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THIS PROJECT CONSISTS OF AN APPLICATION FOR A STRATEGIC HOUSING DEVELOPMENT BY WESTAR INVESTMENTS LIMITED (THE APPLICANT) FOR A NEW RESIDENTIAL DEVELOPMENT ON LANDS MEASURING APPROXIMATELY 10.36 HECTARES AT CAPDOO & ABBEYLANDS, CELBRIDGE ROAD, CLANE, CO. KILDARE. THE APPLICATION IS FOR A DEVELOPMENT THAT INCLUDES 333 DWELLINGS CONSISTING OF:
121 NO. 2, 3 & 4 BEDROOM HOUSING UNITS,
144 NO. 1, 2 & 3 BEDROOM APARTMENTS,
68 NO. 1, 2 & 3 BEDROOM DUPLEX & MAISONETTE TYPE UNITS,
A CRÈCHE AND A PUBLIC PARK ADJACENT TO THE RIVER LIFFEY WITH 3 NO. VEHICULAR/PEDESTRIAN ACCESSES AND SITE, LANDSCAPING AND ASSOCIATED INFRASTRUCTURAL WORKS. THE SUBJECT SITE IS SITUATED ON THE EASTERN SIDE OF REGIONAL ROAD R403 IN THE EASTERN ENVIRONS OF CLANE TOWN, C. 650M FROM THE TOWN CENTRE'

INFRASTRUCTURE DESIGN REPORT

November 2020

Job Title:	***THIS PROJECT CONSISTS OF AN APPLICATION FOR A STRATEGIC HOUSING DEVELOPMENT BY WESTAR INVESTMENTS LIMITED (THE APPLICANT) FOR A NEW RESIDENTIAL DEVELOPMENT ON LANDS MEASURING APPROXIMATELY 10.36 HECTARES AT CAPDOO & ABBEYLANDS, CELBRIDGE ROAD, CLANE, CO. KILDARE. THE APPLICATION IS FOR A DEVELOPMENT THAT INCLUDES 333 DWELLINGS CONSISTING OF: 121 NO. 2, 3 & 4 BEDROOM HOUSING UNITS, 144 NO. 1, 2 & 3 BEDROOM APARTMENTS, 68 NO. 1, 2 & 3 BEDROOM DUPLEX & MAISONETTE TYPE UNITS, A CRÈCHE AND A PUBLIC PARK ADJACENT TO THE RIVER LIFFEY WITH 3 NO. VEHICULAR/PEDESTRIAN ACCESSES AND SITE, LANDSCAPING AND ASSOCIATED INFRASTRUCTURAL WORKS. THE SUBJECT SITE IS SITUATED ON THE EASTERN SIDE OF REGIONAL ROAD R403 IN THE EASTERN ENVIRONS OF CLANE TOWN, C. 650M FROM THE TOWN CENTRE'***
Job Number:	**20017**
Report Title:	**Infrastructure Design Report**
Report Reference:	**20017-REV-002**
Author:	**Brian Connolly**
Date:	**November 2020**
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APPENDICES

1.0 INTRODUCTION

1.1 Background

This infrastructure design report is to accompany a planning submission for a residential development of 333 dwellings at Capdoo, Clane, Co. Kildare.

The lands are zoned "C1 : New Residential" in the Clane Loal Area Plan 2017-2023.

This application comprises 333 residential units and will provide infrastructure comprising a road layout, footpaths, cycle-track, foul, surface water and water supply services in accordance with the Clane Local Area Plan and the Kildare County Development Plan (2017-2023).

This report aims to consider the revised development's main infrastructure elements, including the following;

- Surface water strategy and servicing.
- Foul sewer strategy and servicing.
- Water supply and servicing.
- Preliminary flood risk assessment.
- Road Layout/Site access.

1.2 Location

The subject site, of some 10.3 hectares (25.44 acres), is located at the north eastern extent of the village of Clane. The site has the benefit of abutting the River Liffey. The site is bounded by existing residential developments to the south and west and access to the site is via Brooklands residential development and Alexandra Walk residential scheme, see Figure 1.1.

The development lands are identified as KDA 1 in the Clane Local Area Plan 2017-2023 and are zoned "C –New Residential/Infill".

The site is currently used for Agriculture. Existing boundaries within the site are predominantly hedgerows, walls and fencing.

Figure 1.1 Site Location.

1.3.1 Topography

The proposed development site rises from the river Liffey to the centre of the site and then drops back towards the existing Brooklands Residential development at an average gradient of approximately 1.4% as shown in Figure 1.2. A topographical survey of the Site is provided.

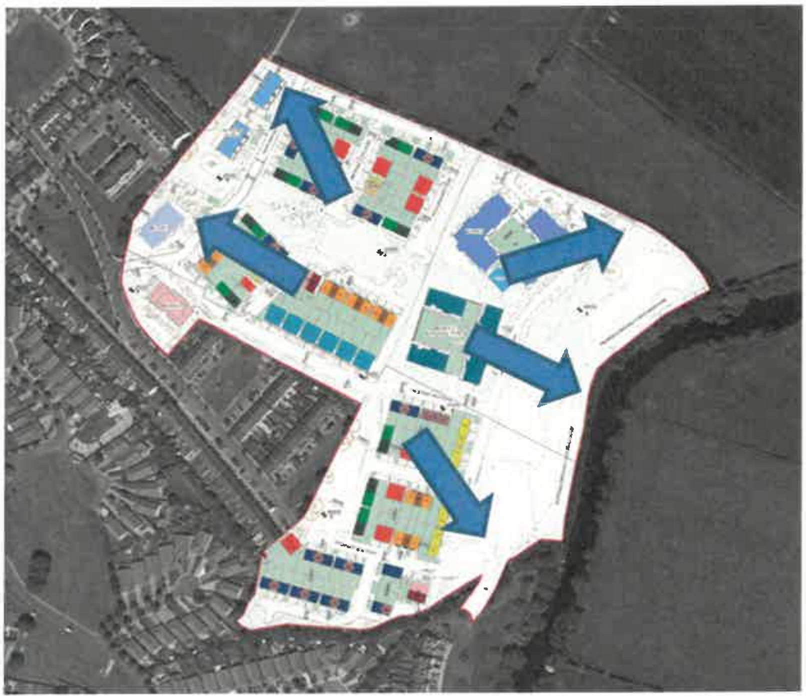


Figure 1.2 Site Topography.

1.4 Proposed Development

It is proposed to construct 333 residential units on the Site together with associated access roads, footpaths and infrastructure/services. A linear park is also proposed along the river Liffey.

1.5 Flood Risk

A separate Site Specific Flood Risk Assessment, FRA, has been prepared by Consult.IE as part of the application. The FRA recommends all finished floor levels should be constructed above 65.68m OD and all road levels constructed above 65.68m OD in agreement with the recommendation of Water Services Department of Kildare Co Council.

2.0 ACCESS AND ROADS

2.1 Overall Road and Access Layout

The proposed development will be accessed via Brooklands Residential Scheme from the R403. An Bord Pleanala granted permission to Ardstone Ltd, planning ref ABP 304632-19 to upgrade the existing R403/Brooklands/Capdoo Link road junction. Details of this upgrade are included in this application, Drawing 20017-306 1 & 2. Our client is willing to carry out these works if not completed by Ardstone Ltd. A secondary entrance is also provided via Alexandra Walk with access off the Clane relief road.

The development layout has been designed with speed reduction bends to provide traffic calming together with a combination of road vertical and horizontal geometry and forward sight visibility to reduce speeds. Design speed limits of 30km/hr are applied throughout the development as per Design Manual for Urban Roads and Streets (DMURS).

2.2 Road Layout Design

The proposed development's road layout and hierarchy is shown on site masterplan. The standard road cross-sections and construction details are also shown on this drawing and comprise the following;

- Main Access Road – 6.0m wide carriageway with a 1.0m planting strip/verge and 2m path and cycle-track on both sides.
- Development Local Streets – typically 5.5m wide carriageway with 2.0m footpaths.

Maximum road corner radii of between 3.5 and 5m are provided within the local streets and on the main access road as per DMURS.

An independent Road Safety Audit was carried out by Roadplan.ie and their recommendations were taking into account.

2.3 Pavement Design Standards

The main internal access roads are designed in accordance with the Design Manual for Urban Roads and Streets (DMURS) and Local Authority requirements.

2.4 Vehicle Tracking

The proposed development has been tracked to show the development's turning heads will accommodate large refuse vehicles and fire engines, Drawing 20017-305-1&2.

2.5 Driveway Access

All houses have access driveways set to accommodate a targeted maximum 1:20 driveway gradient. All driveways are permeable paving within private curtilage. Entrances to driveways in public footpaths comprise of drop kerbs with 150mm deep concrete pavement.

3.0 SURFACE WATER DRAINAGE

3.1 Existing Surface Water

The existing site is greenfield and the topography of the site generally slopes moderately from the south western boundary of the site to the North eastern boundary at an average gradient of approximately 1.4%, to an open drain and ultimately discharges to the River Liffey downstream. The drains will be retained throughout the site and similar to the the River Liffey, heavy planting is proposed to protect the residents and small children. Please refer to the Landscape Architect drawings.

3.2 General Design

The surface water drainage system will collect storm-water run-off generated from the proposed residential development using traditional pipe-work and manholes laid along the main access roads collecting run-off from impermeable road surfaces via gullies and adjoining areas. SUDS will also be incorporated to reduce run-off volumes and improve run-off water quality as described in Section 3.3 below.

The surface water drainage system for the residential development has been designed with two catchments as shown on drawing 20017-303. Surface water sections are showing on drawing 20017-303 - 2 & 4. The surface water will be attenuated in underground "stormtech" systems before discharging to the open drain at a controlled flow rate.

3.2.1 Compliance with Surface Water Policy

Surface water management for the proposed development is designed to comply with the Greater Dublin Strategic Drainage Study (GDSDS) policies and guidelines and the requirements of Kildare County Council. The guidelines require the following four main criteria to be provided by the development's surface water design;

- Criterion 1: River Water Quality Protection – satisfied by providing interception storage using permeable paving in driveways, treatment of run- off within the SUDS features e.g. permeable paving for driveways/parking bays, within the attenuation storage system and oil separators on the main surface water outfalls from the development.
- Criterion 2: River Regime Protection – satisfied by attenuating run-off with flow control devices prior to discharge to the outfall.
- Criterion 3: Level of Service (flooding) for the site – satisfied by the Site being outside the 1000 year coastal and fluvial flood zones, (See Flood Risk Assessment). Pluvial flood risk addressed by development designed to accommodate a 100 year storm as per GDSDS. Planned flood routing for storms greater than 100 year level, considered in design, the development has

been designed to provide an overland flood route from the development towards the surface water outfall.

- Criterion 4: River flood protection – attenuation and long term storage provided within the SUDS features e.g. permeable paving construction and attenuation facility.

3.2.2 Surface Water Design

In accordance with SUDS principals, permeable paving is provided for all driveways which will also collect run-off from adjacent private footpaths and run-off from house roofs. Permeable paving will provide "in curtilage" attenuation, storage and soakage for run- off.

Surface water discharge rates from the surface water network will be controlled by a Hydro-brake flow control device at each attenuation storage area.

A green roof is proposed to the undercroft car-parking structures. Typical construction details are shown on Drawing 20017-314. The location of rainwater butts for dwellings and Rainwater Harvesting tanks for the Apartment and Creche Blocks are shown on Drawing 20017-303

Surface water attenuation storage for the development will be provided within stormtech attenuation tanks in accordance with the GDSDS. The tanks will provide storage for the 100 year storm for the catchment. The layout of the attenuation tank is shown on Drawing 20017-303 with typical details on 20017-314.

Surface water discharge rates from the surface water network will be controlled by a Hydro-brake flow control device at each attenuation storage area.

3.2.3 Ground Investigation

Preliminary site investigation was undertaken by IGSL on the Subject Site which included trial pits and infiltration tests. Infiltration tests in accordance with BRE Digest 365 were carried out at different locations throughout the site The infiltration tests carried out resulted in a soakage rate of f = 3.8662E-05 m/sec to f =1.05119E-06 m/sec. The lowest rate was used in the design of the permeable paving. The benefit of infiltration results of pit 6 and 7 were used in the design of the attenuation tanks. The results of Pit 6 & Pit 7 conclude the stormtech chambers must be wrapped in Bentonite. The Site Investigation report is attached in Appendix F.

3.3 SUDS

In accordance with the GDSDS it is proposed to use Sustainable Urban Drainage systems (SUDS) for managing storm-water for the proposed development. The aim of the SUDS strategy for the site will be to;

- Attenuate storm-water runoff.
- Reduce storm-water runoff.

- Reduce pollution impact.
- Replicate the natural characteristics of rainfall runoff for the site.
- Recharge the groundwater profile

The proposed layout of the drainage and SuDS is detailed on drawings 20017-303 and 20017-314.

An assessment of the potential SuDS that could be incorporated within the site was conducted using the site investigation data, www.uksuds.com/irish_suds/index.htm website and the SuDS Manual. A SuDS evaluation report is provided in Appendix A. Since the proposed development drainage will be constructed to a taking in charge standard, the range of SuDS features available are restricted but include the following;

1. Extents of impermeable areas reduced where allowable.
2. Permeable, self-draining areas incorporated in landscaped areas.
3. All driveways to be permeable paving. Run-off from these permeable paving areas is allowed to infiltrate to the sub-soil and provide attenuation, storage and soakage for run-off generated by adjacent impermeable surfaces.
4. Down pipes from roof surfaces to rain water butts with overflows to permeable paved areas to dwellings.
5. Attenuation storage system.
6. Green roofs provided to undercroft car-parking structure
7. Rainwater harvesting tanks to Apartment and Creche blocks
8. A petrol interceptor to be provided before both attenuation tanks.

3.4 Attenuation Calculations

Run-off from the proposed development will be limited/attenuated using vortex flow control devices (Hydro-brake or equivalent) limiting discharge to greenfield run-off rates (Q_{bar}) in accordance with the GDSDS for the total area of the site within the catchment of the new drainage networks (Total area 10.3Ha).

The calculated allowable discharge for the development catchment is calculated as 9.3l/s and 20.21 l/s for tanks 1 and 2 respectively as per www.uksuds.com/irish_suds/index.htm website and the SUDS Manual.

Attenuation volumes have been designed using Microdrainage Windes analysis software taking account of design invert levels, ground levels and depth and type of system. In total 1,682m^3 of storm-water storage is provided within the attenuation facilities.

Discharge rates from the Site are in-line with the GDSDS recommendations; refer to design run-off calculations in Appendix B.

Surface water storage volumes to accommodate a 100 year storm include for climate change, refer to Appendix B for Windes attenuation calculations. Typical details and cross-sections of the proposed surface water attenuation facilities are provided on drawings 20017-303-2 and 314. Details of the "in curtilage" SuDS proposed includes the permeable driveways as shown on drawing 20017-314.

3.5 Interception Volume

To prevent pollutants or sediments discharging into water courses the GDSDS requires "interception storage" to be incorporated into the development. This interception storage is designed to receive the run-off for rainfall depths of 5mm up to 10mm if possible. The SUDS features including permeable driveways and attenuation facilities will provide the necessary interception volume required by the GDSDS. Petrol Interceptors are also provided at the entrance to both of the attenuation tanks. Typical details are shown on drawing 20017-314.

3.6 Design Standards

Drainage is designed in accordance with the Greater Dublin Regional Code of Practice for Drainage Works. Surface water pipe-work was sized using the following parameters:

• Return period for pipe work	2 years, check 30 year 15 minute, no flooding. check 100 year 15 minute, flooding in designated areas.
• Time of entry	4 minutes
• Discharge Limit	29.5 l/s @ 100 years
• Pipe Friction (Ks)	0.6 mm
• Minimum Velocity	0.7 m/s
• Standard Average Annual Rainfall	821mm (UK SuDS.com)
• M5-60	16.1mm (Met Eireann)
• Ratio r (M5-60/M5-2D)	0.28 (Met Eireann)
• Attenuation Tank Storm Return Event	GDSDS Volume 2, p61, Criterion 3 30 year no flooding on site. 100 year check no internal property flooding. Flood routing plan. FFL freeboard above 100 year flood level. No flooding to adjacent areas.

- Climate Change Allowance 20%
- Factor of Safety for infiltration 2.0
- Runoff from Roads and Footpaths 100%
- Runoff from Roofs (draining via permeable pavement) 60%
- Runoff from Driveways (draining via SuDS feature) 60%

Surface water sewers have been designed in accordance with IS EN 752 and the recommendations of the 'Greater Dublin Strategic Drainage Study', (GDSDS).

Standard drainage details, as outlined on drawings 20017-303 and 303-14, are in accordance with the Greater Dublin Regional Code of Practice for Drainage Works.

The minimum pipe diameter for public surface water sewers is 225mm. Private drains within the proposed development will be 100mm as outlined on individual house drawings.

Refer to drawings 20017-303 for the proposed surface water layout.

Surface water sewer calculations for the main drainage networks is included in Appendix B and C.

3.7 Climate Change

Surface water calculations for the development made use of rainfall values for Clane, provided by UK SuDS.com. Rainfall intensities were increased by a factor of 10% (flows factored by 20%) to take account of climate change, as required by the GDSDS for attenuation storage design.

3.8 Pluvial Flooding Provision

The surface water network, attenuation storage and site levels are designed to accommodate a 100 year storm event and includes climate change provision. Floor levels of houses are set above the 100 year flood levels by a minimum of 0.5m for protection. For storms in excess of 100 years, the development has been designed to provide overland flood routes along the various development roads towards the surface water drainage outfall. Refer to Consult.ie Site Specific Flood Risk Assessment for further details.

3.9 Surface Water Quality Impact

Run-off rates from the site are controlled by vortex flow control devices. Surface water management proposals for the development also incorporate the following to reduce its impact;

- Designed in accordance with GDSDS requirements;

- Incorporates SuDS features e.g. permeable paving in high risk parking areas at the front of houses;
- On-line attenuation/infiltration facilities with an oil separator prior to discharge to a public surface water sewer.
- The attenuation system will be maintained by the contractor in accordance with the manufacturers' recommendation until the scheme is taking in charge. "Stormtech" has a maintenance program which can be agreed with the planning authority prior to commencement.

4.0 FOUL DRAINAGE

4.1 Existing Foul Drainage

The subject site is green-field and therefore has no foul loading at present. It is proposed to divide the foul sewer into two catchments, Catchment 1, Western part of site to Abbey Park pumping station via Brooklands and Catchment 2, Eastern part of site also through Brooklands to the Abbey Park pumping station. The Abbey Park pumping station is in the control of the applicant. A 225mm diameter foul sewer runs to the pumping station.

We note the contents of the pre-connection reply from Irish Water, dated 3 July, 2020 for 80 units initially and by deduction, the remaining units on completion of the Upper Liffey Valley Sewerage Scheme Contract 2B. We understand the Upper Liffey Valley Sewerage Scheme Contract 2B will be completed by quarter 3 of 2021 as per Irish Water letter dated 03 July, 2020. Phase B and Phase C will consist of 75 units, with the balance of 103 units in Phase D. A phasing drawing, ref PE20057-CWO-ZZ-ZZ DRA-0008 was prepared by Architects' CWOB showing the phasing of the development.

In response to the issues raised by Irish Water in their report to An Bord pleanala, we confirm the applicants are in charge of the adjoining third party lands of Brooklands and Abbeylands, see Drawing 20017-304. Letters of consent to discharge the effluent through these lands are included with this application. The capacity of the Abbeylands pumping station are included in Appendix D. The pumping station at Abbeylands was constructed circa 1990 and will require some upgrading to comply with current Irish Water Standards and Codes of Practice. As per the pre-connection feasibility reply to our clients' by Irish Water dated 03 July, 2020, our client is prepared to demonstrate and upgrade if necessary the Third Party infrastructure so it is in compliance with the requirements of Irish Water Code of Practice and Standard Details to satisfy the current and the additional demand.

4.2 Future Foul Drainage

The foul sewer network has been continued to the lands to the North of the subject site for future developments.

4.3 Design Strategy

The proposed foul drainage system for the entire site has been designed as two separate catchments (refer to drawing 20017-303 & 304), based on the topography of the site. 130 units and the crèche, predominantly to the West of the site, will discharge to the Abbeylands pumping station,(capacity calculation included in Appendix D) via Brooklands residential scheme with the remaining 203 units discharging also to the Abbeylands pumping station, (capacity calculations included in Appendix D).

Individual houses will connect to the 225mm and 150mm diameter foul drains via individual 100mm diameter house connections, as per Irish Water Code of Practice for Wastewater Infrastructure.

No. of Residential Units	No. of Persons @ 3 per unit & 60 Creche	Dry Weather Flow (Litres/person /day)	Peak Flow - 6 x DWF (l/s)	Daily Demand (m3)
333 + Creche	1,059	333 (Dwelling) 60 (Creche)	14.00	201

4.4 Design Calculations

Foul sewers have been designed in accordance with the Building Regulations and specifically in accordance with the principles and methods set out in the Irish Water Code of Practice, IS EN752 (2008), IS EN12056: Part 2 (2000) and the recommendations of the 'Greater Dublin Strategic Drainage Study', (GDSDS).

The following criteria have been applied:

Demand	600l/dwelling/day (based on 3 persons per house and a per capita wastewater flow of 200 litres per head per day.)
Discharge units	14 units per house (as BS8301)
Pipe Friction (Ks)	1.5 mm
Minimum Velocity	0.75 m/s (self-cleansing velocity)
Maximum Velocity	3.0 m/s
Frequency Factor	0.5 for domestic use
Manhole Depths	< 5.0m

Foul sewer design calculations are provided in Appendix D.

All foul sewers and manholes will be constructed in accordance with the Irish Water Standard Details and the Irish Water Code of Practice for Wastewater.

4.5 Compliance with Irish Water Standards

The proposed foul sewer design and layout is in accordance with the Irish Water Code of Practice for Wastewater Infrastructure and The Irish Water Wastewater Infrastructure Standard Details. Connections to the existing infrastructure will be carried out in accordance in accordance with the Irish Water Code of Practice for Wastewater Infrastructure and The Irish Water, Wastewater Infrastructure Standard Details.

4.6 Proposals for protection or diversion of Irish Water Assets

The proposed foul sewer design does not envisage the removal or diversion of existing foul sewers. Connections to the existing infrastructure will be carried out in accordance in accordance with the Irish Water Code of Practice for Wastewater Infrastructure and The Irish Water, Wastewater Infrastructure Standard Details.

4.7 Foul Environmental Impacts

This application comprises 333 residential units. The development will discharge by gravity to a Pumping Station located in the adjoining Abbey Park (in control of applicant).

An Irish Water Pre-Connection Enquiry form has been submitted to Irish Water and an Irish Water Feedback form has been received outlining that a Wastewater connection is possible for the proposed development. Refer to Appendix E for a copy of each form.

