	26.630	0.266	100.1	0.000	0.00	0.0	0.600	o	675
S1.024	25.090	4.234	5.9	0.000	0.00	0.0	0.600	o	300

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)
S1.021	50.00	10.77	67.865	5.780	0.0	0.0	0.0	4.41	1247.3	782.7
S13.000	50.00	5.37	71.000	0.204	0.0	0.0	0.0	2.89	115.1	27.6
S13.001	50.00	5.41	67.900	0.209	0.0	0.0	0.0	2.82	112.2	28.3
S13.002	50.00	5.50	67.600	0.210	0.0	0.0	0.0	1.17	46.5	28.4
S14.000	50.00	5.73	68.500	0.130	0.0	0.0	0.0	1.25	49.7	17.6
S14.001	50.00	5.88	68.000	0.175	0.0	0.0	0.0	1.23	48.9	23.7
S14.002	50.00	6.46	67.900	0.264	0.0	0.0	0.0	1.20	47.6	35.7
S13.003	50.00	6.87	67.550	0.704	0.0	0.0	0.0	2.77	110.2	95.3
S13.004	50.00	7.96	64.500	0.797	0.0	0.0	0.0	1.28	141.0	107.9
S15.000	50.00	5.38	67.750	0.185	0.0	0.0	0.0	2.91	115.7	25.1
S13.005	50.00	8.96	64.084	0.982	0.0	0.0	0.0	1.28	141.1	133.0
S1.022	50.00	11.00	63.702	6.762	0.0	0.0	0.0	6.02	1701.7	915.7
S1.023	50.00	11.17	58.500	6.762	0.0	0.0	0.0	2.62	937.4	915.7
S1.024	50.00	5.06	58.234	0.000	35.3	0.0	0.0	6.50	459.4	35.3

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)
SS2.124	85.000	1.500	1050	S1.000	83.500	225				
SS2.125	84.800	1.500	1050	S2.000	83.300	225				
SS2.123	84.650	1.500	1050	S1.001	83.150	225	S1.000	83.150	225	
							S2.000	83.150	225	
SS2.126	84.350	1.500	1050	S3.000	82.850	225				
SS2.122	84.400	1.890	1200	S1.002	82.510	300	S1.001	82.950	225	365
							S3.000	82.510	225	
SS2.121	83.550	1.500	1050	S1.003	82.050	300	S1.002	82.050	300	
SS2.120	83.300	1.500	1050	S1.004	81.800	300	S1.003	81.800	300	
SS2.128	83.350	1.500	1050	S4.000	81.850	225				
SS2.127	82.600	1.500	1050	S4.001	81.100	225	S4.000	81.100	225	
SS2.119	82.750	1.776	1350	S1.005	80.974	375	S1.004	80.974	300	
							S4.001	80.974	225	
SS2.118	82.500	1.649	1350	S1.006	80.851	450	S1.005	80.851	375	
SS2.132	84.700	1.500	1050	S5.000	83.200	225				
SS2.131	84.200	1.500	1050	S5.001	82.700	225	S5.000	82.700	225	
SS2.130	84.100	1.500	1050	S5.002	82.600	225	S5.001	82.600	225	
SS2.129	82.600	1.500	1050	S5.003	81.100	300	S5.002	81.100	225	
SS2.117	82.200	1.649	1350	S1.007	80.551	450	S1.006	80.551	450	
							S5.003	80.551	300	
SS2.116	82.000	1.513	1350	S1.008	80.487	450	S1.007	80.487	450	
SS2.115	81.800	1.514	1350	S1.009	80.286	450	S1.008	80.286	450	
SS2.135	82.300	1.500	1050	S6.000	80.800	225				
SS2.134	82.100	1.550	1050	S6.001	80.550	225	S6.000	80.550	225	
SS2.133	82.050	1.521	1050	S6.002	80.529	225	S6.001	80.529	225	
SS2.114	81.750	1.948	1350	S1.010	79.802	450	S1.009	79.802	450	
							S6.002	80.147	225	120
SS2.113	81.350	1.870	1350	S1.011	79.480	450	S1.010	79.480	450	
SS2.137	80.750	1.500	1050	S7.000	79.250	225				
SS2.136	79.250	1.500	1050	S8.000	77.750	225				
SS2.135	79.500	1.793	1050	S7.001	77.707	300	S7.000	77.707	225	
							S8.000	77.707	225	
SS2.112	78.300	1.650	1350	S1.012	76.650	450	S1.011	76.650	450	
							S7.001	76.650	300	
SS2.111A	78.150	1.700	1350	S1.013	76.450	450	S1.012	76.450	450	
SS2.111	78.000	4.523	1500	S1.014	73.477	525	S1.013	76.300	450	2748
SS2.138	79.000	1.500	1050	S9.000	77.500	225				
SS2.110	76.300	3.877	1500	S1.015	72.423	525	S1.014	72.423	525	
							S9.000	74.800	225	2077
SS2.109	75.750	3.591	1500	S1.016	72.159	600	S1.015	72.159	525	
SS2.108	73.250	1.800	1500	S1.017	71.450	600	S1.016	71.450	600	
SS2.143	78.500	1.500	1050	S10.000	77.000	225				
SS2.142	77.400	1.500	1050	S11.000	75.900	225				
SS2.141	76.750	1.748	1200	S10.001	75.002	225	S10.000	75.250	225	248
							S11.000	75.002	225	
SS2.146	73.000	1.500	1050	S12.000	71.500	225				

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)
SS2.145	73.450	2.064	1200	S12.001	71.386	225	S12.000	71.386	225	
SS2.144	73.400	2.062	1200	S12.002	71.338	225	S12.001	71.338	225	
SS2.140	73.300	2.113	1200	S10.002	71.187	300	S10.001	71.750	225	488
							S12.002	71.187	225	
SS2.139	73.050	2.116	1350	S10.003	70.934	375	S10.002	70.934	300	
SS2.107	73.000	2.209	1500	S1.018	70.791	600	S1.017	71.200	600	409
							S10.003	70.791	375	
SS2.106	69.900	1.801	1500	S1.019	68.099	600	S1.018	68.099	600	
SS2.105	69.850	1.897	1500	S1.020	67.953	600	S1.019	67.953	600	
SS2.104	69.400	1.535	1500	S1.021	67.865	600	S1.020	67.865	600	
SS2.152	72.500	1.500	1050	S13.000	71.000	225				
SS2.151	69.400	1.500	1050	S13.001	67.900	225	S13.000	67.900	225	
SS2.150	69.100	1.500	1050	S13.002	67.600	225	S13.001	67.600	225	
SS2.155	70.000	1.500	1050	S14.000	68.500	225				
SS2.154	69.500	1.500	1050	S14.001	68.000	225	S14.000	68.000	225	
SS2.153	69.400	1.500	1050	S14.002	67.900	225	S14.001	67.900	225	
SS2.149	69.050	1.500	1050	S13.003	67.550	225	S13.002	67.550	225	
							S14.002	67.550	225	
SS2.148	66.000	1.500	1350	S13.004	64.500	375	S13.003	64.500	225	
SS2.156	69.250	1.500	1050	S15.000	67.750	225				
SS2.147	66.000	1.916	1350	S13.005	64.084	375	S13.004	64.084	375	
							S15.000	64.500	225	266
SS2.103	66.500	2.798	1500	S1.022	63.702	600	S1.021	64.699	600	997
							S13.005	63.702	375	
SS2.102	60.000	1.500	1500	S1.023	58.500	675	S1.022	58.500	600	
SS2.101	59.500	1.266	1500	S1.024	58.234	300	S1.023	58.234	675	
SS2.100	55.000	1.000	0		OUTFALL		S1.024	54.000	300	

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	SS2.124	85.000	83.500	1.275	1050
S2.000	o	225	SS2.125	84.800	83.300	1.275	1050
S1.001	o	225	SS2.123	84.650	83.150	1.275	1050
S3.000	o	225	SS2.126	84.350	82.850	1.275	1050
S1.002	o	300	SS2.122	84.400	82.510	1.590	1200
S1.003	o	300	SS2.121	83.550	82.050	1.200	1050
S1.004	o	300	SS2.120	83.300	81.800	1.200	1050
S4.000	o	225	SS2.128	83.350	81.850	1.275	1050
S4.001	o	225	SS2.127	82.600	81.100	1.275	1050
S1.005	o	375	SS2.119	82.750	80.974	1.401	1350
S1.006	o	450	SS2.118	82.500	80.851	1.199	1350
S5.000	o	225	SS2.132	84.700	83.200	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	69.590	198.8	SS2.123	84.650	83.150	1.275	1050
S2.000	26.185	174.6	SS2.123	84.650	83.150	1.275	1050
S1.001	13.900	69.5	SS2.122	84.400	82.950	1.225	1200
S3.000	56.765	167.0	SS2.122	84.400	82.510	1.665	1200
S1.002	62.105	135.0	SS2.121	83.550	82.050	1.200	1050
S1.003	8.034	32.1	SS2.120	83.300	81.800	1.200	1050
S1.004	19.490	23.6	SS2.119	82.750	80.974	1.476	1350
S4.000	46.320	61.8	SS2.127	82.600	81.100	1.275	1050
S4.001	21.120	167.6	SS2.119	82.750	80.974	1.551	1350
S1.005	20.480	166.5	SS2.118	82.500	80.851	1.274	1350
S1.006	50.120	167.1	SS2.117	82.200	80.551	1.199	1350
S5.000	49.250	98.5	SS2.131	84.200	82.700	1.275	1050

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)
S5.001	o	225	SS2.131	84.200	82.700	1.275	1050
S5.002	o	225	SS2.130	84.100	82.600	1.275	1050
S5.003	o	300	SS2.129	82.600	81.100	1.200	1050
S1.007	o	450	SS2.117	82.200	80.551	1.199	1350
S1.008	o	450	SS2.116	82.000	80.487	1.063	1350
S1.009	o	450	SS2.115	81.800	80.286	1.064	1350
S6.000	o	225	SS2.135	82.300	80.800	1.275	1050
S6.001	o	225	SS2.134	82.100	80.550	1.325	1050
S6.002	o	225	SS2.133	82.050	80.529	1.296	1050
S1.010	o	450	SS2.114	81.750	79.802	1.498	1350
S1.011	o	450	SS2.113	81.350	79.480	1.420	1350
S7.000	o	225	SS2.137	80.750	79.250	1.275	1050
S8.000	o	225	SS2.136	79.250	77.750	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)
S5.001	6.315	63.2	SS2.130	84.100	82.600	1.275	1050
S5.002	74.945	50.0	SS2.129	82.600	81.100	1.275	1050
S5.003	86.440	157.4	SS2.117	82.200	80.551	1.349	1350
S1.007	10.750	168.0	SS2.116	82.000	80.487	1.063	1350
S1.008	7.405	36.8	SS2.115	81.800	80.286	1.064	1350
S1.009	48.415	100.0	SS2.114	81.750	79.802	1.498	1350
S6.000	41.695	166.8	SS2.134	82.100	80.550	1.325	1050
S6.001	3.440	163.8	SS2.133	82.050	80.529	1.296	1050
S6.002	63.845	167.1	SS2.114	81.750	80.147	1.378	1350
S1.010	32.155	99.9	SS2.113	81.350	79.480	1.420	1350
S1.011	65.870	23.3	SS2.112	78.300	76.650	1.200	1350
S7.000	38.995	25.3	SS2.135	79.500	77.707	1.568	1050
S8.000	7.155	166.4	SS2.135	79.500	77.707	1.568	1050

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)
S7.001	o	300	SS2.135	79.500	77.707	1.493	1050
S1.012	o	450	SS2.112	78.300	76.650	1.200	1350
S1.013	o	450	SS2.111A	78.150	76.450	1.250	1350
S1.014	o	525	SS2.111	78.000	73.477	3.998	1500
S9.000	o	225	SS2.138	79.000	77.500	1.275	1050
S1.015	o	525	SS2.110	76.300	72.423	3.352	1500
S1.016	o	600	SS2.109	75.750	72.159	2.991	1500
S1.017	o	600	SS2.108	73.250	71.450	1.200	1500
S10.000	o	225	SS2.143	78.500	77.000	1.275	1050
S11.000	o	225	SS2.142	77.400	75.900	1.275	1050
S10.001	o	225	SS2.141	76.750	75.002	1.523	1200
S12.000	o	225	SS2.146	73.000	71.500	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)
S7.001	71.700	67.8	SS2.112	78.300	76.650	1.350	1350
S1.012	5.450	27.3	SS2.111A	78.150	76.450	1.250	1350
S1.013	5.450	36.3	SS2.111	78.000	76.300	1.250	1500
S1.014	52.685	50.0	SS2.110	76.300	72.423	3.352	1500
S9.000	68.925	25.5	SS2.110	76.300	74.800	1.275	1500
S1.015	13.200	50.0	SS2.109	75.750	72.159	3.066	1500
S1.016	59.880	84.5	SS2.108	73.250	71.450	1.200	1500
S1.017	7.300	29.2	SS2.107	73.000	71.200	1.200	1500
S10.000	38.590	22.1	SS2.141	76.750	75.250	1.275	1200
S11.000	89.845	100.1	SS2.141	76.750	75.002	1.523	1200
S10.001	40.825	12.6	SS2.140	73.300	71.750	1.325	1200
S12.000	18.955	166.3	SS2.145	73.450	71.386	1.839	1200

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)
S12.001	o	225	SS2.145	73.450	71.386	1.839	1200
S12.002	o	225	SS2.144	73.400	71.338	1.837	1200
S10.002	o	300	SS2.140	73.300	71.187	1.813	1200
S10.003	o	375	SS2.139	73.050	70.934	1.741	1350
S1.018	o	600	SS2.107	73.000	70.791	1.609	1500
S1.019	o	600	SS2.106	69.900	68.099	1.201	1500
S1.020	o	600	SS2.105	69.850	67.953	1.297	1500
S1.021	o	600	SS2.104	69.400	67.865	0.935	1500
S13.000	o	225	SS2.152	72.500	71.000	1.275	1050
S13.001	o	225	SS2.151	69.400	67.900	1.275	1050
S13.002	o	225	SS2.150	69.100	67.600	1.275	1050
S14.000	o	225	SS2.155	70.000	68.500	1.275	1050
S14.001	o	225	SS2.154	69.500	68.000	1.275	1050
S14.002	o	225	SS2.153	69.400	67.900	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)
S12.001	8.030	167.3	SS2.144	73.400	71.338	1.837	1200
S12.002	25.270	167.4	SS2.140	73.300	71.187	1.888	1200
S10.002	42.189	166.8	SS2.139	73.050	70.934	1.816	1350
S10.003	23.800	166.4	SS2.107	73.000	70.791	1.834	1500
S1.018	96.615	35.9	SS2.106	69.900	68.099	1.201	1500
S1.019	5.855	40.1	SS2.105	69.850	67.953	1.297	1500
S1.020	3.500	39.8	SS2.104	69.400	67.865	0.935	1500
S1.021	96.945	30.6	SS2.103	66.500	64.699	1.201	1500
S13.000	63.950	20.6	SS2.151	69.400	67.900	1.275	1050
S13.001	6.513	21.7	SS2.150	69.100	67.600	1.275	1050
S13.002	6.230	124.6	SS2.149	69.050	67.550	1.275	1050
S14.000	54.675	109.4	SS2.154	69.500	68.000	1.275	1050
S14.001	11.285	112.9	SS2.153	69.400	67.900	1.275	1050
S14.002	41.595	118.8	SS2.149	69.050	67.550	1.275	1050

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)
S13.003	o	225	SS2.149	69.050	67.550	1.275	1050
S13.004	o	375	SS2.148	66.000	64.500	1.125	1350
S15.000	o	225	SS2.156	69.250	67.750	1.275	1050
S13.005	o	375	SS2.147	66.000	64.084	1.541	1350
S1.022	o	600	SS2.103	66.500	63.702	2.198	1500
S1.023	o	675	SS2.102	60.000	58.500	0.825	1500
S1.024	o	300	SS2.101	59.500	58.234	0.966	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S13.003	68.520	22.5	SS2.148	66.000	64.500	1.275	1350
S13.004	83.280	200.2	SS2.147	66.000	64.084	1.541	1350
S15.000	66.295	20.4	SS2.147	66.000	64.500	1.275	1350
S13.005	76.350	199.9	SS2.103	66.500	63.702	2.423	1500
S1.022	85.715	16.5	SS2.102	60.000	58.500	0.900	1500
S1.023	26.630	100.1	SS2.101	59.500	58.234	0.591	1500
S1.024	25.090	5.9	SS2.100	55.000	54.000	0.700	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)
S1.024	SS2.100	55.000	54.000	54.000	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	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	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)	18.800	Storm Duration (mins)	30
Ratio R	0.250		

