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Engineering Services Report

Proposed Residential Development

Drumlark, Co. Cavan

Client: Drumlark Investments Ltd

Job No. D111

February 2024


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ENGINEERING SERVICES REPORT

PROPOSED RESIDENTIAL DEVELOPMENT, DRUMLARK, CO. CAVAN

TABLE OF CONTENTS

File Location: Job-D111\B_DOCUMENTS\1.0 Planning\Reports\ESR

BS 1192 FIELD	**D111-CSC-ZZ-XX-RP-C-0001**

Job Ref.	Author	Reviewed By	Authorised By	Issue Date	Rev. No.
D111	LJ	NB	OS	27.02.2024	P3
D111	LJ	NB	OS	21.02.2024	P2
D111	LJ	NB	OS	14.07.2023	P1

1.0 INTRODUCTION

Cronin & Sutton Consulting Engineers (CS Consulting) have been commissioned by Drumlark Investments Ltd to prepare an Engineering Services Report to accompany a planning submission for a proposed 145-units Large-scale Residential Development (LRD) at Drumlark, Cavan.

1.1 Report Overview

This report details the following aspects of the proposed development:

- Stormwater Drainage Infrastructure
- Foul Drainage Infrastructure
- Potable Water Infrastructure

In preparing this report, CS Consulting has made reference to the following:

- Cavan County Development Plan 2022–2028;
- Regional Code of Practice For development works, Version 6;
- Irish Water's Code of Practice for Water Infrastructure;
- Irish Water's Code of Practice for Wastewater Infrastructure;
- Local Authority Drainage Records

The Engineering Services Report is to be read in conjunction with the engineering drawings and documents submitted by CS Consulting, and with the various additional information submitted by the other members of the design team, as part of the planning submission.

1.2 Site Location

The proposed development site in located approx. 3kms north from the Cavan Town Centre. The site is located in the administrative jurisdiction of Cavan County Council and has a development site area of circa 4.62ha.

Figure 1 – Location of Proposed Development Site
(*map data & imagery: EPA, OSM Contributors, Google*)

The location of the proposed development site is shown in **Figure 1** above; the indicative extents of the development site, as well as relevant elements of the surrounding road network, are shown in more detail in **Figure 2.**

Figure 2 – Site Extents and elements of surrounding street network
(map data & imagery: OSM Contributors, Google)

The subject site is bound by greenfield on all the sides. There are a few existing residential developments to the north-east of the development site.

1.3 Site Characteristics

The subject development is greenfield. There is an existing water course approx. 80m from the eastern boundary of the development site.
There is also an existing Ringfort along the north-western boundary of the site. The development site boundary shall have a buffer of 30m from the Ringfort.

1.4 Ground Conditions

A topographical survey of the subject site was carried out. The site currently falls from approx. 89.62 mAOD along north-western boundary of the site to 73.99 mAOD towards north-eastern boundary of the site.

1.5 Proposed Development

The development will consist of the provision of a total of 145no. residential units along with provision of a crèche. Particulars of the development comprise as follows:

a. Site excavation works to facilitate the proposed development to include excavation and general site preparation works.
b. The reprofiling of ground levels within the site as required.
c. The provision of a total of 91no. residential dwellings which will consist of 25no. 2 bed units, 55no. 3 bed units and 11no. 4 bed units. The dwellings range in height from single storey to two storey.
d. The provision of a total of 54no. duplex apartment units consisting of 15no.1 bed units and 39no. 2bed units. The duplex apartment blocks range in height from two storey to three storey in height.
e. Provision of a 2 storey creche with associated parking, bicycle and bin storage.
f. Provision of associated car parking at surface level via a combination of in-curtilage parking for dwellings and via on-street parking for the creche and duplex apartment units.
g. Provision of electric vehicle charge points with associated site infrastructure ducting to provide charge points for residents throughout the site.
h. Provision of associated bicycle storage facilities at surface level throughout the site and bin storage facilities
i. Creation of a new access point from the public road with associated works to include for a connections to the existing public footpath along with provision of a pedestrian crossing point with a raised table.
j. The provision of a new shared cycleway and footpath to serve the site.
k. Provision of internal access roads and footpaths and associated works.
l. Provision of residential communal open space areas to include formal play areas along with all hard and soft landscape works with public

lighting, planting and boundary treatments to include boundary walls, railings & fencing.

m. Internal site works and attenuation systems which will include for provision of a hydrocarbon and silt interceptor prior to discharge into the surface water network.

n. All ancillary site development/construction works to facilitate foul, water and service networks for connection to the existing foul, water and ESB networks.

2.0 WATER SUPPLY

2.1 Existing Water Supply

Irish Water Drainage Records indicate an existing 150mm diameter uPVC watermain traversing the site along the eastern boundary. IW Records also indicate an existing 150mm diameter pipe along L1532 approx. 80m east of the development.

2.2 Proposed Water Supply Design & Calculations

The proposed development comprises of 145no. residential units and 342.1 sqm crèche.

It is proposed to take the water supply off the existing watermain of 150mm diameter to the east of the development site along L1532. The proposed watermain connection shall be via 150mm diameter watermain pipe. The existing 150mm diameter watermain pipe traversing the development site shall be connected and diverted to run along the internal road network.

2.2.1 Residential Units Water Demand

The Irish Water Code of Practice for Water Infrastructure specifies an average potable water demand of 150 litres per person per day for domestic dwellings, and an average occupancy of 2.7 persons per residential unit. The development's applicable design population is therefore 392 people, and the average potable water demand of the proposed development may be calculated as:

⇒ 150 l/person/day.

⇒ Average water demand

150 l/day x 392 people = 58,800 l/person/day = 0.680 l/sec

⇒ Peak water demand (5 times average water demand)

5 x 0.680 l/sec = 3.402 l/sec.

2.2.2 Crèche Water Demand

The Irish Water Code of Practice for Water Infrastructure does not specify potable water consumption rates for non-domestic uses; therefore, the water demand is assumed to be 150l/person/day. Taking into consideration the size of the creche, it is assumed that a maximum of 30no. people shall be present on a daily basis. Therefore, the potable water demand for the creche may be calculated as:

⇒ 150 l/person/day.

⇒ Average water demand

150 l/day x 30 people = 4500 l/person/day = 0.052 l/sec

⇒ Peak water demand (5 times average water demand)

5 x 0.052 l/sec = 0.260 l/sec.

2.2.3 Total Potable Water Demand by the Proposed Development

- Average Demand = 0.680 l/s + 0.052 l/s = 0.732 l/s
- Peak Demand = 3.402 l/s + 0.260 l/s = 3.662 l/s.

The watermain network for the development shall be in accordance with the Building Regulations and to the requirements and specifications of Irish Water.

Please refer to CS Consulting Drawing **D111-CSC-XX-XX-DR-C-0003** for the watermain layout for the proposed development.

2.3 Irish Water Liaison

A Pre-Connection Enquiry (PCE) was submitted to Irish Water for the proposed development. As a response to the PCE, a confirmation of Feasibility (CoF) was issued by Irish Water which states a water connection is feasible without infrastructural upgrades. However, it was noted that;

'Please note that according to our records there is an existing water main running through this site (see drawing attached).

Any structures or works over or in close proximity to Irish Water infrastructure that will inhibit access for maintenance or endanger structural or functional integrity of the infrastructure are not allowed.

The layout of the development must ensure that this pipe is protected and adequate separation distances are provided between Irish Water infrastructure and any structures on site. Alternatively you may enter into a diversion agreement with Irish Water and divert the pipe to accommodate your development. If you wish to proceed with this option please contact Irish Water at Diversions@water.ie and submit detailed design drawings before submitting your planning application. It will be necessary to provide a wayleave over this pipe to the benefit of Irish Water and ensure that it is accessible for maintenance. For more information, please see go to the link below: https://www.water.ie/connections/developer-services/diversions.'

It is proposed to divert the existing watermain running within the site. A formal diversion agreement shall be submitted to Irish Water subject to planning. See **Appendix B** to this report for a copy of Confirmation of Feasibility (CoF) also included in **Appendix B** is the Statement of Design Acceptance (SoDA) by Irish Water.

2.4 Design Standards

- Irish Water Code of Practice for Water Infrastructure.
- Building Regulations.

3.0 FOUL DRAINAGE

3.1 Existing Foul Drainage Infrastructure

Irish Water Drainage Records indicate an existing 225mm diameter uPVC combined sewer along L1532 to the east of the development site.

A utility survey was carried out in and around the subject site. The survey results do not show any foul sewer in the close proximity of the development site.

3.2 Proposed Foul Drainage Design & Calculations

The proposed development shall require a new separate foul drainage system to collect and convey the effluent generated by the proposed buildings. The drainage network for the proposed development has been designed in accordance with:

- The Regional Code of Practice Drainage Works,
- The Greater Dublin Strategic Drainage Study,
- Irish Water Code of Practice for Wastewater Infrastructure.

The drainage network for the development shall be in accordance with Part H of the Building Regulations and to the requirements and specifications set out in the Irish Water Code of Practice for Wastewater.

The proposed development comprises of 145no. residential units and 342.1 sqm crèche.

The foul effluent generated by the proposed development site is divided into two catchment areas.

Catchment 1 includes the north and west section of houses. All the foul effluent generated within this catchment area shall discharge into existing

combined sewer running along L1532. The foul effluent shall be collected in separate foul pipes and flow under gravity via a new connection.