The proposed foul water design and layout was submitted to Irish Water and a letter of Design Acceptance was issued by Irish Water. This is included in Appendix H.

5.0 WATER SUPPLY AND DISTRIBUTION

5.1 Existing Water supply

An existing 150mm diameter public uPVC water-mains passes the subject site on the Brooklands entrance. Please refer to Irish Water Map in Appendix G. Adequate supply of water is available to meet fire-fighting demands.

5.2 Development Water Main Layout

The development's water-main distribution system is indicated on drawings 20017-304 1&2 and 20017-315. A connection will be made to the existing 150 diam water-mains at the south-west boundary entrance off Brooklands Housing Scheme, (in control of the applicant) to service the development. A 150mm diameter spine water main will be provided along the main access road through the Subject Site with a number of 100mm diameters looped water-mains provided along the Local Streets. A connection is made back to the existing 150mm water-mains at Brooklands residential scheme at the bottom south-west corner of the site.

The connection to the public water main will include a metered connection with sluice valve arrangement in accordance with the requirements of Irish Water.

The selected pipe material options for the development will be PE-100.

Individual houses will have their own connections to the distribution main via service connections and boundary boxes. Individual service boundary boxes will be of the type to suit Irish Water and to facilitate domestic meter installation.

Hydrants are provided for fire-fighting at locations to ensure that each dwelling is within the required Building Regulations distance of 46.0m to a hydrant.

5.3 Compliance with Irish Water Standards

The proposed water-mains design and layout is in accordance with the Irish Water Code of Practice for Water Infrastructure and The Irish Water, Water Infrastructure Standard Details. The proposed water design and layout was submitted to Irish Water and a letter of Design Acceptance was issued by Irish Water. This is included in Appendix H.

5.4 Proposals for protection or diversion of Irish Water Assets

The proposed water design does not envisage the removal or diversion of water-mains. Connections to the existing infrastructure will be carried out in accordance in accordance with the Irish Water Code of Practice for Water Infrastructure and The Irish Water, Water Infrastructure Standard Details.

5.5 Water Demand & Conservation

The average daily domestic demand (ADDD) for the proposed development is approximately 136.1m^3 and an average day / peak week demand of 170.1 m^3 has been calculated as outlined in the Irish Water Code of Practice for Water Infrastructure.

The average water demand is estimated to be 1.97 l/s. The peak demand for sizing of the pipe network (5 times the average day, peak week demand) is calculated as 9.9l/s.

Each house will provide 24 hours of cold water storage in the header tank and houses will utilise water saving features for the fittings to reduce water demand.

Adequate provision is provided for fire fighting purposes.

An Irish Water Pre-Connection Enquiry form, including calculations has been submitted to Irish Water and an Irish Water Feedback form has been received outlining that a Watermain connection is possible for the proposed development.

A letter of Design Acceptance is included in Appendix H.

Appendix A

IRISH SUDS REPORT

Site Drainage Evaluation

Site name: Capdoo Commons
Site location: Clane, Co. Kildare

Report Reference: 1544347714187

1. INTRODUCTION

This is a bespoke report providing initial guidance on potential implementation of SuDS for the development site in line with current best practice.

The use of this tool should be supplemented by more detailed guidance on SuDS best practice provided in a number of sources, principally the CIRIA SUDS Manual (2007), other CIRIA documents; the Use of SUDS in High Density Developments, HR Wallingford, (2005) and other HR Wallingford documents.

The objective is to provide some early guidance on the numbers and types of components that might be suitable for consideration within the site design. This may facilitate pre-application discussions with planners and other relevant authorities.

This guidance has been provided prior to the completion of the SUDS standards and the supporting guidance. However the principles of this tool are unlikely to be very different to the aims of the SUDS standards. HR Wallingford is not liable for the use of any output from the use of this tool and the performance of the drainage system. It is recommended that detailed design using appropriately experienced engineers professionals and tools is undertaken before finalising any drainage scheme arrangement for a site.

THE CONTENT OF THE REPORT

This report is split into 8 sections as follows:

2. GENERIC SuDS BEST PRACTICE PRINCIPLES

To comply with current best practice, the drainage system should:

(i) manage runoff at or close to its source;
(ii) manage runoff at the surface;
(iii) be integrated with public open space areas and contribute towards meeting the objectives of the urban plan;
(iv) be cost-effective to operate and maintain.

The drainage system should endeavour to ensure that, for any particular site:

(i) natural hydrological processes are protected through maintaining Interception of an initial depth of rainfall and prioritising infiltration, where appropriate;
(ii) flood risk is managed through the control of runoff peak flow rates and volumes discharged from the site;
(iii) stormwater runoff is treated to prevent detrimental impacts to the receiving water body as a result of urban contaminants.

In addition, it is desirable to maximise the amenity and ecological benefits associated with the drainage system where there are appropriate opportunities. SuDS are green infrastructure components and can provide health benefits, and reduce the vulnerability of developments to the impacts of climate change.

3. RUNOFF DESTINATION

Introduction

Infiltration should be prioritised as the method of controlling surface water runoff from the development site, unless it can be demonstrated that the use of infiltration would have a detrimental environmental impact.

Groundwater (via Infiltration)
Infiltration may not be appropriate for managing runoff from this site. Robust studies are reqired to confirm the significance of the following constraints to infiltration:

(1) The subsurface geology is primarily impermeable and the use of infiltration is unlikely to be suitable. Where infiltration rates are confirmed via testing to be < 1 x 10-7 m/s, infiltration will be very limited. Where infiltration rates are between 1 x 10-7 and 1 x 10-5 m/s, then soils can still provide Interception and partial infiltration. If rates are confirmed to be > 1 x 10-5 m/s, full infiltration can be considered in the design.

The groundwater beneath the site is designated as , and this designation will define the treatment requirement for any infiltrated water (See Water Quality Design Criteria).

Surface water body
All runoff that cannot be discharged to groundwater will be managed on site and discharged to a surface water body.

The receiving surface water body for runoff from the site is: the *Liffey*. The riparian owner is: .

4. HYDRAULIC DESIGN CRITERIA

Introduction
Best practice criteria for hydraulic control require Interception, runoff and volume control.

Interception
To fulfill the requirements for Interception, there should normally be no runoff from the site for an initial depth of rainfall - usually 5mm. This is achieved through the use of infiltration, evapotranspiration, or rainwater harvesting.

Flow and Volume Control
Local guidance states that there are no additional requirements for peak flow or volume control for this site. Therefore, once Interception requirements have been fulfilled, residual surface runoff can be conveyed directly to the watercourse for this site.

The site is a greenfield development, therefore runoff from the site needs to be constrained to the equivalent greenfield rates and volumes.

Attenuation and hydraulic controls will be used to manage flow rates.

Rainwater harvesting, or the use of Long Term Storage can be used to achieve greenfield runoff volume control. Where volume control is not practicable, flows discharged from the site will be constrained to Qbar or 2 l/s/ha (whichever is the greater).

5. WATER QUALITY DESIGN CRITERIA

Introduction
Current best practice takes a risk-based approach to managing discharges of surface runoff to the receiving environment. The following text provides guidance on the extent of water quality management likely to be appropriate for the site.

Hazard Classification
Runoff from clean roof surfaces (ie not metal roofs, roofs close to polluted atmospheric discharges, or roofs close to populations of flocking birds) is classified as Low in terms of hazard status.

Runoff from roads, parking and other areas of residential, commercial and industrial sites (that are not contaminated with waste, high levels of hydrocarbons, or other chemicals) is classified as Medium in terms of hazard status.

Treatment requirements for disposal to surface water systems
The level of urbanisation of the catchment at the point of the discharge from the site is < 20%, therefore it may be classified as a sensitive receptor.

Roof runoff will require 1 treatment stage prior to discharge.

Runoff from other parts of this site such as roads, parking and other areas will require 3 treatment stages prior to discharge.

6. SITE-SPECIFIC DRAINAGE DESIGN CONSIDERATIONS

The design of SuDS with access to temporary or permanent water should consider public health and safety as well as issues associated with construction and operational management of the structures. Health and safety issues and risk mitigation features are presented in the CIRIA SuDS Manual.

Individual SuDS components should not be treated in isolation, but should be seen together as providing a suite of drainage features which are appropriate in different combinations for varying scales. It is always desirable to have a mix of SuDS components across the site as different components have different capacities for treatment of individual pollutants.

7. SuDS CONSTRUCTION

SuDS are a combination of civil engineering structures and landscaping practice. Due to the limited experience of building SuDS in the water industry, there are a number of key issues which need to be particularly considered as their construction requires a change in approach to some standard construction practices.

• SuDS components should be constructed in line with either the manufacturer's guidelines or best practice methods.
• The construction of SuDS usually only requires the use of fairly standard civil engineering construction and landscaping operations, such as excavation, filling, grading, top-soiling, seeding, planting etc. These operations are specified in various standard construction documents, such as the Civil Engineering Specification for the Water Industry (CESWI).
• Construction of soakaways is regulated by the Buildings Regulations part H (Drainage and waste disposal) which sets out the requirements for drainage of rainwater from the roofs of buildings.
• During construction, any surfaces which are intended to enable infiltration must be protected from compaction. This includes protecting from heavy traffic or storage of materials.
• Water contaminated with silt must not be allowed to enter a watercourse or drain as it can cause pollution. All parts of the drainage system must be protected from construction runoff to prevent silt clogging the system and causing pollution downstream. Measures to prevent this include soil stabilisation, early construction of sediment management basins, channelling run-off away from watercourses and surface water drains, and erosion prevention measures.
• After the end of the construction period and prior to handover to the site owner/operator:
 - Subsoil that has been compacted during construction activities should be broken up prior to the re-application of topsoil to garden areas and other areas of public open space to reinstate the natural infiltration performance of the ground;
 - Any areas of the SuDs that have been compacted during construction but are intended to permit infiltration must be completely refurbished;
 - Checks must be made for blockages or partial blockages of orifices or pipe systems;
 - Any silt deposited during the construction must be completely removed;
 - Soils must be stabilised and protected from erosion whilst planting becomes established.

Detailed guidance on the construction related issues for SuDS is available in the SuDS Manual and the associated Construction Site handbook (CIRIA, 2007).

8. SuDS COMPONENTS PERFORMANCE

	Interception	Peak flow control: Low	Peak flow control: High	Volume reduction	Volume control	Gross sediments	Fine sediments	Hydrocarbons/ PAHs	Metals	Nutrients
Rainwater Harvesting	Y	Y	S	Y	N	N	N	N	N	N
Pervious Pavement	Y	Y	Y	Y	Y	Y	Y	Y	Y	Var
Filter Strips	Y	N	N	N	N	Y	N	Y	Y	Var
Swales	Y	Y	S	Y(*)	N	Y	Y(+)	Y	Y	Y(-)
Trenches	Y	Y	S	Y(*)	N	N	N	Y	Y	Y(-)
Detention Basins	Y	Y	Y	N	Y	Y	Y(+)	Y	Y	Var
Ponds	N	Y	Y	N	Y	N(~)	Y	Limited	Y	Var
Wetlands	N	Y	S	N	Y	N(~)	Y	Limited	Y	Y
Green Roofs	Y	Y	N	N	N	N	N	Y	N	N
Bioretention Systems	Y	Y	S	Y(*)	N	N(~)	Y	Y	Y	Y
Proprietary Treatment Systems	N	N	N	N	N	Y	Y	Y(!)	Y(!)	Y(!)
Subsurface Storage	N	Y	Y	N	Y	N(~)	N	N	N	N
Subsurface Conveyance Pipes	N	N	N	N	Y	N(~)	N	N	N	N

Notes:

S: Not normally with standard designs, but possible where space is available and designs mitigate impact of high flow rates.
Y(*): Where infiltration is facilitated by the design.
N(~): Gross sediment retention is possible, but not recommended due to negative maintenance and performance implications.
Y(+): Where designs minimise the risk of fine sediment mobilisation during larger events.
Y(!): Where designs specifically promote the trapping and breakdown of oils and PAH based constitutents.
Y("): Where subsurface soil structure facilitates the trapping and breakdown of oils and PAH based constituents.
Var: The nutrient removal performance is variable, and can be negative in some situations.
Y(-): Good nutrient removal performance where subsurface biofiltration systems with a permanently saturated zone included within the design.

9. GUIDANCE ON THE USE OF INDIVIDUAL COMPONENTS

Rainwater Harvesting

• *Roofs*
Rainwater harvesting systems can be used to effectively drain roofs and provide both water supply and stormwater management benefits.

Pervious Pavement

• *Roofs*
Roof water can be drained into pervious pavement areas using diffusers to dissipate the point inflows. Detailed design of the pavement will need to take account of the additional impermeable roof area.

• *Roads*
Some types of pervious pavement can be used for relatively highly trafficked roads and pavement manufacturers should be consulted on the appropriate specification.

• *Car parks/other impermable surfaces*
Pervious pavements provide effective drainage, storage and treatment of car park surfacing,

Filter Strips

• *Roads*
Filter strips can provide treatment for road runoff, upstream of swales or trench components. They can reduce the need for kerbing and runoff collection systems.

• *Car parks/other impermable surfaces*
Filter strips can provide treatment for runoff from impermeable surfaces, upstream of swales or trench components. They can reduce the need for kerbing and runoff collection systems.

• *Site size > 50 ha*
The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

Swales

• *Roofs*
Swales can be used to convey roof water to other parts of the site.

• *Roads*
Swales provide treatment and conveyance of road runoff. There are a range of swale types - standard grass channels, underdrained swales, and wetland swales - depending on drainage requirements.

• *Car parks/other impermable surfaces*
Swales provide treatment and conveyance of runoff from impermeable areas. There are a range of swale types - standard grass channels, underdrained swales, and wetland swales - depending on drainage requirements.

• *Site size > 50 ha*
The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

Trenches

• *Roofs*
Trenches can be used to convey roof water to other parts of the site.

• *Roads*
Trenches can provide treatment and conveyance of road runoff. They require effective pretreatment to minimise the risk of blockage.

• *Car parks/other impermable surfaces*
Trenches can provide treatment and conveyance of runoff for impermeable areas.

• *Site size > 50 ha*
The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

Detention Basins

• *Roofs*
Detention basins can be used to attenuate and treat runoff.

• *Roads*
Detention basins can be used to attenuate and treat runoff.

• *Car parks/other impermable surfaces*
Detention basins can be used to attenuate and treat runoff.

• *Site size > 50 ha*
The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria. A risk assessment should be used to determine the maximum appropriate depth of stored water in the basin.

Ponds

• *Roofs*
Ponds can be used to attenuate and treat roof runoff.

• *Roads*
Ponds can be used to attenuate and treat runoff. However, they are best implemented at the lower end of the treatment train as a 'polishing' component. They should not be used as sediment management devices, as sediment and wet vegetation is relatively costly to extract and dispose of. If poor quality water remains in ponds for extended periods, nutrient concentrations can rise - particularly in the summer months, and the pond can become unattractive with poor amenity and biodiversity potential.

• *Car parks/other impermable surfaces*
Ponds can be used to attenuate and treat runoff. However, they are best implemented at the lower end of the treatment train as a 'polishing' component. They should not be used as sediment management devices, as sediment and wet vegetation is relatively costly to extract and dispose of. If poor quality water remains in ponds for extended periods, nutrient concentrations can rise - particularly in the summer months, and the pond can become unattractive with poor amenity and biodiversity potential.

• *Site size > 50 ha*
The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

• *Other*
Ponds built in permeable soils will require lining to maintain the water level of the permanent pool. The lining may be finished 100 or 200 mm lower than the outlet invert to encourage some infiltration to take place to contribute to interception.

Wetlands

• *Roofs*
Wetlands can be used to attenuate and treat roof runoff.

• *Roads*
Wetlands can be used to attenuate and treat runoff. However, they are best implemented at the lower end of the treatment train as a 'polishing' component. They should not be used as sediment management devices, as sediment and wet vegetation is relatively costly to extract and dispose of. If poor quality water remains in wetlands for extended periods, nutrient concentrations can rise - particularly in the summer months, and the wetland can become unattractive with poor amenity and biodiversity potential.

• *Car parks/other impermable surfaces*

Wetlands can be used to attenuate and treat runoff. However, they are best implemented at the lower end of the treatment train as a 'polishing' component. They should not be used as sediment management devices, as sediment and wet vegetation is relatively costly to extract and dispose of. If poor quality water remains in wetlands for extended periods, nutrient concentrations can rise - particularly in the summer months, and the wetland can become unattractive with poor amenity and biodiversity potential.

• *Site size > 50 ha*
The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

Green Roofs

• *Roofs*
Green roofs can be designed to provide interception, management and treatment of rainfall up to specified rainfall depths.

Bioretention Systems

• *Roofs*
Bioretention systems can be used to attenuate and treat roof runoff.

• *Roads*
Linear bioretention systems (ie biofiltration swales) can be used to attenuate and treat road runoff.

• *Car parks/other impermable surfaces*
Bioretention systems canbe used for car park drainage.

• *Site size > 50 ha*
Bioretention systems will tend to be suitable for managing small areas only.The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

Proprietary Treatment Systems

• *Roads*
Proprietary treatment systems can be used where surface vegetated systems are impracticable. However, regular monitoring needs to be ensured so that they are maintained so that they continue to function effectively.

• *Car parks/other impermable surfaces*
Proprietary treatment systems could be used where surface vegetated systems are impracticable. However, regular monitoring needs to be ensured so that they are maintained so that they continue to function effectively.

• *Site size > 50 ha*
Proprietary treatment systems will tend to be suitable for managing small areas only. The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

Subsurface Storage

• *Roofs*
Subsurface storage can be used to attenuate roof runoff.

• *Roads*
Subsurface storage can be used to attenuate road runoff.

• *Car parks/other impermable surfaces*
Subsurface storage can be used to attenuate car park runoff.

Subsurface Conveyance Pipes

TANK 1

HR Wallingford
Working with water

Greenfield runoff estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Brian Connolly
Site name:	Capdoo Commons
Site location:	Clane, Co. Kildare

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments" W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site coordinates

Latitude:	53.29476° N
Longitude:	6.67473° W

Reference: 6504607

Methodology	IH124

Site characteristics

Total site area (ha)	4.3	

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	2	2
HOST class	---	---
SPR/SPRHOST	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm)	812	812
Hydrological region	12	12
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 30 year	2.13	2.13
Growth curve factor: 100 year	2.61	2.61

Notes:

(1) Is Q_{BAR} < 2.0 l/s/ha?

(2) Are flow rates < 5.0 l/s?

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite may be a requirement for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	9.32	9.32
1 in 1 year (l/s)	7.92	7.92
1 in 30 years (l/s)	19.86	19.86
1 in 100 years (l/s)	24.33	24.33

TANK 2

HR Wallingford
Working with water

Greenfield runoff estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:

Site name: Capdoo Commons

Site location: Clane

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site coordinates

Latitude: 53.29476° N

Longitude: 6.67267° W

Reference:

Methodology	IH124

Site characteristics

Total site area (ha)	9.2	

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	2	2
HOST class	---	---
SPR/SPRHOST	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm)	821	821
Hydrological region	12	12
Growth curve factor 1 year	0.85	0.85
Growth curve factor 30 year	2.13	2.13
Growth curve factor 100 year	2.61	2.61

Notes:

(1) Is Q_{BAR} < 2.0 l/s/ha?

(2) Are flow rates < 5.0 l/s?

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite may be a requirement for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	20.21	20.21
1 in 1 year (l/s)	17.17	17.17
1 in 30 years (l/s)	43.04	43.04
1 in 100 years (l/s)	52.74	52.74

Appendix B

SURFACE WATER DISCHARGE AND ATTENUATION

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 733 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	0.500	0.500	0.0	9.3	9.3	268.4	O K
30 min Winter	0.696	0.696	0.0	9.3	9.3	373.3	O K
60 min Winter	0.901	0.901	0.0	9.3	9.3	483.4	O K
120 min Winter	1.112	1.112	0.0	9.3	9.3	596.5	O K
180 min Winter	1.233	1.233	0.0	9.3	9.3	661.3	O K
240 min Winter	1.314	1.314	0.0	9.3	9.3	704.9	O K
360 min Winter	1.414	1.414	0.0	9.3	9.3	758.6	O K
480 min Winter	1.468	1.468	0.0	9.3	9.3	787.6	O K
600 min Winter	1.496	1.496	0.0	9.3	9.3	802.6	O K
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
960 min Winter	1.499	1.499	0.0	9.3	9.3	804.0	O K
1440 min Winter	1.461	1.461	0.0	9.3	9.3	783.9	O K
2160 min Winter	1.366	1.366	0.0	9.3	9.3	732.8	O K
2880 min Winter	1.247	1.247	0.0	9.3	9.3	668.7	O K
4320 min Winter	0.988	0.988	0.0	9.3	9.3	530.2	O K
5760 min Winter	0.741	0.741	0.0	9.3	9.3	397.3	O K
7200 min Winter	0.521	0.521	0.0	9.3	9.3	279.6	O K
8640 min Winter	0.339	0.339	0.0	9.3	9.3	182.0	O K
10080 min Winter	0.202	0.202	0.0	9.3	9.3	108.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	80.247	0.0	272.7	26
30 min Winter	56.084	0.0	382.3	40
60 min Winter	36.915	0.0	509.3	68
120 min Winter	23.512	0.0	649.2	126
180 min Winter	17.903	0.0	741.6	184
240 min Winter	14.722	0.0	813.1	242
360 min Winter	11.142	0.0	923.0	356
480 min Winter	9.130	0.0	1008.2	470
600 min Winter	7.819	0.0	1078.9	580
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
960 min Winter	5.633	0.0	1241.5	884
1440 min Winter	4.243	0.0	1393.1	1106
2160 min Winter	3.194	0.0	1593.5	1568
2880 min Winter	2.609	0.0	1734.9	2020
4320 min Winter	1.958	0.0	1952.4	2860
5760 min Winter	1.596	0.0	2126.3	3640
7200 min Winter	1.362	0.0	2267.2	4392
8640 min Winter	1.196	0.0	2388.5	5016
10080 min Winter	1.072	0.0	2495.1	5560

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	15.600	Shortest Storm (mins)	15
Ratio R	0.264	Longest Storm (mins)	10080
Summer Storms	No	Climate Change %	+20

Time Area Diagram

Total Area (ha) 1.652

Time From:	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**
0	4	0.551	4	8	0.551	8	12	0.551

Model Details

Storage is Online Cover Level (m) 2.000

Cellular Storage Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.60
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	894.0	894.0	1.600	0.0	1073.4
1.500	894.0	1073.4			

Hydroslide Outflow Control

Design Head (m)	1.510	Invert Level (m)	0.000
Design Flow (l/s)	9.3	Maximum Head (m)	2.025
Range	VS	Minimum Pipe Diameter (mm)	150
Application	Stormwater	Minimum Manhole Diameter (mm)	1800
Model	DR 200/150 VS		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.6	1.200	9.3	3.000	9.8	7.000	14.9
0.200	9.3	1.400	9.3	3.500	10.6	7.500	15.5
0.300	9.3	1.600	9.3	4.000	11.3	8.000	16.0
0.400	9.3	1.800	9.3	4.500	12.0	8.500	16.5
0.500	9.3	2.000	9.3	5.000	12.6	9.000	16.9
0.600	9.3	2.200	8.4	5.500	13.2	9.500	17.4
0.800	9.3	2.400	8.7	6.000	13.8		
1.000	9.3	2.600	9.1	6.500	14.4		

StormTech

A division of ADS

User Inputs

Chamber Model	MC-3500
Outlet Control Structure	No Outlet
Project Name	Capdoo, Clane SHD
Project Location	Capdoo, Clane (TANK 1)
Project Date	10/24/2020
Engineer	Brian Connolly Associates
Measurement Type	Metric
Required Storage Volume	808 cubic meters
Stone Porosity	40%
Stone Above Chambers	305 mm.
Stone Foundation Depth	229 mm.
Average Cover Over Chambers	610 mm.
Design Constraint	Width
Design Constraint Dimension	15 meters

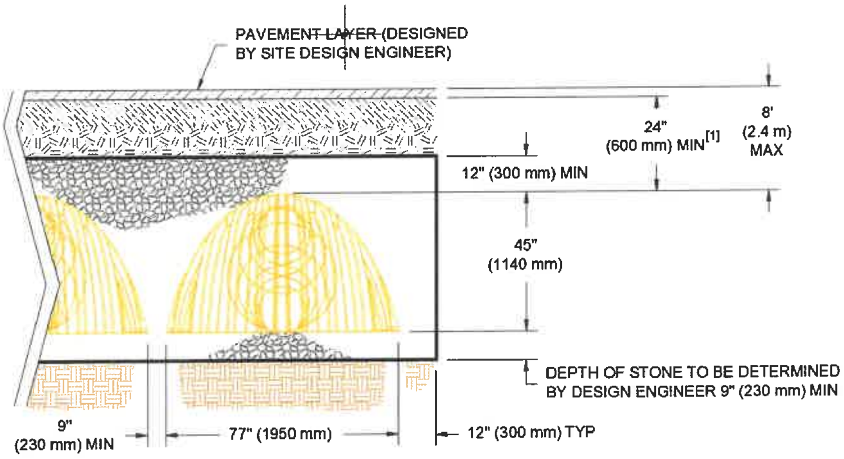
Results

System Volume and Bed Size

Installed Storage Volume	809 cubic meters
Storage Volume Per Chamber	5.0 cubic meters
Storage Volume Per End Cap	1.3 cubic meters
Number Of Chambers Required	151 each
Number Of End Caps Required	12 each
Rows/Chambers	1 row(s) of 26 chamber(s)
Leftover Rows/Chambers	5 row(s) of 25 chamber(s)
Maximum Length	59.63 meters
Maximum Width	13.49 meters
Approx. Bed Size Required	780 square meters

System Components

Amount Of Stone Required	833 cubic meters
Volume Of Excavation (Not Including Fill)	1309 cubic meters
Non-woven Filter Fabric Required	1808 square meters
Length Of Isolator Row	57.92 meters
Woven Isolator Row Fabric	303 square meters



[1] - TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

ADVANCED DRAINAGE SYSTEMS, INC.