Online Controls for Storm

Hydro-Brake® Manhole: SS2.101, DS/PN: S1.024, Volume (m³): 11.2

Design Head (m) 1.000 Diameter (mm) 237
Design Flow (l/s) 35.3 Invert Level (m) 58.234
Hydro-Brake® Type Md5 SW Only

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.5	1.200	37.7	3.000	58.6	7.000	89.4
0.200	20.9	1.400	40.3	3.500	63.2	7.500	92.6
0.300	29.8	1.600	42.9	4.000	67.6	8.000	95.6
0.400	33.4	1.800	45.4	4.500	71.7	8.500	98.6
0.500	34.3	2.000	47.8	5.000	75.6	9.000	101.4
0.600	34.1	2.200	50.1	5.500	79.3	9.500	104.2
0.800	34.0	2.400	52.4	6.000	82.8		
1.000	35.4	2.600	54.5	6.500	86.2		

Storage Structures for Storm

Tank or Pond Manhole: SS2.101, DS/PN: S1.024

Invert Level (m) 58.234

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2655.0	1.000	2655.0

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%	100/15 Summer				
S2.000	15 Winter	100	0%	100/15 Summer				
S1.001	15 Winter	100	0%	100/15 Summer				
S3.000	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				
S4.000	15 Winter	100	0%					
S4.001	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				
S5.000	15 Winter	100	0%	100/15 Summer				
S5.001	15 Winter	100	0%	100/15 Summer				
S5.002	15 Winter	100	0%	100/15 Summer				
S5.003	15 Winter	100	0%	100/15 Summer				
S1.007	15 Winter	100	0%	100/15 Summer				
S1.008	15 Winter	100	0%	100/15 Summer				
S1.009	15 Winter	100	0%	100/15 Summer				
S6.000	15 Winter	100	0%	100/15 Summer				
S6.001	15 Winter	100	0%	100/15 Summer				
S6.002	15 Winter	100	0%	100/15 Summer				
S1.010	15 Winter	100	0%	100/15 Summer				
S1.011	30 Winter	100	0%					
S7.000	15 Winter	100	0%					
S8.000	15 Winter	100	0%	100/15 Summer				
S7.001	15 Winter	100	0%	100/15 Summer				
S1.012	30 Winter	100	0%	100/15 Summer	100/15 Winter			3
S1.013	30 Winter	100	0%	100/15 Summer				
S1.014	30 Winter	100	0%	100/15 Summer				
S9.000	15 Winter	100	0%					
S1.015	30 Winter	100	0%	100/15 Summer				
S1.016	30 Winter	100	0%	100/15 Summer				
S1.017	30 Winter	100	0%	100/15 Summer	100/15 Winter			2
S10.000	15 Winter	100	0%					
S11.000	15 Winter	100	0%	100/15 Summer				
S10.001	15 Winter	100	0%					
S12.000	30 Winter	100	0%	100/15 Summer	100/15 Winter			3
S12.001	15 Winter	100	0%	100/15 Summer				

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S12.002	15 Winter	100	0%	100/15 Summer				
S10.002	15 Winter	100	0%	100/15 Summer				
S10.003	15 Winter	100	0%	100/15 Summer				
S1.018	15 Winter	100	0%	100/15 Summer				
S1.019	30 Winter	100	0%	100/15 Summer	100/15 Summer			6
S1.020	30 Winter	100	0%	100/15 Summer				
S1.021	30 Winter	100	0%					
S13.000	15 Winter	100	0%					
S13.001	15 Winter	100	0%	100/15 Summer	100/15 Winter			1
S13.002	15 Winter	100	0%	100/15 Summer	100/15 Summer			5
S14.000	15 Winter	100	0%	100/15 Summer				
S14.001	15 Winter	100	0%	100/15 Summer	100/15 Summer			4
S14.002	15 Winter	100	0%	100/15 Summer	100/15 Summer			4
S13.003	15 Winter	100	0%	100/15 Summer	100/15 Summer			4
S13.004	15 Winter	100	0%	100/15 Summer				
S15.000	15 Winter	100	0%					
S13.005	15 Winter	100	0%	100/15 Summer				
S1.022	30 Winter	100	0%					
S1.023	30 Winter	100	0%	100/15 Summer				
S1.024	1440 Winter	100	0%	100/15 Summer	100/480 Winter			3

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	SS2.124	84.860	1.135	0.000	1.44	0.0	51.2	FLOOD RISK
S2.000	SS2.125	84.152	0.627	0.000	0.63	0.0	23.0	SURCHARGED
S1.001	SS2.123	84.102	0.727	0.000	1.47	0.0	79.9	SURCHARGED
S3.000	SS2.126	83.726	0.651	0.000	0.38	0.0	14.6	SURCHARGED
S1.002	SS2.122	83.681	0.871	0.000	1.61	0.0	146.0	SURCHARGED
S1.003	SS2.121	82.595	0.245	0.000	1.11	0.0	139.3	SURCHARGED
S1.004	SS2.120	82.294	0.194	0.000	0.73	0.0	145.9	SURCHARGED
S4.000	SS2.128	81.930	-0.145	0.000	0.27	0.0	16.9	OK
S4.001	SS2.127	81.890	0.564	0.000	0.45	0.0	16.5	SURCHARGED
S1.005	SS2.119	81.863	0.514	0.000	1.26	0.0	163.8	SURCHARGED
S1.006	SS2.118	81.678	0.377	0.000	0.86	0.0	194.1	SURCHARGED
S5.000	SS2.132	83.678	0.253	0.000	0.86	0.0	43.1	SURCHARGED
S5.001	SS2.131	83.415	0.490	0.000	0.94	0.0	41.8	SURCHARGED
S5.002	SS2.130	83.345	0.520	0.000	0.81	0.0	57.8	SURCHARGED
S5.003	SS2.129	82.366	0.966	0.000	1.33	0.0	113.7	FLOOD RISK
S1.007	SS2.117	81.491	0.490	0.000	1.73	0.0	292.5	SURCHARGED
S1.008	SS2.116	81.234	0.297	0.000	1.15	0.0	290.0	SURCHARGED
S1.009	SS2.115	80.974	0.238	0.000	1.03	0.0	302.7	SURCHARGED
S6.000	SS2.135	81.647	0.622	0.000	0.80	0.0	30.7	SURCHARGED
S6.001	SS2.134	81.478	0.703	0.000	1.24	0.0	33.3	SURCHARGED
S6.002	SS2.133	81.446	0.692	0.000	1.61	0.0	62.6	SURCHARGED
S1.010	SS2.114	80.466	0.214	0.000	1.31	0.0	368.4	SURCHARGED
S1.011	SS2.113	79.742	-0.188	0.000	0.63	0.0	394.7	OK
S7.000	SS2.137	79.347	-0.128	0.000	0.38	0.0	37.5	OK

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
S8.000	SS2.136	78.619	0.644	0.000	0.48	0.0	14.3	SURCHARGED
S7.001	SS2.135	78.607	0.600	0.000	0.70	0.0	90.7	SURCHARGED
S1.012	SS2.112	78.330	1.230	0.000	1.99	0.0	502.0	FLOOD RISK
S1.013	SS2.111A	78.053	1.153	0.000	2.30	0.0	502.3	FLOOD RISK
S1.014	SS2.111	77.792	3.790	0.000	1.37	0.0	842.0	FLOOD RISK
S9.000	SS2.138	77.626	-0.099	0.000	0.58	0.0	58.4	OK
S1.015	SS2.110	75.840	2.892	0.000	2.22	0.0	875.6	SURCHARGED
S1.016	SS2.109	74.540	1.781	0.000	1.36	0.0	907.6	SURCHARGED
S1.017	SS2.108	73.250	1.200	0.000	1.81	0.0	904.4	FLOOD RISK
S10.000	SS2.143	77.089	-0.136	0.000	0.32	0.0	34.3	OK
S11.000	SS2.142	76.833	0.708	0.000	1.30	0.0	65.7	SURCHARGED
S10.001	SS2.141	75.172	-0.055	0.000	0.86	0.0	120.2	OK
S12.000	SS2.146	73.004	1.279	0.000	0.90	0.0	32.6	FLOOD RISK
S12.001	SS2.145	73.113	1.502	0.000	1.14	0.0	35.2	SURCHARGED
S12.002	SS2.144	73.173	1.610	0.000	1.15	0.0	42.6	FLOOD RISK
S10.002	SS2.140	73.196	1.709	0.000	1.94	0.0	155.3	FLOOD RISK
S10.003	SS2.139	72.577	1.268	0.000	1.14	0.0	151.8	SURCHARGED
S1.018	SS2.107	72.439	1.048	0.000	0.96	0.0	1032.5	SURCHARGED
S1.019	SS2.106	69.969	1.270	0.000	2.29	0.0	877.5	FLOOD RISK
S1.020	SS2.105	69.202	0.649	0.000	2.53	0.0	877.5	SURCHARGED
S1.021	SS2.104	68.285	-0.180	0.000	0.83	0.0	957.6	OK
S13.000	SS2.152	71.135	-0.090	0.000	0.65	0.0	72.4	OK
S13.001	SS2.151	69.400	1.275	0.007	0.97	0.0	74.8	FLOOD RISK
S13.002	SS2.150	69.108	1.283	0.000	2.12	0.0	66.8	FLOOD RISK
S14.000	SS2.155	69.836	1.111	0.000	0.75	0.0	35.7	FLOOD RISK
S14.001	SS2.154	69.500	1.275	0.476	0.99	0.0	41.0	FLOOD RISK
S14.002	SS2.153	69.403	1.278	0.000	1.12	0.0	50.9	FLOOD RISK
S13.003	SS2.149	69.054	1.279	0.000	1.14	0.0	122.1	FLOOD RISK
S13.004	SS2.148	65.348	0.473	0.000	1.05	0.0	140.5	SURCHARGED
S15.000	SS2.156	67.876	-0.099	0.000	0.59	0.0	65.9	OK
S13.005	SS2.147	64.884	0.425	0.000	1.41	0.0	189.0	SURCHARGED
S1.022	SS2.103	64.084	-0.218	0.000	0.73	0.0	1140.3	OK
S1.023	SS2.102	59.678	0.503	0.000	1.74	0.0	1137.0	SURCHARGED
S1.024	SS2.101	59.604	1.070	0.000	0.10	0.0	39.9	FLOOD RISK

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 (%)	0
M5-60 (mm)	18.800	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	0.174	4-8	0.375	8-12	0.021

Total Area Contributing (ha) = 0.570

Total Pipe Volume (m³) = 25.046

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	56.660	2.000	28.3	0.075	5.00	0.0	0.600	o	225
S1.001	37.400	1.000	37.4	0.075	0.00	0.0	0.600	o	225
S1.002	77.280	0.258	300.0	0.050	0.00	0.0	0.600	o	300
S2.000	84.575	0.750	112.8	0.120	5.00	0.0	0.600	o	225
S2.001	41.415	2.500	16.6	0.100	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	5.38	66.000	0.075	0.0	0.0	0.0	2.47	98.1	10.2
S1.001	50.00	5.67	64.000	0.150	0.0	0.0	0.0	2.15	85.3	20.3
S1.002	50.00	7.10	63.000	0.200	0.0	0.0	0.0	0.90	63.8	27.1
S2.000	50.00	6.15	67.250	0.120	0.0	0.0	0.0	1.23	48.9	16.2
S2.001	50.00	6.36	66.500	0.220	0.0	0.0	0.0	3.23	128.5	29.8

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)
S1.003	90.650	0.302	300.0	0.050	0.00	0.0	0.600	o	300
S3.000	64.500	2.250	28.7	0.100	5.00	0.0	0.600	o	225
S1.004	9.645	0.032	301.4	0.000	0.00	0.0	0.600	o	375
S1.005	3.000	0.010	300.0	0.000	0.00	0.0	0.600	o	375
S1.006	6.575	1.000	6.6	0.000	0.00	0.0	0.600	o	300

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)
S1.003	50.00	8.77	62.742	0.470	0.0	0.0	0.0	0.90	63.8	63.6
S3.000	50.00	5.44	67.750	0.100	0.0	0.0	0.0	2.45	97.5	13.5
S1.004	50.00	8.93	62.440	0.570	0.0	0.0	0.0	1.04	114.7	77.2
S1.005	50.00	8.98	62.408	0.570	0.0	0.0	0.0	1.04	115.0	77.2
S1.006	50.00	5.02	62.398	0.000	5.7	0.0	0.0	6.17	436.1	5.7

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SS2.208	67.500	1.500	1050	S1.000	66.000	225				
SS2.207	65.500	1.500	1050	S1.001	64.000	225	S1.000	64.000	225	
SS2.206	64.500	1.500	1050	S1.002	63.000	300	S1.001	63.000	225	
SS2.210	68.750	1.500	1050	S2.000	67.250	225				
SS2.209	68.000	1.500	1050	S2.001	66.500	225	S2.000	66.500	225	
SS2.205	65.500	2.758	1200	S1.003	62.742	300	S1.002	62.742	300	
							S2.001	64.000	225	1183
SS2.204	69.250	1.500	1050	S3.000	67.750	225				
SS2.203	67.000	4.560	1350	S1.004	62.440	375	S1.003	62.440	300	
							S3.000	65.500	225	2910
SS2.202	65.500	3.092	1350	S1.005	62.408	375	S1.004	62.408	375	
SS2.201	64.000	1.602	1350	S1.006	62.398	300	S1.005	62.398	375	
SS2.200	62.760	1.362	0		OUTFALL		S1.006	61.398	300	

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	SS2.208	67.500	66.000	1.275	1050
S1.001	o	225	SS2.207	65.500	64.000	1.275	1050
S1.002	o	300	SS2.206	64.500	63.000	1.200	1050
S2.000	o	225	SS2.210	68.750	67.250	1.275	1050
S2.001	o	225	SS2.209	68.000	66.500	1.275	1050
S1.003	o	300	SS2.205	65.500	62.742	2.458	1200
S3.000	o	225	SS2.204	69.250	67.750	1.275	1050
S1.004	o	375	SS2.203	67.000	62.440	4.185	1350
S1.005	o	375	SS2.202	65.500	62.408	2.717	1350
S1.006	o	300	SS2.201	64.000	62.398	1.302	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)
S1.000	56.660	28.3	SS2.207	65.500	64.000	1.275	1050
S1.001	37.400	37.4	SS2.206	64.500	63.000	1.275	1050
S1.002	77.280	300.0	SS2.205	65.500	62.742	2.458	1200
S2.000	84.575	112.8	SS2.209	68.000	66.500	1.275	1050
S2.001	41.415	16.6	SS2.205	65.500	64.000	1.275	1200
S1.003	90.650	300.0	SS2.203	67.000	62.440	4.260	1350
S3.000	64.500	28.7	SS2.203	67.000	65.500	1.275	1350
S1.004	9.645	301.4	SS2.202	65.500	62.408	2.717	1350
S1.005	3.000	300.0	SS2.201	64.000	62.398	1.227	1350
S1.006	6.575	6.6	SS2.200	62.760	61.398	1.062	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)
S1.006	SS2.200	62.760	61.398	61.000	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	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	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)	18.800	Storm Duration (mins)	30
Ratio R	0.250		

Online Controls for Storm

Hydro-Brake® Manhole: SS2.201, DS/PN: S1.006, Volume (m³): 2.5

Design Head (m)	0.500	Diameter (mm)	113
Design Flow (l/s)	5.7	Invert Level (m)	62.398
Hydro-Brake® Type	Md5 SW Only		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.5	1.200	8.4	3.000	13.3	7.000	20.3
0.200	5.3	1.400	9.1	3.500	14.4	7.500	21.0
0.300	5.3	1.600	9.7	4.000	15.4	8.000	21.7
0.400	5.4	1.800	10.3	4.500	16.3	8.500	22.4
0.500	5.6	2.000	10.9	5.000	17.2	9.000	23.1
0.600	6.0	2.200	11.4	5.500	18.0	9.500	23.7
0.800	6.9	2.400	11.9	6.000	18.8		
1.000	7.7	2.600	12.4	6.500	19.6		