Catchment 2 includes the small group of houses and the creche along the south and south-eastern part of the development site. All the foul effluent generated within this catchment area shall discharge into the existing combined sewer along L1532 to the south-east. The foul effluent shall be collected in separate foul pipes and flow under gravity via a new connection.

See **Figure 3** below for Foul Catchment extents.

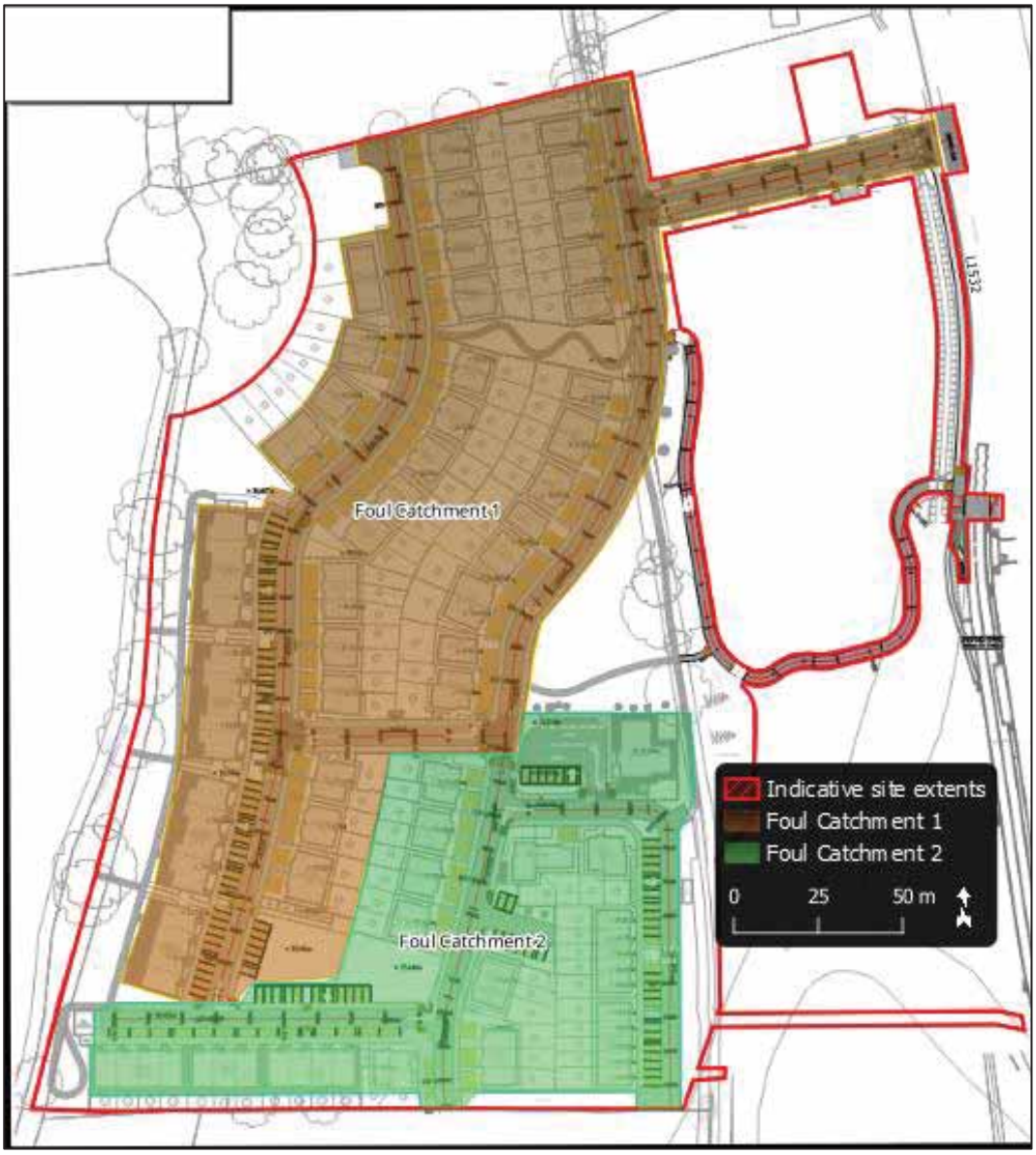

Figure 3 – Proposed Foul Catchments
(map data & imagery: OSM Contributors, Google, QGIS)

3.2.1 Foul Effluent generated by the Residential Units

The Irish Water Code of Practice for Wastewater Infrastructure specifies an average foul effluent flow rate of 165 litres per person per day for domestic dwellings (150 litres per person per day, plus a 10% allowance for external infiltration) and an average occupancy of 2.7 persons per residential unit. The development's applicable design

population is therefore 392 people, and the foul effluent to be generated by the proposed residential units may be calculated as:

⇒ 165 l/person/day.

⇒ Dry Weather Flow (DWF)

165 l/day x 392 people = 64,680 l/person/day = 0.748 l/sec

⇒ Peak Flow (6 times DWF)

6 x 0.748 l/sec = 4.491 l/sec.

3.2.2 Foul Effluent generated by the Crèche

The Irish Water Code of Practice for Wastewater Infrastructure specifies an average foul effluent flow rate of 50 litres per person per day for School without Canteen. Taking into consideration the size of the creche, it is assumed that a maximum of 30no. people shall be present on a daily basis. Therefore, the foul effluent generated by the creche may be calculated as:

⇒ 50 l/person/day.

⇒ Dry Weather Flow (DWF)

50 l/day x 30 people = 1500 l/person/day = 0.017 l/sec

⇒ Peak Flow (6 times DWF)

6 x 0.017 l/sec = 0.102 l/sec.

3.2.3 Total Foul Effluent generated by the Proposed Development

- Average Flow = 0.748 l/s + 0.017 l/s = 0.765 l/s
- Peak Flow = 4.491 l/s + 0.102 l/s = 4.593 l/s

Please refer to CS Consulting Drawing **D111-CSC-XX-XX-DR-C-0002** for the watermain layout for the proposed development and **Appendix C** for Foul Drainage Calculations.

3.3 Irish Water Liaison

A Pre-Connection Enquiry (PCE) was submitted to Irish Water for the proposed development. As a response to the PCE, a confirmation of Feasibility (CoF) was issued by the Irish Water and was noted that wastewater connection is feasible without infrastructure upgrades. See **Appendix B** of this report also included in **Appendix B** is the Statement of Design Acceptance (SoDA) by Irish Water.

3.4 Design Standards

- Irish Water Code of Practice for Wastewater Infrastructure.
- Part H of the Building Regulations.

4.0 SURFACE WATER MANAGEMENT PLAN

4.1 Existing Surface Water Drainage Infrastructure

There is an existing watercourse ditches to the west of the development site. This watercourse serves the existing residential estates.

A utility survey was carried out by Apex Surveyors in and around the subject site. The survey results indicate an existing storm sewer of 225mm diameter along L1532 to the east of the development site. The survey also indicates that an existing 150mm diameter storm sewer traverses the development site along the eastern boundary. Please refer to CS Consulting drawing no. **D111-CSC-XX-XX-DR-C-0021** for the utility survey.

4.2 Proposed Surface Water Drainage Design

4.2.1 Proposed surface water drainage layout and connection points

The proposed development comprises two principal catchments for the collection and disposal of stormwater runoff from impermeable areas:

- Catchment 1 of 2.37ha, includes the north and western sections of the development site, and all the storm water from this Catchment Area shall discharge into existing ditch running adjacent to L1532.
- Catchment 2 of 1.19ha, includes the southern and south-eastern section of the development site, and the storm water from this catchment area shall discharge into the existing ditch running adjacent to L1532.