SiteASSIST by StormTech
FOR STORMTECH INSTRUCTIONS, DOWNLOAD THE INSTALLATION APP

Capdoo, Clane SHD

Capdoo, Clane (TANK 1)

STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500 OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MADE FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD. THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS.

   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm) MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING..
10. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

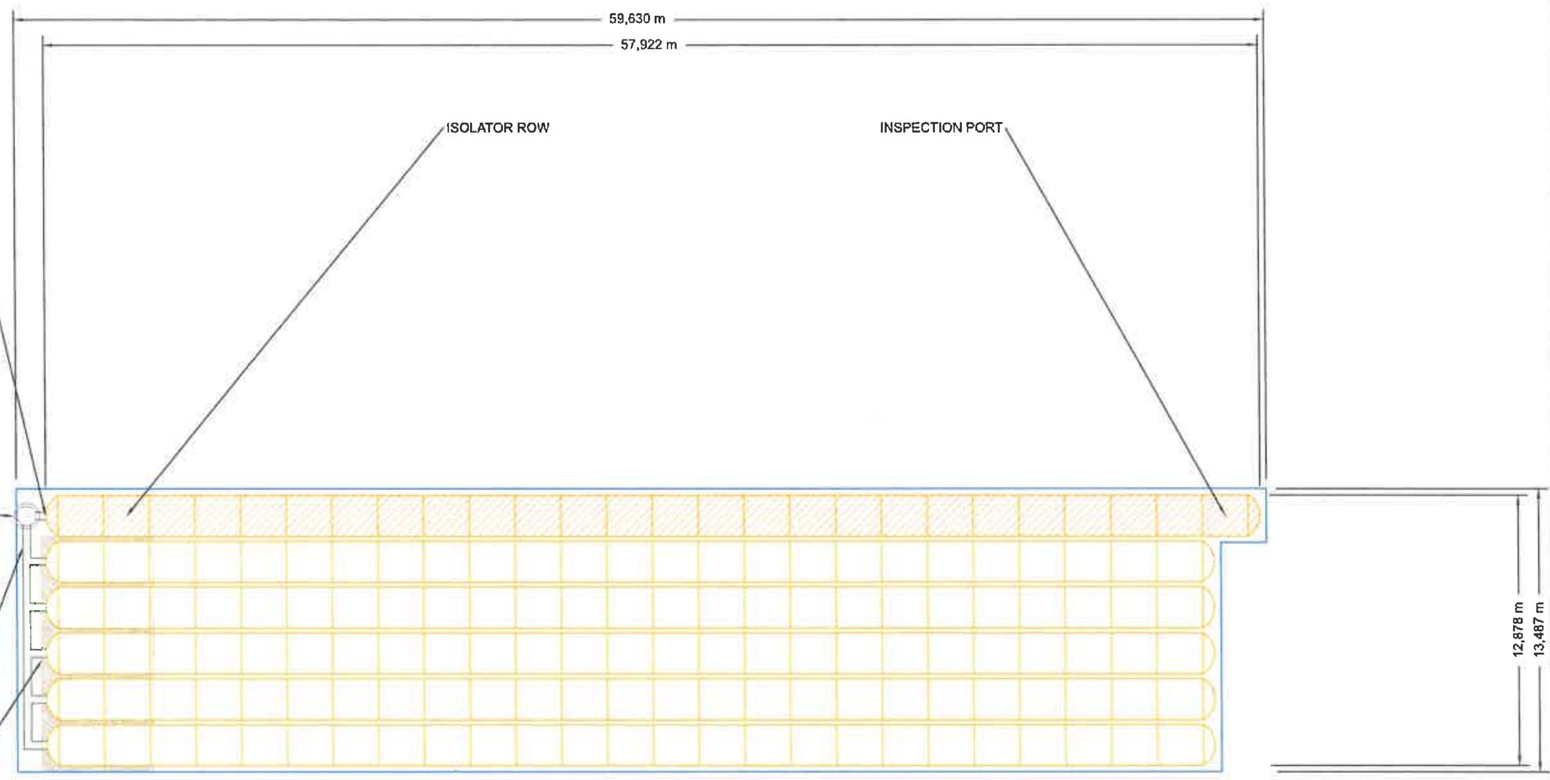
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

CONCEPTUAL LAYOUT

(151) STORMTECH MC-3500 CHAMBERS
(12) STORMTECH MC-3500 END CAPS
INSTALLED WITH 305 mm COVER STONE, 229 mm BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 809 m³
AREA OF SYSTEM: 780 m²
PERIMETER OF SYSTEM: 146 m

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION



Capdoo, Clane SHD
Capdoo, Clane (TANK 1)

REV	DRW	CHK	DESCRIPTION

DATE: 10/24/2020 DRAWN: BC
PROJECT #: Tool CHECKED: ---

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NOT TO SCALE

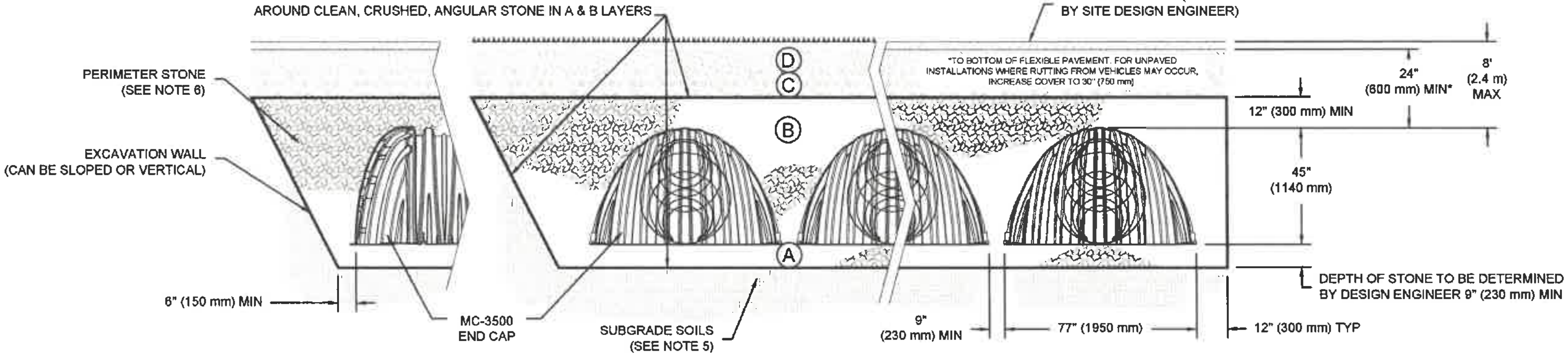
SHEET
2 OF 5

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2,3]

PLEASE NOTE:

1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. MC-3500 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

Capdoo, Clane SHD
Capdoo, Clane (TANK 1)

DATE: 10/24/2020 DRAWN: BC
PROJECT #: Tool CHECKED: ---

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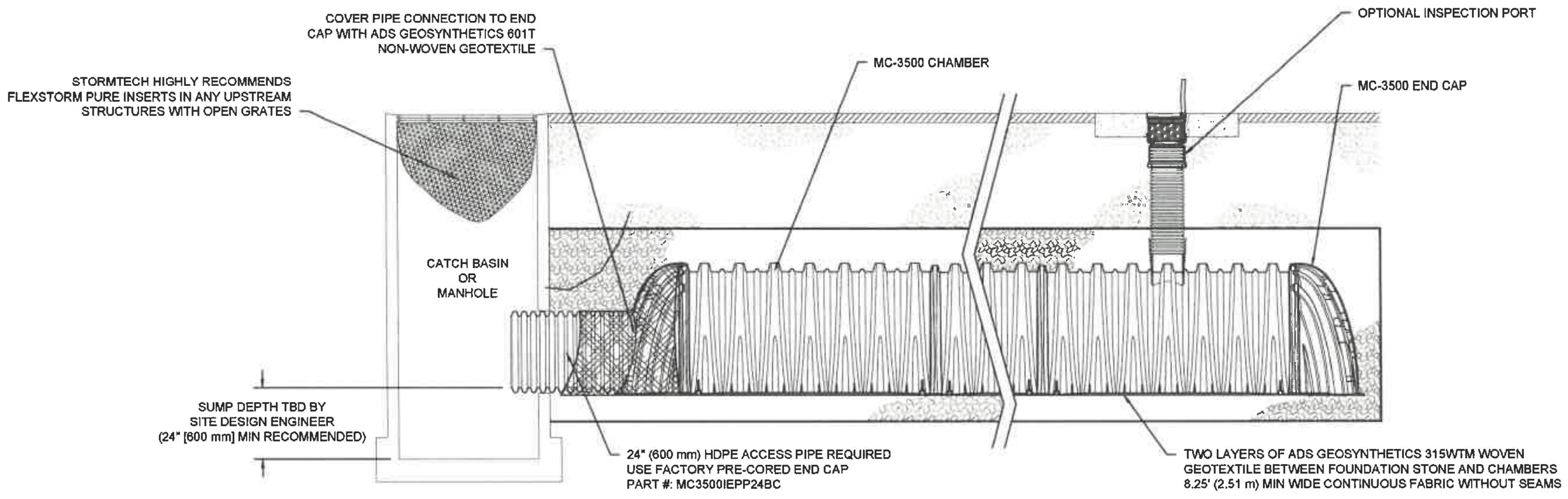


MC-3500 ISOLATOR ROW DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

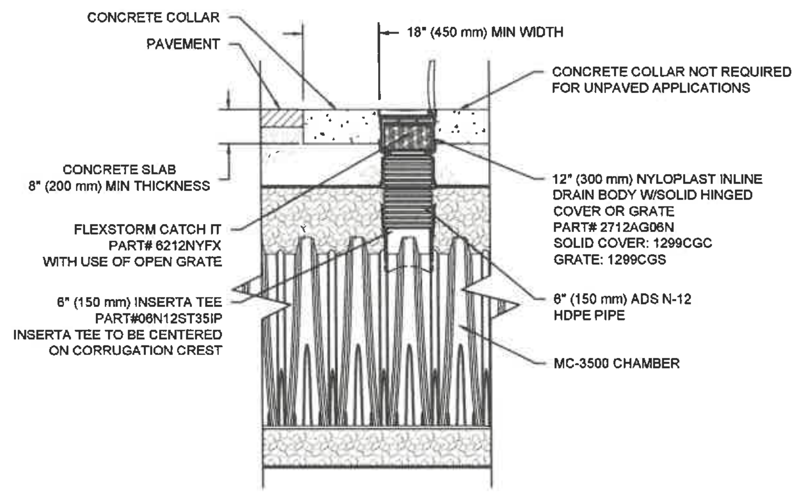
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



MC-3500 6" INSPECTION PORT DETAIL

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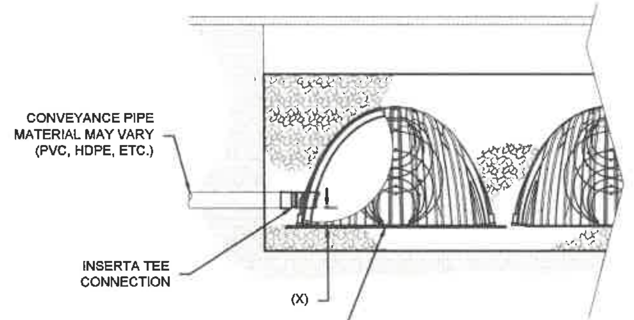
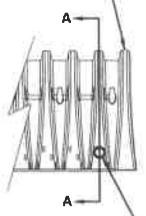
DATE: 10/24/2020	DRAWN: BC
PROJECT #: Tool	CHECKED: ---

INSERTA TEE DETAIL
NTS



SECTION A-A



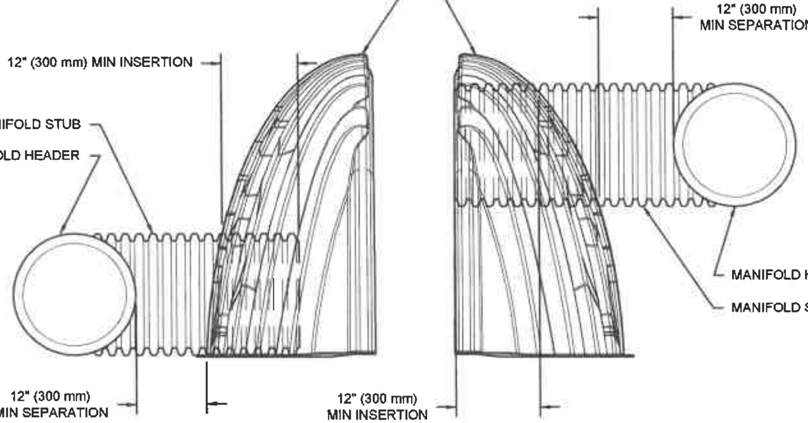
SIDE VIEW

CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)

INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON

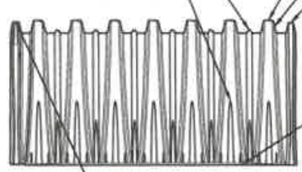
NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

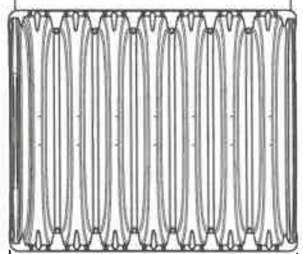
MC-SERIES END CAP INSERTION DETAIL
NTS

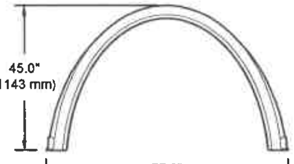


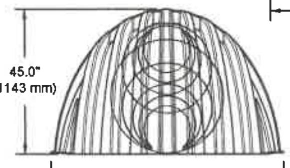
NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

MC-3500 TECHNICAL SPECIFICATION
NTS









NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	178.9 CUBIC FEET	(5.06 m³)
WEIGHT	135.0 lbs.	(61.2 kg)

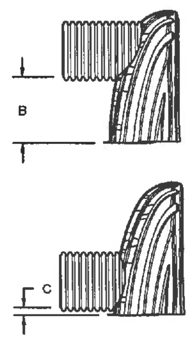
NOMINAL END CAP SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 22.5"	(1956 mm X 1143 mm X 571 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	46.0 CUBIC FEET	(1.30 m³)
WEIGHT	50.0 lbs.	(22.7 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP30BC	30" (750 mm)	---	



NOTE: ALL DIMENSIONS ARE NOMINAL

CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS.
CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm)
THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHTEST POSSIBLE FOR THE PIPE SIZE.

REV	DRW	CHK	DESCRIPTION

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Capdoo, Clane SHD
Capdoo, Clane (TANK 1)

DATE: 10/24/2020 DRAWN: BC
PROJECT #: Tool CHECKED: ---

Microstrain Ltd		Page 1
Unit B3 Metropoint Business Park Swords Co. Dublin	CAPDOO, CLANE, TANK 2 100YRP+20% 20.21 l/s	
Date 24APR19 File	Designed by STORMTECH MC3500 Checked by LP	
XP Solutions	Source Control 2015.1	

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 428 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	0.630	0.630	0.0	13.0	13.0	328.9	O K
30 min Winter	0.873	0.873	0.0	14.6	14.6	455.8	O K
60 min Winter	1.123	1.123	0.0	16.4	16.4	586.2	O K
120 min Winter	1.366	1.366	0.0	18.0	18.0	713.0	O K
180 min Winter	1.492	1.492	0.0	18.8	18.8	779.0	O K
240 min Winter	1.567	1.567	0.0	19.3	19.3	818.1	O K
360 min Winter	1.639	1.639	0.0	19.7	19.7	855.6	O K
480 min Winter	1.662	1.662	0.0	19.9	19.9	867.7	O K
600 min Winter	1.677	1.677	0.0	20.0	20.0	875.4	O K
720 min Winter	1.678	1.678	0.0	20.0	20.0	876.0	O K
960 min Winter	1.656	1.656	0.0	19.8	19.8	864.2	O K
1440 min Winter	1.567	1.567	0.0	19.3	19.3	818.0	O K
2160 min Winter	1.409	1.409	0.0	18.3	18.3	735.5	O K
2880 min Winter	1.255	1.255	0.0	17.3	17.3	655.0	O K
4320 min Winter	0.985	0.985	0.0	15.4	15.4	513.9	O K
5760 min Winter	0.755	0.755	0.0	13.8	13.8	394.1	O K
7200 min Winter	0.536	0.536	0.0	12.9	12.9	279.9	O K
8640 min Winter	0.343	0.343	0.0	12.9	12.9	178.8	O K
10080 min Winter	0.255	0.255	0.0	12.3	12.3	133.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	80.247	0.0	339.1	26
30 min Winter	56.084	0.0	474.4	40
60 min Winter	36.915	0.0	628.6	68
120 min Winter	23.512	0.0	801.0	124
180 min Winter	17.903	0.0	914.9	180
240 min Winter	14.722	0.0	1003.1	236
360 min Winter	11.142	0.0	1138.8	344
480 min Winter	9.130	0.0	1244.2	398
600 min Winter	7.819	0.0	1331.8	470
720 min Winter	6.686	0.0	1407.6	598
960 min Winter	5.633	0.0	1534.7	704
1440 min Winter	4.243	0.0	1732.4	1004
2160 min Winter	3.194	0.0	1961.1	1436
2880 min Winter	2.609	0.0	2135.5	1856
4320 min Winter	1.958	0.0	2403.8	2680
5760 min Winter	1.596	0.0	2614.4	3464
7200 min Winter	1.362	0.0	2788.0	4248
8640 min Winter	1.196	0.0	2937.9	4760
10080 min Winter	1.072	0.0	3070.2	5344

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	15.600	Shortest Storm (mins)	15
Ratio R	0.264	Longest Storm (mins)	10080
Summer Storms	No	Climate Change %	+20

Time Area Diagram

Total Area (ha) 2.031

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.677	4	8	0.677	8	12	0.677

Model Details

Storage is Online Cover Level (m) 2.500

Cellular Storage Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.60
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	870.0	870.0	1.800	0.0	1070.6
1.700	870.0	1070.6			

Hydro-Brake® Outflow Control

Design Head (m) 1.700 Hydro-Brake® Type Md5 SW Only Invert Level (m) 0.000
Design Flow (l/s) 20.2 Diameter (mm) 160

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.5	1.200	16.9	3.000	26.7	7.000	40.8
0.200	11.1	1.400	18.2	3.500	28.8	7.500	42.2
0.300	12.8	1.600	19.5	4.000	30.8	8.000	43.6
0.400	12.8	1.800	20.7	4.500	32.7	8.500	44.9
0.500	12.7	2.000	21.8	5.000	34.5	9.000	46.2
0.600	12.9	2.200	22.9	5.500	36.1	9.500	47.5
0.800	14.1	2.400	23.9	6.000	37.7		
1.000	15.5	2.600	24.8	6.500	39.3		

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User Inputs

Chamber Model	MC-3500
Outlet Control Structure	No Outlet
Project Name	Capdoo, Clane SHD
Project Location	Capdoo, Clane (TANK 2)
Project Date	10/24/2020
Engineer	Brian Connolly Associates
Measurement Type	Metric
Required Storage Volume	876 cubic meters
Stone Porosity	40%
Stone Above Chambers	305 mm.
Stone Foundation Depth	229 mm.
Average Cover Over Chambers	610 mm.
Design Constraint	Width
Design Constraint Dimension	18 meters

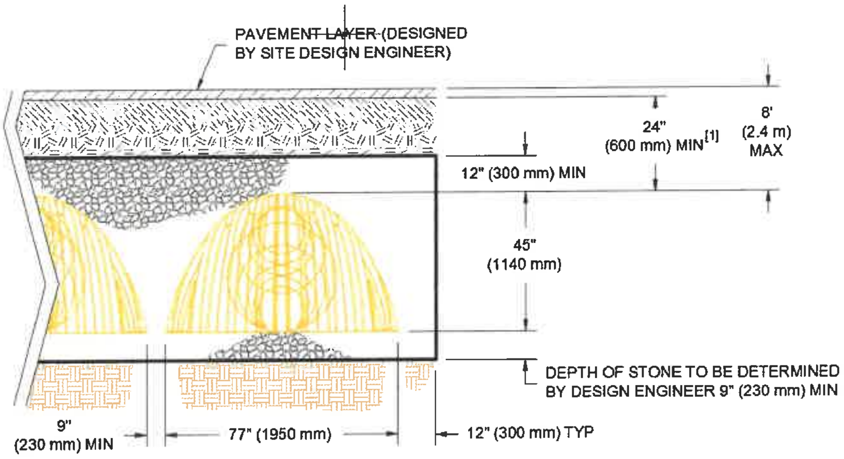
Results

System Volume and Bed Size

Installed Storage Volume	881 cubic meters
Storage Volume Per Chamber	5.0 cubic meters
Storage Volume Per End Cap	1.3 cubic meters
Number Of Chambers Required	164 each
Number Of End Caps Required	16 each
Rows/Chambers	4 row(s) of 21 chamber(s)
Leftover Rows/Chambers	4 row(s) of 20 chamber(s)
Maximum Length	48.71 meters
Maximum Width	17.86 meters
Approx. Bed Size Required	851 square meters

System Components

Amount Of Stone Required	909 cubic meters
Volume Of Excavation (Not Including Fill)	1427 cubic meters
Non-woven Filter Fabric Required	1927 square meters
Length Of Isolator Row	47.00 meters
Woven Isolator Row Fabric	248 square meters



[1] - TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

ADVANCED DRAINAGE SYSTEMS, INC.