Storage Structures for Storm

Tank or Pond Manhole: SS2.201, DS/PN: S1.006

Invert Level (m) 62.398

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	696.0	0.500	696.0

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				
S2.000	15 Winter	100	0%					
S2.001	15 Winter	100	0%					
S1.003	15 Winter	100	0%	100/15 Summer				
S3.000	15 Winter	100	0%					
S1.004	15 Winter	100	0%	100/15 Summer				
S1.005	15 Winter	100	0%	100/15 Summer				
S1.006	960 Winter	100	0%	100/240 Winter				

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	SS2.208	66.082	-0.143	0.000	0.28	0.0	26.6	OK
S1.001	SS2.207	64.741	0.516	0.000	0.61	0.0	49.2	SURCHARGED
S1.002	SS2.206	64.474	1.174	0.000	0.88	0.0	54.2	FLOOD RISK
S2.000	SS2.210	67.419	-0.056	0.000	0.85	0.0	40.8	OK
S2.001	SS2.209	66.632	-0.093	0.000	0.62	0.0	75.3	OK
S1.003	SS2.205	64.290	1.247	0.000	1.92	0.0	118.7	SURCHARGED
S3.000	SS2.204	67.847	-0.128	0.000	0.38	0.0	35.4	OK
S1.004	SS2.203	63.032	0.217	0.000	1.74	0.0	145.3	SURCHARGED
S1.005	SS2.202	62.893	0.110	0.000	1.75	0.0	145.7	SURCHARGED
S1.006	SS2.201	62.755	0.057	0.000	0.02	0.0	5.4	SURCHARGED

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 (%)	0
M5-60 (mm)	18.800	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)
0-4	0.179	4-8	0.171

Total Area Contributing (ha) = 0.350

Total Pipe Volume (m³) = 13.658

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	65.550	0.525	124.9	0.100	5.00	0.0	0.600	o	225
S2.000	20.950	0.125	167.6	0.050	5.00	0.0	0.600	o	225
S1.001	29.075	0.174	167.1	0.075	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	5.93	62.150	0.100	0.0	0.0	0.0	1.17	46.5	13.5
S2.000	50.00	5.35	61.750	0.050	0.0	0.0	0.0	1.01	40.0	6.8
S1.001	50.00	6.42	61.625	0.225	0.0	0.0	0.0	1.01	40.1	30.5

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)
S3.000	39.745	1.300	30.6	0.075	5.00	0.0	0.600	o	225
S1.002	19.050	0.451	42.2	0.000	0.00	0.0	0.600	o	225
S1.003	39.820	0.199	200.0	0.000	0.00	0.0	0.600	o	300
S4.000	24.345	1.000	24.3	0.050	5.00	0.0	0.600	o	225
S1.004	15.620	1.302	12.0	0.000	0.00	0.0	0.600	o	300
S1.005	5.000	0.050	100.0	0.000	0.00	0.0	0.600	o	300
S1.006	37.350	5.883	6.3	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)
S3.000	50.00	5.28	62.800	0.075	0.0	0.0	0.0	2.37	94.4	10.2
S1.002	50.00	6.57	61.451	0.300	0.0	0.0	0.0	2.02	80.3	40.6
S1.003	50.00	7.17	61.000	0.300	0.0	0.0	0.0	1.11	78.3	40.6
S4.000	50.00	5.15	62.500	0.050	0.0	0.0	0.0	2.66	105.9	6.8
S1.004	50.00	7.23	59.402	0.350	0.0	0.0	0.0	4.56	322.6	47.4
S1.005	50.00	7.28	58.100	0.350	0.0	0.0	0.0	1.57	111.1	47.4
S1.006	50.00	5.12	58.050	0.000	3.5	0.0	0.0	5.23	207.8	3.5

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SS3.110	63.650	1.500	1050	S1.000	62.150	225				
SS3.109	63.250	1.500	1050	S2.000	61.750	225				
SS3.108	63.800	2.175	1200	S1.001	61.625	225	S1.000	61.625	225	
							S2.000	61.625	225	
SS3.107	64.300	1.500	1050	S3.000	62.800	225				
SS3.106	63.000	1.549	1050	S1.002	61.451	225	S1.001	61.451	225	
							S3.000	61.500	225	49
SS3.105	62.500	1.500	1050	S1.003	61.000	300	S1.002	61.000	225	
SS3.104	64.000	1.500	1050	S4.000	62.500	225				
SS3.103	63.000	3.598	1200	S1.004	59.402	300	S1.003	60.801	300	1399
							S4.000	61.500	225	2023
SS3.102	59.500	1.400	1050	S1.005	58.100	300	S1.004	58.100	300	
SS3.101	59.000	0.950	1050	S1.006	58.050	225	S1.005	58.050	300	
SS3.100	54.500	2.333	0		OUTFALL		S1.006	52.167	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	SS3.110	63.650	62.150	1.275	1050
S2.000	o	225	SS3.109	63.250	61.750	1.275	1050
S1.001	o	225	SS3.108	63.800	61.625	1.950	1200
S3.000	o	225	SS3.107	64.300	62.800	1.275	1050
S1.002	o	225	SS3.106	63.000	61.451	1.324	1050
S1.003	o	300	SS3.105	62.500	61.000	1.200	1050
S4.000	o	225	SS3.104	64.000	62.500	1.275	1050
S1.004	o	300	SS3.103	63.000	59.402	3.298	1200
S1.005	o	300	SS3.102	59.500	58.100	1.100	1050
S1.006	o	225	SS3.101	59.000	58.050	0.725	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	65.550	124.9	SS3.108	63.800	61.625	1.950	1200
S2.000	20.950	167.6	SS3.108	63.800	61.625	1.950	1200
S1.001	29.075	167.1	SS3.106	63.000	61.451	1.324	1050
S3.000	39.745	30.6	SS3.106	63.000	61.500	1.275	1050
S1.002	19.050	42.2	SS3.105	62.500	61.000	1.275	1050
S1.003	39.820	200.0	SS3.103	63.000	60.801	1.899	1200
S4.000	24.345	24.3	SS3.103	63.000	61.500	1.275	1200
S1.004	15.620	12.0	SS3.102	59.500	58.100	1.100	1050
S1.005	5.000	100.0	SS3.101	59.000	58.050	0.650	1050
S1.006	37.350	6.3	SS3.100	54.500	52.167	2.108	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)
S1.006	SS3.100	54.500	52.167	52.167	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	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	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)	18.800	Storm Duration (mins)	30
Ratio R	0.250		

Online Controls for Storm

Hydro-Brake® Manhole: SS3.101, DS/PN: S1.006, Volume (m³): 1.1

Design Head (m) 0.600 Hydro-Brake® Type Md4 Invert Level (m) 58.050
Design Flow (l/s) 3.5 Diameter (mm) 77

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.3	1.200	5.1	3.000	8.0	7.000	12.2
0.200	3.1	1.400	5.5	3.500	8.6	7.500	12.7
0.300	2.7	1.600	5.8	4.000	9.2	8.000	13.1
0.400	2.9	1.800	6.2	4.500	9.8	8.500	13.5
0.500	3.3	2.000	6.5	5.000	10.3	9.000	13.9
0.600	3.6	2.200	6.9	5.500	10.8	9.500	14.2
0.800	4.1	2.400	7.2	6.000	11.3		
1.000	4.6	2.600	7.4	6.500	11.8		

Storage Structures for Storm

Tank or Pond Manhole: SS3.101, DS/PN: S1.006

Invert Level (m) 58.050

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	195.0	0.600	195.0

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%	100/15 Summer				
S2.000	15 Winter	100	0%	100/15 Summer				
S1.001	15 Winter	100	0%	100/15 Summer				
S3.000	15 Winter	100	0%					
S1.002	15 Winter	100	0%	100/15 Summer				
S1.003	15 Winter	100	0%	100/15 Summer				
S4.000	15 Winter	100	0%					
S1.004	15 Winter	100	0%					
S1.005	480 Winter	100	0%	100/15 Summer				
S1.006	480 Winter	100	0%	100/15 Summer				

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	SS3.110	62.557	0.182	0.000	0.68	0.0	30.6	SURCHARGED
S2.000	SS3.109	62.385	0.410	0.000	0.39	0.0	14.0	SURCHARGED
S1.001	SS3.108	62.355	0.505	0.000	1.59	0.0	59.4	SURCHARGED
S3.000	SS3.107	62.885	-0.140	0.000	0.30	0.0	26.8	OK
S1.002	SS3.106	61.903	0.227	0.000	1.12	0.0	81.3	SURCHARGED
S1.003	SS3.105	61.336	0.036	0.000	1.12	0.0	81.3	SURCHARGED
S4.000	SS3.104	62.565	-0.160	0.000	0.19	0.0	18.0	OK
S1.004	SS3.103	59.524	-0.178	0.000	0.34	0.0	92.9	OK
S1.005	SS3.102	58.772	0.372	0.000	0.30	0.0	18.7	SURCHARGED
S1.006	SS3.101	58.770	0.495	0.000	0.02	0.0	3.9	FLOOD RISK

Appendix F – SuDS Design Sheets

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.05

Design rainfall intensity

Location of catchment area	Other
Impermeable area drained to the system	A = **4.0** m^2
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.360**
5-year return period rainfall of 60 minutes duration	M5_60min = **18.8** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = **300** mm
Width of pit	w = **1000** mm
Length of pit	l = **1000** mm
Percentage free volume	V_{free} = **30** %
Soil infiltration rate	f = **157.×10^{-6}** m/s
Wetted area of pit 50% full	a_{s50} = l × d + w × d = **600000** mm^2

Table equations

Inflow (cl.3.3.1)	I = M100 × A
Outflow (cl.3.3.2)	O = a_{s50} × f × D
Storage (cl.3.3.3)	S = I - O

Note: The following Z2 table values are user defined.

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m^3)	Outflow (m^3)	Storage required (m^3)
5	0.36;	6.8;	1.90;	12.9;	0.05;	0.03;	0.02
10	0.51;	9.6;	1.96;	18.8;	0.08;	0.06;	0.02
15	0.62;	11.7;	1.97;	23.0;	0.09;	0.08;	0.01
30	0.79;	14.9;	1.98;	29.4;	0.12;	0.17;	0.00
60	1.00;	18.8;	1.94;	36.5;	0.15;	0.34;	0.00
120	1.22;	22.9;	1.91;	43.7;	0.17;	0.68;	0.00
240	1.48;	27.8;	1.87;	52.0;	0.21;	1.36;	0.00
360	1.67;	31.4;	1.84;	57.7;	0.23;	2.03;	0.00
600	1.90;	35.7;	1.80;	64.4;	0.26;	3.39;	0.00
1440	2.42;	45.5;	1.74;	79.3;	0.32;	8.14;	0.00

Required storage volume	S_{req} = **0.02** m^3
Soakaway storage volume	S_{act} = l × d × w × V_{free} = **0.09** m^3

PASS - Soakaway storage volume

Time for emptying soakaway to half volume	t_{s50} = S_{req} × 0.5 / (a_{s50} × f) = 1min 47s

PASS - Soakaway discharge time less than or equal to 24 hours

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.05

Design rainfall intensity

Location of catchment area	Other
Impermeable area drained to the system	A = **23.7** m^2
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.360**
5-year return period rainfall of 60 minutes duration	M5_60min = **18.8** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = **300** mm
Width of pit	w = **5800** mm
Length of pit	l = **5100** mm
Percentage free volume	V_{free} = **30** %
Soil infiltration rate	f = **24.9×10^{-6}** m/s
Wetted area of pit 50% full	a_{s50} = l × d + w × d = **3270000** mm^2

Table equations

Inflow (cl.3.3.1)	I = M100 × A
Outflow (cl.3.3.2)	O = a_{s50} × f × D
Storage (cl.3.3.3)	S = I - O

Note: The following Z2 table values are user defined.

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m^3)	Outflow (m^3)	Storage required (m^3)
5	0.36;	6.8;	1.90;	12.9;	0.30;	0.02;	0.28
10	0.51;	9.6;	1.96;	18.8;	0.45;	0.05;	0.40
15	0.62;	11.7;	1.97;	23.0;	0.55;	0.07;	0.47
30	0.79;	14.9;	1.98;	29.4;	0.70;	0.15;	0.55
60	1.00;	18.8;	1.94;	36.5;	0.87;	0.29;	0.57
120	1.22;	22.9;	1.91;	43.7;	1.04;	0.59;	0.45
240	1.48;	27.8;	1.87;	52.0;	1.23;	1.17;	0.06
360	1.67;	31.4;	1.84;	57.7;	1.37;	1.76;	0.00
600	1.90;	35.7;	1.80;	64.4;	1.53;	2.93;	0.00
1440	2.42;	45.5;	1.74;	79.3;	1.88;	7.03;	0.00

Required storage volume	S_{req} = **0.57** m^3
Soakaway storage volume	S_{act} = l × d × w × V_{free} = **2.66** m^3

PASS - Soakaway storage volume

Time for emptying soakaway to half volume	t_{s50} = S_{req} × 0.5 / (a_{s50} × f) = 58min 21s

PASS - Soakaway discharge time less than or equal to 24 hours

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.05

Design rainfall intensity

Location of catchment area	Other
Impermeable area drained to the system	A = **30.0** m^2
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.360**
5-year return period rainfall of 60 minutes duration	M5_60min = **18.8** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = **1000** mm
Width of pit	w = **1000** mm
Length of pit	l = **1000** mm
Percentage free volume	V_{free} = **95** %
Soil infiltration rate	f = **157.×10^{-6}** m/s
Wetted area of pit 50% full	a_{s50} = l × d + w × d = **2000000** mm^2

Table equations

Inflow (cl.3.3.1)	I = M100 × A
Outflow (cl.3.3.2)	O = a_{s50} × f × D
Storage (cl.3.3.3)	S = I - O

Note: The following Z2 table values are user defined.