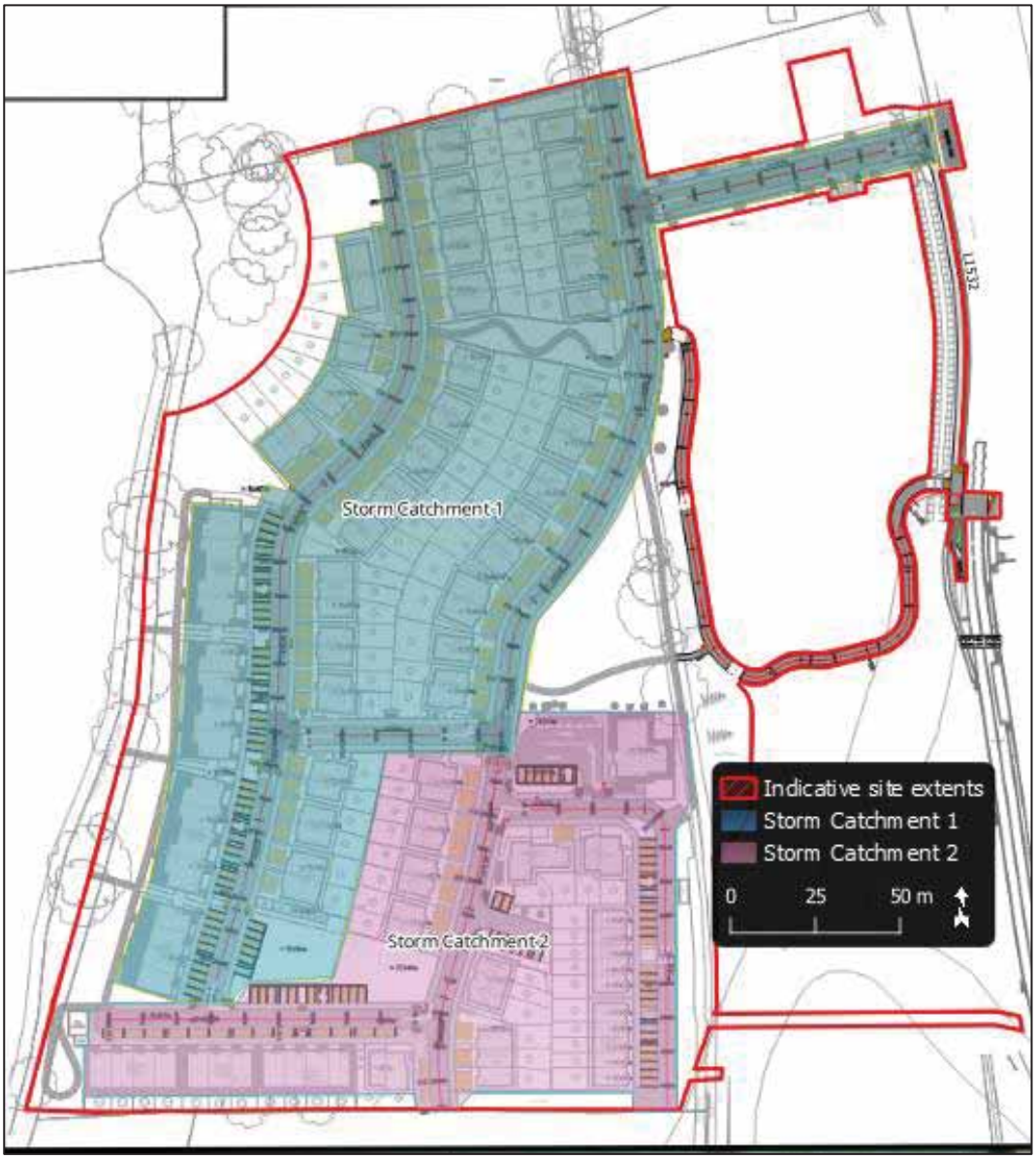

Figure 4 – Proposed Storm Catchments
(map data & imagery: OSM Contributors, Google, QGIS)

Refer to **Figure 4** for Storm Catchment extents and CS Consulting drawings **D111-CSC-XX-XX-DR-C-0002** for full details of the development's proposed stormwater drainage arrangements.

4.2.2 Summary of Compliance with Criteria 1-4 of GDSDS

The GDSDS and the Regional Code of Practice for Drainage Works require that a development's stormwater drainage arrangements satisfy four main criteria:

- Criterion 1: River Water Quality Protection – satisfied by treatment of run-off within SuDS features, e.g., Swales, Bioretention, Green Roofs etc.
- Criterion 2: River Regime Protection - satisfied by attenuating run-off from the site.
- Criterion 3: Level of Service (flooding) for the site – satisfied by the site being outside the 1000-year coastal and fluvial flood extent areas.
- Criterion 4: River Flood Protection – attenuation and/or long-term storage provided within the SuDS features.

In accordance with the requirements of Cavan County Council, the proposed development shall incorporate Sustainable Drainage Systems (SuDS) features. These serve a dual purpose in managing stormwater within new developments.

4.2.3 Stormwater discharge attenuation

The primary role of SuDS features is to restrict post development stormwater run-off to greenfield discharge rates. The development is to retain storm water volumes predicted to be experienced during extreme rainfall events. This is defined as the volume of storm water generated during a 1-in-100-year storm event, increased by 20% to account for the predicted effects of climate change.

4.2.4 Initial treatment of stormwater runoff

The second function of SuDS features is to permit stormwater quality to be improved before disposal and, where applicable, to allow stormwater to infiltrate into the ground on site rather than discharging to the public drainage system or to watercourses.

The proposed new stormwater drainage infrastructure has been designed and will be constructed in accordance with:

i) The Greater Dublin Strategic Drainage Study (GDSDS), Volume 2
ii) The Greater Dublin Regional Code of Practice for Drainage Works
iii) British Standard BS EN 752:2008 (Drains and Sewer Systems Outside Buildings)
iv) Part H of the Building Regulations (Building Drainage)

4.3 Proposed Sustainable Drainage System (SuDS) Design

Cavan County Council's Drainage Division requires that all developments adhere to their policy of implementing Sustainable Drainage Systems (SuDS). SuDS not only entail restricting stormwater discharge during extreme storm events but also to integrate sustainable water management solutions to create safe places. The features proposed shall reduce run-off volumes and pollution concentrations and enhance groundwater recharge and biodiversity.

4.3.1 Attenuation Storage

The restriction of post development run-off to greenfield discharge rates is to be achieved primarily through the provision of onsite attenuation storage, which shall retain excess runoff during extreme rainfall events and allow this to be discharged at a controlled rate.

In accordance with Cavan County Council's requirements, the subject site must retain stormwater generated on site during a 1-in-100-year storm event (increased by 20% for predicted climate change effects) and limit stormwater discharge from the site to the greenfield discharge rate.

To ensure an accurate calculation of the required attenuation for the development site Met Eireann was contacted to provide:

i. The SAAR (Standard Annual Average Rainfall) of the area: 973mm/year.

ii. The sliding duration table for the site indicating the 1-in-100-year rainwater intensities to be used.

iii. Soil type value for the subject lands, this has been established as soil type 3.

QBar is calculated as follows: $QBAR = 0.00108 \times AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$.

These parameters allow the Q-Bar greenfield runoff rate to be calculated. The calculated Q-Bar rate was determined to be 6.46 l/s/ha. A total attenuation storage volume of 1630m³ is required for the development site, and a total attenuation storage volume of 1630m³ is provided. Refer to the stormwater attenuation calculations attached as **Appendix D.**

Catchment 1

Catchment 1 has an area of 2.37ha (with an additional 1.01Ha to accommodate development of future areas) The greenfield runoff rate has been established as 22.8 l/s and the attenuation storage requirement is 1100m³. Total attenuation storage of 1100m³ (560m³ +

540m³) is provided for this catchment. Stormwater from this catchment shall discharge to the existing ditch to the north-east of the development site via a flow control device, at a maximum rate of 22.8 l/s.

Catchment 2

Catchment 2 has an area of 1.19ha. The greenfield runoff rate has been established as 7.9 l/s and the attenuation storage requirement is 530m³. Total attenuation storage of 530m³ is provided for this catchment. Stormwater from this catchment shall discharge to the existing ditch via a flow control device, at a maximum rate of 7.9 l/s.

4.3.2 Proposed SuDS Elements

The proposed SuDS features within the subject development shall consist of:

a. Low water usage sanitary appliances to reduce the volume of potable water required for use within buildings.
b. Permeable paving for car-parking bays to allow rainwater to dissipate into the ground, mimicking the current natural arrangement.
c. Green Roofs for the apartment blocks.
d. Installation of online water butts to capture rainwater from roof areas and to store this for local use, landscaping and maintenance purposes, further reducing reliance on the potable water network.
e. Swales to capture the rainwater from the internal network and permit infiltration.
f. Attenuation tank with permeability to allow for infiltration.
g. Tree pits, Bio-retention areas.

4.3.3 SuDS Outline Management Plan

For the SUDS strategy to work as designed, it is important that the entire drainage system is well maintained. It shall be the responsibility of the site management team to ensure the drainage system is maintained. Maintenance and clearing of gullies drain manholes (including catch pits) and attenuation tanks shall ensure adequate performance.

4.4 Works to the Existing Stream

As part of this application, it is proposed to establish a 2-meterwide pedestrian footpath alongside the existing L1532 to establish connectivity between the primary junction of the development and the zebra crossing. Presently, there exists a stream flowing from north to south along the western side of the existing L1532 road within the development's ownership boundary. To accommodate the proposed footpath, it is necessary to alter the existing stream. The section of the stream to be altered spans approximately 100 meters, and the westward shift required is in the range of 1-2 meters.

Furthermore, where the proposed road junction and the shared pedestrian and cyclist path cross the stream, the installation of two culverts is imperative. The sizing of these culverts has been estimated based on the OPW CFRAM maps, utilizing the 100-year top of water flood level and the existing channel dimensions. It is worth noting that the watercourse works and culvert sizing are to be agreed in detail with OPW during the Section 50 application process.

5.0 FOUNDATIONS

The construction of the houses will involve complex sequencing of activities and various construction methodologies could be adopted to deliver the Contract. It is envisaged that the proposed buildings could be constructed as combination of blockwork and/or timber frame elements subject to change in detailed design stages.

As noted, the construction methodology and therefore the programme of the construction activities will be dictated by the Contractor.

The following outlines a general construction sequence:

Buildings Structure:

- Construction of the foundations traditional strip foundations, ground beams and floor slabs;
- Construction of rising elements to ground floor;
- Construction of 215mm masonry load bearing walls and any required reinforced concrete beams and columns;
- Installation of precast floor panels on load bearing walls;
- Installation of screed on precast floor panels.