SiteASSIST by StormTech
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Capdoo, Clane SHD

Capdoo, Clane (TANK 2)

STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500 OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MADE FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS.

   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm) MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING..
10. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

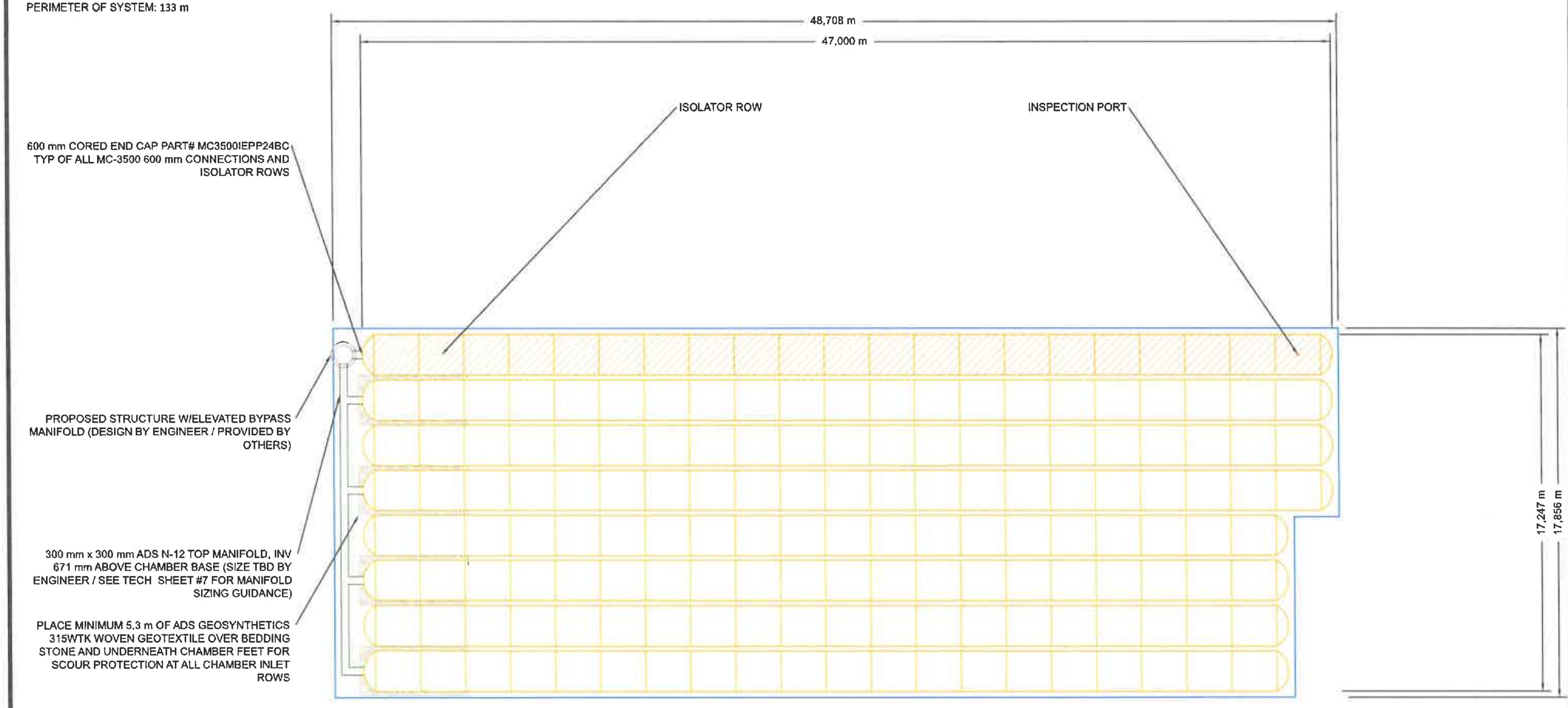
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

CONCEPTUAL LAYOUT

(164) STORMTECH MC-3500 CHAMBERS
(16) STORMTECH MC-3500 END CAPS
INSTALLED WITH 305 mm COVER STONE, 229 mm BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 881 m³
AREA OF SYSTEM: 851 m²
PERIMETER OF SYSTEM: 133 m

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION



Capdoo, Clane SHD	
Capdoo, Clane (TANK 2)	
DATE: 10/24/2020	DRAWN: BC
PROJECT #: Tool	CHECKED: ---

REV	DRW	CHK	DESCRIPTION

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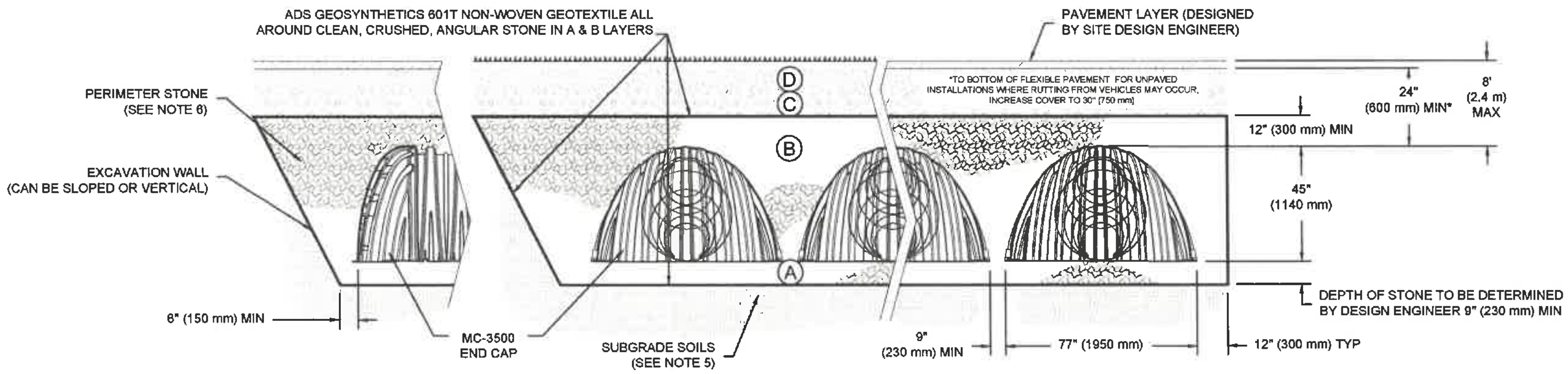
NOT TO SCALE

SHEET 2 OF 5

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145¹ A-1, A-2-4, A-3 OR AASHTO M43¹ 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43¹ 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43¹ 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. ² ³

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. MC-3500 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

Capdoo, Clane SHD
Capdoo, Clane (TANK 2)

DATE: 10/24/2020 DRAWN: BC
PROJECT #: Tool CHECKED: ---

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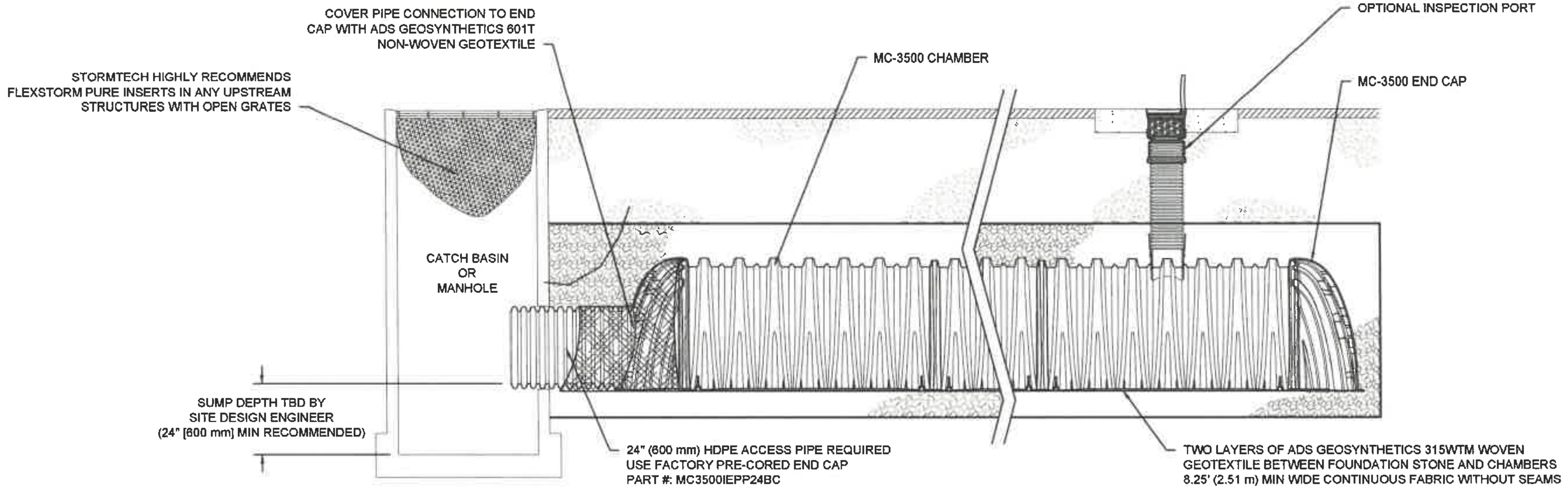


MC-3500 ISOLATOR ROW DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

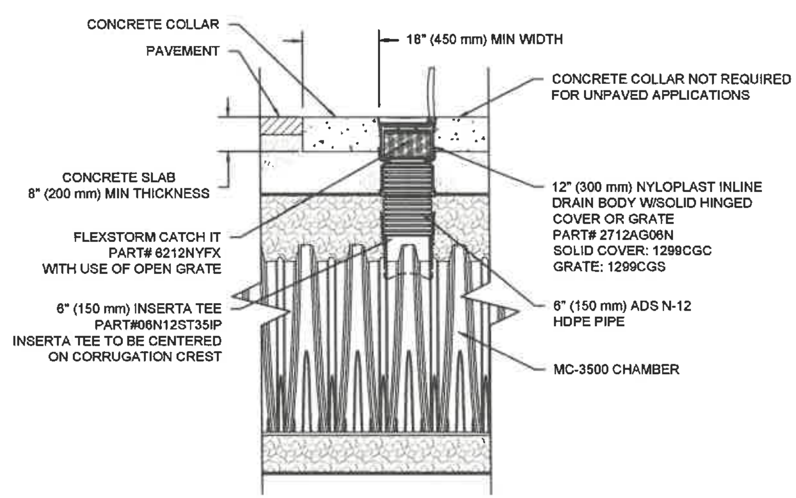
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



MC-3500 6" INSPECTION PORT DETAIL
NTS

REV	DRW	CHK	DESCRIPTION

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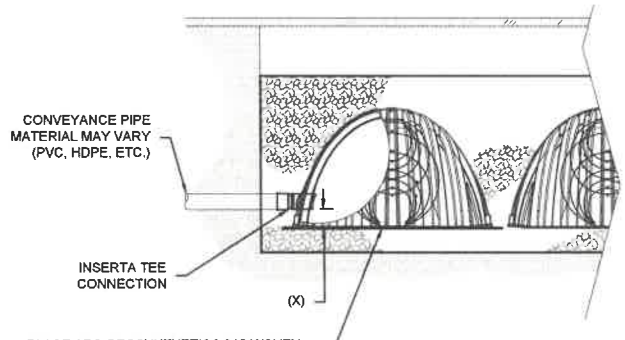
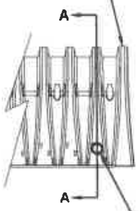
DATE:	10/24/2020	DRAWN:	BC
PROJECT #: Tool		CHECKED:	---

INSERTA TEE DETAIL
NTS



SECTION A-A

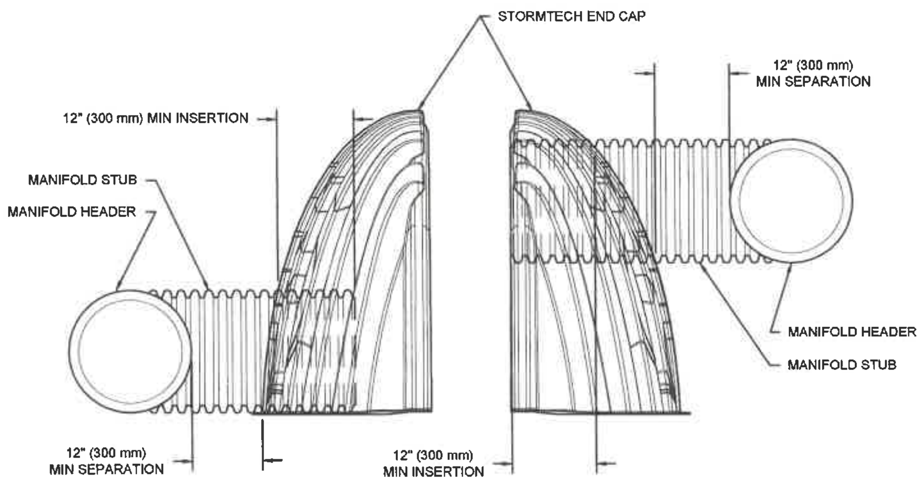


SIDE VIEW

CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

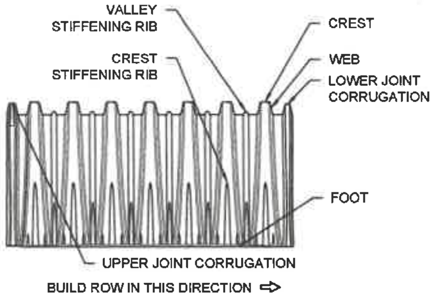
NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

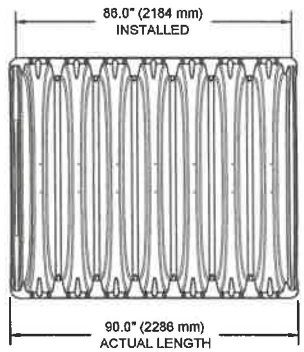
MC-SERIES END CAP INSERTION DETAIL
NTS

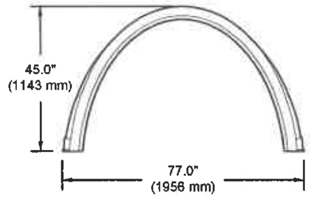


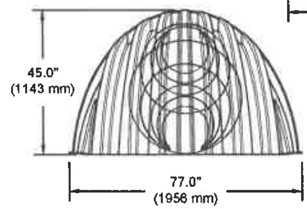
NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

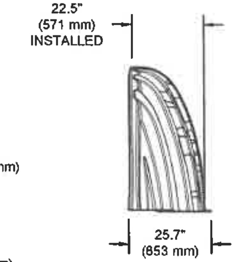
MC-3500 TECHNICAL SPECIFICATION
NTS











NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	178.9 CUBIC FEET	(5.06 m³)
WEIGHT	135.0 lbs.	(61.2 kg)

NOMINAL END CAP SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 22.5"	(1956 mm X 1143 mm X 571 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	46.0 CUBIC FEET	(1.30 m³)
WEIGHT	50.0 lbs.	(22.7 kg)

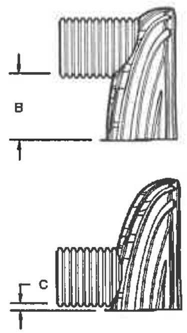
*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP30BC	30" (750 mm)	---	

NOTE: ALL DIMENSIONS ARE NOMINAL

CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS.
CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm)
THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHTEST POSSIBLE FOR THE PIPE SIZE.



Capdoo, Clane SHD
Capdoo, Clane (TANK 2)

DATE: 10/24/2020	DRAWN: BC
PROJECT #: Tool	CHECKED: ---

REV	DRW	CHK	DESCRIPTION

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Appendix C

SURFACE WATER CALCULATIONS

IE CONSULTING
WATER-ENVIRONMENTAL-CIVIL

Our Ref: IE2181/PMS/4733

Your Ref:

Date: 24th November 2020

The Planning Officer
Kildare County Council
Devoy Park
Naas
Co Kildare

Dear Sir / Madam

Re: Proposed Strategic Housing Development at Capdoo & Abbeylands, Clane, Co Kildare – Assessment of Potential Residual Pluvial Flood Risk

As illustrated on the Proposed Foul & Surface Water Drainage layout drawing prepared by BCA Consulting Engineers, the stormwater management system to serve the proposed strategic housing development at Capdoo & Abbeylands, Clane has been designed in general consideration of the Kildare County Council drainage policy and the GDSDS guidelines.

In order to access any potential residual pluvial flood risk associated with the stormwater drainage network to serve the proposed strategic housing development the network has been subject to an additional hydraulic simulation analysis utilising the Micro-Drainage software package in order to demonstrate the following:-

- Analysis to demonstrate that the proposed development storm water drainage and management system has been designed not to flood any part of the site in a 1 in 30 year return design storm and to ensure a free-board of 300mm below each manhole cover level & inclusive of climate change allowance and inclusive of allowance for urban creep (GDSDS Level of Service – Site Flooding criteria)
- Analysis to check for exceedence up to the 1 in 100 year return design storm and inclusive of climate change allowance and inclusive of allowance for urban creep (GDSDS Level of Service – Site Flooding criteria)
- Additional simulation analysis in consideration of 1 in 1 year and 1 in 2 year return design storm event (inclusive of climate change allowance).

The output of the Micro-Drainage hydraulic simulation analysis is presented in *Appendix A*.

As presented in the hydraulic simulation analysis output in *Appendix A*, under 'Summary of Critical Results by Maximum Level (Rank 1) for Storm', the simulation criteria for each simulated return period (1 in 1 year, 1 in 2 year, 1 in 30 year & 1 in 100 year) has applied a 'Margin of Flood Risk Warning' of 300m. This criteria has been set in order to ensure that in the event of an extreme rainfall event, and where surcharging of the storm water drainage pipes and manholes is predicted to occur during these events, then a freeboard of 300mm is maintained between each manhole cover level and the surcharged water level in each manhole.

As summarised in the Micro-Drainage hydraulic simulation output analysis presented in *Appendix A*, in consideration of a 1 in 30 year return period design storm, inclusive of climate change, a minimum freeboard of 300mm is maintained within the storm water drainage system (Page 32-35 of Micro-Drainage calculations).

In consideration of a 1 in 100 year return period design storm, inclusive of climate change, maximum water levels within the storm water drainage system would not exceed proposed manhole cover levels and would therefore not present a residual pluvial flood risk to the proposed development site (Page 37-40 of Micro-Drainage calculations).

In summary the storm water drainage and management system to serve the proposed strategic housing development is not predicted to present a residual pluvial flood risk to the development and is considered to comply with the GDSDS Level of Service – Site Flooding Criteria.