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m^3)	Outflow (m^3)	Storage required (m^3)
5	0.36;	6.8;	1.90;	12.9;	0.39;	0.09;	0.29
10	0.51;	9.6;	1.96;	18.8;	0.56;	0.19;	0.38
15	0.62;	11.7;	1.97;	23.0;	0.69;	0.28;	0.41
30	0.79;	14.9;	1.98;	29.4;	0.88;	0.57;	0.32
60	1.00;	18.8;	1.94;	36.5;	1.10;	1.13;	0.00
120	1.22;	22.9;	1.91;	43.7;	1.31;	2.26;	0.00
240	1.48;	27.8;	1.87;	52.0;	1.56;	4.52;	0.00
360	1.67;	31.4;	1.84;	57.7;	1.73;	6.78;	0.00
600	1.90;	35.7;	1.80;	64.4;	1.93;	11.30;	0.00
1440	2.42;	45.5;	1.74;	79.3;	2.38;	27.13;	0.00

Required storage volume	S_{req} = **0.41** m^3
Soakaway storage volume	S_{act} = l × d × w × V_{free} = **0.95** m^3

PASS - Soakaway storage volume

Time for emptying soakaway to half volume	t_{s50} = S_{req} × 0.5 / (a_{s50} × f) = 10min 53s

PASS - Soakaway discharge time less than or equal to 24 hours

Appendix G – 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	73.270	1.221	60.0	0.000	14	0.0	1.500	o	150
F2.000	25.825	1.021	25.3	0.000	9	0.0	1.500	o	150
F1.001	17.075	0.114	149.8	0.000	0	0.0	1.500	o	225
F3.000	42.945	0.716	60.0	0.000	3	0.0	1.500	o	150
F1.002	62.450	0.416	150.0	0.000	16	0.0	1.500	o	225
F1.003	5.170	0.034	150.0	0.000	0	0.0	1.500	o	225
F1.004	18.830	0.465	40.5	0.000	5	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	83.150	0.000	0.0	14	0.0	16	0.45	1.13	20.0	0.4
F2.000	82.950	0.000	0.0	9	0.0	10	0.52	1.75	30.9	0.3
F1.001	81.929	0.000	0.0	23	0.0	22	0.36	0.94	37.3	0.7
F3.000	83.000	0.000	0.0	3	0.0	8	0.27	1.13	20.0	0.1
F1.002	81.815	0.000	0.0	42	0.0	29	0.43	0.94	37.2	1.3
F1.003	81.399	0.000	0.0	42	0.0	29	0.43	0.94	37.2	1.3
F1.004	81.364	0.000	0.0	47	0.0	22	0.71	1.81	71.8	1.5

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)
F4.000	46.605	0.777	60.0	0.000	2	0.0	1.500	o	150
F4.001	23.315	0.623	37.4	0.000	0	0.0	1.500	o	150
F1.005	19.030	0.250	76.1	0.000	0	0.0	1.500	o	225
F1.006	53.125	0.300	177.1	0.000	0	0.0	1.500	o	225
F5.000	49.610	0.827	60.0	0.000	7	0.0	1.500	o	150
F5.001	6.505	0.108	60.0	0.000	1	0.0	1.500	o	150
F5.002	74.525	1.165	64.0	0.000	0	0.0	1.500	o	150
F5.003	85.135	1.703	50.0	0.000	0	0.0	1.500	o	225
F1.007	8.575	0.057	150.0	0.000	0	0.0	1.500	o	225
F1.008	8.295	0.055	150.0	0.000	0	0.0	1.500	o	225
F1.009	48.930	0.327	149.6	0.000	0	0.0	1.500	o	225
F6.000	38.370	0.640	60.0	0.000	6	0.0	1.500	o	150
F6.001	4.485	0.075	59.8	0.000	1	0.0	1.500	o	150
F6.002	66.765	1.128	59.2	0.000	3	0.0	1.500	o	150
F1.010	29.910	0.150	199.4	0.000	4	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)
F4.000	82.300	0.000	0.0	2	0.0	6	0.24	1.13	20.0	0.1
F4.001	81.523	0.000	0.0	2	0.0	6	0.28	1.44	25.4	0.1
F1.005	80.899	0.000	0.0	49	0.0	27	0.58	1.32	52.3	1.5
F1.006	80.649	0.000	0.0	49	0.0	33	0.43	0.86	34.2	1.5
F5.000	82.850	0.000	0.0	7	0.0	11	0.36	1.13	20.0	0.2
F5.001	82.023	0.000	0.0	8	0.0	12	0.37	1.13	20.0	0.2
F5.002	81.915	0.000	0.0	8	0.0	12	0.37	1.10	19.4	0.2
F5.003	80.750	0.000	0.0	8	0.0	10	0.37	1.63	64.6	0.2
F1.007	79.047	0.000	0.0	57	0.0	34	0.48	0.94	37.2	1.8
F1.008	78.989	0.000	0.0	57	0.0	34	0.48	0.94	37.2	1.8
F1.009	78.934	0.000	0.0	57	0.0	34	0.48	0.94	37.3	1.8
F6.000	80.450	0.000	0.0	6	0.0	11	0.34	1.13	20.0	0.2
F6.001	79.810	0.000	0.0	7	0.0	11	0.36	1.13	20.0	0.2
F6.002	79.735	0.000	0.0	10	0.0	13	0.40	1.14	20.1	0.3
F1.010	78.607	0.000	0.0	71	0.0	40	0.46	0.81	32.3	2.2

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)
F1.011	61.485	2.008	30.6	0.000	8	0.0	1.500	o	225
F1.012	5.905	0.150	39.4	0.000	0	0.0	1.500	o	225
F1.013	7.825	0.150	52.2	0.000	0	0.0	1.500	o	225
F1.014	49.375	0.329	150.1	0.000	0	0.0	1.500	o	225
F7.000	68.495	2.900	23.6	0.000	8	0.0	1.500	o	150
F1.015	13.385	0.089	150.4	0.000	0	0.0	1.500	o	225
F1.016	60.704	1.642	37.0	0.000	0	0.0	1.500	o	225
F1.017	72.220	3.250	22.2	0.000	0	0.0	1.500	o	225
F1.018	7.845	0.150	52.3	0.000	0	0.0	1.500	o	225
F1.019	36.705	0.500	73.4	0.000	0	0.0	1.500	o	225
F1.020	61.130	0.850	71.9	0.000	8	0.0	1.500	o	225
F1.021	38.358	0.950	40.4	0.000	0	0.0	1.500	o	225
F1.022	28.170	1.050	26.8	0.000	0	0.0	1.500	o	225
F8.000	38.155	1.750	21.8	0.000	6	0.0	1.500	o	150
F9.000	87.145	1.452	60.0	0.000	12	0.0	1.500	o	150

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)
F1.011	78.457	0.000	0.0	79	0.0	27	0.92	2.08	82.6	2.4
F1.012	76.449	0.000	0.0	79	0.0	28	0.84	1.83	72.9	2.4
F1.013	76.299	0.000	0.0	79	0.0	30	0.76	1.59	63.3	2.4
F1.014	73.460	0.000	0.0	79	0.0	39	0.53	0.94	37.2	2.4
F7.000	77.350	0.000	0.0	8	0.0	10	0.51	1.81	31.9	0.2
F1.015	73.131	0.000	0.0	87	0.0	41	0.54	0.94	37.2	2.7
F1.016	73.042	0.000	0.0	87	0.0	29	0.89	1.89	75.2	2.7
F1.017	71.400	0.000	0.0	87	0.0	26	1.06	2.44	97.1	2.7
F1.018	68.150	0.000	0.0	87	0.0	32	0.78	1.59	63.2	2.7
F1.019	68.000	0.000	0.0	87	0.0	35	0.70	1.34	53.3	2.7
F1.020	67.500	0.000	0.0	95	0.0	36	0.72	1.35	53.9	2.9
F1.021	66.650	0.000	0.0	95	0.0	31	0.88	1.81	71.9	2.9
F1.022	65.700	0.000	0.0	95	0.0	28	1.02	2.22	88.3	2.9
F8.000	76.650	0.000	0.0	6	0.0	8	0.48	1.88	33.3	0.2
F9.000	75.550	0.000	0.0	12	0.0	14	0.42	1.13	20.0	0.4

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)
F8.001	43.415	1.809	24.0	0.000	3	0.0	1.500	o	225
F10.000	43.325	0.722	60.0	0.000	7	0.0	1.500	o	150
F8.002	25.755	0.129	199.7	0.000	0	0.0	1.500	o	225
F8.003	5.810	0.029	200.3	0.000	0	0.0	1.500	o	225
F8.004	28.475	0.654	43.5	0.000	0	0.0	1.500	o	225
F8.005	67.060	2.794	24.0	0.000	0	0.0	1.500	o	225
F8.006	5.336	0.222	24.0	0.000	0	0.0	1.500	o	225
F8.007	4.515	0.023	196.3	0.000	0	0.0	1.500	o	225
F11.000	54.485	0.908	60.0	0.000	10	0.0	1.500	o	150
F11.001	10.625	0.071	149.6	0.000	5	0.0	1.500	o	150
F11.002	39.705	0.265	149.8	0.000	8	0.0	1.500	o	225
F8.008	68.055	2.856	23.8	0.000	22	0.0	1.500	o	225
F8.009	83.800	0.419	200.0	0.000	16	0.0	1.500	o	225
F12.000	88.345	3.250	27.2	0.000	16	0.0	1.500	o	150

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)
F8.001	72.787	0.000	0.0	21	0.0	14	0.66	2.35	93.4	0.7
F10.000	71.700	0.000	0.0	7	0.0	11	0.36	1.13	20.0	0.2
F8.002	70.978	0.000	0.0	28	0.0	26	0.35	0.81	32.2	0.9
F8.003	70.849	0.000	0.0	28	0.0	26	0.35	0.81	32.2	0.9
F8.004	70.820	0.000	0.0	28	0.0	18	0.59	1.74	69.3	0.9
F8.005	70.166	0.000	0.0	28	0.0	16	0.72	2.35	93.4	0.9
F8.006	67.372	0.000	0.0	28	0.0	16	0.72	2.35	93.3	0.9
F8.007	67.150	0.000	0.0	28	0.0	25	0.35	0.82	32.5	0.9
F11.000	68.100	0.000	0.0	10	0.0	13	0.40	1.13	20.0	0.3
F11.001	67.192	0.000	0.0	15	0.0	20	0.33	0.72	12.6	0.5
F11.002	67.121	0.000	0.0	23	0.0	22	0.36	0.94	37.2	0.7
F8.008	66.856	0.000	0.0	73	0.0	24	0.97	2.36	93.7	2.3
F8.009	64.000	0.000	0.0	89	0.0	45	0.49	0.81	32.2	2.8
F12.000	67.400	0.000	0.0	16	0.0	14	0.61	1.68	29.8	0.5

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)
F8.010	68.915	0.345	200.0	0.000	0	0.0	1.500	o	225
F13.000	35.265	1.350	26.1	0.000	10	0.0	1.500	o	150
F8.011	68.915	0.345	200.0	0.000	0	0.0	1.500	o	225
F1.023	72.305	0.362	200.0	0.000	0	0.0	1.500	o	225
F14.000	50.730	0.800	63.4	0.000	10	0.0	1.500	o	150
F15.000	44.620	1.550	28.8	0.000	0	0.0	1.500	o	150
F15.001	6.065	0.400	15.2	0.000	0	0.0	1.500	o	150
F14.001	13.437	0.200	67.2	0.000	0	0.0	1.500	o	150
F14.002	28.165	0.952	29.6	0.000	16	0.0	1.500	o	225
F1.024	73.250	0.366	200.0	0.000	0	0.0	1.500	o	225
F16.000	41.465	1.250	33.2	0.000	12	0.0	1.500	o	150

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)
F8.010	63.581	0.000	0.0	105	0.0	48	0.52	0.81	32.2	3.3
F13.000	66.500	0.000	0.0	10	0.0	11	0.53	1.72	30.4	0.3
F8.011	63.236	0.000	0.0	115	0.0	51	0.53	0.81	32.2	3.6
F1.023	62.892	0.000	0.0	210	0.0	69	0.63	0.81	32.2	6.5
F14.000	64.750	0.000	0.0	10	0.0	14	0.39	1.10	19.5	0.3
F15.000	65.750	0.000	0.0	0	0.0	0	0.00	1.64	28.9	0.0
F15.001	64.200	0.000	0.0	0	0.0	0	0.00	2.26	39.9	0.0
F14.001	63.800	0.000	0.0	10	0.0	14	0.39	1.07	18.9	0.3
F14.002	63.600	0.000	0.0	26	0.0	16	0.66	2.11	84.1	0.8
F1.024	62.530	0.000	0.0	236	0.0	73	0.66	0.81	32.2	7.3
F16.000	63.250	0.000	0.0	12	0.0	13	0.52	1.52	26.9	0.4

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)
F17.000	17.145	0.286	59.9	0.000	0	0.0	1.500	o	150
F17.001	13.950	0.093	150.0	0.000	0	0.0	1.500	o	150
F1.025	5.640	0.235	24.0	0.000	0	0.0	1.500	o	225
F1.026	37.015	1.542	24.0	0.000	0	0.0	1.500	o	225
F1.027	5.301	0.221	24.0	0.000	0	0.0	1.500	o	225
F1.028	9.405	0.392	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)
F17.000	61.400	0.000	0.0	0	0.0	0	0.00	1.13	20.0	0.0
F17.001	61.114	0.000	0.0	0	0.0	0	0.00	0.71	12.6	0.0
F1.025	61.021	0.000	0.0	248	0.0	44	1.42	2.35	93.4	7.7
F1.026	59.042	0.000	0.0	248	0.0	44	1.42	2.35	93.4	7.7
F1.027	54.721	0.000	0.0	248	0.0	44	1.42	2.35	93.4	7.7
F1.028	52.562	0.000	0.0	248	0.0	44	1.42	2.35	93.4	7.7

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)
FF2.129	85.000	1.850	1200	F1.000	83.150	150				
FF2.130	84.800	1.850	1200	F2.000	82.950	150				
FF2.128	84.650	2.721	1200	F1.001	81.929	225	F1.000	81.929	150	
							F2.000	81.929	150	
FF2.131	84.350	1.350	1050	F3.000	83.000	150				
FF2.127	84.400	2.585	1200	F1.002	81.815	225	F1.001	81.815	225	
							F3.000	82.284	150	394
FF2.126	83.550	2.151	1200	F1.003	81.399	225	F1.002	81.399	225	
FF2.125	83.450	2.086	1200	F1.004	81.364	225	F1.003	81.364	225	
FF2.133	83.350	1.050	1050	F4.000	82.300	150				
FF2.132	82.600	1.077	1050	F4.001	81.523	150	F4.000	81.523	150	
FF2.124	82.750	1.851	1200	F1.005	80.899	225	F1.004	80.899	225	
							F4.001	80.900	150	
FF2.123	82.500	1.851	1200	F1.006	80.649	225	F1.005	80.649	225	
FF2.137	84.700	1.850	1200	F5.000	82.850	150				
FF2.136	84.200	2.177	1200	F5.001	82.023	150	F5.000	82.023	150	
FF2.135	84.100	2.185	1200	F5.002	81.915	150	F5.001	81.915	150	
FF2.134	82.600	1.850	1200	F5.003	80.750	225	F5.002	80.750	150	
FF2.122	82.200	3.153	1200	F1.007	79.047	225	F1.006	80.349	225	1303
							F5.003	79.047	225	
FF2.121	82.000	3.011	1200	F1.008	78.989	225	F1.007	78.989	225	
FF2.120	81.700	2.766	1200	F1.009	78.934	225	F1.008	78.934	225	
FF2.140	82.300	1.850	1200	F6.000	80.450	150				
FF2.139	82.100	2.290	1200	F6.001	79.810	150	F6.000	79.810	150	
FF2.138	82.050	2.315	1200	F6.002	79.735	150	F6.001	79.735	150	
FF2.119	81.750	3.143	1200	F1.010	78.607	225	F1.009	78.607	225	
							F6.002	78.607	150	
FF2.118	81.350	2.893	1200	F1.011	78.457	225	F1.010	78.457	225	
FF2.117	78.300	1.851	1200	F1.012	76.449	225	F1.011	76.449	225	
FF2.116	78.150	1.851	1200	F1.013	76.299	225	F1.012	76.299	225	
FF2.115	78.000	4.540	1200	F1.014	73.460	225	F1.013	76.149	225	2689
FF2.141	79.200	1.850	1200	F7.000	77.350	150				
FF2.114	76.300	3.169	1200	F1.015	73.131	225	F1.014	73.131	225	
							F7.000	74.450	150	1244
FF2.113	75.750	2.708	1200	F1.016	73.042	225	F1.015	73.042	225	
FF2.111	73.250	1.850	1200	F1.017	71.400	225	F1.016	71.400	225	
FF2.110	70.000	1.850	1200	F1.018	68.150	225	F1.017	68.150	225	
FF2.109	69.850	1.850	1200	F1.019	68.000	225	F1.018	68.000	225	
FF2.108	69.350	1.850	1200	F1.020	67.500	225	F1.019	67.500	225	
FF2.107	68.500	1.850	1200	F1.021	66.650	225	F1.020	66.650	225	
FF2.106	67.550	1.850	1200	F1.022	65.700	225	F1.021	65.700	225	
FF2.154	78.500	1.850	1200	F8.000	76.650	150				
FF2.155	77.400	1.850	1200	F9.000	75.550	150				
FF2.153	76.750	3.963	1200	F8.001	72.787	225	F8.000	74.900	150	2038
							F9.000	74.098	150	1236
FF2.152	73.050	1.350	1050	F10.000	71.700	150				