Envelope / Cladding:

- Commencement of envelope works to ground floor when structure has progressed to 1st floor level, with suitable temporary openings in the façade left for ease of transport of construction material;

Mechanical & Electrical fit-out:

- First fix will commence at each level behind structure; and

- This will be followed by the second fix and the final connections

Fit-out:

- Initial installation of stud work when cladding is complete, and floor is weather tight;
- Installation of equipment and associated connection to services; and
- Completion of finishes.

Commissioning:

- The final commissioning period will commence during fit-out; and
- The above is an indicative construction sequence. The final sequence will be dictated by the Contractor. The Contractor must issue a detailed construction programme outlining the various stages prior to commencement of works.

Appendix A: Existing Irish Water & Local Authority Record Plans


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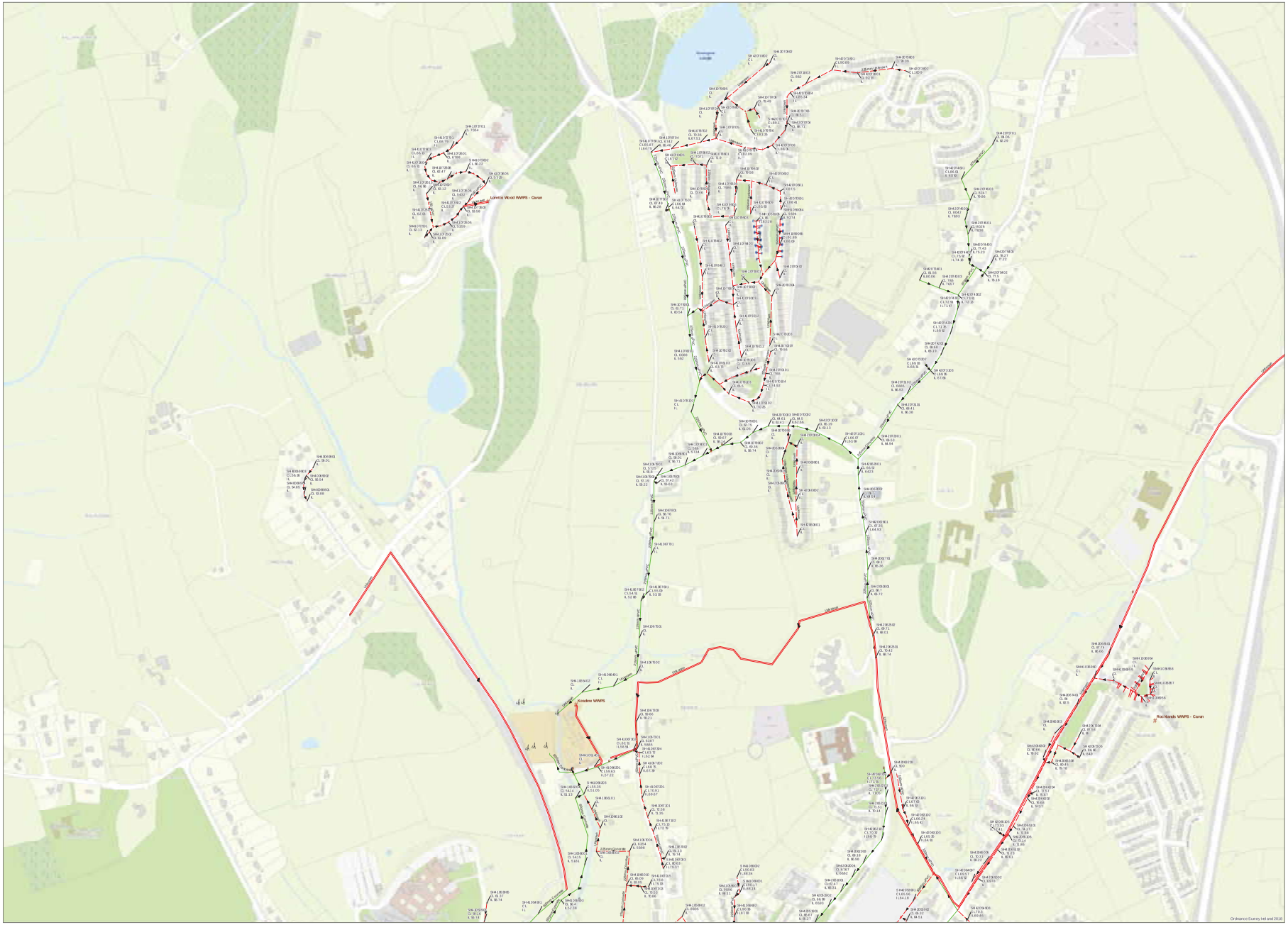


UISCE ÉIREANN : IRISH WATER

Legend

Sewer Manholes
- Standard
- Other; Unknown

Sewer Discharge Points
- Outfall
- Other; Unknown

Sewer Inlets
- Standard
- Other; Unknown

Sewer Fittings
- Other; Unknown

Sewer Mains (Irish Water)
- Gravity - Combined
- Gravity - Foul
- Pumping - Foul

Sewer Lateral Lines
- Sewer Lateral Lines

Pump Station
- Pump Station

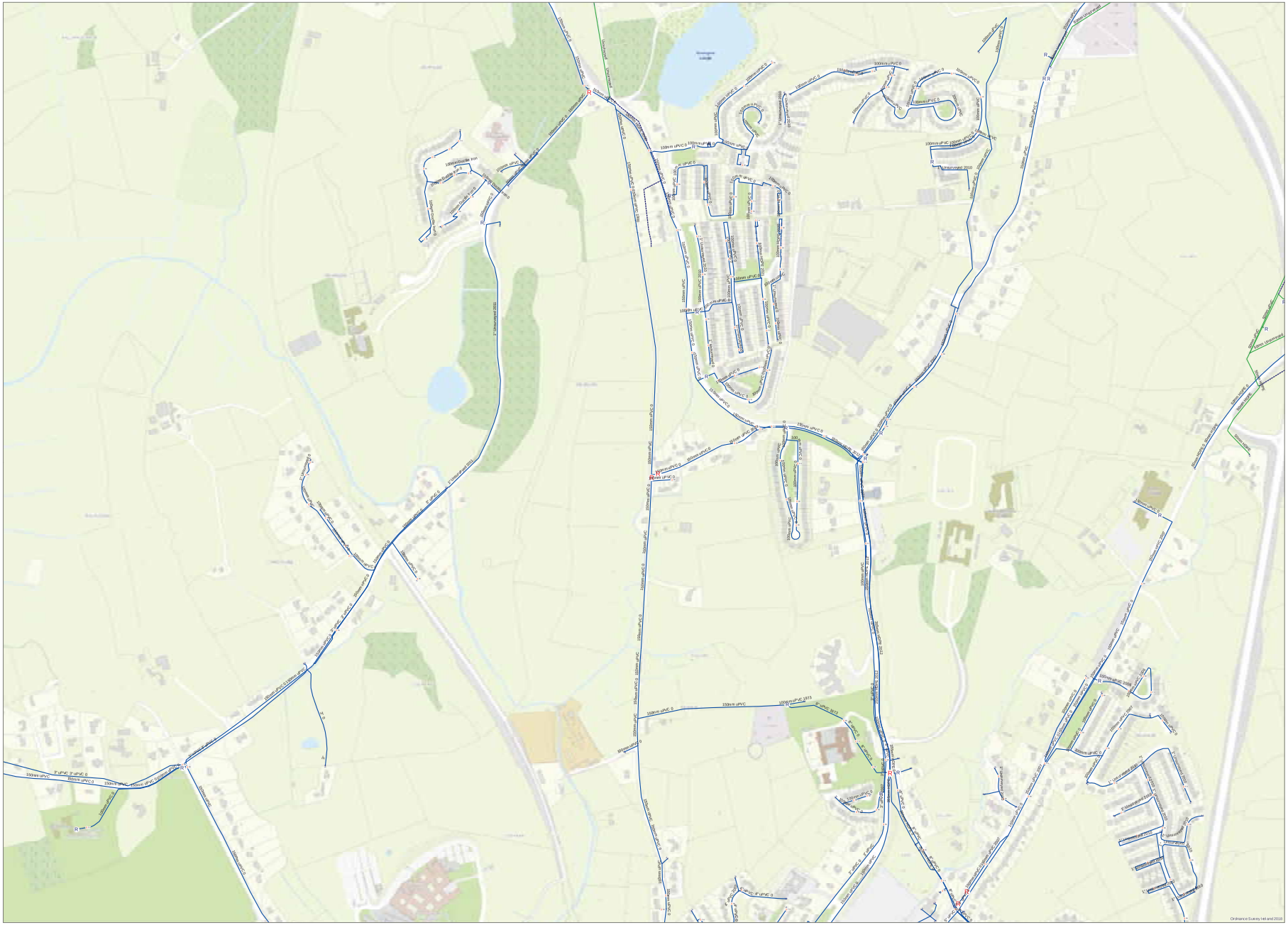
Waste Water Treatment Plant
- Waste Water Treatment Plant

0 70 140 280 m

Coordinate System: TM65 Irish Grid
Projection: Transverse Mercator

Scale @ A3:	1:3,064
Drawing No.:	IW-AGG-2018-000
Drawn By:	MI
Checked By:	<Add Name>
Approved By:	<Add Name>
Drawn Date	14/02/2023
Checked Date:	<dd/mm/yyyy>
Approved Date:	<dd/mm/yyyy>