Yours Sincerely

Paul McShane

<u>Senior Hydrological Engineer</u>

For IE Consulting

APPENDIX A

Micro-Drainage

Hydraulic Simulation Summary
Output Calculations

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	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	10
Ratio R	0.200	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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)	500

Designed with Level Soffits

Time Area Diagram for Storm at outfall S (pipe S1.008)

Time (mins)	**Area (ha)**	**Time (mins)**	**Area (ha)**	**Time (mins)**	**Area (ha)**
0-4	0.001	4-8	1.603	8-12	0.834

Total Area Contributing (ha) = 2.439

Total Pipe Volume (m³) = 118.462

Time Area Diagram at outfall S (pipe S10.006)

Time (mins)	**Area (ha)**	**Time (mins)**	**Area (ha)**	**Time (mins)**	**Area (ha)**
0-4	0.199	4-8	2.006	8-12	0.426

Total Area Contributing (ha) = 2.631

Total Pipe Volume (m³) = 205.266

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**

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
S1.000	47.891	0.479	100.0	0.182	4.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S2.000	44.572	0.371	120.0	0.136	4.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.001	27.099	0.165	164.2	0.061	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S3.000	36.349	0.481	75.6	0.129	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S4.000	45.814	0.306	149.7	0.152	4.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S3.001	46.218	0.206	224.4	0.123	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S1.002	67.267	0.117	574.9	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S5.000	37.726	0.400	94.3	0.118	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S5.001	38.653	0.155	249.4	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S5.002	70.035	0.575	121.8	0.118	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S6.000	33.520	0.230	145.7	0.108	4.00	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)
S1.000	50.00	4.51	64.904	0.182	0.0	0.0	2.5	1.57	111.1	27.1
S2.000	50.00	4.52	64.425	0.136	0.0	0.0	1.8	1.43	101.4	20.2
S1.001	50.00	4.89	64.053	0.378	0.0	0.0	5.1	1.22	86.5	56.3
S3.000	50.00	4.40	64.575	0.129	0.0	0.0	1.7	1.51	59.9	19.2
S4.000	50.00	4.60	64.400	0.152	0.0	0.0	2.1	1.28	90.7	22.6
S3.001	50.00	5.23	64.019	0.404	0.0	0.0	5.5	1.21	133.1	60.2
S1.002	50.00	6.73	63.813	0.782	0.0	0.0	10.6	0.75	82.7«	116.5
S5.000	50.00	4.47	65.325	0.118	0.0	0.0	1.6	1.35	53.5	17.6
S5.001	50.00	5.25	64.925	0.160	0.0	0.0	2.2	0.82	32.7	23.9
S5.002	50.00	6.07	64.695	0.278	0.0	0.0	3.8	1.42	100.6	41.5
S6.000	50.00	4.52	64.425	0.108	0.0	0.0	1.5	1.08	43.0	16.0

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
S5.003	43.075	0.186	231.6	0.096	0.00	0.0	0.600	o	375	Pipe/Conduit	
S5.004	55.087	0.238	231.5	0.181	0.00	0.0	0.600	o	600	Pipe/Conduit	
S7.000	105.943	0.610	173.7	0.288	4.00	0.0	0.600	o	300	Pipe/Conduit	
S8.000	53.499	0.225	237.8	0.286	4.00	0.0	0.600	o	375	Pipe/Conduit	
S8.001	20.097	0.085	236.4	0.022	0.00	0.0	0.600	o	375	Pipe/Conduit	
S7.001	78.729	0.530	148.5	0.161	0.00	0.0	0.600	o	375	Pipe/Conduit	
S9.000	76.216	1.296	58.8	0.236	4.00	0.0	0.600	o	225	Pipe/Conduit	
S7.002	20.805	0.134	155.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.003	5.902	0.024	245.9	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.004	60.709	0.067	906.1	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S1.005	6.764	0.023	300.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.006	39.086	0.130	300.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.007	48.491	0.162	300.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.008	6.236	0.021	300.0	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)
S5.003	50.00	6.67	64.120	0.482	0.0	0.0	6.5	1.19	131.0	71.9
S5.004	50.00	7.25	63.934	0.664	0.0	0.0	9.0	1.60	451.4	98.9
S7.000	50.00	5.48	64.990	0.288	0.0	0.0	3.9	1.19	84.1	42.9
S8.000	50.00	4.76	64.670	0.286	0.0	0.0	3.9	1.17	129.3	42.6
S8.001	50.00	5.05	64.445	0.308	0.0	0.0	4.2	1.17	129.7	45.9
S7.001	50.00	6.37	64.360	0.757	0.0	0.0	10.2	1.48	164.0	112.7
S9.000	50.00	4.74	65.125	0.236	0.0	0.0	3.2	1.71	67.9	35.1
S7.002	50.00	6.58	63.830	0.993	0.0	0.0	13.4	1.63	259.1	147.9
S1.003	50.00	7.31	63.696	2.439	0.0	0.0	33.0	1.55	437.8	363.3
S1.004	50.00	8.41	63.672	2.439	0.0	0.0	33.0	0.92	407.1	363.3
S1.005	50.00	8.56	63.605	2.439	0.0	0.0	33.0	0.75	29.8«	363.3
S1.006	50.00	9.43	63.582	2.439	0.0	0.0	33.0	0.75	29.8«	363.3
S1.007	50.00	10.51	63.452	2.439	0.0	0.0	33.0	0.75	29.8«	363.3
S1.008	50.00	10.65	63.291	2.439	0.0	0.0	33.0	0.75	29.8«	363.3

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S10.000	47.647	0.210	226.9	0.355	4.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S10.001	76.508	0.340	225.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S11.000	50.741	0.230	220.6	0.095	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S12.000	55.287	0.240	230.4	0.183	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S11.001	26.083	0.120	217.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S13.000	35.184	0.160	219.9	0.052	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S13.001	28.457	0.120	237.1	0.098	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S13.002	10.027	0.040	250.7	0.032	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S13.003	11.539	0.060	192.3	0.011	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S13.004	51.717	0.230	224.9	0.054	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S14.000	21.348	0.070	305.0	0.049	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S13.005	70.828	0.310	228.5	0.264	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S13.006	8.146	0.040	203.7	0.017	0.00	0.0	0.600	o	375	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)
S10.000	50.00	4.76	64.060	0.355	0.0	0.0	4.8	1.04	73.5	52.8
S10.001	50.00	5.99	63.850	0.355	0.0	0.0	4.8	1.04	73.8	52.8
S11.000	50.00	4.97	64.200	0.095	0.0	0.0	1.3	0.88	34.8	14.1
S12.000	50.00	5.07	64.210	0.183	0.0	0.0	2.5	0.86	34.1	27.2
S11.001	50.00	5.57	63.970	0.278	0.0	0.0	3.8	0.88	35.1«	41.3
S13.000	50.00	4.67	64.810	0.052	0.0	0.0	0.7	0.88	34.9	7.7
S13.001	50.00	5.23	64.650	0.150	0.0	0.0	2.0	0.84	33.6	22.3
S13.002	50.00	5.40	64.530	0.182	0.0	0.0	2.5	0.99	69.9	27.1
S13.003	50.00	5.57	64.490	0.193	0.0	0.0	2.6	1.13	79.9	28.8
S13.004	50.00	6.39	64.430	0.248	0.0	0.0	3.4	1.04	73.8	36.9
S14.000	50.00	4.48	64.270	0.049	0.0	0.0	0.7	0.74	29.6	7.3
S13.005	50.00	7.38	64.200	0.561	0.0	0.0	7.6	1.19	131.9	83.5
S13.006	50.00	7.49	63.890	0.578	0.0	0.0	7.8	1.27	139.8	86.1

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
S11.002	11.294	0.050	225.9	0.016	0.00	0.0	0.600	o	375	Pipe/Conduit	
S11.003	66.102	0.290	227.9	0.252	0.00	0.0	0.600	o	450	Pipe/Conduit	
S10.002	32.104	0.190	169.0	0.068	0.00	0.0	0.600	o	450	Pipe/Conduit	
S15.000	26.075	0.030	869.2	0.039	4.00	0.0	0.600	o	750	Pipe/Conduit	
S15.001	50.212	0.070	717.3	0.135	0.00	0.0	0.600	o	750	Pipe/Conduit	
S16.000	50.617	0.230	220.1	0.136	4.00	0.0	0.600	o	225	Pipe/Conduit	
S16.001	19.635	0.090	218.2	0.029	0.00	0.0	0.600	o	225	Pipe/Conduit	
S16.002	9.341	0.040	233.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.000	12.814	0.060	213.6	0.027	4.00	0.0	0.600	o	225	Pipe/Conduit	
S16.003	50.011	0.200	250.1	0.049	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.002	51.920	0.070	741.7	0.131	0.00	0.0	0.600	o	750	Pipe/Conduit	
S18.000	20.049	0.340	59.0	0.039	4.00	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)
S11.002	50.00	7.65	63.850	0.872	0.0	0.0	11.8	1.20	132.7	129.9
S11.003	50.00	8.47	63.800	1.124	0.0	0.0	15.2	1.34	213.5	167.5
S10.002	50.00	8.81	63.510	1.547	0.0	0.0	21.0	1.56	248.3	230.5
S15.000	50.00	4.46	63.670	0.039	0.0	0.0	0.5	0.94	415.7	5.8
S15.001	50.00	5.27	63.640	0.174	0.0	0.0	2.4	1.04	458.2	25.9
S16.000	50.00	4.96	64.640	0.136	0.0	0.0	1.8	0.88	34.9	20.2
S16.001	50.00	5.33	64.410	0.165	0.0	0.0	2.2	0.88	35.0	24.5
S16.002	50.00	5.52	64.320	0.165	0.0	0.0	2.2	0.85	33.8	24.5
S17.000	50.00	4.24	64.340	0.027	0.0	0.0	0.4	0.89	35.4	4.0
S16.003	50.00	6.36	64.280	0.240	0.0	0.0	3.2	0.99	70.0	35.7
S15.002	50.00	7.21	63.570	0.545	0.0	0.0	7.4	1.02	450.5	81.1
S18.000	50.00	4.20	64.200	0.039	0.0	0.0	0.5	1.71	67.8	5.8

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
S15.003	65.202	0.090	724.5	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	🔒
S19.000	26.689	0.120	222.4	0.043	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S20.000	41.030	0.103	398.3	0.058	4.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S19.001	79.656	0.370	215.3	0.209	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S15.004	30.318	0.080	379.0	0.125	0.00	0.0	0.600	o	750	Pipe/Conduit	🔒
S15.005	4.016	0.010	401.6	0.066	0.00	0.0	0.600	o	750	Pipe/Conduit	🔒
S10.003	20.653	0.031	666.2	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	🔒
S10.004	16.333	0.027	604.9	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	🔒
S10.005	49.089	0.082	598.6	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	🔒
S10.006	21.382	0.036	598.6	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)
S15.003	50.00	8.26	63.500	0.584	0.0	0.0	7.9	1.03	455.9	86.9
S19.000	50.00	4.51	63.900	0.043	0.0	0.0	0.6	0.87	34.7	6.5
S20.000	50.00	4.87	63.882	0.058	0.0	0.0	0.8	0.78	55.3	8.6
S19.001	50.00	6.12	63.780	0.310	0.0	0.0	4.2	1.07	75.5	46.2
S15.004	50.00	8.61	63.410	1.019	0.0	0.0	13.8	1.43	632.4	151.7
S15.005	50.00	8.66	63.330	1.084	0.0	0.0	14.7	1.39	614.2	161.5
S10.003	50.00	9.13	63.320	2.631	0.0	0.0	35.6	1.08	475.6	391.9
S10.004	50.00	9.37	63.289	2.631	0.0	0.0	35.6	1.13	499.4	391.9
S10.005	50.00	10.09	63.262	2.631	0.0	0.0	35.6	1.14	502.1	391.9
S10.006	50.00	10.77	63.180	2.631	0.0	0.0	35.6	0.53	21.0«	391.9

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SS110	65.950	1.046	Open Manhole	1200	S1.000	64.904	300				
SS111	65.850	1.425	Open Manhole	1200	S2.000	64.425	300				
SS112	66.100	2.047	Open Manhole	1200	S1.001	64.053	300	S1.000	64.425	300	372
								S2.000	64.054	300	1
SS108	66.000	1.425	Open Manhole	1200	S3.000	64.575	225				
SS107	65.900	1.500	Open Manhole	1200	S4.000	64.400	300				
SS109	65.770	1.751	Open Manhole	1350	S3.001	64.019	375	S3.000	64.094	225	
								S4.000	64.094	300	
SS113	66.300	2.487	Open Manhole	1350	S1.002	63.813	375	S1.001	63.888	300	
								S3.001	63.813	375	
SS101	66.750	1.425	Open Manhole	1200	S5.000	65.325	225				
SS102	66.350	1.425	Open Manhole	1200	S5.001	64.925	225	S5.000	64.925	225	
SS103	66.100	1.405	Open Manhole	1200	S5.002	64.695	300	S5.001	64.770	225	
SS104	65.850	1.425	Open Manhole	1200	S6.000	64.425	225				
SS105	65.740	1.620	Open Manhole	1350	S5.003	64.120	375	S5.002	64.120	300	
								S6.000	64.195	225	
SS106	65.900	1.966	Open Manhole	1500	S5.004	63.934	600	S5.003	63.934	375	
SS116	66.600	1.610	Open Manhole	1200	S7.000	64.990	300				
SS114	66.150	1.480	Open Manhole	1350	S8.000	64.670	375				
SS115	66.600	2.155	Open Manhole	1350	S8.001	64.445	375	S8.000	64.445	375	
SS116	66.650	2.290	Open Manhole	1350	S7.001	64.360	375	S7.000	64.380	300	
								S8.001	64.360	375	
SS118	66.550	1.425	Open Manhole	1200	S9.000	65.125	225				
SS119	66.750	2.921	Open Manhole	1350	S7.002	63.830	450	S7.001	63.830	375	
								S9.000	63.829	225	
SS120	66.200	2.504	Open Manhole	1500	S1.003	63.696	600	S1.002	63.696	375	
								S5.004	63.696	600	
								S7.002	63.696	450	
SS121	66.200	2.528	Open Manhole	1800	S1.004	63.672	750	S1.003	63.672	600	
SS122	66.750	3.145	Open Manhole	1800	S1.005	63.605	225	S1.004	63.605	750	
SS123	66.800	3.218	Open Manhole	1200	S1.006	63.582	225	S1.005	63.582	225	
SS124	66.350	2.898	Open Manhole	1200	S1.007	63.452	225	S1.006	63.452	225	
SS125	66.100	2.810	Open Manhole	1200	S1.008	63.291	225	S1.007	63.290	225	
S	66.100	2.830	Open Manhole	0		OUTFALL		S1.008	63.270	225	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SS214	67.100	3.040	Open Manhole	1200	S10.000	64.060	300				
SS215	67.500	3.650	Open Manhole	1200	S10.001	63.850	300	S10.000	63.850	300	
SS210	66.700	2.500	Open Manhole	1200	S11.000	64.200	225				
SS209	66.750	2.540	Open Manhole	1200	S12.000	64.210	225				
SS211	66.800	2.830	Open Manhole	1200	S11.001	63.970	225	S11.000	63.970	225	
								S12.000	63.970	225	
SS201	66.750	1.940	Open Manhole	1200	S13.000	64.810	225				
SS202	66.850	2.200	Open Manhole	1200	S13.001	64.650	225	S13.000	64.650	225	
SS203	66.900	2.370	Open Manhole	1200	S13.002	64.530	300	S13.001	64.530	225	
SS204	66.850	2.360	Open Manhole	1200	S13.003	64.490	300	S13.002	64.490	300	
SS205	66.800	2.370	Open Manhole	1200	S13.004	64.430	300	S13.003	64.430	300	
SS206	66.950	2.680	Open Manhole	1200	S14.000	64.270	225				
SS207	66.700	2.500	Open Manhole	1350	S13.005	64.200	375	S13.004	64.200	300	
								S14.000	64.200	225	
SS208	66.800	2.910	Open Manhole	1350	S13.006	63.890	375	S13.005	63.890	375	
SS212	66.900	3.050	Open Manhole	1350	S11.002	63.850	375	S11.001	63.850	225	
								S13.006	63.850	375	
SS213	67.000	3.200	Open Manhole	1350	S11.003	63.800	450	S11.002	63.800	375	
SS216	67.250	3.740	Open Manhole	1350	S10.002	63.510	450	S10.001	63.510	300	
								S11.003	63.510	450	
SS222	65.900	2.230	Open Manhole	1800	S15.000	63.670	750				
SS223	66.200	2.560	Open Manhole	1800	S15.001	63.640	750	S15.000	63.640	750	
SS217	66.000	1.360	Open Manhole	1200	S16.000	64.640	225				
SS218	66.200	1.790	Open Manhole	1200	S16.001	64.410	225	S16.000	64.410	225	
SS219	66.350	2.030	Open Manhole	1200	S16.002	64.320	225	S16.001	64.320	225	
SS220	66.100	1.760	Open Manhole	1200	S17.000	64.340	225				
SS221	66.150	1.870	Open Manhole	1200	S16.003	64.280	300	S16.002	64.280	225	
								S17.000	64.280	225	
SS224	66.100	2.530	Open Manhole	1800	S15.002	63.570	750	S15.001	63.570	750	
								S16.003	64.080	300	60
SS225	66.000	1.800	Open Manhole	1200	S18.000	64.200	225				
SS220	65.850	2.350	Open Manhole	1800	S15.003	63.500	750	S15.002	63.500	750	
								S18.000	63.860	225	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SS229	67.000	3.100	Open Manhole	1200	S19.000	63.900	225				
SS228	66.500	2.618	Open Manhole	1200	S20.000	63.882	300				
SS230	66.500	2.721	Open Manhole	1200	S19.001	63.780	300	S19.000	63.780	225	
								S20.000	63.779	300	
SS227	66.450	3.040	Open Manhole	1800	S15.004	63.410	750	S15.003	63.410	750	
								S19.001	63.410	300	
SS231	66.450	3.120	Open Manhole	1800	S15.005	63.330	750	S15.004	63.330	750	
SS232	66.750	3.430	Open Manhole	1800	S10.003	63.320	750	S10.002	63.320	450	
								S15.005	63.320	750	
SS233	66.000	2.711	Open Manhole	1800	S10.004	63.289	750	S10.003	63.289	750	
SS234	65.500	2.238	Open Manhole	1800	S10.005	63.262	750	S10.004	63.262	750	
SS235	65.350	2.170	Open Manhole	1800	S10.006	63.180	225	S10.005	63.180	750	
S	64.700	1.556	Open Manhole	0		OUTFALL		S10.006	63.144	225	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	300	SS110	65.950	64.904	0.746	Open Manhole	1200
S2.000	o	300	SS111	65.850	64.425	1.125	Open Manhole	1200
S1.001	o	300	SS112	66.100	64.053	1.747	Open Manhole	1200
S3.000	o	225	SS108	66.000	64.575	1.200	Open Manhole	1200
S4.000	o	300	SS107	65.900	64.400	1.200	Open Manhole	1200
S3.001	o	375	SS109	65.770	64.019	1.376	Open Manhole	1350
S1.002	o	375	SS113	66.300	63.813	2.112	Open Manhole	1350
S5.000	o	225	SS101	66.750	65.325	1.200	Open Manhole	1200
S5.001	o	225	SS102	66.350	64.925	1.200	Open Manhole	1200
S5.002	o	300	SS103	66.100	64.695	1.105	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	47.891	100.0	SS112	66.100	64.425	1.375	Open Manhole	1200
S2.000	44.572	120.0	SS112	66.100	64.054	1.746	Open Manhole	1200
S1.001	27.099	164.2	SS113	66.300	63.888	2.112	Open Manhole	1350
S3.000	36.349	75.6	SS109	65.770	64.094	1.451	Open Manhole	1350
S4.000	45.814	149.7	SS109	65.770	64.094	1.376	Open Manhole	1350
S3.001	46.218	224.4	SS113	66.300	63.813	2.112	Open Manhole	1350
S1.002	67.267	574.9	SS120	66.200	63.696	2.129	Open Manhole	1500
S5.000	37.726	94.3	SS102	66.350	64.925	1.200	Open Manhole	1200
S5.001	38.653	249.4	SS103	66.100	64.770	1.105	Open Manhole	1200
S5.002	70.035	121.8	SS105	65.740	64.120	1.320	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.000	o	225	SS104	65.850	64.425	1.200	Open Manhole	1200
S5.003	o	375	SS105	65.740	64.120	1.245	Open Manhole	1350
S5.004	o	600	SS106	65.900	63.934	1.366	Open Manhole	1500
S7.000	o	300	SS116	66.600	64.990	1.310	Open Manhole	1200
S8.000	o	375	SS114	66.150	64.670	1.105	Open Manhole	1350
S8.001	o	375	SS115	66.600	64.445	1.780	Open Manhole	1350
S7.001	o	375	SS116	66.650	64.360	1.915	Open Manhole	1350
S9.000	o	225	SS118	66.550	65.125	1.200	Open Manhole	1200
S7.002	o	450	SS119	66.750	63.830	2.470	Open Manhole	1350
S1.003	o	600	SS120	66.200	63.696	1.904	Open Manhole	1500
S1.004	o	750	SS121	66.200	63.672	1.778	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.000	33.520	145.7	SS105	65.740	64.195	1.320	Open Manhole	1350
S5.003	43.075	231.6	SS106	65.900	63.934	1.591	Open Manhole	1500
S5.004	55.087	231.5	SS120	66.200	63.696	1.904	Open Manhole	1500
S7.000	105.943	173.7	SS116	66.650	64.380	1.970	Open Manhole	1350
S8.000	53.499	237.8	SS115	66.600	64.445	1.780	Open Manhole	1350
S8.001	20.097	236.4	SS116	66.650	64.360	1.915	Open Manhole	1350
S7.001	78.729	148.5	SS119	66.750	63.830	2.545	Open Manhole	1350
S9.000	76.216	58.8	SS119	66.750	63.829	2.696	Open Manhole	1350
S7.002	20.805	155.3	SS120	66.200	63.696	2.054	Open Manhole	1500
S1.003	5.902	245.9	SS121	66.200	63.672	1.928	Open Manhole	1800
S1.004	60.709	906.1	SS122	66.750	63.605	2.395	Open Manhole	1800

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.005	o	225	SS122	66.750	63.605	2.920	Open Manhole	1800
S1.006	o	225	SS123	66.800	63.582	2.993	Open Manhole	1200
S1.007	o	225	SS124	66.350	63.452	2.673	Open Manhole	1200
S1.008	o	225	SS125	66.100	63.291	2.584	Open Manhole	1200
S10.000	o	300	SS214	67.100	64.060	2.740	Open Manhole	1200
S10.001	o	300	SS215	67.500	63.850	3.350	Open Manhole	1200
S11.000	o	225	SS210	66.700	64.200	2.275	Open Manhole	1200
S12.000	o	225	SS209	66.750	64.210	2.315	Open Manhole	1200
S11.001	o	225	SS211	66.800	63.970	2.605	Open Manhole	1200
S13.000	o	225	SS201	66.750	64.810	1.715	Open Manhole	1200
S13.001	o	225	SS202	66.850	64.650	1.975	Open Manhole	1200
S13.002	o	300	SS203	66.900	64.530	2.070	Open Manhole	1200
S13.003	o	300	SS204	66.850	64.490	2.060	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.005	6.764	300.0	SS123	66.800	63.582	2.993	Open Manhole	1200
S1.006	39.086	300.0	SS124	66.350	63.452	2.673	Open Manhole	1200
S1.007	48.491	300.0	SS125	66.100	63.290	2.585	Open Manhole	1200
S1.008	6.236	300.0	S	66.100	63.270	2.605	Open Manhole	0
S10.000	47.647	226.9	SS215	67.500	63.850	3.350	Open Manhole	1200
S10.001	76.508	225.0	SS216	67.250	63.510	3.440	Open Manhole	1350
S11.000	50.741	220.6	SS211	66.800	63.970	2.605	Open Manhole	1200
S12.000	55.287	230.4	SS211	66.800	63.970	2.605	Open Manhole	1200
S11.001	26.083	217.4	SS212	66.900	63.850	2.825	Open Manhole	1350
S13.000	35.184	219.9	SS202	66.850	64.650	1.975	Open Manhole	1200
S13.001	28.457	237.1	SS203	66.900	64.530	2.145	Open Manhole	1200
S13.002	10.027	250.7	SS204	66.850	64.490	2.060	Open Manhole	1200
S13.003	11.539	192.3	SS205	66.800	64.430	2.070	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S13.004	o	300	SS205	66.800	64.430	2.070	Open Manhole	1200
S14.000	o	225	SS206	66.950	64.270	2.455	Open Manhole	1200
S13.005	o	375	SS207	66.700	64.200	2.125	Open Manhole	1350
S13.006	o	375	SS208	66.800	63.890	2.535	Open Manhole	1350
S11.002	o	375	SS212	66.900	63.850	2.675	Open Manhole	1350
S11.003	o	450	SS213	67.000	63.800	2.750	Open Manhole	1350
S10.002	o	450	SS216	67.250	63.510	3.290	Open Manhole	1350
S15.000	o	750	SS222	65.900	63.670	1.480	Open Manhole	1800
S15.001	o	750	SS223	66.200	63.640	1.810	Open Manhole	1800
S16.000	o	225	SS217	66.000	64.640	1.135	Open Manhole	1200
S16.001	o	225	SS218	66.200	64.410	1.565	Open Manhole	1200
S16.002	o	225	SS219	66.350	64.320	1.805	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S13.004	51.717	224.9	SS207	66.700	64.200	2.200	Open Manhole	1350
S14.000	21.348	305.0	SS207	66.700	64.200	2.275	Open Manhole	1350
S13.005	70.828	228.5	SS208	66.800	63.890	2.535	Open Manhole	1350
S13.006	8.146	203.7	SS212	66.900	63.850	2.675	Open Manhole	1350
S11.002	11.294	225.9	SS213	67.000	63.800	2.825	Open Manhole	1350
S11.003	66.102	227.9	SS216	67.250	63.510	3.290	Open Manhole	1350
S10.002	32.104	169.0	SS232	66.750	63.320	2.980	Open Manhole	1800
S15.000	26.075	869.2	SS223	66.200	63.640	1.810	Open Manhole	1800
S15.001	50.212	717.3	SS224	66.100	63.570	1.780	Open Manhole	1800
S16.000	50.617	220.1	SS218	66.200	64.410	1.565	Open Manhole	1200
S16.001	19.635	218.2	SS219	66.350	64.320	1.805	Open Manhole	1200
S16.002	9.341	233.5	SS221	66.150	64.280	1.645	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S17.000	o	225	SS220	66.100	64.340	1.535	Open Manhole	1200
S16.003	o	300	SS221	66.150	64.280	1.570	Open Manhole	1200
S15.002	o	750	SS224	66.100	63.570	1.780	Open Manhole	1800
S18.000	o	225	SS225	66.000	64.200	1.575	Open Manhole	1200
S15.003	o	750	SS220	65.850	63.500	1.600	Open Manhole	1800
S19.000	o	225	SS229	67.000	63.900	2.875	Open Manhole	1200
S20.000	o	300	SS228	66.500	63.882	2.318	Open Manhole	1200
S19.001	o	300	SS230	66.500	63.780	2.420	Open Manhole	1200
S15.004	o	750	SS227	66.450	63.410	2.290	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S17.000	12.814	213.6	SS221	66.150	64.280	1.645	Open Manhole	1200
S16.003	50.011	250.1	SS224	66.100	64.080	1.720	Open Manhole	1800
S15.002	51.920	741.7	SS220	65.850	63.500	1.600	Open Manhole	1800
S18.000	20.049	59.0	SS220	65.850	63.860	1.765	Open Manhole	1800
S15.003	65.202	724.5	SS227	66.450	63.410	2.290	Open Manhole	1800
S19.000	26.689	222.4	SS230	66.500	63.780	2.495	Open Manhole	1200
S20.000	41.030	398.3	SS230	66.500	63.779	2.421	Open Manhole	1200
S19.001	79.656	215.3	SS227	66.450	63.410	2.740	Open Manhole	1800
S15.004	30.318	379.0	SS231	66.450	63.330	2.370	Open Manhole	1800