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)
FF2.151	73.275	2.297	1200	F8.002	70.978	225	F8.001	70.978	225	
							F10.000	70.978	150	
FF2.150	73.400	2.551	1200	F8.003	70.849	225	F8.002	70.849	225	
FF2.149	73.450	2.630	1200	F8.004	70.820	225	F8.003	70.820	225	
FF2.148	72.500	2.334	1200	F8.005	70.166	225	F8.004	70.166	225	
FF2.147	69.300	1.928	1200	F8.006	67.372	225	F8.005	67.372	225	
FF2.146	69.000	1.850	1200	F8.007	67.150	225	F8.006	67.150	225	
FF2.158	69.950	1.850	1200	F11.000	68.100	150				
FF2.157	69.500	2.308	1200	F11.001	67.192	150	F11.000	67.192	150	
FF2.156	69.400	2.279	1200	F11.002	67.121	225	F11.001	67.121	150	
FF2.145	69.050	2.194	1200	F8.008	66.856	225	F8.007	67.127	225	271
							F11.002	66.856	225	
FF2.144	65.500	1.500	1050	F8.009	64.000	225	F8.008	64.000	225	
FF2.159	69.250	1.850	1200	F12.000	67.400	150				
FF2.143	66.000	2.419	1200	F8.010	63.581	225	F8.009	63.581	225	
							F12.000	64.150	150	494
FF2.160	68.350	1.850	1200	F13.000	66.500	150				
FF2.142	67.000	3.764	1200	F8.011	63.236	225	F8.010	63.236	225	
							F13.000	65.150	150	1839
FF2.105	66.500	3.608	1200	F1.023	62.892	225	F1.022	64.650	225	1758
							F8.011	62.892	225	
FF2.163	66.100	1.350	1050	F14.000	64.750	150				
FF2.165	67.250	1.500	1050	F15.000	65.750	150				
FF2.164	65.700	1.500	1050	F15.001	64.200	150	F15.000	64.200	150	
FF2.162	65.300	1.500	1050	F14.001	63.800	150	F14.000	63.950	150	150
							F15.001	63.800	150	
FF2.161	65.450	1.850	1200	F14.002	63.600	225	F14.001	63.600	150	
FF2.104	64.500	1.970	1200	F1.024	62.530	225	F1.023	62.530	225	
							F14.002	62.648	225	118
FF2.167	64.600	1.350	1050	F16.000	63.250	150				
FF2.168	63.250	1.850	1200	F17.000	61.400	150				
FF2.166	63.500	2.386	1200	F17.001	61.114	150	F17.000	61.114	150	
FF2.103	63.000	1.979	1200	F1.025	61.021	225	F1.024	62.164	225	1143
							F16.000	62.000	150	904
							F17.001	61.021	150	
FF2.102	62.500	3.458	1200	F1.026	59.042	225	F1.025	60.786	225	1744
FF2.101	59.000	4.279	1200	F1.027	54.721	225	F1.026	57.500	225	2779
FF2.100	56.000	3.438	1200	F1.028	52.562	225	F1.027	54.500	225	1938
FExis FS.001	55.370	3.200	0		OUTFALL		F1.028	52.170	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	FF2.129	85.000	83.150	1.700	1200
F2.000	o	150	FF2.130	84.800	82.950	1.700	1200
F1.001	o	225	FF2.128	84.650	81.929	2.496	1200
F3.000	o	150	FF2.131	84.350	83.000	1.200	1050
F1.002	o	225	FF2.127	84.400	81.815	2.360	1200
F1.003	o	225	FF2.126	83.550	81.399	1.926	1200
F1.004	o	225	FF2.125	83.450	81.364	1.861	1200
F4.000	o	150	FF2.133	83.350	82.300	0.900	1050
F4.001	o	150	FF2.132	82.600	81.523	0.927	1050
F1.005	o	225	FF2.124	82.750	80.899	1.626	1200
F1.006	o	225	FF2.123	82.500	80.649	1.626	1200
F5.000	o	150	FF2.137	84.700	82.850	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	73.270	60.0	FF2.128	84.650	81.929	2.571	1200
F2.000	25.825	25.3	FF2.128	84.650	81.929	2.571	1200
F1.001	17.075	149.8	FF2.127	84.400	81.815	2.360	1200
F3.000	42.945	60.0	FF2.127	84.400	82.284	1.966	1200
F1.002	62.450	150.0	FF2.126	83.550	81.399	1.926	1200
F1.003	5.170	150.0	FF2.125	83.450	81.364	1.861	1200
F1.004	18.830	40.5	FF2.124	82.750	80.899	1.626	1200
F4.000	46.605	60.0	FF2.132	82.600	81.523	0.927	1050
F4.001	23.315	37.4	FF2.124	82.750	80.900	1.700	1200
F1.005	19.030	76.1	FF2.123	82.500	80.649	1.626	1200
F1.006	53.125	177.1	FF2.122	82.200	80.349	1.626	1200
F5.000	49.610	60.0	FF2.136	84.200	82.023	2.027	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)
F5.001	o	150	FF2.136	84.200	82.023	2.027	1200
F5.002	o	150	FF2.135	84.100	81.915	2.035	1200
F5.003	o	225	FF2.134	82.600	80.750	1.625	1200
F1.007	o	225	FF2.122	82.200	79.047	2.928	1200
F1.008	o	225	FF2.121	82.000	78.989	2.786	1200
F1.009	o	225	FF2.120	81.700	78.934	2.541	1200
F6.000	o	150	FF2.140	82.300	80.450	1.700	1200
F6.001	o	150	FF2.139	82.100	79.810	2.140	1200
F6.002	o	150	FF2.138	82.050	79.735	2.165	1200
F1.010	o	225	FF2.119	81.750	78.607	2.918	1200
F1.011	o	225	FF2.118	81.350	78.457	2.668	1200
F1.012	o	225	FF2.117	78.300	76.449	1.626	1200
F1.013	o	225	FF2.116	78.150	76.299	1.626	1200
F1.014	o	225	FF2.115	78.000	73.460	4.315	1200
F7.000	o	150	FF2.141	79.200	77.350	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)
F5.001	6.505	60.0	FF2.135	84.100	81.915	2.035	1200
F5.002	74.525	64.0	FF2.134	82.600	80.750	1.700	1200
F5.003	85.135	50.0	FF2.122	82.200	79.047	2.928	1200
F1.007	8.575	150.0	FF2.121	82.000	78.989	2.786	1200
F1.008	8.295	150.0	FF2.120	81.700	78.934	2.541	1200
F1.009	48.930	149.6	FF2.119	81.750	78.607	2.918	1200
F6.000	38.370	60.0	FF2.139	82.100	79.810	2.140	1200
F6.001	4.485	59.8	FF2.138	82.050	79.735	2.165	1200
F6.002	66.765	59.2	FF2.119	81.750	78.607	2.993	1200
F1.010	29.910	199.4	FF2.118	81.350	78.457	2.668	1200
F1.011	61.485	30.6	FF2.117	78.300	76.449	1.626	1200
F1.012	5.905	39.4	FF2.116	78.150	76.299	1.626	1200
F1.013	7.825	52.2	FF2.115	78.000	76.149	1.626	1200
F1.014	49.375	150.1	FF2.114	76.300	73.131	2.944	1200
F7.000	68.495	23.6	FF2.114	76.300	74.450	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)
F1.015	o	225	FF2.114	76.300	73.131	2.944	1200
F1.016	o	225	FF2.113	75.750	73.042	2.483	1200
F1.017	o	225	FF2.111	73.250	71.400	1.625	1200
F1.018	o	225	FF2.110	70.000	68.150	1.625	1200
F1.019	o	225	FF2.109	69.850	68.000	1.625	1200
F1.020	o	225	FF2.108	69.350	67.500	1.625	1200
F1.021	o	225	FF2.107	68.500	66.650	1.625	1200
F1.022	o	225	FF2.106	67.550	65.700	1.625	1200
F8.000	o	150	FF2.154	78.500	76.650	1.700	1200
F9.000	o	150	FF2.155	77.400	75.550	1.700	1200
F8.001	o	225	FF2.153	76.750	72.787	3.738	1200
F10.000	o	150	FF2.152	73.050	71.700	1.200	1050
F8.002	o	225	FF2.151	73.275	70.978	2.072	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)
F1.015	13.385	150.4	FF2.113	75.750	73.042	2.483	1200
F1.016	60.704	37.0	FF2.111	73.250	71.400	1.625	1200
F1.017	72.220	22.2	FF2.110	70.000	68.150	1.625	1200
F1.018	7.845	52.3	FF2.109	69.850	68.000	1.625	1200
F1.019	36.705	73.4	FF2.108	69.350	67.500	1.625	1200
F1.020	61.130	71.9	FF2.107	68.500	66.650	1.625	1200
F1.021	38.358	40.4	FF2.106	67.550	65.700	1.625	1200
F1.022	28.170	26.8	FF2.105	66.500	64.650	1.625	1200
F8.000	38.155	21.8	FF2.153	76.750	74.900	1.700	1200
F9.000	87.145	60.0	FF2.153	76.750	74.098	2.502	1200
F8.001	43.415	24.0	FF2.151	73.275	70.978	2.072	1200
F10.000	43.325	60.0	FF2.151	73.275	70.978	2.147	1200
F8.002	25.755	199.7	FF2.150	73.400	70.849	2.326	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)
F8.003	o	225	FF2.150	73.400	70.849	2.326	1200
F8.004	o	225	FF2.149	73.450	70.820	2.405	1200
F8.005	o	225	FF2.148	72.500	70.166	2.109	1200
F8.006	o	225	FF2.147	69.300	67.372	1.703	1200
F8.007	o	225	FF2.146	69.000	67.150	1.625	1200
F11.000	o	150	FF2.158	69.950	68.100	1.700	1200
F11.001	o	150	FF2.157	69.500	67.192	2.158	1200
F11.002	o	225	FF2.156	69.400	67.121	2.054	1200
F8.008	o	225	FF2.145	69.050	66.856	1.969	1200
F8.009	o	225	FF2.144	65.500	64.000	1.275	1050
F12.000	o	150	FF2.159	69.250	67.400	1.700	1200
F8.010	o	225	FF2.143	66.000	63.581	2.194	1200
F13.000	o	150	FF2.160	68.350	66.500	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)
F8.003	5.810	200.3	FF2.149	73.450	70.820	2.405	1200
F8.004	28.475	43.5	FF2.148	72.500	70.166	2.109	1200
F8.005	67.060	24.0	FF2.147	69.300	67.372	1.703	1200
F8.006	5.336	24.0	FF2.146	69.000	67.150	1.625	1200
F8.007	4.515	196.3	FF2.145	69.050	67.127	1.698	1200
F11.000	54.485	60.0	FF2.157	69.500	67.192	2.158	1200
F11.001	10.625	149.6	FF2.156	69.400	67.121	2.129	1200
F11.002	39.705	149.8	FF2.145	69.050	66.856	1.969	1200
F8.008	68.055	23.8	FF2.144	65.500	64.000	1.275	1050
F8.009	83.800	200.0	FF2.143	66.000	63.581	2.194	1200
F12.000	88.345	27.2	FF2.143	66.000	64.150	1.700	1200
F8.010	68.915	200.0	FF2.142	67.000	63.236	3.539	1200
F13.000	35.265	26.1	FF2.142	67.000	65.150	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)
F8.011	o	225	FF2.142	67.000	63.236	3.539	1200
F1.023	o	225	FF2.105	66.500	62.892	3.383	1200
F14.000	o	150	FF2.163	66.100	64.750	1.200	1050
F15.000	o	150	FF2.165	67.250	65.750	1.350	1050
F15.001	o	150	FF2.164	65.700	64.200	1.350	1050
F14.001	o	150	FF2.162	65.300	63.800	1.350	1050
F14.002	o	225	FF2.161	65.450	63.600	1.625	1200
F1.024	o	225	FF2.104	64.500	62.530	1.745	1200
F16.000	o	150	FF2.167	64.600	63.250	1.200	1050
F17.000	o	150	FF2.168	63.250	61.400	1.700	1200
F17.001	o	150	FF2.166	63.500	61.114	2.236	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)
F8.011	68.915	200.0	FF2.105	66.500	62.892	3.383	1200
F1.023	72.305	200.0	FF2.104	64.500	62.530	1.745	1200
F14.000	50.730	63.4	FF2.162	65.300	63.950	1.200	1050
F15.000	44.620	28.8	FF2.164	65.700	64.200	1.350	1050
F15.001	6.065	15.2	FF2.162	65.300	63.800	1.350	1050
F14.001	13.437	67.2	FF2.161	65.450	63.600	1.700	1200
F14.002	28.165	29.6	FF2.104	64.500	62.648	1.627	1200
F1.024	73.250	200.0	FF2.103	63.000	62.164	0.611	1200
F16.000	41.465	33.2	FF2.103	63.000	62.000	0.850	1200
F17.000	17.145	59.9	FF2.166	63.500	61.114	2.236	1200
F17.001	13.950	150.0	FF2.103	63.000	61.021	1.829	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)
F1.025	o	225	FF2.103	63.000	61.021	1.754	1200
F1.026	o	225	FF2.102	62.500	59.042	3.233	1200
F1.027	o	225	FF2.101	59.000	54.721	4.054	1200
F1.028	o	225	FF2.100	56.000	52.562	3.213	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)
F1.025	5.640	24.0	FF2.102	62.500	60.786	1.489	1200
F1.026	37.015	24.0	FF2.101	59.000	57.500	1.275	1200
F1.027	5.301	24.0	FF2.100	56.000	54.500	1.275	1200
F1.028	9.405	24.0	FExis FS.001	55.370	52.170	2.975	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)
F1.028	FExis FS.001	55.370	52.170	52.170	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 H – Storm Water Longitudinal Sections

MH Name	SS2.122	SS2.123	SS2.124	
Hor Scale 1100 Ver Scale 500 Datum (m) 72.000		3.000	2.000	
PN		S1.001	S1.000	
Dia (mm)		225	225	
Slope (1:X)		69.5	198.8	
Cover Level (m)	84.400	84.650	85.000	
Invert Level (m)		82.950 83.150	83.150 83.500	
Length (m)		13.900	69.590	

MH Name	SS2.119	SS2.120		SS2.122	
Hor Scale 1100 Ver Scale 500 Datum (m) 71.000		4.001		3.000	
PN		S1.004		S1.002	
Dia (mm)		300		300	
Slope (1:X)		23.6		135.0	
Cover Level (m)	82.750	83.300	83.550	84.400	
Invert Level (m)		80.974 81.800	81.800 82.050	82.050 82.510	
Length (m)		19.490		62.105	

MH Name	SS2.115			SS2.118	SS2.119	
Hor Scale 1100 Ver Scale 500 Datum (m) 70.000				5.003		4.001
PN				S1.006	S1.005	
Dia (mm)				450	375	
Slope (1:X)				167.1	166.5	
Cover Level (m)	81.800	82.000	82.200	82.500	82.750	
Invert Level (m)		80.487	80.487	80.551	80.551	80.851	80.851	80.974	
Length (m)				50.120	20.480	

MH Name	SS2.113	SS2.114	SS2.115	
Hor Scale 1100 Ver Scale 500 Datum (m) 69.000			6.002	
PN		S1.010	S1.009	
Dia (mm)		450	450	
Slope (1:X)		99.9	100.0	
Cover Level (m)	81.350	81.750	81.800	
Invert Level (m)	79.480	79.802	79.802	80.286
Length (m)		32.155	48.415	

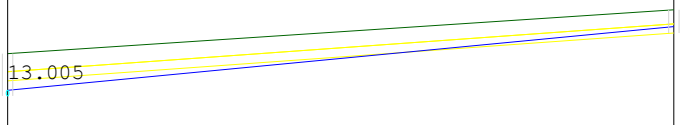
MH Name	SS2.111			SS2.113	
Hor Scale 1100 Ver Scale 500 Datum (m) 66.000			7.001		
PN				S1.011	
Dia (mm)				450	
Slope (1:X)				23.3	
Cover Level (m)	78.000	78.150	78.300	81.350	
Invert Level (m)		76.450	76.650	76.650	79.480
Length (m)				65.870	

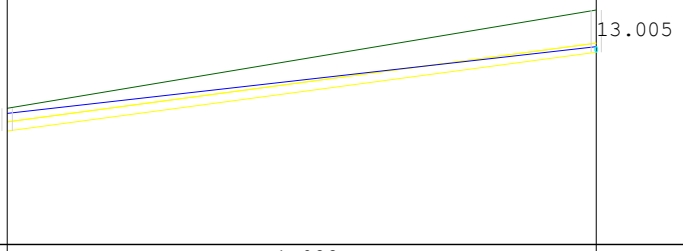
MH Name	SS2.109		SS2.111	
Hor Scale 1100 Ver Scale 500 Datum (m) 64.000			9.000	
PN			S1.014	
Dia (mm)			525	
Slope (1:X)			50.0	
Cover Level (m)	75.750	76.300	78.000	
Invert Level (m)		72.159	72.423	72.423	73.477
Length (m)			52.685	