Sewer Network
Drumlark, Co. Cavan



UISCE ÉIREANN : IRISH WATER

Legend

Non Boundary Meter
R Meter

Boundary Meter
R District (Boundary Meter)

Water Hydrants
Fire Hydrant

Pump Stations
Pump Stations

Water Network Structures
Water Network Structures

Abstraction Point
Abstraction Point

Water Fittings
Cap
Other Fitting

Water Mains(Irish Water Owned)
Potable Water

Water Mains(Non Irish Water Owned)
Potable Water

Water Abandoned Lines
Water Abandoned Lines

0 70 140 280 m

Coordinate System: TM65 Irish Grid Projection: Transverse Mercator	
Scale @ A3:	1:3,064
Drawing No.:	IW-AGG-2018-000
Drawn By:	MI
Checked By:	<Add Name>
Approved By:	<Add Name>
Drawn Date	14/02/2023
Checked Date:	<dd/mm/yyyy>
Approved Date:	<dd/mm/yyyy>

Water Distribution
Drumlark, Co. Cavan

Appendix B: Confirmation of Feasibility (CoF)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Joe Fryers
CS Consulting
19-22 Dame Street
Dublin 2
Dublin
D02 E267

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

28 February 2024

Re: Design Submission for Site at Drumlark, Cavan (Phase 1 – 145 units), (the "Development")
(the "Design Submission") / Connection Reference No: CDS23000589

Dear Joe Fryers,

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: Richard Daly
Email: richard.daly@water.ie

Yours sincerely,

Dermot Phelan
Connections Delivery Manager

Appendix A

Document Title & Revision

- Proposed Drainage Layout – Drawing No. D111-CSC-XX-XX-DR-C-0002_Rev P5
- Proposed Watermain Layout – Drawing No. D111-CSC-XX-XX-DR-C-0003_Rev P5
- Proposed Drainage Details Sheet 1 – Drawing No. D111-CSC-XX-XX-DR-C-004_Rev P1
- Proposed Drainage Details Sheet 1 – Drawing No. D111-CSC-XX-XX-DR-C-004_Rev P1
- Proposed Watermain Details Sheet 1 – Drawing No. D111-CSC-XX-XX-DR-C-007_Rev P2
- Proposed Watermain Details Sheet 2 – Drawing No. D111-CSC-XX-XX-DR-C-008_Rev P2
- Irish Water Long Sections Sheet 1 – Drawing No. D111-CSC-XX-XX-DR-C-0100_Rev P2
- Irish Water Long Sections Sheet 2 – Drawing No. D111-CSC-XX-XX-DR-C-0101_Rev P2
- Irish Water Long Sections Sheet 3 – Drawing No. D111-CSC-XX-XX-DR-C-0102_Rev P2

*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.

CONFIRMATION OF FEASIBILITY

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

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

www.water.ie

Joe Fryers

19-22 Dame Street
Dublin 2
Co. Dublin
D02E267

8 March 2023

Our Ref: CDS23000572 Pre-Connection Enquiry
Site At, Drumlark, Cavan, Cavan

Dear Applicant/Agent,

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

Irish Water has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 150 unit(s) at Site At, Drumlark, Cavan, Cavan, (the **Development)**.

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

- **Water Connection**
  - **Feasible without infrastructure upgrade by Irish Water**
  - Please note that according to our records there is an existing water main running through this site (see drawing attached).

    Any structures or works over or in close proximity to Irish Water infrastructure that will inhibit access for maintenance or endanger structural or functional integrity of the infrastructure are not allowed.

    The layout of the development must ensure that this pipe is protected and adequate separation distances are provided between Irish Water infrastructure and any structures on site. Alternatively you may enter into a diversion agreement with Irish Water and divert the pipe to accommodate your development. If you wish to proceed with this option please contact Irish Water at

		Diversions@water.ie and submit detailed design drawings before submitting your planning application. It will be necessary to provide a wayleave over this pipe to the benefit of Irish Water and ensure that it is accessible for maintenance. For more information, please see go to the link below: https://www.water.ie/connections/developer-services/diversions/
• **Wastewater Connection**	-	**Feasible without infrastructure upgrade by Irish Water**

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water 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 Irish Water.

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/

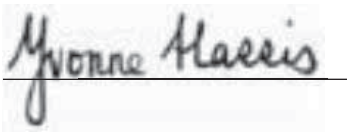
Where can you find more information?

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

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Irish Water's network(s). This is not a connection offer and capacity in Irish Water's network(s) may only be secured by entering into a connection agreement with Irish Water.

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

Yours sincerely,



Yvonne Harris
Head of Customer Operations

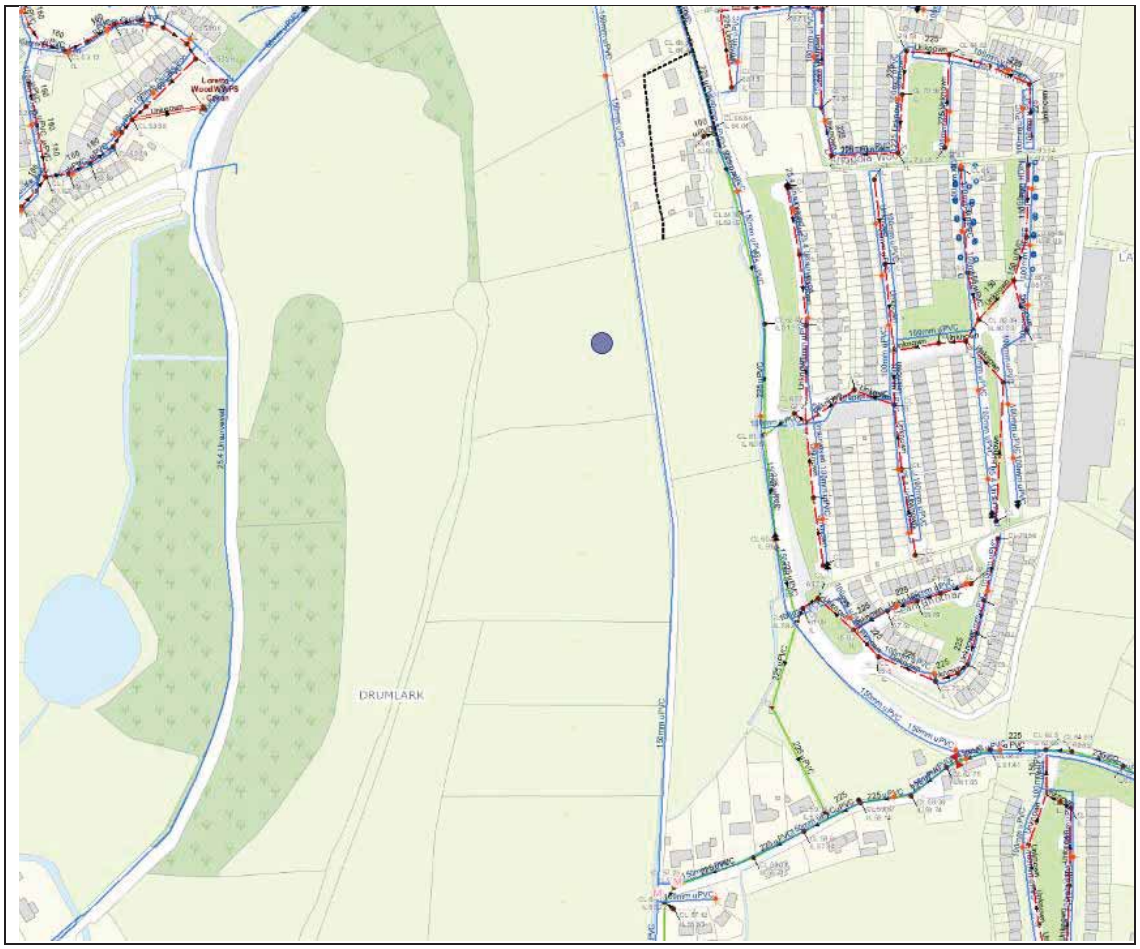
Section A - What is important to know?

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 Irish Water's network(s). • Before the Development can connect to Irish Water's network(s), you must submit a connection application and be granted and sign a connection agreement with Irish Water.
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?	• Irish Water connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Irish Water's network(s), including works in the public space, must be carried out by Irish Water*. *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 Irish Water's network(s)?	• Requests for maps showing Irish Water'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 Irish Water 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 Irish Water's Network(s)

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



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 Irish Water'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 Irish Water.