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S15.005	o	750	SS231	66.450	63.330	2.370	Open Manhole	1800
S10.003	o	750	SS232	66.750	63.320	2.680	Open Manhole	1800
S10.004	o	750	SS233	66.000	63.289	1.961	Open Manhole	1800
S10.005	o	750	SS234	65.500	63.262	1.488	Open Manhole	1800
S10.006	o	225	SS235	65.350	63.180	1.945	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S15.005	4.016	401.6	SS232	66.750	63.320	2.680	Open Manhole	1800
S10.003	20.653	666.2	SS233	66.000	63.289	1.961	Open Manhole	1800
S10.004	16.333	604.9	SS234	65.500	63.262	1.488	Open Manhole	1800
S10.005	49.089	598.6	SS235	65.350	63.180	1.420	Open Manhole	1800
S10.006	21.382	598.6	S	64.700	63.144	1.331	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.182	0.182	0.182
2.000	User	-	100	0.136	0.136	0.136
1.001	User	-	100	0.061	0.061	0.061
3.000	User	-	100	0.129	0.129	0.129
4.000	User	-	100	0.152	0.152	0.152
3.001	User	-	100	0.123	0.123	0.123
1.002	-	-	100	0.000	0.000	0.000
5.000	User	-	100	0.118	0.118	0.118
5.001	User	-	100	0.042	0.042	0.042
5.002	User	-	100	0.118	0.118	0.118
6.000	User	-	100	0.108	0.108	0.108
5.003	User	-	100	0.096	0.096	0.096
5.004	User	-	100	0.181	0.181	0.181
7.000	User	-	100	0.288	0.288	0.288
8.000	User	-	100	0.286	0.286	0.286
8.001	User	-	100	0.022	0.022	0.022
7.001	User	-	100	0.161	0.161	0.161
9.000	User	-	100	0.236	0.236	0.236
7.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
10.000	User	-	100	0.355	0.355	0.355
10.001	-	-	100	0.000	0.000	0.000
11.000	User	-	100	0.095	0.095	0.095
12.000	User	-	100	0.183	0.183	0.183
11.001	-	-	100	0.000	0.000	0.000
13.000	User	-	100	0.052	0.052	0.052
13.001	User	-	100	0.098	0.098	0.098
13.002	User	-	100	0.032	0.032	0.032
13.003	User	-	100	0.011	0.011	0.011
13.004	User	-	100	0.054	0.054	0.054
14.000	User	-	100	0.049	0.049	0.049
13.005	User	-	100	0.264	0.264	0.264
13.006	User	-	100	0.017	0.017	0.017
11.002	User	-	100	0.016	0.016	0.016
11.003	User	-	100	0.252	0.252	0.252
10.002	User	-	100	0.068	0.068	0.068
15.000	User	-	100	0.039	0.039	0.039
15.001	User	-	100	0.135	0.135	0.135
16.000	User	-	100	0.136	0.136	0.136
16.001	User	-	100	0.029	0.029	0.029
16.002	-	-	100	0.000	0.000	0.000

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
17.000	User	-	100	0.027	0.027	0.027
16.003	User	-	100	0.049	0.049	0.049
15.002	User	-	100	0.131	0.131	0.131
18.000	User	-	100	0.039	0.039	0.039
15.003	-	-	100	0.000	0.000	0.000
19.000	User	-	100	0.043	0.043	0.043
20.000	User	-	100	0.058	0.058	0.058
19.001	User	-	100	0.209	0.209	0.209
15.004	User	-	100	0.125	0.125	0.125
15.005	User	-	100	0.066	0.066	0.066
10.003	-	-	100	0.000	0.000	0.000
10.004	-	-	100	0.000	0.000	0.000
10.005	-	-	100	0.000	0.000	0.000
10.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				5.070	5.070	5.070

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)
S1.008	S	66.100	63.270	0.000	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)
S10.006	S	64.700	63.144	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	10.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.200		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SS121, DS/PN: S1.004, Volume (m³): 7.6

Unit Reference MD-SHE-0206-2430-1700-2430
Design Head (m) 1.700
Design Flow (l/s) 24.3
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface Sump Available
Yes Diameter (mm) 206
Invert Level (m) 63.672
Minimum Outlet Pipe Diameter (mm) 225
Suggested Manhole Diameter (mm) 1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	24.3	Kick-Flo®	1.100	19.7
Flush-Flo™	0.506	24.3	Mean Flow over Head Range	-	21.0

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	7.1	1.200	20.6	3.000	31.9	7.000	48.0
0.200	19.8	1.400	22.1	3.500	34.3	7.500	49.6
0.300	23.2	1.600	23.6	4.000	36.6	8.000	51.2
0.400	24.1	1.800	25.0	4.500	38.7	8.500	52.7
0.500	24.3	2.000	26.2	5.000	40.8	9.000	54.2
0.600	24.2	2.200	27.5	5.500	42.7	9.500	55.6
0.800	23.4	2.400	28.6	6.000	44.5		
1.000	21.6	2.600	29.8	6.500	46.3		

Hydro-Brake® Optimum Manhole: SS234, DS/PN: S10.005, Volume (m³): 12.1

Unit Reference MD-SHE-0290-5100-1600-5100
Design Head (m) 1.600
Design Flow (l/s) 51.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface Sump Available
Yes Diameter (mm) 290
Invert Level (m) 63.262
Minimum Outlet Pipe Diameter (mm) 375

Hydro-Brake® Optimum Manhole: SS234, DS/PN: S10.005, Volume (m³): 12.1

Suggested Manhole Diameter (mm) 2100

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	51.0	Kick-Flo®	1.119	42.9
Flush-Flo™	0.520	50.9	Mean Flow over Head Range	-	43.2

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	9.0	1.200	44.4	3.000	69.1	7.000	104.3
0.200	29.8	1.400	47.8	3.500	74.5	7.500	107.9
0.300	48.4	1.600	51.0	4.000	79.5	8.000	111.4
0.400	50.3	1.800	54.0	4.500	84.1	8.500	114.7
0.500	50.9	2.000	56.8	5.000	88.6	9.000	118.0
0.600	50.8	2.200	59.5	5.500	92.8	9.500	121.1
0.800	49.5	2.400	62.0	6.000	96.8		
1.000	46.8	2.600	64.5	6.500	100.6		

Storage Structures for Storm

Cellular Storage Manhole: SS121, DS/PN: S1.004

Invert Level (m) 63.672 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.60
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1133.0	0.0	0.400	1133.0	0.0
0.100	1133.0	0.0	0.500	1133.0	0.0
0.200	1133.0	0.0	0.700	1133.0	0.0
0.300	1133.0	0.0	0.885	1133.0	0.0

Cellular Storage Manhole: SS234, DS/PN: S10.005

Invert Level (m) 63.262 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.60
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	871.0	0.0	0.600	871.0	0.0
0.100	871.0	0.0	0.700	871.0	0.0
0.200	871.0	0.0	0.717	871.0	0.0
0.300	871.0	0.0	1.000	871.0	0.0
0.400	871.0	0.0	1.200	871.0	0.0
0.500	871.0	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 10.000
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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.200
Region Scotland and Ireland Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.850

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Coarse Inertia Status OFF
DTS 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) 1
Climate Change (%) 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SS110	15 Winter	1	+0%					65.006
S2.000	SS111	15 Winter	1	+0%					64.518
S1.001	SS112	30 Winter	1	+0%	1/15 Winter				64.367
S3.000	SS108	15 Winter	1	+0%					64.664
S4.000	SS107	15 Winter	1	+0%					64.504
S3.001	SS109	30 Winter	1	+0%					64.352
S1.002	SS113	30 Winter	1	+0%	1/15 Summer				64.322
S5.000	SS101	15 Winter	1	+0%					65.415
S5.001	SS102	15 Winter	1	+0%					65.068
S5.002	SS103	15 Winter	1	+0%					64.819
S6.000	SS104	15 Winter	1	+0%					64.522
S5.003	SS105	720 Winter	1	+0%					64.316
S5.004	SS106	720 Winter	1	+0%					64.312
S7.000	SS116	15 Winter	1	+0%					65.144
S8.000	SS114	15 Winter	1	+0%					64.823
S8.001	SS115	15 Winter	1	+0%					64.653

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS110	-0.198	0.000	0.26		26.7	OK	
S2.000	SS111	-0.207	0.000	0.21		20.0	OK	
S1.001	SS112	0.014	0.000	0.54		42.0	SURCHARGED	
S3.000	SS108	-0.136	0.000	0.34		19.0	OK	
S4.000	SS107	-0.196	0.000	0.26		22.1	OK	
S3.001	SS109	-0.042	0.000	0.34		42.0	OK	
S1.002	SS113	0.134	0.000	0.89		69.7	SURCHARGED	
S5.000	SS101	-0.135	0.000	0.34		17.4	OK	
S5.001	SS102	-0.082	0.000	0.71		22.1	OK	
S5.002	SS103	-0.176	0.000	0.36		34.8	OK	
S6.000	SS104	-0.128	0.000	0.39		15.9	OK	
S5.003	SS105	-0.179	0.000	0.10		11.7	OK	
S5.004	SS106	-0.222	0.000	0.04		15.5	OK	
S7.000	SS116	-0.146	0.000	0.48		39.6	OK	
S8.000	SS114	-0.222	0.000	0.34		41.2	OK	
S8.001	SS115	-0.167	0.000	0.38		41.5	OK	

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.	Water Level (m)
S7.001	SS116	15 Winter	1	+0%					64.579
S9.000	SS118	15 Winter	1	+0%					65.242
S7.002	SS119	720 Winter	1	+0%	1/480 Winter				64.314
S1.003	SS120	480 Winter	1	+0%	1/480 Winter				64.319
S1.004	SS121	480 Winter	1	+0%					64.330
S1.005	SS122	480 Winter	1	+0%	1/180 Winter				63.884
S1.006	SS123	480 Winter	1	+0%					63.793
S1.007	SS124	480 Winter	1	+0%					63.651
S1.008	SS125	600 Summer	1	+0%					63.516
S10.000	SS214	15 Winter	1	+0%					64.260
S10.001	SS215	15 Winter	1	+0%					64.040
S11.000	SS210	15 Winter	1	+0%					64.310
S12.000	SS209	15 Winter	1	+0%					64.391
S11.001	SS211	15 Winter	1	+0%	1/15 Summer				64.268
S13.000	SS201	15 Winter	1	+0%					64.883
S13.001	SS202	15 Winter	1	+0%					64.776
S13.002	SS203	15 Winter	1	+0%					64.670
S13.003	SS204	15 Winter	1	+0%					64.626
S13.004	SS205	15 Winter	1	+0%					64.565
S14.000	SS206	15 Winter	1	+0%					64.383
S13.005	SS207	15 Winter	1	+0%					64.387
S13.006	SS208	15 Winter	1	+0%					64.212
S11.002	SS212	15 Winter	1	+0%					64.170
S11.003	SS213	30 Winter	1	+0%					64.061
S10.002	SS216	30 Winter	1	+0%	1/30 Winter				63.962
S15.000	SS222	30 Winter	1	+0%					63.891
S15.001	SS223	30 Winter	1	+0%					63.879
S16.000	SS217	15 Winter	1	+0%					64.767
S16.001	SS218	15 Winter	1	+0%					64.554
S16.002	SS219	15 Winter	1	+0%					64.475
S17.000	SS220	15 Winter	1	+0%					64.424
S16.003	SS221	15 Winter	1	+0%					64.423
S15.002	SS224	30 Winter	1	+0%					63.872
S18.000	SS225	15 Winter	1	+0%					64.241
S15.003	SS220	30 Winter	1	+0%					63.857
S19.000	SS229	15 Winter	1	+0%					63.972
S20.000	SS228	15 Winter	1	+0%					63.975
S19.001	SS230	15 Winter	1	+0%					63.935
S15.004	SS227	30 Winter	1	+0%					63.865
S15.005	SS231	360 Winter	1	+0%					63.888
S10.003	SS232	360 Winter	1	+0%					63.889
S10.004	SS233	360 Winter	1	+0%					63.879
S10.005	SS234	360 Winter	1	+0%					63.884
S10.006	SS235	600 Winter	1	+0%	1/30 Summer				63.554

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S7.001	SS116	-0.156	0.000	0.61		95.0	OK	
S9.000	SS118	-0.108	0.000	0.52		34.2	OK	
S7.002	SS119	0.034	0.000	0.11		23.4	SURCHARGED	
S1.003	SS120	0.023	0.000	0.31		70.9	SURCHARGED	
S1.004	SS121	-0.092	0.000	0.07		23.9	OK	
S1.005	SS122	0.054	0.000	1.03		23.9	SURCHARGED	
S1.006	SS123	-0.014	0.000	0.84		23.9	OK	
S1.007	SS124	-0.026	0.000	0.84		23.9	OK	
S1.008	SS125	0.000	0.000	1.05		24.0	OK	
S10.000	SS214	-0.100	0.000	0.74		51.3	OK	
S10.001	SS215	-0.110	0.000	0.69		49.0	OK	
S11.000	SS210	-0.115	0.000	0.40		13.3	OK	
S12.000	SS209	-0.044	0.000	0.78		25.5	OK	
S11.001	SS211	0.073	0.000	0.91		29.5	SURCHARGED	
S13.000	SS201	-0.152	0.000	0.23		7.6	OK	
S13.001	SS202	-0.099	0.000	0.60		18.7	OK	
S13.002	SS203	-0.160	0.000	0.40		22.0	OK	
S13.003	SS204	-0.164	0.000	0.38		23.5	OK	
S13.004	SS205	-0.165	0.000	0.41		28.9	OK	
S14.000	SS206	-0.112	0.000	0.26		7.0	OK	
S13.005	SS207	-0.188	0.000	0.48		60.0	OK	
S13.006	SS208	-0.053	0.000	0.61		60.0	OK	
S11.002	SS212	-0.055	0.000	0.87		87.5	OK	
S11.003	SS213	-0.189	0.000	0.54		107.2	OK	
S10.002	SS216	0.002	0.000	0.61		131.0	SURCHARGED	
S15.000	SS222	-0.529	0.000	0.02		4.3	OK	
S15.001	SS223	-0.511	0.000	0.03		13.5	OK	
S16.000	SS217	-0.098	0.000	0.58		19.4	OK	
S16.001	SS218	-0.081	0.000	0.69		22.0	OK	
S16.002	SS219	-0.070	0.000	0.79		22.1	OK	
S17.000	SS220	-0.141	0.000	0.13		3.9	OK	
S16.003	SS221	-0.157	0.000	0.46		30.3	OK	
S15.002	SS224	-0.448	0.000	0.12		45.4	OK	
S18.000	SS225	-0.184	0.000	0.09		5.7	OK	
S15.003	SS220	-0.393	0.000	0.10		38.7	OK	
S19.000	SS229	-0.153	0.000	0.20		6.4	OK	
S20.000	SS228	-0.207	0.000	0.16		8.1	OK	
S19.001	SS230	-0.145	0.000	0.50		36.6	OK	
S15.004	SS227	-0.295	0.000	0.13		65.9	OK	
S15.005	SS231	-0.192	0.000	0.09		33.4	OK	
S10.003	SS232	-0.181	0.000	0.32		86.5	OK	
S10.004	SS233	-0.160	0.000	0.35		85.4	OK	
S10.005	SS234	-0.128	0.000	0.10		43.4	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S10.006	SS235	0.149	0.000	2.69		44.8	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	10.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.200
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.850

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Coarse	Inertia Status	OFF
DTS 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)	2
Climate Change (%)	0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SS110	15 Winter	2	+0%					65.017
S2.000	SS111	15 Winter	2	+0%					64.528
S1.001	SS112	30 Winter	2	+0%	2/15 Summer				64.490
S3.000	SS108	15 Winter	2	+0%					64.674
S4.000	SS107	30 Winter	2	+0%					64.530
S3.001	SS109	30 Winter	2	+0%	2/15 Summer				64.477
S1.002	SS113	720 Winter	2	+0%	2/15 Summer				64.460
S5.000	SS101	15 Winter	2	+0%					65.426
S5.001	SS102	15 Winter	2	+0%					65.091
S5.002	SS103	15 Winter	2	+0%					64.834
S6.000	SS104	15 Winter	2	+0%					64.534
S5.003	SS105	720 Winter	2	+0%					64.458
S5.004	SS106	720 Winter	2	+0%					64.454
S7.000	SS116	15 Winter	2	+0%					65.164
S8.000	SS114	15 Winter	2	+0%					64.841
S8.001	SS115	15 Winter	2	+0%					64.674

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS110	-0.187	0.000	0.31		32.3	OK	
S2.000	SS111	-0.197	0.000	0.25		24.1	OK	
S1.001	SS112	0.137	0.000	0.58		45.3	SURCHARGED	
S3.000	SS108	-0.126	0.000	0.40		22.9	OK	
S4.000	SS107	-0.170	0.000	0.26		22.2	OK	
S3.001	SS109	0.083	0.000	0.39		48.1	SURCHARGED	
S1.002	SS113	0.272	0.000	0.26		20.1	SURCHARGED	
S5.000	SS101	-0.124	0.000	0.41		21.0	OK	
S5.001	SS102	-0.059	0.000	0.85		26.5	OK	
S5.002	SS103	-0.161	0.000	0.43		41.8	OK	
S6.000	SS104	-0.116	0.000	0.47		19.1	OK	
S5.003	SS105	-0.037	0.000	0.11		13.4	OK	
S5.004	SS106	-0.080	0.000	0.04		17.5	OK	
S7.000	SS116	-0.126	0.000	0.58		47.7	OK	
S8.000	SS114	-0.204	0.000	0.41		49.8	OK	
S8.001	SS115	-0.146	0.000	0.46		50.4	OK	

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.	Water Level (m)
S7.001	SS116	15 Winter	2	+0%					64.613
S9.000	SS118	15 Winter	2	+0%					65.257
S7.002	SS119	720 Winter	2	+0%	2/15 Summer				64.456
S1.003	SS120	480 Winter	2	+0%	2/180 Winter				64.453
S1.004	SS121	480 Winter	2	+0%	2/480 Winter				64.460
S1.005	SS122	480 Winter	2	+0%	2/120 Summer				63.886
S1.006	SS123	480 Winter	2	+0%					63.796
S1.007	SS124	480 Winter	2	+0%					63.652
S1.008	SS125	600 Summer	2	+0%					63.516
S10.000	SS214	15 Winter	2	+0%					64.309
S10.001	SS215	30 Winter	2	+0%					64.103
S11.000	SS210	15 Winter	2	+0%					64.382
S12.000	SS209	15 Winter	2	+0%	2/15 Summer				64.473
S11.001	SS211	15 Winter	2	+0%	2/15 Summer				64.348
S13.000	SS201	15 Winter	2	+0%					64.891
S13.001	SS202	15 Winter	2	+0%					64.793
S13.002	SS203	15 Winter	2	+0%					64.680
S13.003	SS204	15 Winter	2	+0%					64.636
S13.004	SS205	15 Winter	2	+0%					64.581
S14.000	SS206	15 Winter	2	+0%					64.412
S13.005	SS207	15 Winter	2	+0%					64.417
S13.006	SS208	30 Winter	2	+0%	2/15 Winter				64.317
S11.002	SS212	30 Winter	2	+0%	2/30 Winter				64.240
S11.003	SS213	30 Winter	2	+0%					64.143
S10.002	SS216	30 Winter	2	+0%	2/15 Winter				64.021
S15.000	SS222	600 Winter	2	+0%					63.935
S15.001	SS223	30 Winter	2	+0%					63.948
S16.000	SS217	15 Winter	2	+0%					64.784
S16.001	SS218	15 Winter	2	+0%					64.598
S16.002	SS219	15 Winter	2	+0%					64.497
S17.000	SS220	15 Winter	2	+0%					64.429
S16.003	SS221	15 Winter	2	+0%					64.434
S15.002	SS224	30 Winter	2	+0%					63.954
S18.000	SS225	15 Winter	2	+0%					64.246
S15.003	SS220	600 Winter	2	+0%					63.933
S19.000	SS229	15 Winter	2	+0%					63.986
S20.000	SS228	15 Winter	2	+0%					63.993
S19.001	SS230	30 Winter	2	+0%					63.989
S15.004	SS227	360 Winter	2	+0%					63.943
S15.005	SS231	360 Winter	2	+0%					63.966
S10.003	SS232	360 Winter	2	+0%					63.979
S10.004	SS233	360 Winter	2	+0%					63.975
S10.005	SS234	360 Winter	2	+0%					63.975
S10.006	SS235	600 Winter	2	+0%	2/15 Winter				63.592