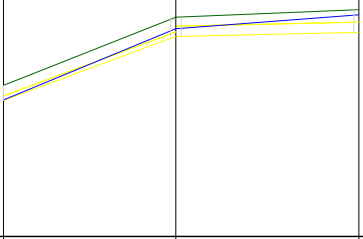
MH Name	SS2.107		SS2.109	
Hor Scale 1100 Ver Scale 500 Datum (m) 62.000		10.003		
PN			S1.016	
Dia (mm)			600	
Slope (1:X)			84.5	
Cover Level (m)	73.000	73.250	75.750	
Invert Level (m)		71.450	71.450 72.159	
Length (m)			59.880	

MH Name	SS2.106	SS2.107	
Hor Scale 1100 Ver Scale 500 Datum (m) 59.000		10.003	
PN		S1.018	
Dia (mm)		600	
Slope (1:X)		35.9	
Cover Level (m)	69.900	73.000	
Invert Level (m)	68.099	70.791	
Length (m)		96.615	

MH Name	SS2.104		
Hor Scale 1100 Ver Scale 500 Datum (m)57.000			
PN			
Dia (mm)			
Slope (1:X)			
Cover Level (m)	69.400	69.900	
Invert Level (m)		68.099	
Length (m)			

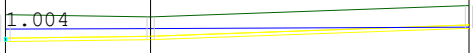
MH Name	SS2.103	SS2.104	
Hor Scale 1100 Ver Scale 500 Datum (m)55.000			
PN		S1.021	
Dia (mm)		600	
Slope (1:X)		30.6	
Cover Level (m)	66.500	69.400	
Invert Level (m)	64.699	67.865	
Length (m)		96.945	

MH Name	SS2.102	SS2.103	
Hor Scale 1100 Ver Scale 500 Datum (m)51.000			
PN		S1.022	
Dia (mm)		600	
Slope (1:X)		16.5	
Cover Level (m)	60.000	66.500	
Invert Level (m)	58.500	63.702	
Length (m)		85.715	

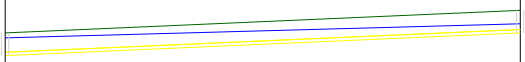
MH Name	SS2.100	SS2.101	SS2.102	
Hor Scale 1100 Ver Scale 500 Datum (m)45.000				
PN		S1.024	S1.023	
Dia (mm)		300	675	
Slope (1:X)		5.9	100.1	
Cover Level (m)	55.000	59.500	60.000	
Invert Level (m)		54.000 58.234	58.234 58.500	
Length (m)		25.090	26.630	

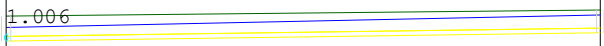
MH Name	SS2.123	SS2.125	
Hor Scale 1100 Ver Scale 500 Datum (m)72.000			
PN		S2.000	
Dia (mm)		225	
Slope (1:X)		174.6	
Cover Level (m)	84.650	84.800	
Invert Level (m)		83.150	83.300
Length (m)		26.185	

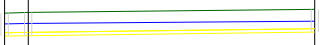
MH Name	SS2.122	SS2.126	
Hor Scale 1100 Ver Scale 500 Datum (m)72.000			
PN		S3.000	
Dia (mm)		225	
Slope (1:X)		167.0	
Cover Level (m)	84.400	84.350	
Invert Level (m)		82.510	82.850
Length (m)		56.765	

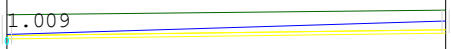
MH Name	SS2.119	SS2.127	SS2.128	
Hor Scale 1100 Ver Scale 500 Datum (m)71.000				
PN		S4.001	S4.000	
Dia (mm)		225	225	
Slope (1:X)		167.6	61.8	
Cover Level (m)	82.750	82.600	83.350	
Invert Level (m)		80.974 81.100	81.100 81.850	
Length (m)		21.120	46.320	

MH Name	SS2.130		SS2.132	
Hor Scale 1100 Ver Scale 500 Datum (m)72.000				
PN			S5.000	
Dia (mm)			225	
Slope (1:X)			98.5	
Cover Level (m)	84.100	84.200	84.700	
Invert Level (m)		82.700 82.700	83.200	
Length (m)			49.250	

MH Name	SS2.129	SS2.130	
Hor Scale 1100 Ver Scale 500 Datum (m)71.000			
PN		S5.002	
Dia (mm)		225	
Slope (1:X)		50.0	
Cover Level (m)	82.600	84.100	
Invert Level (m)	81.100	82.600	
Length (m)		74.945	

MH Name	SS2.117	SS2.129	
Hor Scale 1100 Ver Scale 500 Datum (m)70.000			
PN		S5.003	
Dia (mm)		300	
Slope (1:X)		157.4	
Cover Level (m)	82.200	82.600	
Invert Level (m)	80.551	81.100	
Length (m)		86.440	

MH Name	SS2.133		SS2.135	
Hor Scale 1100 Ver Scale 500 Datum (m) 70.000				
PN			S6.000	
Dia (mm)			225	
Slope (1:X)			166.8	
Cover Level (m)	82.050		82.300	
Invert Level (m)		80.550	80.800	
Length (m)			41.695	

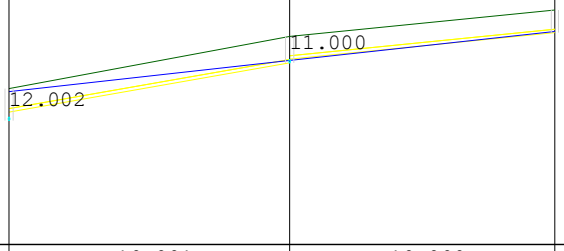
MH Name	SS2.114	SS2.133	
Hor Scale 1100 Ver Scale 500 Datum (m) 69.000			
PN		S6.002	
Dia (mm)		225	
Slope (1:X)		167.1	
Cover Level (m)	81.750	82.050	
Invert Level (m)	80.147	80.529	
Length (m)		63.845	

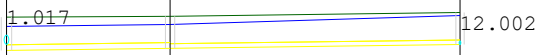
MH Name	SS2.135	SS2.137	
Hor Scale 1100 Ver Scale 500 Datum (m) 68.000		8.000	
PN		S7.000	
Dia (mm)		225	
Slope (1:X)		25.3	
Cover Level (m)	79.500	80.750	
Invert Level (m)		77.707	79.250
Length (m)		38.995	

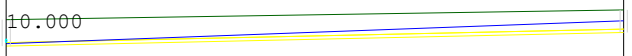
MH Name	SS2.112	SS2.135	
Hor Scale 1100 Ver Scale 500 Datum (m) 67.000		1.011	8.000
PN		S7.001	
Dia (mm)		300	
Slope (1:X)		67.8	
Cover Level (m)	78.300	79.500	
Invert Level (m)		76.650	77.707
Length (m)		71.700	

MH Name	SS2.135		
Hor Scale 1100 Ver Scale 500 Datum (m) 67.000		7.000	
PN			
Dia (mm)			
Slope (1:X)			
Cover Level (m)	79.500	79.250	
Invert Level (m)		77.750	
Length (m)			

MH Name	SS2.110	SS2.138	
Hor Scale 1100 Ver Scale 500 Datum (m) 64.000		1.014	
PN		S9.000	
Dia (mm)		225	
Slope (1:X)		25.5	
Cover Level (m)	76.300	79.000	
Invert Level (m)	74.800	77.500	
Length (m)		68.925	

MH Name	SS2.140	SS2.141	SS2.143	
Hor Scale 1100 Ver Scale 500 Datum (m) 63.000				
PN		S10.001	S10.000	
Dia (mm)		225	225	
Slope (1:X)		12.6	22.1	
Cover Level (m)	73.300	76.750	78.500	
Invert Level (m)		71.750 / 75.002	75.250 / 77.000	
Length (m)		40.825	38.590	

MH Name	SS2.107	SS2.139	SS2.140	
Hor Scale 1100 Ver Scale 500 Datum (m) 61.000				
PN		S10.003	S10.002	
Dia (mm)		375	300	
Slope (1:X)		166.4	166.8	
Cover Level (m)	73.000	73.050	73.300	
Invert Level (m)		70.791 / 70.934	70.934 / 71.187	
Length (m)		23.800	42.189	

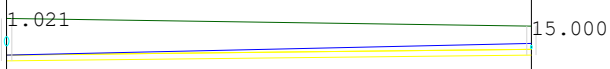
MH Name	SS2.141	SS2.142	
Hor Scale 1100 Ver Scale 500 Datum (m) 65.000			
PN		S11.000	
Dia (mm)		225	
Slope (1:X)		100.1	
Cover Level (m)	76.750	77.400	
Invert Level (m)	75.002	75.900	
Length (m)		89.845	

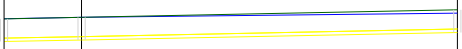
MH Name	SS2.140	SS2.144		SS2.146	
Hor Scale 1100 Ver Scale 500 Datum (m) 61.000					
PN		S12.002		S12.000	
Dia (mm)		225		225	
Slope (1:X)		167.4		166.3	
Cover Level (m)	73.300	73.400	73.450	73.000	
Invert Level (m)		71.187 71.338	71.338 71.386	71.386 71.500	
Length (m)		25.270		18.955	

MH Name	SS2.149			SS2.152	
Hor Scale 1100 Ver Scale 500 Datum (m)59.000		14.002			
PN				S13.000	
Dia (mm)				225	
Slope (1:X)				20.6	
Cover Level (m)	69.050	69.100	69.400	72.500	
Invert Level (m)		67.600	67.900	71.000	
Length (m)				63.950	

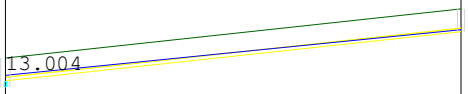
MH Name	SS2.148	SS2.149	
Hor Scale 1100 Ver Scale 500 Datum (m)55.000		14.002	
PN		S13.003	
Dia (mm)		225	
Slope (1:X)		22.5	
Cover Level (m)	66.000	69.050	
Invert Level (m)		64.500	67.550
Length (m)		68.520	

MH Name	SS2.147	SS2.148	
Hor Scale 1100 Ver Scale 500 Datum (m)54.000			
PN		S13.004	
Dia (mm)		375	
Slope (1:X)		200.2	
Cover Level (m)	66.000	66.000	
Invert Level (m)		64.084	64.500
Length (m)		83.280	

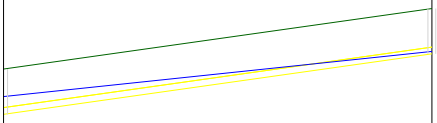
MH Name	SS2.103	SS2.147	
Hor Scale 1100 Ver Scale 500 Datum (m)54.000			
PN		S13.005	
Dia (mm)		375	
Slope (1:X)		199.9	
Cover Level (m)	66.500	66.000	
Invert Level (m)		63.702	64.084
Length (m)		76.350	

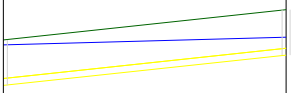
MH Name	SS2.153		SS2.155	
Hor Scale 1100 Ver Scale 500 Datum (m)57.000				
PN			S14.000	
Dia (mm)			225	
Slope (1:X)			109.4	
Cover Level (m)	69.400	69.500	70.000	
Invert Level (m)		67.900 68.000	68.000	68.500
Length (m)			54.675	

MH Name	SS2.149	SS2.153	
Hor Scale 1100 Ver Scale 500 Datum (m)57.000		13.002	
PN		S14.002	
Dia (mm)		225	
Slope (1:X)		118.8	
Cover Level (m)	69.050	69.400	
Invert Level (m)		67.550	67.900
Length (m)		41.595	

MH Name	SS2.147	SS2.156	
Hor Scale 1100 Ver Scale 500 Datum (m)55.000			
PN		S15.000	
Dia (mm)		225	
Slope (1:X)		20.4	
Cover Level (m)	66.000	69.250	
Invert Level (m)	64.500	67.750	
Length (m)		66.295	

Denis O'Sullivan & Associates		Page 1
Unit 5, Joyce House Barrack Square Ballincollig, Co. Cork	Catchment Area No. 2 Castlepark, Mallow, Co. Cork	
Date 27/09/2024 File SW Model Catchmen...	Designed By S.O.'Grady Checked By	
Micro Drainage	Network W.12.4	

MH Name	SS2.207	SS2.208	
Hor Scale 1000 Ver Scale 250 Datum (m) 60.000			
PN		S1.000	
Dia (mm)		225	
Slope (1:X)		28.3	
Cover Level (m)	65.500	67.500	
Invert Level (m)	64.000	66.000	
Length (m)		56.660	

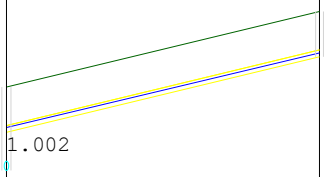
MH Name	SS2.206	SS2.207	
Hor Scale 1000 Ver Scale 250 Datum (m) 58.000			
PN		S1.001	
Dia (mm)		225	
Slope (1:X)		37.4	
Cover Level (m)	64.500	65.500	
Invert Level (m)	63.000	64.000	
Length (m)		37.400	

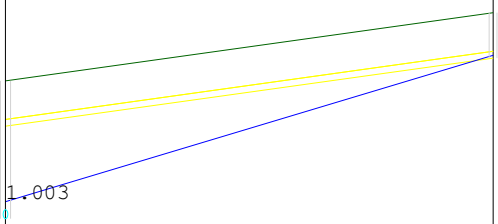
MH Name	SS2.205	SS2.206	
Hor Scale 1000 Ver Scale 250 Datum (m)58.000		2.001	
PN		S1.002	
Dia (mm)		300	
Slope (1:X)		300.0	
Cover Level (m)	65.500	64.500	
Invert Level (m)	62.742	63.000	
Length (m)		77.280	

MH Name	SS2.203	SS2.205	
Hor Scale 1000 Ver Scale 250 Datum (m)59.000		3.000	2.001
PN		S1.003	
Dia (mm)		300	
Slope (1:X)		300.0	
Cover Level (m)	67.000	65.500	
Invert Level (m)	62.440	62.742	
Length (m)		90.650	

MH Name	SS2.200				
Hor Scale 1000 Ver Scale 250 Datum (m) 58.000				3.000	
PN					
Dia (mm)					
Slope (1:X)					
Cover Level (m)	62.760	64.000		67.000	
Invert Level (m)		62.398	62.408	62.440	
Length (m)					

MH Name	SS2.209	SS2.210	
Hor Scale 1000 Ver Scale 250 Datum (m) 62.000			
PN		S2.000	
Dia (mm)		225	
Slope (1:X)		112.8	
Cover Level (m)	68.000	68.750	
Invert Level (m)	66.500	67.250	
Length (m)		84.575	

MH Name	SS2.205	SS2.209	
Hor Scale 1000 Ver Scale 250 Datum (m) 60.000			
PN		S2.001	
Dia (mm)		225	
Slope (1:X)		16.6	
Cover Level (m)	65.500	68.000	
Invert Level (m)		64.000	66.500
Length (m)		41.415	

MH Name	SS2.203	SS2.204	
Hor Scale 1000 Ver Scale 250 Datum (m) 60.000			
PN		S3.000	
Dia (mm)		225	
Slope (1:X)		28.7	
Cover Level (m)	67.000	69.250	
Invert Level (m)		65.500	67.750
Length (m)		64.500	

Appendix J – Foul Sewer Longitudinal Sections

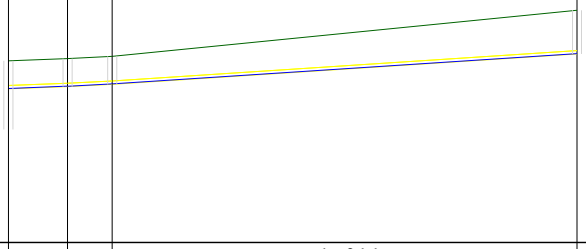
Denis O'Sullivan & Associates		Page 1
Unit 5, Joyce House Barrack Square Ballincollig, Co. Cork	Residential Development Castlepark, Mallow Co. Cork	
Date 26/09/2024 File FS MODEL.MDX	Designed By S.O.'Grady Checked By	
Micro Drainage	Network W.12.4	