Whilst every care has been taken in respect of the information on Irish Water's network(s), Irish Water 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 Irish Water's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Irish Water'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 C: Foul Drainage Network Calculations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FOUL SEWERAGE DESIGN

Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	150.00	Maximum Backdrop Height (m)	6.000
Persons per House	2.70	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)	200

Designed with Level Soffits

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	17.446	1.342	13.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.001	49.173	0.820	60.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.002	20.673	0.345	60.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.003	29.217	0.487	60.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.004	17.333	0.289	60.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.005	20.774	0.944	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.006	41.250	1.875	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F2.000	37.519	0.625	60.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F2.001	39.601	0.264	150.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F1.007	64.862	0.721	90.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.008	26.623	0.296	90.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.009	16.586	0.276	60.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	77.542	0.000	0.0	0	0.0	0	0.00	3.19	127.0	0.0
F1.001	76.200	0.000	0.0	0	0.0	0	0.00	1.48	59.0	0.0
F1.002	75.380	0.000	0.0	0	0.0	0	0.00	1.48	59.0	0.0
F1.003	75.035	0.000	0.0	0	0.0	0	0.00	1.48	59.0	0.0
F1.004	74.549	0.000	0.0	0	0.0	0	0.00	1.48	59.0	0.0
F1.005	74.260	0.000	0.0	0	0.0	0	0.00	2.45	97.5	0.0
F1.006	73.315	0.000	0.0	0	0.0	0	0.00	2.45	97.5	0.0
F2.000	71.964	0.000	0.0	0	0.0	0	0.00	1.13	20.0	0.0
F2.001	71.339	0.000	0.0	0	0.0	0	0.00	0.71	12.6	0.0
F1.007	71.000	0.000	0.0	0	0.0	0	0.00	1.21	48.1	0.0
F1.008	70.279	0.000	0.0	0	0.0	0	0.00	1.21	48.1	0.0
F1.009	69.983	0.000	0.0	0	0.0	0	0.00	1.48	59.0	0.0

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.010	32.590	0.543	60.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.011	28.877	0.481	60.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.012	30.761	0.513	60.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.013	26.926	1.224	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F3.000	13.718	0.624	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F3.001	25.959	1.180	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.014	62.998	2.032	31.0	0.000	0	0.0	1.500	o	300	Pipe/Conduit	
F1.015	25.902	0.618	41.9	0.000	0	0.0	1.500	o	300	Pipe/Conduit	
F1.016	3.575	0.024	150.0	0.000	0	0.0	1.500	o	300	Pipe/Conduit	
F4.000	73.036	3.320	22.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F5.000	93.127	3.326	28.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F4.001	23.995	1.091	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F4.002	65.183	2.963	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F4.003	22.809	1.037	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F6.000	22.844	1.523	15.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.010	69.707	0.000	0.0	0	0.0	0	0.00	1.48	59.0	0.0
F1.011	69.164	0.000	0.0	0	0.0	0	0.00	1.48	59.0	0.0
F1.012	68.683	0.000	0.0	0	0.0	0	0.00	1.48	59.0	0.0
F1.013	68.170	0.000	0.0	0	0.0	0	0.00	2.45	97.5	0.0
F3.000	69.000	0.000	0.0	0	0.0	0	0.00	2.45	97.5	0.0
F3.001	68.376	0.000	0.0	0	0.0	0	0.00	2.45	97.5	0.0
F1.014	66.400	0.000	0.0	0	0.0	0	0.00	2.50	176.4	0.0
F1.015	63.763	0.000	0.0	0	0.0	0	0.00	2.14	151.5	0.0
F1.016	62.527	0.000	0.0	0	0.0	0	0.00	1.13	80.0	0.0
F4.000	70.820	0.000	0.0	0	0.0	0	0.00	1.87	33.1	0.0
F5.000	70.747	0.000	0.0	0	0.0	0	0.00	2.17	86.4	0.0
F4.001	67.421	0.000	0.0	0	0.0	0	0.00	2.45	97.6	0.0
F4.002	66.330	0.000	0.0	0	0.0	0	0.00	2.45	97.5	0.0
F4.003	63.367	0.000	0.0	0	0.0	0	0.00	2.45	97.5	0.0
F6.000	69.100	0.000	0.0	0	0.0	0	0.00	2.27	40.1	0.0

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F7.000	14.047	0.639	22.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F6.001	14.469	1.113	13.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F6.002	6.455	0.497	13.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F6.003	57.450	3.379	17.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F4.004	97.949	3.710	26.4	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F4.005	7.005	0.318	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F7.000	68.500	0.000	0.0	0	0.0	0	0.00	1.87	33.1	0.0
F6.001	67.577	0.000	0.0	0	0.0	0	0.00	2.44	43.1	0.0
F6.002	66.464	0.000	0.0	0	0.0	0	0.00	2.44	43.1	0.0
F6.003	65.967	0.000	0.0	0	0.0	0	0.00	2.13	37.7	0.0
F4.004	62.330	0.000	0.0	0	0.0	0	0.00	2.24	89.0	0.0
F4.005	58.620	0.000	0.0	0	0.0	0	0.00	2.45	97.5	0.0

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)
F1.016	F	64.100	62.503	0.000	0	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)
F4.005	F	61.330	58.302	58.300	0	0

Appendix D: Surface Water Network Calculations & Modelling Analysis & Attenuation


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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	PIMP (%)	100
M5-60 (mm)	16.800	Add Flow / Climate Change (%)	0
Ratio R	0.329	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	10.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	250

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	21.922	0.091	240.9	0.510	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	16.290	0.627	26.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	50.950	0.204	249.8	0.265	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.003	18.714	0.150	125.0	0.090	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.004	28.421	0.944	30.1	0.204	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.005	17.959	0.242	74.1	0.077	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.006	23.456	0.321	73.1	0.098	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.007	41.557	2.451	17.0	0.263	0.00	0.0	0.600	o	375	Pipe/Conduit	
S2.000	38.087	0.317	120.0	0.131	5.00	0.0	0.600	o	450	Pipe/Conduit	
S2.001	38.813	0.323	120.0	0.280	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.36	77.500	0.510	0.0	0.0	0.0	1.01	71.3	69.1
S1.001	50.00	5.45	77.409	0.510	0.0	0.0	0.0	3.10	218.8	69.1
S1.002	50.00	6.19	75.711	0.775	0.0	0.0	0.0	1.14	126.1	104.9
S1.003	50.00	6.39	75.507	0.865	0.0	0.0	0.0	1.62	178.8	117.2
S1.004	50.00	6.53	75.357	1.069	0.0	0.0	0.0	3.31	365.9	144.7
S1.005	50.00	6.67	74.413	1.146	0.0	0.0	0.0	2.11	232.7	155.2
S1.006	50.00	6.86	74.171	1.244	0.0	0.0	0.0	2.12	234.3	168.4
S1.007	50.00	7.01	73.850	1.506	0.0	0.0	0.0	4.42	488.0	204.0
S2.000	50.00	5.34	72.000	0.131	0.0	0.0	0.0	1.85	295.0	17.7
S2.001	50.00	5.69	71.683	0.411	0.0	0.0	0.0	1.85	295.0	55.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.008	67.767	0.847	80.0	0.059	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.009	27.006	0.338	80.0	0.146	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.010	7.839	0.098	80.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.011	12.964	0.162	80.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.012	8.378	0.326	25.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.013	26.451	0.388	68.2	0.148	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.014	29.911	0.150	199.4	0.098	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.015	30.401	0.152	200.0	0.071	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.016	29.940	0.225	133.1	0.075	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.000	9.019	0.045	200.0	0.500	5.00	0.0	0.600	o	300	Pipe/Conduit	
S3.001	6.574	0.033	199.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.002	13.086	0.063	206.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.003	28.877	2.188	13.2	0.119	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.017	56.110	3.979	14.1	0.255	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.018	6.657	0.027	250.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.019	13.843	0.545	25.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.020	5.542	0.290	19.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.021	6.513	0.013	500.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.008	50.00	7.43	71.350	1.976	0.0	0.0	0.0	2.72	770.3	267.6
S1.009	50.00	7.59	70.503	2.123	0.0	0.0	0.0	2.72	770.3	287.5
S1.010	50.00	7.64	70.165	2.123	0.0	0.0	0.0	2.72	770.3	287.5
S1.011	50.00	7.72	70.067	2.123	0.0	0.0	0.0	2.72	770.3	287.5
S1.012	50.00	7.76	68.400	2.123	0.0	0.0	0.0	3.11	220.1«	287.5
S1.013	50.00	8.00	68.074	2.271	0.0	0.0	0.0	1.91	134.8«	307.5
S1.014	50.00	8.44	67.686	2.369	0.0	0.0	0.0	1.11	78.4«	320.7
S1.015	50.00	8.90	67.536	2.440	0.0	0.0	0.0	1.11	78.3«	330.4
S1.016	50.00	9.27	67.384	2.515	0.0	0.0	0.0	1.36	96.2«	340.6
S3.000	50.00	5.14	69.500	0.500	0.0	0.0	0.0	1.11	78.3	67.7
S3.001	50.00	5.23	69.455	0.500	0.0	0.0	0.0	1.11	78.5	67.7
S3.002	50.00	5.43	69.422	0.500	0.0	0.0	0.0	1.09	77.0	67.7
S3.003	50.00	5.55	69.359	0.619	0.0	0.0	0.0	4.35	307.5	83.9
S1.017	50.00	9.46	67.159	3.389	0.0	0.0	0.0	4.85	535.3	458.9
S1.018	50.00	9.56	63.162	3.389	0.0	0.0	0.0	1.14	126.1«	458.9
S1.019	50.00	9.62	63.135	3.389	0.0	0.0	0.0	3.61	398.5«	458.9
S1.020	50.00	9.65	62.590	3.389	0.0	0.0	0.0	3.01	119.6«	458.9
S1.021	50.00	9.84	62.300	3.389	0.0	0.0	0.0	0.58	23.0«	458.9