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S7.001	SS116	-0.122	0.000	0.73		113.6	OK	
S9.000	SS118	-0.093	0.000	0.62		41.2	OK	
S7.002	SS119	0.176	0.000	0.13		26.8	SURCHARGED	
S1.003	SS120	0.157	0.000	0.35		80.5	SURCHARGED	
S1.004	SS121	0.038	0.000	0.07		24.0	SURCHARGED	
S1.005	SS122	0.056	0.000	1.03		24.0	SURCHARGED	
S1.006	SS123	-0.011	0.000	0.85		24.0	OK	
S1.007	SS124	-0.025	0.000	0.84		24.0	OK	
S1.008	SS125	0.000	0.000	1.06		24.2	OK	
S10.000	SS214	-0.051	0.000	0.88		61.1	OK	
S10.001	SS215	-0.047	0.000	0.69		48.7	OK	
S11.000	SS210	-0.043	0.000	0.48		15.9	OK	
S12.000	SS209	0.038	0.000	0.91		29.9	SURCHARGED	
S11.001	SS211	0.153	0.000	1.07		34.8	SURCHARGED	
S13.000	SS201	-0.144	0.000	0.28		9.1	OK	
S13.001	SS202	-0.082	0.000	0.72		22.6	OK	
S13.002	SS203	-0.150	0.000	0.49		26.6	OK	
S13.003	SS204	-0.154	0.000	0.46		28.3	OK	
S13.004	SS205	-0.149	0.000	0.50		34.8	OK	
S14.000	SS206	-0.083	0.000	0.31		8.3	OK	
S13.005	SS207	-0.158	0.000	0.57		70.9	OK	
S13.006	SS208	0.052	0.000	0.66		64.9	SURCHARGED	
S11.002	SS212	0.015	0.000	0.97		97.5	SURCHARGED	
S11.003	SS213	-0.107	0.000	0.62		123.6	OK	
S10.002	SS216	0.061	0.000	0.74		158.5	SURCHARGED	
S15.000	SS222	-0.485	0.000	0.00		1.1	OK	
S15.001	SS223	-0.442	0.000	0.05		18.3	OK	
S16.000	SS217	-0.081	0.000	0.69		23.3	OK	
S16.001	SS218	-0.037	0.000	0.77		24.5	OK	
S16.002	SS219	-0.048	0.000	0.89		24.7	OK	
S17.000	SS220	-0.136	0.000	0.15		4.6	OK	
S16.003	SS221	-0.146	0.000	0.52		34.0	OK	
S15.002	SS224	-0.366	0.000	0.14		54.3	OK	
S18.000	SS225	-0.179	0.000	0.11		6.9	OK	
S15.003	SS220	-0.317	0.000	0.04		14.4	OK	
S19.000	SS229	-0.139	0.000	0.23		7.5	OK	
S20.000	SS228	-0.189	0.000	0.19		9.7	OK	
S19.001	SS230	-0.091	0.000	0.54		39.5	OK	
S15.004	SS227	-0.217	0.000	0.07		34.0	OK	
S15.005	SS231	-0.114	0.000	0.10		35.8	OK	
S10.003	SS232	-0.091	0.000	0.36		96.4	OK	
S10.004	SS233	-0.064	0.000	0.39		94.7	OK	
S10.005	SS234	-0.037	0.000	0.11		48.3	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S10.006	SS235	0.187	0.000	2.94		48.9	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 10.000
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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.200
Region Scotland and Ireland Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.850

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Coarse Inertia Status OFF
DTS 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) 30
Climate Change (%) 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SS110	15 Winter	30	+0%	30/15 Winter				65.305
S2.000	SS111	15 Winter	30	+0%	30/15 Summer				65.278
S1.001	SS112	960 Winter	30	+0%	30/15 Summer				65.191
S3.000	SS108	15 Winter	30	+0%	30/15 Summer				65.292
S4.000	SS107	30 Winter	30	+0%	30/15 Summer				65.232
S3.001	SS109	960 Winter	30	+0%	30/15 Summer				65.190
S1.002	SS113	960 Winter	30	+0%	30/15 Summer				65.187
S5.000	SS101	15 Winter	30	+0%	30/15 Winter				65.552
S5.001	SS102	15 Winter	30	+0%	30/15 Summer				65.355
S5.002	SS103	960 Winter	30	+0%	30/15 Winter				65.190
S6.000	SS104	960 Winter	30	+0%	30/15 Summer				65.188
S5.003	SS105	960 Winter	30	+0%	30/15 Summer				65.185
S5.004	SS106	960 Winter	30	+0%	30/15 Winter				65.181
S7.000	SS116	15 Winter	30	+0%	30/15 Summer				65.566
S8.000	SS114	15 Winter	30	+0%	30/15 Summer				65.346
S8.001	SS115	15 Winter	30	+0%	30/15 Summer				65.267

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS110	0.101	0.000	0.55		57.6	SURCHARGED	
S2.000	SS111	0.553	0.000	0.36		33.8	SURCHARGED	
S1.001	SS112	0.838	0.000	0.17		12.9	SURCHARGED	
S3.000	SS108	0.492	0.000	0.64		36.2	SURCHARGED	
S4.000	SS107	0.532	0.000	0.39		33.3	SURCHARGED	
S3.001	SS109	0.796	0.000	0.11		13.7	SURCHARGED	
S1.002	SS113	0.999	0.000	0.34		26.4	SURCHARGED	
S5.000	SS101	0.002	0.000	0.71		36.0	SURCHARGED	
S5.001	SS102	0.205	0.000	1.48		45.9	SURCHARGED	
S5.002	SS103	0.195	0.000	0.11		10.3	SURCHARGED	
S6.000	SS104	0.538	0.000	0.10		3.8	SURCHARGED	
S5.003	SS105	0.690	0.000	0.14		16.6	SURCHARGED	
S5.004	SS106	0.647	0.000	0.06		22.8	SURCHARGED	
S7.000	SS116	0.276	0.000	0.96		78.2	SURCHARGED	
S8.000	SS114	0.301	0.000	0.72		86.5	SURCHARGED	
S8.001	SS115	0.447	0.000	0.60		65.5	SURCHARGED	

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.	Water Level (m)
S7.001	SS116	15 Winter	30	+0%	30/15 Summer				65.239
S9.000	SS118	15 Winter	30	+0%	30/15 Summer				65.725
S7.002	SS119	960 Winter	30	+0%	30/15 Summer				65.183
S1.003	SS120	960 Winter	30	+0%	30/15 Summer				65.179
S1.004	SS121	960 Winter	30	+0%	30/60 Winter				65.177
S1.005	SS122	240 Summer	30	+0%	30/30 Summer				63.886
S1.006	SS123	60 Winter	30	+0%					63.797
S1.007	SS124	240 Summer	30	+0%					63.652
S1.008	SS125	720 Summer	30	+0%					63.516
S10.000	SS214	30 Summer	30	+0%	30/15 Summer				65.148
S10.001	SS215	30 Winter	30	+0%	30/15 Summer				64.871
S11.000	SS210	30 Winter	30	+0%	30/15 Summer				65.398
S12.000	SS209	30 Winter	30	+0%	30/15 Summer				65.595
S11.001	SS211	30 Winter	30	+0%	30/15 Summer				65.296
S13.000	SS201	30 Winter	30	+0%	30/15 Summer				65.563
S13.001	SS202	30 Winter	30	+0%	30/15 Summer				65.521
S13.002	SS203	30 Winter	30	+0%	30/15 Summer				65.423
S13.003	SS204	30 Winter	30	+0%	30/15 Summer				65.393
S13.004	SS205	30 Winter	30	+0%	30/15 Summer				65.362
S14.000	SS206	30 Winter	30	+0%	30/15 Summer				65.285
S13.005	SS207	30 Winter	30	+0%	30/15 Summer				65.266
S13.006	SS208	30 Winter	30	+0%	30/15 Summer				65.061
S11.002	SS212	30 Winter	30	+0%	30/15 Summer				64.960
S11.003	SS213	30 Winter	30	+0%	30/15 Summer				64.771
S10.002	SS216	360 Winter	30	+0%	30/15 Summer				64.550
S15.000	SS222	600 Winter	30	+0%	30/240 Winter				64.520
S15.001	SS223	600 Winter	30	+0%	30/180 Winter				64.520
S16.000	SS217	15 Winter	30	+0%	30/15 Summer				65.129
S16.001	SS218	15 Winter	30	+0%	30/15 Summer				64.866
S16.002	SS219	15 Winter	30	+0%	30/15 Summer				64.671
S17.000	SS220	600 Winter	30	+0%					64.528
S16.003	SS221	600 Winter	30	+0%					64.527
S15.002	SS224	600 Winter	30	+0%	30/180 Winter				64.520
S18.000	SS225	360 Winter	30	+0%	30/240 Winter				64.520
S15.003	SS220	360 Winter	30	+0%	30/120 Winter				64.521
S19.000	SS229	600 Winter	30	+0%	30/15 Summer				64.530
S20.000	SS228	360 Winter	30	+0%	30/15 Summer				64.535
S19.001	SS230	360 Winter	30	+0%	30/15 Summer				64.536
S15.004	SS227	360 Winter	30	+0%	30/60 Winter				64.536
S15.005	SS231	360 Winter	30	+0%	30/15 Winter				64.537
S10.003	SS232	360 Winter	30	+0%	30/15 Winter				64.551
S10.004	SS233	360 Winter	30	+0%	30/60 Summer				64.560
S10.005	SS234	360 Winter	30	+0%	30/60 Summer				64.562
S10.006	SS235	360 Summer	30	+0%	30/15 Summer				63.614

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S7.001	SS116	0.504	0.000	1.01		156.7	SURCHARGED	
S9.000	SS118	0.375	0.000	0.94		62.2	SURCHARGED	
S7.002	SS119	0.903	0.000	0.17		34.2	SURCHARGED	
S1.003	SS120	0.883	0.000	0.36		82.6	SURCHARGED	
S1.004	SS121	0.755	0.000	0.07		24.3	SURCHARGED	
S1.005	SS122	0.056	0.000	1.03		24.0	SURCHARGED	
S1.006	SS123	-0.010	0.000	0.83		23.6	OK	
S1.007	SS124	-0.025	0.000	0.84		24.0	OK	
S1.008	SS125	0.000	0.000	1.06		24.3	OK	
S10.000	SS214	0.788	0.000	1.36		94.0	SURCHARGED	
S10.001	SS215	0.721	0.000	1.10		78.0	SURCHARGED	
S11.000	SS210	0.973	0.000	0.54		18.0	SURCHARGED	
S12.000	SS209	1.160	0.000	1.14		37.5	SURCHARGED	
S11.001	SS211	1.101	0.000	1.67		54.1	SURCHARGED	
S13.000	SS201	0.528	0.000	0.37		12.3	SURCHARGED	
S13.001	SS202	0.646	0.000	0.99		30.8	SURCHARGED	
S13.002	SS203	0.593	0.000	0.60		33.0	SURCHARGED	
S13.003	SS204	0.603	0.000	0.57		34.8	SURCHARGED	
S13.004	SS205	0.632	0.000	0.64		44.3	SURCHARGED	
S14.000	SS206	0.790	0.000	0.39		10.4	SURCHARGED	
S13.005	SS207	0.691	0.000	0.79		98.3	SURCHARGED	
S13.006	SS208	0.796	0.000	1.04		101.6	SURCHARGED	
S11.002	SS212	0.735	0.000	1.58		159.0	SURCHARGED	
S11.003	SS213	0.521	0.000	1.02		201.9	SURCHARGED	
S10.002	SS216	0.590	0.000	0.45		96.6	SURCHARGED	
S15.000	SS222	0.100	0.000	0.01		1.6	SURCHARGED	
S15.001	SS223	0.130	0.000	0.02		6.2	SURCHARGED	
S16.000	SS217	0.264	0.000	1.14		38.2	SURCHARGED	
S16.001	SS218	0.231	0.000	1.38		43.7	SURCHARGED	
S16.002	SS219	0.126	0.000	1.57		43.7	SURCHARGED	
S17.000	SS220	-0.037	0.000	0.04		1.3	OK	
S16.003	SS221	-0.053	0.000	0.18		11.8	OK	
S15.002	SS224	0.200	0.000	0.05		20.5	SURCHARGED	
S18.000	SS225	0.095	0.000	0.04		2.6	SURCHARGED	
S15.003	SS220	0.271	0.000	0.08		32.1	SURCHARGED	
S19.000	SS229	0.405	0.000	0.06		2.0	SURCHARGED	
S20.000	SS228	0.353	0.000	0.07		3.8	SURCHARGED	
S19.001	SS230	0.456	0.000	0.27		19.6	SURCHARGED	
S15.004	SS227	0.376	0.000	0.12		57.0	SURCHARGED	
S15.005	SS231	0.457	0.000	0.17		61.6	SURCHARGED	
S10.003	SS232	0.481	0.000	0.59		157.9	SURCHARGED	
S10.004	SS233	0.521	0.000	0.63		154.4	SURCHARGED	
S10.005	SS234	0.550	0.000	0.12		50.8	SURCHARGED	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S10.006	SS235	0.209	0.000	3.06		50.8	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 10.000
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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.200
Region Scotland and Ireland Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.850

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Coarse Inertia Status OFF
DTS 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.	Water Level (m)
S1.000	SS110	15 Winter	100	+0%	100/15 Summer				65.845
S2.000	SS111	15 Winter	100	+0%	100/15 Summer				65.819
S1.001	SS112	30 Winter	100	+0%	100/15 Summer				65.893
S3.000	SS108	15 Winter	100	+0%	100/15 Summer				65.830
S4.000	SS107	15 Winter	100	+0%	100/15 Summer				65.728
S3.001	SS109	15 Winter	100	+0%	100/15 Summer				65.675
S1.002	SS113	960 Winter	100	+0%	100/15 Summer				65.646
S5.000	SS101	15 Winter	100	+0%	100/15 Summer				65.988
S5.001	SS102	15 Winter	100	+0%	100/15 Summer				65.771
S5.002	SS103	960 Winter	100	+0%	100/15 Summer				65.649
S6.000	SS104	960 Winter	100	+0%	100/15 Summer				65.647
S5.003	SS105	960 Winter	100	+0%	100/15 Summer				65.644
S5.004	SS106	960 Winter	100	+0%	100/15 Summer				65.640
S7.000	SS116	15 Winter	100	+0%	100/15 Summer				66.379
S8.000	SS114	15 Winter	100	+0%	100/15 Summer				65.971
S8.001	SS115	15 Winter	100	+0%	100/15 Summer				65.876

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS110	0.641	0.000	0.65		68.0	FLOOD RISK	
S2.000	SS111	1.094	0.000	0.41		39.2	FLOOD RISK	
S1.001	SS112	1.540	0.000	1.16		90.3	FLOOD RISK	
S3.000	SS108	1.030	0.000	0.67		38.0	FLOOD RISK	
S4.000	SS107	1.028	0.000	0.51		43.0	FLOOD RISK	
S3.001	SS109	1.281	0.000	0.89		108.6	FLOOD RISK	
S1.002	SS113	1.458	0.000	0.42		32.4	SURCHARGED	
S5.000	SS101	0.438	0.000	0.83		41.9	SURCHARGED	
S5.001	SS102	0.621	0.000	1.63		50.6	SURCHARGED	
S5.002	SS103	0.654	0.000	0.13		12.4	SURCHARGED	
S6.000	SS104	0.997	0.000	0.11		4.5	FLOOD RISK	
S5.003	SS105	1.149	0.000	0.17		20.0	FLOOD RISK	
S5.004	SS106	1.106	0.000	0.07		27.6	FLOOD RISK	
S7.000	SS116	1.089	0.000	1.05		86.0	FLOOD RISK	
S8.000	SS114	0.926	0.000	0.82		98.7	FLOOD RISK	
S8.001	SS115	1.056	0.000	0.76		82.8	SURCHARGED	

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.	Water Level (m)
S7.001	SS116	15 Winter	100	+0%	100/15 Summer				65.807
S9.000	SS118	15 Winter	100	+0%	100/15 Summer				66.401
S7.002	SS119	960 Winter	100	+0%	100/15 Summer				65.642
S1.003	SS120	960 Winter	100	+0%	100/15 Summer				65.638
S1.004	SS121	960 Winter	100	+0%	100/30 Winter				65.636
S1.005	SS122	60 Summer	100	+0%	100/15 Summer				63.891
S1.006	SS123	480 Winter	100	+0%					63.796
S1.007	SS124	60 Summer	100	+0%					63.657
S1.008	SS125	2160 Winter	100	+0%					63.516
S10.000	SS214	15 Winter	100	+0%	100/15 Summer				66.057
S10.001	SS215	15 Winter	100	+0%	100/15 Summer				65.518
S11.000	SS210	30 Winter	100	+0%	100/15 Summer				66.214
S12.000	SS209	30 Winter	100	+0%	100/15 Summer				66.551
S11.001	SS211	30 Winter	100	+0%	100/15 Summer				66.085
S13.000	SS201	30 Winter	100	+0%	100/15 Summer				66.440
S13.001	SS202	30 Winter	100	+0%	100/15 Summer				66.388
S13.002	SS203	30 Winter	100	+0%	100/15 Summer				66.240
S13.003	SS204	30 Winter	100	+0%	100/15 Summer				66.194
S13.004	SS205	30 Winter	100	+0%	100/15 Summer				66.138
S14.000	SS206	30 Winter	100	+0%	100/15 Summer				66.023
S13.005	SS207	30 Winter	100	+0%	100/15 Summer				65.996
S13.006	SS208	30 Winter	100	+0%	100/15 Summer				65.696
S11.002	SS212	30 Winter	100	+0%	100/15 Summer				65.555
S11.003	SS213	30 Winter	100	+0%	100/15 Summer				65.287
S10.002	SS216	480 Winter	100	+0%	100/15 Summer				65.079
S15.000	SS222	600 Winter	100	+0%	100/120 Summer				65.051
S15.001	SS223	600 Winter	100	+0%	100/60 Winter				65.051
S16.000	SS217	15 Winter	100	+0%	100/15 Summer				65.532
S16.001	SS218	15 Winter	100	+0%	100/15 Summer				65.105
S16.002	SS219	600 Winter	100	+0%	100/15 Summer				65.062
S17.000	SS220	600 Winter	100	+0%	100/15 Summer				65.059
S16.003	SS221	600 Winter	100	+0%	100/15 Summer				65.058
S15.002	SS224	600 Winter	100	+0%	100/30 Winter				65.051
S18.000	SS225	480 Winter	100	+0%	100/60 Winter				65.056
S15.003	SS220	480 Winter	100	+0%	100/15 Winter				65.054
S19.000	SS229	600 Winter	100	+0%	100/15 Summer				65.061
S20.000	SS228	480 Winter	100	+0%	100/15 Summer				65.065
S19.001	SS230	480 Winter	100	+0%	100/15 Summer				65.070
S15.004	SS227	480 Winter	100	+0%	100/15 Winter				65.067
S15.005	SS231	480 Winter	100	+0%	100/15 Summer				65.072
S10.003	SS232	480 Winter	100	+0%	100/15 Summer				65.072
S10.004	SS233	480 Winter	100	+0%	100/15 Summer				65.071
S10.005	SS234	480 Winter	100	+0%	100/30 Summer				65.075
S10.006	SS235	60 Summer	100	+0%	100/15 Summer				63.614

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S7.001	SS116	1.072	0.000	1.28		199.1	SURCHARGED	
S9.000	SS118	1.051	0.000	1.09		72.3	FLOOD RISK	
S7.002	SS119	1.362	0.000	0.19		39.8	SURCHARGED	
S1.003	SS120	1.342	0.000	0.43		99.5	SURCHARGED	
S1.004	SS121	1.214	0.000	0.07		24.9	SURCHARGED	
S1.005	SS122	0.061	0.000	1.01		23.5	SURCHARGED	
S1.006	SS123	-0.011	0.000	0.85		24.0	OK	
S1.007	SS124	-0.020	0.000	0.86		24.5	OK	
S1.008	SS125	0.000	0.000	1.07		24.4	OK	
S10.000	SS214	1.697	0.000	1.71		118.3	SURCHARGED	
S10.001	SS215	1.368	0.000	1.54		108.9	SURCHARGED	
S11.000	SS210	1.789	0.000	0.68		22.6	SURCHARGED	
S12.000	SS209	2.116	0.000	1.45		47.7	FLOOD RISK	
S11.001	SS211	1.890	0.000	2.12		68.8	SURCHARGED	
S13.000	SS201	1.405	0.000	0.40		13.0	SURCHARGED	
S13.001	SS202	1.513	0.000	1.06		33.2	SURCHARGED	
S13.002	SS203	1.410	0.000	0.74		40.4	SURCHARGED	
S13.003	SS204	1.404	0.000	0.73		44.7	SURCHARGED	
S13.004	SS205	1.408	0.000	0.80		55.8	SURCHARGED	
S14.000	SS206	1.528	0.000	0.42		11.3	SURCHARGED	
S13.005	SS207	1.421	0.000	1.00		124.2	SURCHARGED	
S13.006	SS208	1.431	0.000	1.30		127.7	SURCHARGED	
S11.002	SS212	1.330	0.000	2.00		200.4	SURCHARGED	
S11.003	SS213	1.037	0.000	1.29		255.8	SURCHARGED	
S10.002	SS216	1.119	0.000	0.45		97.8	SURCHARGED	
S15.000	SS222	0.631	0.000	0.01		2.0	SURCHARGED	
S15.001	SS223	0.661	0.000	0.02		8.3	SURCHARGED	
S16.000	SS217	0.667	0.000	1.36		45.6	SURCHARGED	
S16.001	SS218	0.470	0.000	1.72		54.3	SURCHARGED	
S16.002	SS219	0.517	0.000	0.36		10.0	SURCHARGED	
S17.000	SS220	0.494	0.000	0.05		1.6	SURCHARGED	
S16.003	SS221	0.478	0.000	0.22		14.4	SURCHARGED	
S15.002	SS224	0.731	0.000	0.07		25.7	SURCHARGED	
S18.000	SS225	0.631	0.000	0.04		2.7	SURCHARGED	
S15.003	SS220	0.804	0.000	0.08		31.6	SURCHARGED	
S19.000	SS229	0.936	0.000	0.08		2.4	SURCHARGED	
S20.000	SS228	0.883	0.000	0.07		3.8	SURCHARGED	
S19.001	SS230	0.990	0.000	0.28		20.5	SURCHARGED	
S15.004	SS227	0.907	0.000	0.12		56.8	SURCHARGED	
S15.005	SS231	0.992	0.000	0.17		59.8	SURCHARGED	
S10.003	SS232	1.002	0.000	0.57		153.2	SURCHARGED	
S10.004	SS233	1.032	0.000	0.61		151.1	SURCHARGED	
S10.005	SS234	1.063	0.000	0.12		50.8	SURCHARGED	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S10.006	SS235	0.209	0.000	3.06		50.8	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor 1.000   Additional Flow - % of Total Flow 10.000
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 Offline Controls 0   Number of Time/Area Diagrams 0
Number of Online Controls 2   Number of Storage Structures 2   Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR   Ratio R 0.200
Region Scotland and Ireland   Cv (Summer) 0.750
M5-60 (mm) 20.000   Cv (Winter) 0.850