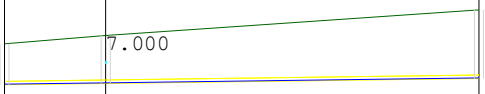
MH Name	FF2.127	FF2.128		FF2.129	
Hor Scale 1000 Ver Scale 500 Datum (m) 72.000		3.000		2.000	
PN		F1.001		F1.000	
Dia (mm)		225		150	
Slope (1:X)		149.8		60.0	
Cover Level (m)	84.400	84.650		85.000	
Invert Level (m)		81.815	81.929	81.929	83.150
Length (m)		17.075		73.270	

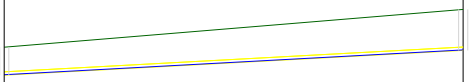
MH Name	FF2.124	FF2.125		FF2.127	
Hor Scale 1000 Ver Scale 500 Datum (m) 71.000		4.001			3.000
PN		F1.004		F1.002	
Dia (mm)		225		225	
Slope (1:X)		40.5		150.0	
Cover Level (m)	82.750	83.450	83.550	84.400	
Invert Level (m)		80.899	81.364	81.399	81.399	81.815
Length (m)		18.830		62.450	

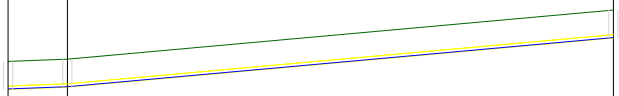
MH Name	FF2.120			FF2.123	FF2.124	
Hor Scale 1000 Ver Scale 500 Datum (m) 69.000				5.003		4.001
PN				F1.006	F1.005	
Dia (mm)				225	225	
Slope (1:X)				177.1	76.1	
Cover Level (m)	81.700	82.000	82.200	82.500	82.750	
Invert Level (m)		78.934 78.989	78.989 79.047	80.349 80.649	80.649 80.899	
Length (m)				53.125	19.030	

MH Name	FF2.118	FF2.119	FF2.120	
Hor Scale 1000 Ver Scale 500 Datum (m) 69.000			6.002	
PN		F1.010	F1.009	
Dia (mm)		225	225	
Slope (1:X)		199.4	149.6	
Cover Level (m)	81.350	81.750	81.700	
Invert Level (m)		78.457 78.607	78.607 78.934	
Length (m)		29.910	48.930	

MH Name	FF2.115			FF2.118	
Hor Scale 1000 Ver Scale 500 Datum (m) 66.000					
PN				F1.011	
Dia (mm)				225	
Slope (1:X)				30.6	
Cover Level (m)	78.000	78.150	78.300	81.350	
Invert Level (m)		76.149 76.299	76.449	76.449 78.457	
Length (m)				61.485	

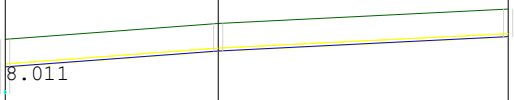
MH Name	FF2.113	FF2.114	FF2.115	
Hor Scale 1000 Ver Scale 500 Datum (m) 64.000				
PN		F1.015	F1.014	
Dia (mm)		225	225	
Slope (1:X)		150.4	150.1	
Cover Level (m)	75.750	76.300	78.000	
Invert Level (m)		73.042 73.131	73.131 73.460	
Length (m)		13.385	49.375	

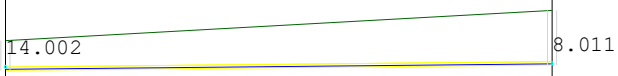
MH Name	FF2.111	FF2.113	
Hor Scale 1000 Ver Scale 500 Datum (m) 62.000			
PN		F1.016	
Dia (mm)		225	
Slope (1:X)		37.0	
Cover Level (m)	73.250	75.750	
Invert Level (m)	71.400	73.042	
Length (m)		60.704	

MH Name	FF2.109		FF2.111	
Hor Scale 1000 Ver Scale 500 Datum (m) 59.000				
PN			F1.017	
Dia (mm)			225	
Slope (1:X)			22.2	
Cover Level (m)	69.850	70.000	73.250	
Invert Level (m)		68.000 68.150	68.150 71.400	
Length (m)			72.220	

MH Name	FF2.108	FF2.109	
Hor Scale 1000 Ver Scale 500 Datum (m)57.000			
PN		F1.019	
Dia (mm)		225	
Slope (1:X)		73.4	
Cover Level (m)	69.350	69.850	
Invert Level (m)		67.500	68.000
Length (m)		36.705	

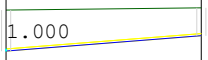
MH Name	FF2.107	FF2.108	
Hor Scale 1000 Ver Scale 500 Datum (m)56.000			
PN		F1.020	
Dia (mm)		225	
Slope (1:X)		71.9	
Cover Level (m)	68.500	69.350	
Invert Level (m)		66.650	67.500
Length (m)		61.130	

MH Name	FF2.105	FF2.106	FF2.107	
Hor Scale 1000 Ver Scale 500 Datum (m)54.000				
PN		F1.022	F1.021	
Dia (mm)		225	225	
Slope (1:X)		26.8	40.4	
Cover Level (m)	66.500	67.550	68.500	
Invert Level (m)		64.650	65.700 / 65.700	66.650
Length (m)		28.170	38.358	

MH Name	FF2.104	FF2.105	
Hor Scale 1000 Ver Scale 500 Datum (m)53.000			
PN		F1.023	
Dia (mm)		225	
Slope (1:X)		200.0	
Cover Level (m)	64.500	66.500	
Invert Level (m)		62.530	62.892
Length (m)		72.305	

MH Name	FF2.102		FF2.104	
Hor Scale 1000 Ver Scale 500 Datum (m) 50.000		16.000 17.001		14.002
PN			F1.024	
Dia (mm)			225	
Slope (1:X)			200.0	
Cover Level (m)	62.500	63.000	64.500	
Invert Level (m)		61.021 62.164	62.530	
Length (m)			73.250	

MH Name	FExis FS.001			FF2.102	
Hor Scale 1000 Ver Scale 500 Datum (m) 46.000					
PN				F1.026	
Dia (mm)				225	
Slope (1:X)				24.0	
Cover Level (m)	55.370	56.000	59.000	62.500	
Invert Level (m)		52.170 52.562	54.721	57.500 59.042	
Length (m)				37.015	

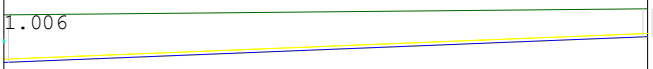
MH Name	FF2.128	FF2.130	
Hor Scale 1000 Ver Scale 500 Datum (m)72.000			
PN		F2.000	
Dia (mm)		150	
Slope (1:X)		25.3	
Cover Level (m)	84.650	84.800	
Invert Level (m)		81.929	82.950
Length (m)		25.825	

MH Name	FF2.127	FF2.131	
Hor Scale 1000 Ver Scale 500 Datum (m)72.000			
PN		F3.000	
Dia (mm)		150	
Slope (1:X)		60.0	
Cover Level (m)	84.400	84.350	
Invert Level (m)		82.284	83.000
Length (m)		42.945	

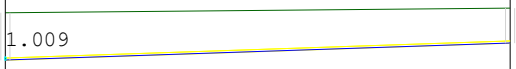
MH Name	FF2.124	FF2.132	FF2.133	
Hor Scale 1000 Ver Scale 500 Datum (m) 71.000				
PN		F4.001	F4.000	
Dia (mm)		150	150	
Slope (1:X)		37.4	60.0	
Cover Level (m)	82.750	82.600	83.350	
Invert Level (m)		80.900	81.523 81.523	82.300
Length (m)		23.315	46.605	

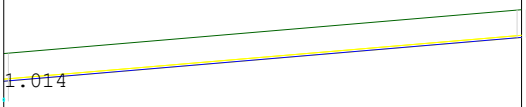
MH Name	FF2.135		FF2.137	
Hor Scale 1000 Ver Scale 500 Datum (m) 72.000				
PN			F5.000	
Dia (mm)			150	
Slope (1:X)			60.0	
Cover Level (m)	84.100	84.200	84.700	
Invert Level (m)		82.023 82.023	82.850	
Length (m)			49.610	

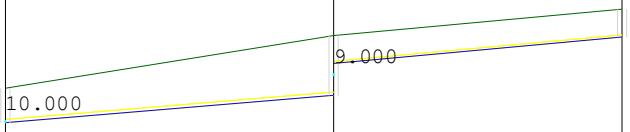
MH Name	FF2.134	FF2.135	
Hor Scale 1000 Ver Scale 500 Datum (m) 71.000			
PN		F5.002	
Dia (mm)		150	
Slope (1:X)		64.0	
Cover Level (m)	82.600	84.100	
Invert Level (m)	80.750	81.915	
Length (m)		74.525	

MH Name	FF2.122	FF2.134	
Hor Scale 1000 Ver Scale 500 Datum (m) 69.000			
PN		F5.003	
Dia (mm)		225	
Slope (1:X)		50.0	
Cover Level (m)	82.200	82.600	
Invert Level (m)	79.047	80.750	
Length (m)		85.135	

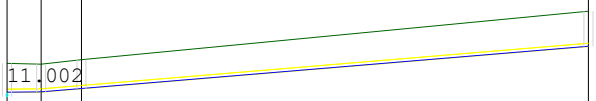
MH Name	FF2.138		FF2.140	
Hor Scale 1000 Ver Scale 500 Datum (m) 70.000				
PN			F6.000	
Dia (mm)			150	
Slope (1:X)			60.0	
Cover Level (m)	82.050	82.100	82.300	
Invert Level (m)		79.810	79.810 80.450	
Length (m)			38.370	

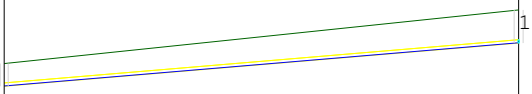
MH Name	FF2.119	FF2.138	
Hor Scale 1000 Ver Scale 500 Datum (m) 69.000			
PN		F6.002	
Dia (mm)		150	
Slope (1:X)		59.2	
Cover Level (m)	81.750	82.050	
Invert Level (m)	78.607	79.735	
Length (m)		66.765	

MH Name	FF2.114	FF2.141	
Hor Scale 1000 Ver Scale 500 Datum (m) 65.000			
PN		F7.000	
Dia (mm)		150	
Slope (1:X)		23.6	
Cover Level (m)	76.300	79.200	
Invert Level (m)	74.450	77.350	
Length (m)		68.495	

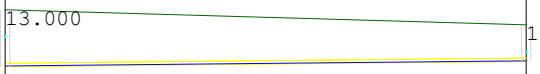
MH Name	FF2.151	FF2.153	FF2.154	
Hor Scale 1000 Ver Scale 500 Datum (m) 63.000				
PN		F8.001	F8.000	
Dia (mm)		225	150	
Slope (1:X)		24.0	21.8	
Cover Level (m)	73.275	76.750	78.500	
Invert Level (m)	70.978	72.787	74.900	76.650
Length (m)		43.415	38.155	

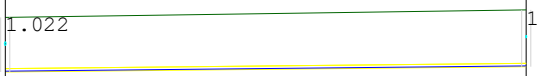
MH Name	FF2.148	FF2.149		FF2.151	
Hor Scale 1000 Ver Scale 500 Datum (m) 60.000					10.000
PN		F8.004		F8.002	
Dia (mm)		225		225	
Slope (1:X)		43.5		199.7	
Cover Level (m)	72.500	73.450	73.400	73.275	
Invert Level (m)		70.166	70.820	70.849	70.849	70.978	
Length (m)		28.475		25.755	

MH Name	FF2.145			FF2.148	
Hor Scale 1000 Ver Scale 500 Datum (m) 58.000		11.002			
PN				F8.005	
Dia (mm)				225	
Slope (1:X)				24.0	
Cover Level (m)	69.050	69.000	69.300	72.500	
Invert Level (m)		67.150	67.372	67.372	70.166	
Length (m)				67.060	

MH Name	FF2.144	FF2.145	
Hor Scale 1000 Ver Scale 500 Datum (m)55.000			11.002
PN		F8.008	
Dia (mm)		225	
Slope (1:X)		23.8	
Cover Level (m)	65.500	69.050	
Invert Level (m)	64.000	66.856	
Length (m)		68.055	

MH Name	FF2.143	FF2.144	
Hor Scale 1000 Ver Scale 500 Datum (m)53.000		 12.000	
PN		F8.009	
Dia (mm)		225	
Slope (1:X)		200.0	
Cover Level (m)	66.000	65.500	
Invert Level (m)	63.581	64.000	
Length (m)		83.800	

MH Name	FF2.142	FF2.143	
Hor Scale 1000 Ver Scale 500 Datum (m)54.000			
PN		F8.010	
Dia (mm)		225	
Slope (1:X)		200.0	
Cover Level (m)	67.000	66.000	
Invert Level (m)	63.236	63.581	
Length (m)		68.915	

MH Name	FF2.105	FF2.142	
Hor Scale 1000 Ver Scale 500 Datum (m)53.000			
PN		F8.011	
Dia (mm)		225	
Slope (1:X)		200.0	
Cover Level (m)	66.500	67.000	
Invert Level (m)	62.892	63.236	
Length (m)		68.915	

MH Name	FF2.153	FF2.155	
Hor Scale 1000 Ver Scale 500 Datum (m) 64.000		8.000	
PN		F9.000	
Dia (mm)		150	
Slope (1:X)		60.0	
Cover Level (m)	76.750	77.400	
Invert Level (m)		74.098 / 75.550	
Length (m)		87.145	

MH Name	FF2.151	FF2.152	
Hor Scale 1000 Ver Scale 500 Datum (m) 61.000		8.001	
PN		F10.000	
Dia (mm)		150	
Slope (1:X)		60.0	
Cover Level (m)	73.275	73.050	
Invert Level (m)		70.978 / 71.700	
Length (m)		43.325	

MH Name	FF2.156		FF2.158	
Hor Scale 1000 Ver Scale 500 Datum (m)57.000				
PN			F11.000	
Dia (mm)			150	
Slope (1:X)			60.0	
Cover Level (m)	69.400	69.500	69.950	
Invert Level (m)		67.121 67.192	67.192 68.100	
Length (m)			54.485	

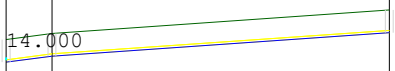
MH Name	FF2.145	FF2.156	
Hor Scale 1000 Ver Scale 500 Datum (m)57.000		8.007	
PN		F11.002	
Dia (mm)		225	
Slope (1:X)		149.8	
Cover Level (m)	69.050	69.400	
Invert Level (m)		66.856 67.121	
Length (m)		39.705	

MH Name	FF2.143		FF2.159	
Hor Scale 1000 Ver Scale 500 Datum (m)55.000		8.009		
PN		F12.000		
Dia (mm)		150		
Slope (1:X)		27.2		
Cover Level (m)	66.000		69.250	
Invert Level (m)		64.150	67.400	
Length (m)		88.345		

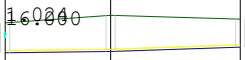
MH Name	FF2.142	FF2.160	
Hor Scale 1000 Ver Scale 500 Datum (m)54.000		8.010	
PN		F13.000	
Dia (mm)		150	
Slope (1:X)		26.1	
Cover Level (m)	67.000	68.350	
Invert Level (m)		65.150	66.500
Length (m)		35.265	

MH Name	FF2.161	FF2.162	FF2.163	
Hor Scale 1000 Ver Scale 500 Datum (m)53.000			15.001	
PN		F14.001	F14.000	
Dia (mm)		150	150	
Slope (1:X)		67.2	63.4	
Cover Level (m)	65.450	65.300	66.100	
Invert Level (m)		63.600 / 63.800	63.950 / 64.750	
Length (m)		13.437	50.730	