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.000	39.810	1.991	20.0	0.186	5.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	20.890	0.240	87.0	0.051	4.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	30.199	1.589	19.0	0.111	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	99.751	5.161	19.3	0.296	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.002	24.285	1.799	13.5	0.097	0.00	0.0	0.600	o	375	Pipe/Conduit	
S4.003	65.018	1.389	46.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S4.004	22.787	0.717	31.8	0.107	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.000	19.492	1.147	17.0	0.045	5.00	0.0	0.600	o	225	Pipe/Conduit	
S8.000	14.557	0.097	150.0	0.119	5.00	0.0	0.600	o	225	Pipe/Conduit	
S7.001	16.331	0.726	22.5	0.051	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.002	8.401	0.295	28.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.003	55.444	4.332	12.8	0.136	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.005	4.218	0.143	29.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.006	2.769	0.020	138.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.000	50.00	5.23	70.646	0.186	0.0	0.0	0.0	2.94	116.9	25.2
S5.000	50.00	4.25	68.900	0.051	0.0	0.0	0.0	1.40	55.8	6.9
S4.001	50.00	5.39	68.646	0.348	0.0	0.0	0.0	3.02	119.9	47.1
S6.000	50.00	5.56	72.465	0.296	0.0	0.0	0.0	2.99	118.9	40.1
S4.002	50.00	5.64	67.050	0.741	0.0	0.0	0.0	4.95	547.1	100.4
S4.003	50.00	6.05	65.250	0.741	0.0	0.0	0.0	2.65	293.2	100.4
S4.004	50.00	6.15	63.860	0.849	0.0	0.0	0.0	3.62	575.0	114.9
S7.000	50.00	5.10	69.868	0.045	0.0	0.0	0.0	3.19	126.8	6.0
S8.000	50.00	5.23	68.800	0.119	0.0	0.0	0.0	1.07	42.4	16.2
S7.001	50.00	5.33	68.700	0.215	0.0	0.0	0.0	2.77	110.2	29.1
S7.002	50.00	5.38	67.970	0.215	0.0	0.0	0.0	2.46	97.9	29.1
S7.003	50.00	5.63	67.475	0.351	0.0	0.0	0.0	3.68	146.2	47.5
S4.005	50.00	6.17	63.143	1.200	0.0	0.0	0.0	3.75	597.1	162.4
S4.006	50.00	6.21	63.000	1.200	0.0	0.0	0.0	1.11	44.1«	162.4

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.007	31.393	0.138	228.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.008	56.771	3.639	15.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.009	2.778	0.011	252.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.007	50.00	6.82	62.980	1.200	0.0	0.0	0.0	0.86	34.3«	162.4
S4.008	50.00	7.10	62.842	1.200	0.0	0.0	0.0	3.33	132.4«	162.4
S4.009	50.00	7.16	59.200	1.200	0.0	0.0	0.0	0.82	32.5«	162.4

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.510	0.510	0.510
1.001	-	-	100	0.000	0.000	0.000
1.002	User	-	100	0.265	0.265	0.265
1.003	User	-	100	0.090	0.090	0.090
1.004	User	-	100	0.204	0.204	0.204
1.005	User	-	100	0.077	0.077	0.077
1.006	User	-	100	0.098	0.098	0.098
1.007	User	-	100	0.263	0.263	0.263
2.000	User	-	100	0.131	0.131	0.131
2.001	User	-	100	0.280	0.280	0.280
1.008	User	-	100	0.059	0.059	0.059
1.009	User	-	100	0.146	0.146	0.146
1.010	-	-	100	0.000	0.000	0.000
1.011	-	-	100	0.000	0.000	0.000
1.012	-	-	100	0.000	0.000	0.000
1.013	User	-	100	0.148	0.148	0.148
1.014	User	-	100	0.098	0.098	0.098
1.015	User	-	100	0.071	0.071	0.071
1.016	User	-	100	0.075	0.075	0.075
3.000	User	-	100	0.500	0.500	0.500
3.001	-	-	100	0.000	0.000	0.000
3.002	-	-	100	0.000	0.000	0.000
3.003	User	-	100	0.119	0.119	0.119
1.017	User	-	100	0.255	0.255	0.255
1.018	-	-	100	0.000	0.000	0.000
1.019	-	-	100	0.000	0.000	0.000
1.020	-	-	100	0.000	0.000	0.000
1.021	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.186	0.186	0.186
5.000	User	-	100	0.051	0.051	0.051
4.001	User	-	100	0.111	0.111	0.111
6.000	User	-	100	0.296	0.296	0.296
4.002	User	-	100	0.097	0.097	0.097
4.003	-	-	100	0.000	0.000	0.000
4.004	User	-	100	0.107	0.107	0.107
7.000	User	-	100	0.045	0.045	0.045
8.000	User	-	100	0.119	0.119	0.119
7.001	User	-	100	0.051	0.051	0.051
7.002	-	-	100	0.000	0.000	0.000
7.003	User	-	100	0.136	0.136	0.136
4.005	-	-	100	0.000	0.000	0.000
4.006	-	-	100	0.000	0.000	0.000
4.007	-	-	100	0.000	0.000	0.000
4.008	-	-	100	0.000	0.000	0.000
4.009	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				4.589	4.589	4.589

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)
S1.021	S	65.000	62.287	62.300	0	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)
S4.009	S	60.000	59.189	59.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	20.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	5
Number of Online Controls	5	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	5	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.800	Storm Duration (mins)	30
Ratio R	0.329		

Online Controls for Storm

Depth/Flow Relationship Manhole: SFUTURE, DS/PN: S1.001, Volume (m³): 3.3

Invert Level (m) 77.409

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	3.2000	1.800	3.2000	3.400	3.2000	5.000	3.2000
0.400	3.2000	2.000	3.2000	3.600	3.2000	5.200	3.2000
0.600	3.2000	2.200	3.2000	3.800	3.2000	5.400	3.2000
0.800	3.2000	2.400	3.2000	4.000	3.2000	5.600	3.2000
1.000	3.2000	2.600	3.2000	4.200	3.2000	5.800	3.2000
1.200	3.2000	2.800	3.2000	4.400	3.2000	6.000	3.2000
1.400	3.2000	3.000	3.2000	4.600	3.2000		
1.600	3.2000	3.200	3.2000	4.800	3.2000		

Hydro-Brake® Optimum Manhole: S13, DS/PN: S1.012, Volume (m³): 12.2

Unit Reference	MD-SHE-0160-2700-7000-2700
Design Head (m)	7.000
Design Flow (l/s)	27.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	160
Invert Level (m)	68.400
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	7.000	27.0
Flush-Flo™	0.697	16.2
Kick-Flo®	1.440	12.7
Mean Flow over Head Range	-	19.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.7	1.200	14.9	3.000	18.0	7.000	27.0
0.200	12.8	1.400	13.2	3.500	19.4	7.500	27.9
0.300	14.4	1.600	13.3	4.000	20.6	8.000	28.8
0.400	15.4	1.800	14.1	4.500	21.8	8.500	29.6
0.500	15.9	2.000	14.8	5.000	23.0	9.000	30.5
0.600	16.2	2.200	15.5	5.500	24.0	9.500	31.3
0.800	16.2	2.400	16.2	6.000	25.1		
1.000	15.8	2.600	16.8	6.500	26.0		

Depth/Flow Relationship Manhole: SFUTURE, DS/PN: S3.001, Volume (m³): 2.3

Invert Level (m) 69.455

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	3.2000	1.800	3.2000	3.400	3.2000	5.000	3.2000
0.400	3.2000	2.000	3.2000	3.600	3.2000	5.200	3.2000
0.600	3.2000	2.200	3.2000	3.800	3.2000	5.400	3.2000
0.800	3.2000	2.400	3.2000	4.000	3.2000	5.600	3.2000
1.000	3.2000	2.600	3.2000	4.200	3.2000	5.800	3.2000
1.200	3.2000	2.800	3.2000	4.400	3.2000	6.000	3.2000
1.400	3.2000	3.000	3.2000	4.600	3.2000		
1.600	3.2000	3.200	3.2000	4.800	3.2000		

Hydro-Brake® Optimum Manhole: S23, DS/PN: S1.020, Volume (m³): 5.7

Unit Reference	MD-SHE-0184-2290-2800-2290
Design Head (m)	2.800
Design Flow (l/s)	22.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	184
Invert Level (m)	62.590
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.800	22.9
Flush-Flo™	0.801	22.6
Kick-Flo®	1.645	17.8
Mean Flow over Head Range	-	19.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.5	1.200	21.8	3.000	23.7	7.000	35.6
0.200	16.7	1.400	20.6	3.500	25.5	7.500	36.8
0.300	19.4	1.600	18.5	4.000	27.2	8.000	37.9
0.400	20.8	1.800	18.5	4.500	28.7	8.500	39.1
0.500	21.8	2.000	19.5	5.000	30.2	9.000	40.2
0.600	22.3	2.200	20.4	5.500	31.7	9.500	41.2
0.800	22.6	2.400	21.3	6.000	33.0		
1.000	22.4	2.600	22.1	6.500	34.3		