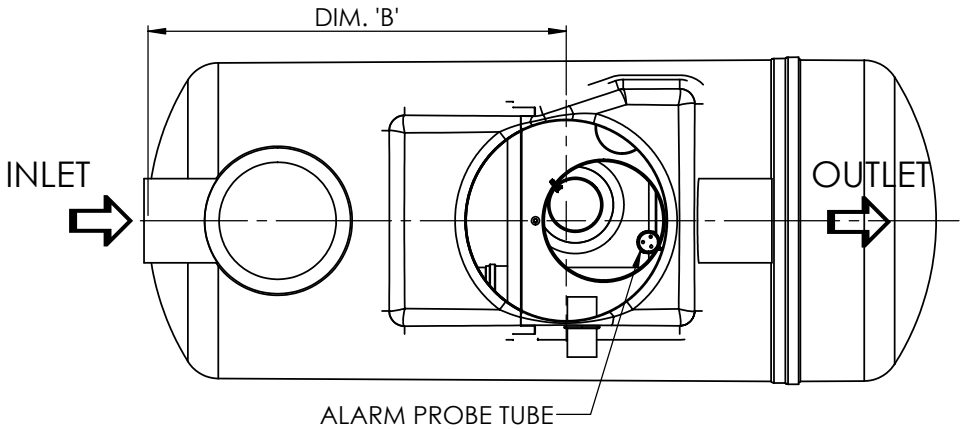
MH Name	FF2.104	FF2.161	
Hor Scale 1000 Ver Scale 500 Datum (m)52.000		1.023	
PN		F14.002	
Dia (mm)		225	
Slope (1:X)		29.6	
Cover Level (m)	64.500	65.450	
Invert Level (m)		62.648 / 63.600	
Length (m)		28.165	

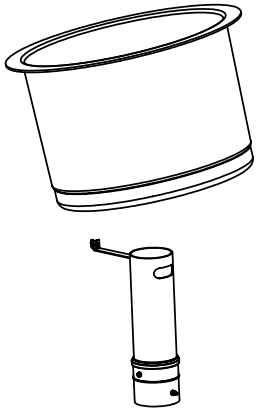
MH Name	FF2.162		FF2.165	
Hor Scale 1000 Ver Scale 500 Datum (m)54.000				
PN			F15.000	
Dia (mm)			150	
Slope (1:X)			28.8	
Cover Level (m)	65.300	65.700	67.250	
Invert Level (m)		64.200	64.200	65.750
Length (m)			44.620	

MH Name	FF2.103	FF2.167	
Hor Scale 1000 Ver Scale 500 Datum (m)51.000			
PN		F16.000	
Dia (mm)		150	
Slope (1:X)		33.2	
Cover Level (m)	63.000	64.600	
Invert Level (m)		62.000	63.250
Length (m)		41.465	

MH Name	FF2.103	FF2.166	FF2.168	
Hor Scale 1000 Ver Scale 500 Datum (m) 51.000				
PN		F17.001	F17.000	
Dia (mm)		150	150	
Slope (1:X)		150.0	59.9	
Cover Level (m)	63.000	63.500	63.250	
Invert Level (m)		61.021 61.114	61.114 61.400	
Length (m)		13.950	17.145	

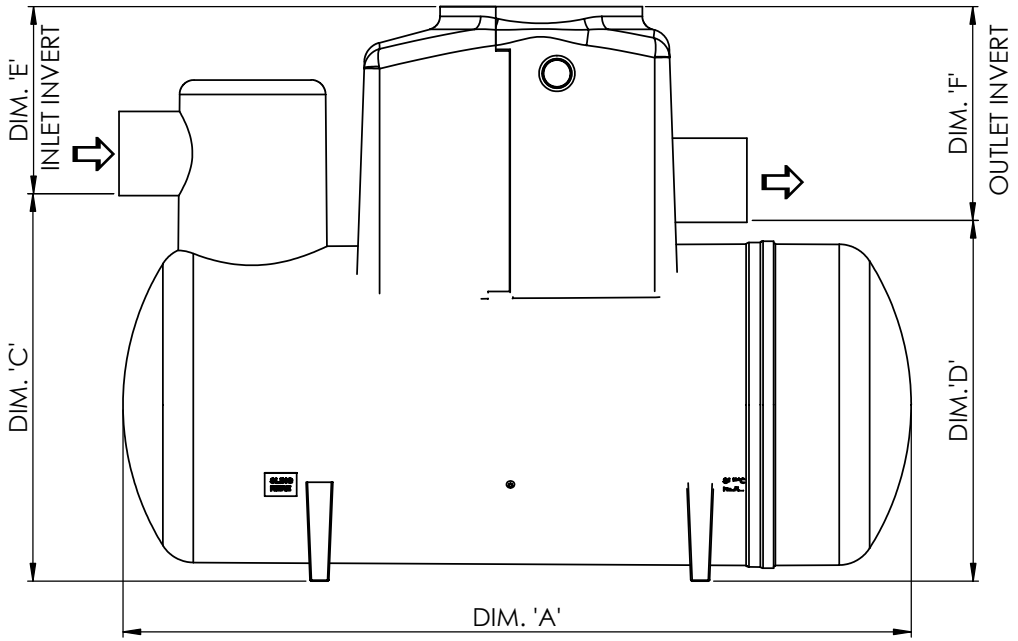
Appendix K – Petrol Interceptor Details

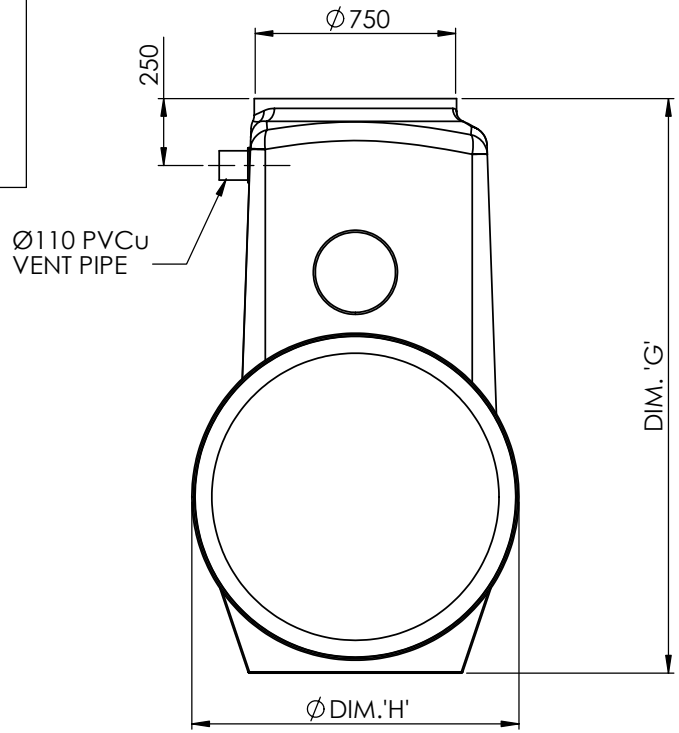




EXTENSION PARTS (IF REQUIRED) INCLUDED IN PRODUCT CODE

NOTES
1. UNITS ARE SUPPLIED WITH THE STANDARD (MINIMUM) PIPEWORK SIZE, AND ORIENTATION SHOWN ON THE DRAWING. THE STANDARD EN858-1 STATES MINIMUM CONNECTION SIZES, UNITS ORDERED WITH DIFFERENT SIZE CONNECTIONS MAY NOT BE FULLY COMPLIANT WITH THE STANDARD. PLEASE CONSULT OUR SALES DEPARTMENT FOR DETAILS OF AVAILABLE OPTIONS, BUT PLEASE NOTE WE DO NOT ALTER INTERNAL PIPEWORK.
2. ALL UNITS SUPPLIED ARE CLASS 1 AND INCLUDE A COALESCER.
3. EXTENSION PARTS FOR DEEPER INVERTS CAN BE PROVIDED FOR ON SITE ASSEMBLY.
4. ALL UNITS REQUIRE APPROPRIATE CONCRETE BASE, COVER AND FRAME TO SUIT APPLIED LOADINGS.
5. THIS DRAWING SHOULD BE USED FOR DIMENSIONAL INFORMATION ONLY.
6. A Ø76mm TUBE IS SUPPLIED TO HOUSE AN OIL ALARM PROBE.





UNIT	NOMINAL FLOW (l/sec.)	DIM.'A'	DIM.'B'	DIM.'C'	DIM.'D'	DIM.'E'	DIM.'F'	DIM.'G'	DIM.'H'	STD. PIPE Ø	APPROX. EMPTY WEIGHT (kg)	FALL ACROSS UNIT
NSBE010	10.0	2070	1095	1450	1350	700	800	2150	1220	315	160	100
NSBE015	15.0	2950	1560	1450	1350	700	800	2150	1220	315	200	100
NSBE020	20.0	3893	2016	1450	1350	700	800	2150	1220	375	220	100
NSBE025	25.0	3575	1900	1680	1580	700	800	2380	1420	375	300	100
NSBE030	30.0	4265	2263	1680	1580	700	800	2380	1420	450	325	100

Please check with Kingspan Environmental that this drawing is the latest issue

Issue	Date	Drawn by	Approved by	Description
05	24.06.13	T.Kelly		CC1131 - Case Feet Changed
04	13.02.13	T.Kelly		CC981 Phase 2 - NSBE025 & 030 Added

Material : Various	Tolerance :
Finish :	Thickness : n/a
Weight :	Surface Area :

Drawing : DS1155

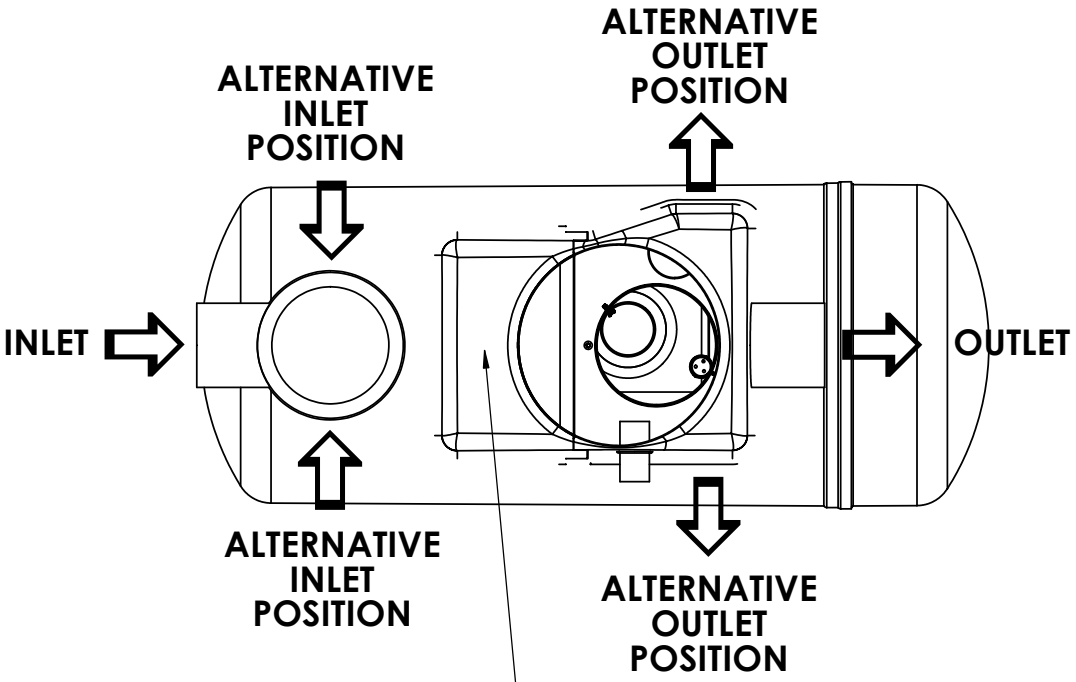
NSBE010 - NSBE030 Bypass Separators

All dimensions in mm

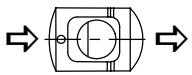
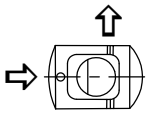
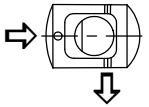
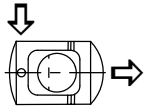
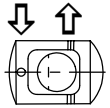
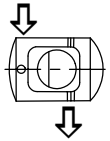
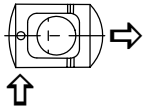
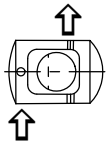
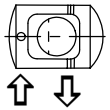
Scale: Not to scale

Kingspan Environmental

R:\Drawing Data\02 - Sales Drawings\DS\DS - 11\DS1155



Please Note:-
Due to the physically small size of the NSBE010, the inlet pipe, all orientation options, is fitted directly into this turret.

Pipe Orientation Options		
OPTION A 	OPTION B 	OPTION C 
OPTION D 	OPTION E 	OPTION F 
OPTION G 	OPTION H 	OPTION K 

Material : Various	Tolerance (unless stated) :	**Drawing : DS1155**	Page 2 of 2
Finish :	Thickness : n/a		
Weight : 229.91 Kg	Surface Area : m²	NSBE010 - 030 BYPASS SEPARATORS	
Modelled By :			

All Dimensions In mm | Scale: Do Not Scale | Third Angle Projection

R:\Drawing Data\02 - Sales Drawings\DS\DS - 11\DS1155

Kingspan Environmental

Appendix L – 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

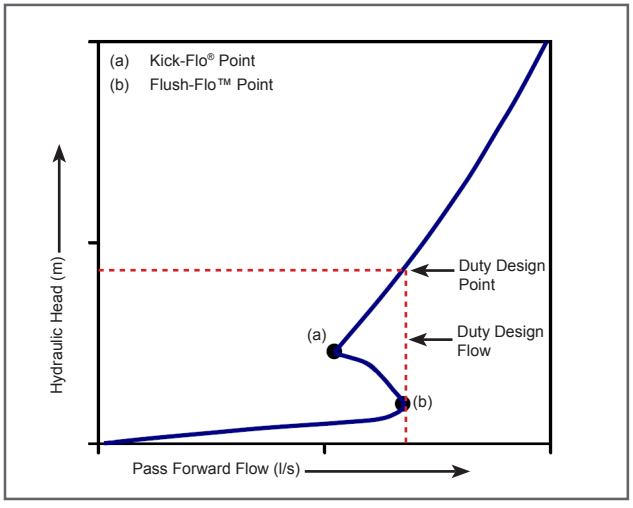
BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4599

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

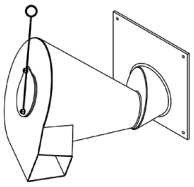
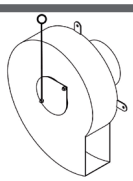
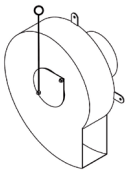
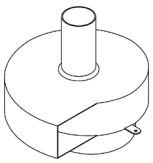
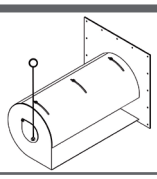
To ensure correct implementation a multiple design-point specification, defining the main hydraulic features of the selected flow control, can be provided by HRD Technologies Ltd. This should include at least the following information:

- 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

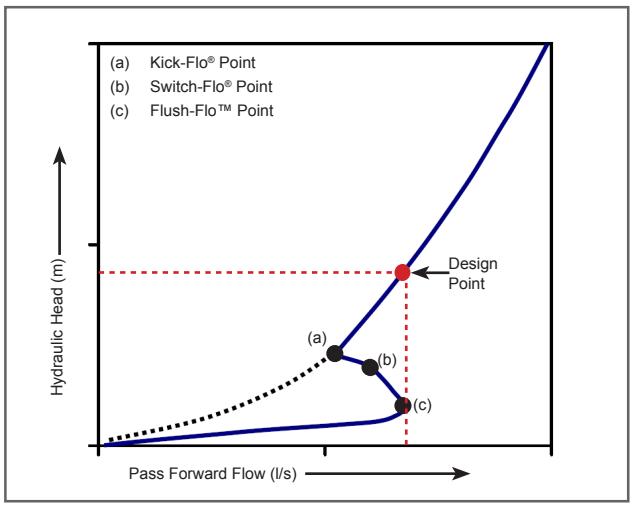
Surface / Storm Water Applications	Foul / Combined Applications
1) Select sump-type Md13 (STH) initially. This is a British Board of Agrément (BBA) approved product that is currently only available in certain sizes – if a size is not available for the specified duty/ design point go to 2) otherwise use 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

HRD Technologies Ltd • Tootenhill House • Rathcoole • Co. Dublin • Ireland
Tel: +353 (0) 1 4013964 • Fax: +353 (0) 1 4013978 • www.hrdtec.com
HRD Technologies Ltd is a subsidiary of Hydro International plc