Hydro-Brake® Optimum Manhole: S36, DS/PN: S4.006, Volume (m³): 5.1

Unit Reference	MD-SHE-0109-7900-2600-7900
Design Head (m)	2.600
Design Flow (l/s)	7.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	109
Invert Level (m)	63.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.600	7.9
Flush-Flo™	0.478	6.3
Kick-Flo®	0.974	5.0
Mean Flow over Head Range	-	6.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	5.5	3.000	8.4	7.000	12.6
0.200	5.5	1.400	5.9	3.500	9.1	7.500	13.1
0.300	6.0	1.600	6.3	4.000	9.7	8.000	13.5
0.400	6.2	1.800	6.6	4.500	10.2	8.500	13.9
0.500	6.3	2.000	7.0	5.000	10.8	9.000	14.2
0.600	6.2	2.200	7.3	5.500	11.3	9.500	14.6
0.800	5.9	2.400	7.6	6.000	11.7		
1.000	5.1	2.600	7.9	6.500	12.2		

Storage Structures for Storm

Tank or Pond Manhole: SFUTURE, DS/PN: S1.001

Invert Level (m) 77.409

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	250.0	1.200	250.0

Tank or Pond Manhole: S13, DS/PN: S1.012

Invert Level (m) 68.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	280.0	2.000	280.0	2.001	0.0

Tank or Pond Manhole: SFUTURE, DS/PN: S3.001

Invert Level (m) 69.463

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	250.0	1.200	250.0

Tank or Pond Manhole: S23, DS/PN: S1.020

Invert Level (m) 62.590

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	270.0	2.000	270.0	2.001	0.0

Tank or Pond Manhole: S36, DS/PN: S4.006

Invert Level (m) 63.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	265.0	2.000	265.0	2.001	0.0

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	20.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	5
Number of Online Controls	5	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.329
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	16.800	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SFUTURE	15 Winter	100	+0%	100/15 Summer			
S1.001	SFUTURE	600 Winter	100	+0%	100/15 Summer			
S1.002	S1	15 Winter	100	+0%				
S1.003	S2	15 Winter	100	+0%				
S1.004	S3	15 Winter	100	+0%	100/15 Winter			
S1.005	S4	15 Winter	100	+0%	100/15 Summer			
S1.006	S5	15 Winter	100	+0%	100/15 Summer			
S1.007	S6	15 Winter	100	+0%				
S2.000	S7	360 Winter	100	+0%				
S2.001	S8	360 Winter	100	+0%	100/240 Winter			
S1.008	S9	360 Winter	100	+0%	100/15 Winter			
S1.009	S10	360 Winter	100	+0%	100/15 Summer			
S1.010	S11	360 Winter	100	+0%	100/15 Summer			
S1.011	S12	360 Winter	100	+0%	100/15 Summer			
S1.012	S13	360 Winter	100	+0%	100/15 Summer			
S1.013	S14	15 Winter	100	+0%	100/15 Summer			
S1.014	S15	15 Winter	100	+0%	100/15 Summer			
S1.015	S16	15 Winter	100	+0%	100/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	SFUTURE	78.638	0.838	0.000	3.15			198.0	SURCHARGED
S1.001	SFUTURE	78.300	0.591	0.000	0.02			3.2	SURCHARGED
S1.002	S1	76.086	0.000	0.000	0.98			114.6	OK
S1.003	S2	75.877	-0.005	0.000	1.00			148.1	OK
S1.004	S3	75.744	0.012	0.000	0.69			221.0	SURCHARGED
S1.005	S4	75.294	0.506	0.000	1.30			250.3	SURCHARGED
S1.006	S5	74.882	0.337	0.000	1.43			288.1	SURCHARGED
S1.007	S6	74.131	-0.094	0.000	0.88			392.7	OK
S2.000	S7	72.436	-0.014	0.000	0.03			8.4	OK
S2.001	S8	72.435	0.302	0.000	0.10			26.4	SURCHARGED
S1.008	S9	72.433	0.483	0.000	0.14			97.4	SURCHARGED
S1.009	S10	72.427	1.324	0.000	0.18			106.8	SURCHARGED
S1.010	S11	72.423	1.658	0.000	0.31			106.8	SURCHARGED
S1.011	S12	72.421	1.754	0.000	0.26			106.8	SURCHARGED
S1.012	S13	72.417	3.717	0.000	0.14			20.7	SURCHARGED
S1.013	S14	68.923	0.549	0.000	0.50			60.5	SURCHARGED
S1.014	S15	68.788	0.802	0.000	1.27			90.8	SURCHARGED
S1.015	S16	68.531	0.695	0.000	1.67			118.7	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.000	SFUTURE	
S1.001	SFUTURE	
S1.002	S1	
S1.003	S2	
S1.004	S3	
S1.005	S4	
S1.006	S5	
S1.007	S6	
S2.000	S7	
S2.001	S8	
S1.008	S9	
S1.009	S10	
S1.010	S11	
S1.011	S12	
S1.012	S13	
S1.013	S14	
S1.014	S15	
S1.015	S16	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.016	S17	15 Winter	100	+0%	100/15 Summer			
S3.000	SFUTURE	15 Winter	100	+0%	100/15 Summer			
S3.001	SFUTURE	600 Winter	100	+0%	100/15 Summer			
S3.002	S18	30 Summer	100	+0%				
S3.003	S19	15 Winter	100	+0%				
S1.017	S20	15 Winter	100	+0%				
S1.018	S21	720 Winter	100	+0%	100/15 Summer			
S1.019	S22	720 Winter	100	+0%	100/15 Winter			
S1.020	S23	720 Winter	100	+0%	100/15 Summer			
S1.021	S24	960 Summer	100	+0%	100/180 Summer			
S4.000	S25	15 Winter	100	+0%				
S5.000	S31	15 Winter	100	+0%	100/15 Summer			
S4.001	S30	15 Winter	100	+0%	100/15 Summer			
S6.000	S26	15 Winter	100	+0%	100/15 Winter			
S4.002	S27	15 Winter	100	+0%				
S4.003	S28	15 Winter	100	+0%	100/15 Summer			
S4.004	S29	600 Winter	100	+0%	100/15 Summer			
S7.000	S30	15 Winter	100	+0%				
S8.000	S31	15 Winter	100	+0%	100/15 Summer			
S7.001	S32	15 Winter	100	+0%				
S7.002	S33	15 Winter	100	+0%	100/15 Summer			
S7.003	S34	15 Winter	100	+0%	100/15 Summer			
S4.005	S35	600 Winter	100	+0%	100/15 Summer			
S4.006	S36	600 Winter	100	+0%	100/15 Summer			
S4.007	S37	600 Winter	100	+0%				
S4.008	S38	600 Winter	100	+0%				
S4.009	S39	600 Winter	100	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.016	S17	68.089	0.405	0.000	1.67			146.0	SURCHARGED
S3.000	SFUTURE	70.420	0.620	0.000	3.41			204.6	SURCHARGED
S3.001	SFUTURE	70.333	0.578	0.000	0.06			3.2	SURCHARGED
S3.002	S18	69.471	-0.251	0.000	0.05			3.3	OK
S3.003	S19	69.450	-0.209	0.000	0.20			55.6	OK
S1.017	S20	67.375	-0.159	0.000	0.60			298.1	OK
S1.018	S21	64.325	0.788	0.000	0.56			47.1	SURCHARGED
S1.019	S22	64.320	0.810	0.000	0.16			46.8	SURCHARGED
S1.020	S23	64.311	1.496	0.000	0.30			22.6	SURCHARGED
S1.021	S24	62.525	0.000	0.000	1.08			22.8	SURCHARGED
S4.000	S25	70.787	-0.084	0.000	0.71			78.2	OK
S5.000	S31	69.553	0.428	0.000	0.45			22.7	SURCHARGED
S4.001	S30	69.515	0.644	0.000	1.17			131.3	SURCHARGED
S6.000	S26	72.789	0.099	0.000	1.01			117.4	SURCHARGED
S4.002	S27	67.263	-0.162	0.000	0.61			286.1	OK
S4.003	S28	65.869	0.244	0.000	1.02			282.2	SURCHARGED

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S4.004	S29	65.771	1.461	0.000	0.08			37.3	FLOOD RISK
S7.000	S30	69.929	-0.164	0.000	0.16			18.8	OK
S8.000	S31	69.103	0.078	0.000	1.34			49.7	SURCHARGED
S7.001	S32	68.918	-0.007	0.000	0.90			88.0	OK
S7.002	S33	68.372	0.177	0.000	1.13			86.8	SURCHARGED
S7.003	S34	68.013	0.313	0.000	0.95			133.7	SURCHARGED
S4.005	S35	65.769	2.176	0.000	0.25			52.4	SURCHARGED
S4.006	S36	65.768	2.543	0.000	0.29			8.0	SURCHARGED
S4.007	S37	63.056	-0.149	0.000	0.25			8.0	OK
S4.008	S38	62.879	-0.188	0.000	0.06			8.0	OK
S4.009	S39	59.283	-0.142	0.000	0.29			8.0	OK

PN	US/MH Name	Level Exceeded
S1.016	S17	
S3.000	SFUTURE	
S3.001	SFUTURE	
S3.002	S18	
S3.003	S19	
S1.017	S20	
S1.018	S21	
S1.019	S22	
S1.020	S23	
S1.021	S24	
S4.000	S25	
S5.000	S31	
S4.001	S30	
S6.000	S26	
S4.002	S27	
S4.003	S28	
S4.004	S29	
S7.000	S30	
S8.000	S31	
S7.001	S32	
S7.002	S33	
S7.003	S34	
S4.005	S35	
S4.006	S36	
S4.007	S37	
S4.008	S38	
S4.009	S39	