Margin for Flood Risk Warning (mm) 300.0   DVD Status OFF
Analysis Timestep Coarse   Inertia Status OFF
DTS 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) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SS110	15 Winter	100	+0%	30/15 Winter				65.845
S2.000	SS111	15 Winter	100	+0%	30/15 Summer				65.819
S1.001	SS112	30 Winter	100	+0%	1/15 Winter				65.893
S3.000	SS108	15 Winter	100	+0%	30/15 Summer				65.830
S4.000	SS107	15 Winter	100	+0%	30/15 Summer				65.728
S3.001	SS109	15 Winter	100	+0%	2/15 Summer				65.675
S1.002	SS113	960 Winter	100	+0%	1/15 Summer				65.646
S5.000	SS101	15 Winter	100	+0%	30/15 Winter				65.988
S5.001	SS102	15 Winter	100	+0%	30/15 Summer				65.771
S5.002	SS103	960 Winter	100	+0%	30/15 Winter				65.649
S6.000	SS104	960 Winter	100	+0%	30/15 Summer				65.647
S5.003	SS105	960 Winter	100	+0%	30/15 Summer				65.644
S5.004	SS106	960 Winter	100	+0%	30/15 Winter				65.640
S7.000	SS116	15 Winter	100	+0%	30/15 Summer				66.379
S8.000	SS114	15 Winter	100	+0%	30/15 Summer				65.971
S8.001	SS115	15 Winter	100	+0%	30/15 Summer				65.876

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS110	0.641	0.000	0.65		68.0	FLOOD RISK	
S2.000	SS111	1.094	0.000	0.41		39.2	FLOOD RISK	
S1.001	SS112	1.540	0.000	1.16		90.3	FLOOD RISK	
S3.000	SS108	1.030	0.000	0.67		38.0	FLOOD RISK	
S4.000	SS107	1.028	0.000	0.51		43.0	FLOOD RISK	
S3.001	SS109	1.281	0.000	0.89		108.6	FLOOD RISK	
S1.002	SS113	1.458	0.000	0.42		32.4	SURCHARGED	
S5.000	SS101	0.438	0.000	0.83		41.9	SURCHARGED	
S5.001	SS102	0.621	0.000	1.63		50.6	SURCHARGED	
S5.002	SS103	0.654	0.000	0.13		12.4	SURCHARGED	
S6.000	SS104	0.997	0.000	0.11		4.5	FLOOD RISK	
S5.003	SS105	1.149	0.000	0.17		20.0	FLOOD RISK	
S5.004	SS106	1.106	0.000	0.07		27.6	FLOOD RISK	
S7.000	SS116	1.089	0.000	1.05		86.0	FLOOD RISK	
S8.000	SS114	0.926	0.000	0.82		98.7	FLOOD RISK	
S8.001	SS115	1.056	0.000	0.76		82.8	SURCHARGED	

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.	Water Level (m)
S7.001	SS116	15 Winter	100	+0%	30/15 Summer				65.807
S9.000	SS118	15 Winter	100	+0%	30/15 Summer				66.401
S7.002	SS119	960 Winter	100	+0%	1/480 Winter				65.642
S1.003	SS120	960 Winter	100	+0%	1/480 Winter				65.638
S1.004	SS121	960 Winter	100	+0%	2/480 Winter				65.636
S1.005	SS122	60 Summer	100	+0%	1/180 Winter				63.891
S1.006	SS123	60 Winter	30	+0%					63.797
S1.007	SS124	60 Summer	100	+0%					63.657
S1.008	SS125	2160 Winter	100	+0%					63.516
S10.000	SS214	15 Winter	100	+0%	30/15 Summer				66.057
S10.001	SS215	15 Winter	100	+0%	30/15 Summer				65.518
S11.000	SS210	30 Winter	100	+0%	30/15 Summer				66.214
S12.000	SS209	30 Winter	100	+0%	2/15 Summer				66.551
S11.001	SS211	30 Winter	100	+0%	1/15 Summer				66.085
S13.000	SS201	30 Winter	100	+0%	30/15 Summer				66.440
S13.001	SS202	30 Winter	100	+0%	30/15 Summer				66.388
S13.002	SS203	30 Winter	100	+0%	30/15 Summer				66.240
S13.003	SS204	30 Winter	100	+0%	30/15 Summer				66.194
S13.004	SS205	30 Winter	100	+0%	30/15 Summer				66.138
S14.000	SS206	30 Winter	100	+0%	30/15 Summer				66.023
S13.005	SS207	30 Winter	100	+0%	30/15 Summer				65.996
S13.006	SS208	30 Winter	100	+0%	2/15 Winter				65.696
S11.002	SS212	30 Winter	100	+0%	2/30 Winter				65.555
S11.003	SS213	30 Winter	100	+0%	30/15 Summer				65.287
S10.002	SS216	480 Winter	100	+0%	1/30 Winter				65.079
S15.000	SS222	600 Winter	100	+0%	30/240 Winter				65.051
S15.001	SS223	600 Winter	100	+0%	30/180 Winter				65.051
S16.000	SS217	15 Winter	100	+0%	30/15 Summer				65.532
S16.001	SS218	15 Winter	100	+0%	30/15 Summer				65.105
S16.002	SS219	600 Winter	100	+0%	30/15 Summer				65.062
S17.000	SS220	600 Winter	100	+0%	100/15 Summer				65.059
S16.003	SS221	600 Winter	100	+0%	100/15 Summer				65.058
S15.002	SS224	600 Winter	100	+0%	30/180 Winter				65.051
S18.000	SS225	480 Winter	100	+0%	30/240 Winter				65.056
S15.003	SS220	480 Winter	100	+0%	30/120 Winter				65.054
S19.000	SS229	600 Winter	100	+0%	30/15 Summer				65.061
S20.000	SS228	480 Winter	100	+0%	30/15 Summer				65.065
S19.001	SS230	480 Winter	100	+0%	30/15 Summer				65.070
S15.004	SS227	480 Winter	100	+0%	30/60 Winter				65.067
S15.005	SS231	480 Winter	100	+0%	30/15 Winter				65.072
S10.003	SS232	480 Winter	100	+0%	30/15 Winter				65.072
S10.004	SS233	480 Winter	100	+0%	30/60 Summer				65.071
S10.005	SS234	480 Winter	100	+0%	30/60 Summer				65.075
S10.006	SS235	360 Summer	30	+0%	1/30 Summer				63.614

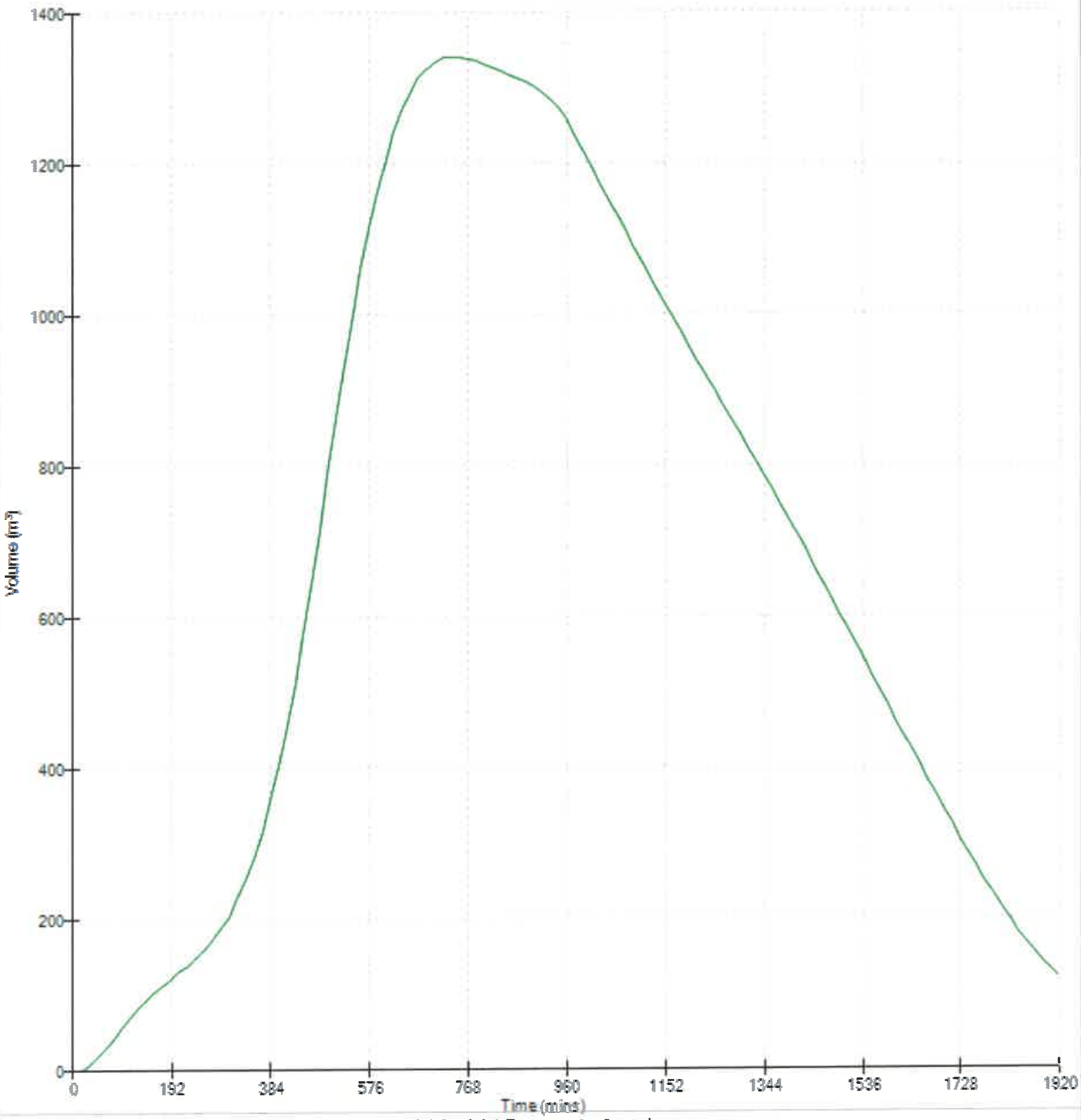
Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S7.001	SS116	1.072	0.000	1.28		199.1	SURCHARGED	
S9.000	SS118	1.051	0.000	1.09		72.3	FLOOD RISK	
S7.002	SS119	1.362	0.000	0.19		39.8	SURCHARGED	
S1.003	SS120	1.342	0.000	0.43		99.5	SURCHARGED	
S1.004	SS121	1.214	0.000	0.07		24.9	SURCHARGED	
S1.005	SS122	0.061	0.000	1.01		23.5	SURCHARGED	
S1.006	SS123	-0.010	0.000	0.83		23.6	OK	
S1.007	SS124	-0.020	0.000	0.86		24.5	OK	
S1.008	SS125	0.000	0.000	1.07		24.4	OK	
S10.000	SS214	1.697	0.000	1.71		118.3	SURCHARGED	
S10.001	SS215	1.368	0.000	1.54		108.9	SURCHARGED	
S11.000	SS210	1.789	0.000	0.68		22.6	SURCHARGED	
S12.000	SS209	2.116	0.000	1.45		47.7	FLOOD RISK	
S11.001	SS211	1.890	0.000	2.12		68.8	SURCHARGED	
S13.000	SS201	1.405	0.000	0.40		13.0	SURCHARGED	
S13.001	SS202	1.513	0.000	1.06		33.2	SURCHARGED	
S13.002	SS203	1.410	0.000	0.74		40.4	SURCHARGED	
S13.003	SS204	1.404	0.000	0.73		44.7	SURCHARGED	
S13.004	SS205	1.408	0.000	0.80		55.8	SURCHARGED	
S14.000	SS206	1.528	0.000	0.42		11.3	SURCHARGED	
S13.005	SS207	1.421	0.000	1.00		124.2	SURCHARGED	
S13.006	SS208	1.431	0.000	1.30		127.7	SURCHARGED	
S11.002	SS212	1.330	0.000	2.00		200.4	SURCHARGED	
S11.003	SS213	1.037	0.000	1.29		255.8	SURCHARGED	
S10.002	SS216	1.119	0.000	0.45		97.8	SURCHARGED	
S15.000	SS222	0.631	0.000	0.01		2.0	SURCHARGED	
S15.001	SS223	0.661	0.000	0.02		8.3	SURCHARGED	
S16.000	SS217	0.667	0.000	1.36		45.6	SURCHARGED	
S16.001	SS218	0.470	0.000	1.72		54.3	SURCHARGED	
S16.002	SS219	0.517	0.000	0.36		10.0	SURCHARGED	
S17.000	SS220	0.494	0.000	0.05		1.6	SURCHARGED	
S16.003	SS221	0.478	0.000	0.22		14.4	SURCHARGED	
S15.002	SS224	0.731	0.000	0.07		25.7	SURCHARGED	
S18.000	SS225	0.631	0.000	0.04		2.7	SURCHARGED	
S15.003	SS220	0.804	0.000	0.08		31.6	SURCHARGED	
S19.000	SS229	0.936	0.000	0.08		2.4	SURCHARGED	
S20.000	SS228	0.883	0.000	0.07		3.8	SURCHARGED	
S19.001	SS230	0.990	0.000	0.28		20.5	SURCHARGED	
S15.004	SS227	0.907	0.000	0.12		56.8	SURCHARGED	
S15.005	SS231	0.992	0.000	0.17		59.8	SURCHARGED	
S10.003	SS232	1.002	0.000	0.57		153.2	SURCHARGED	
S10.004	SS233	1.032	0.000	0.61		151.1	SURCHARGED	
S10.005	SS234	1.063	0.000	0.12		50.8	SURCHARGED	

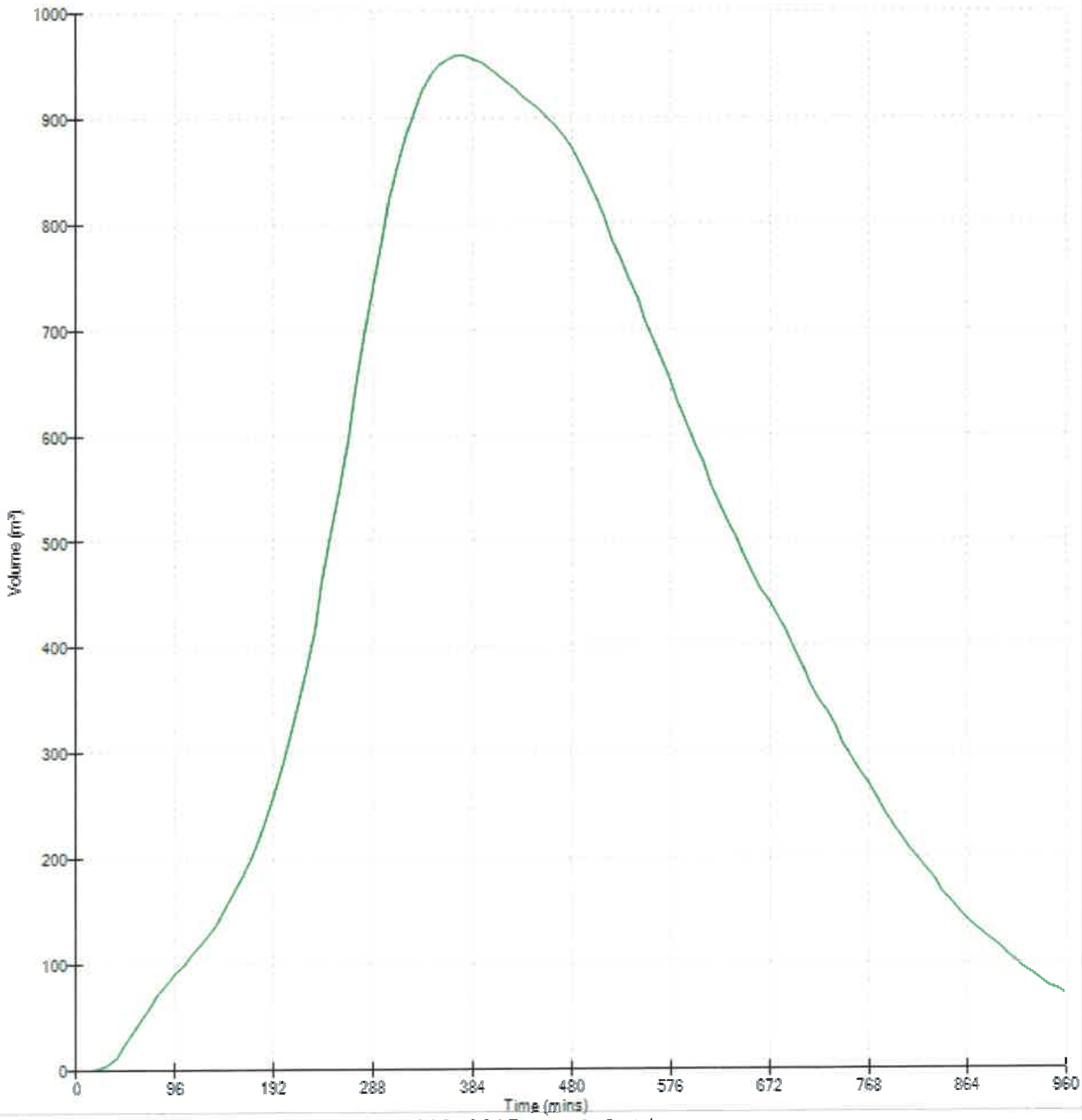
Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S10.006	SS235	0.209	0.000	3.06		50.8	SURCHARGED	

Graphs for Pipe S1.004 US/MH SS121 (Storm)
960 minute 100 year Winter I+0%
Status: SURCHARGED



Graphs for Pipe S10.005 US/MH SS234 (Storm)
480 minute 100 year Winter I+0%
Status: SURCHARGED



Appendix D

FOUL SEWER CALCULATIONS

Title:	Job Ref.:	Calcs. By	Drg. No.		
Housing scheme at Capdoo Commons	20017	Brian Connolly	P- 20017-303	ks: 1.5 mm	brian connolly associates
Client: Westar Investmemts Ltd.	section 100			Discharge: 14 units per house	consulting engineers the studio, wood's way clane, co. kildare
Subject: FOUL SEWER DESIGN	sheet 01 of 02			Sewage @ 15 ° C	tel: (045) 892211: fax (045) 892420

Pipe Section	No. of Houses	Discharge (units)	Total Discharge (units)	Pipe Diam (mm)	U/S I.L. (m)	Length L_{pipe} (m)	Gradient 1 in ...	D/S I.L. (m)	Flow Q (l/s)	Pipe Cap. Q_{cap} (l/s)	CHECK Capacity of pipe. Qcap >Q	Proport. Flow Q/Qp	Velocity V_{pipe} (m/s)	Proport. Velocity V/Vp	Discharge. Velocity $V_{proportional}$ (m/s)	CHECK Self clean vel. V_p >0.75m/sec
F.I.C. 101 to F.I.C. 102	8	112	112	150	65.85	70	80	64.98	3.96	17.29	✓	0.23	0.98	0.82	0.80	✓
F.I.C. 102 to F.I.C. 104	4	56	168	150	64.98	68	100	64.30	4.40	15.46	✓	0.28	0.87	0.86	0.76	✓
F.I.C. 104 to F.I.C. 106	21	294	462	150	64.30	66	100	63.64	6.05	15.46	✓	0.39	0.87	0.94	0.82	✓
F.I.C. 106 to F.I.C. 107	10	140	602	225	63.64	36	175	63.43	6.68	34.40	✓	0.19	0.87	0.78	0.67	✗
F.I.C. 107 to F.I.C. 108	12	168	770	225	63.43	54	175	63.12	7.37	34.40	✓	0.21	0.87	0.80	0.69	✗
F.I.C. 108 to F.I.C. 109	8	112	882	225	63.12	67	175	62.74	7.80	34.40	✓	0.23	0.87	0.81	0.70	✗
F.I.C. 109 to F.I.C. 115	0	0	882	225	62.74	11	200	62.68	7.80	32.17	✓	0.24	0.81	0.83	0.67	✗
F.I.C. 115 to F.I.C. 116	68	952	1834	225	62.68	39	200	62.49	11.05	32.17	✓	0.34	0.81	0.91	0.74	✗
F.I.C. 116 to F.I.C. A	0	0	1834	225	62.49	7	200	62.45	11.05	32.17	✓	0.34	0.81	0.91	0.74	✗
F.I.C. 103 to F.I.C. 104	17	238	238	150	64.99	69	100	64.30	4.86	15.46	✓	0.31	0.87	0.89	0.78	✓
F.I.C. 105 to F.I.C. 106	0	0	0	225	63.67	7	200	63.64	SPUR FOR FUTURE DEVELOPMENT							

Title: Housing scheme at Capdoo Commons Client: Westar Investemts Ltd. Subject: FOUL SEWER DESIGN	Job Ref.: 20017 Section 100 sheet 02 of 02	Calcs. By Brian Connolly	Drg. No. P- 20017-303	ks: 1.5 mm Discharge: 14 units per house Sewage @ 15 °C	brian connolly associates consulting engineers the studio, wood's way clane, co. kildare tel: (045) 892211; fax (045) 892420

Pipe Section	No. of Houses	Discharge (units)	Total Discharge (units)	Pipe Diam (mm)	U/S I.L. (m)	Length L_{pipe} (m)	Gradient 1 in ...	D/S I.L. (m)	Flow Q (l/s)	Pipe Cap. Q_{cap} (l/s)	CHECK Capacity of pipe. Qcap >Q	Proport. Flow Q/Qp	Velocity V_{pipe} (m/s)	Proport. Velocity V/Vp	Discharge. Velocity $V_{proportional}$ (m/s)	CHECK Self clean vel. V_p >0.75m/sec
F.I.C. 110 to F.I.C. 111	12	168	168	150	65.39	80	80	64.39	4.40	17.29	✓	0.25	0.98	0.84	0.82	✓
F.I.C. 111 to F.I.C. 114	8	112	280	150	64.39	71	80	63.50	5.11	17.29	✓	0.30	0.98	0.87	0.85	✓
F.I.C. 114 to F.I.C. 115	25	350	630	150	63.50	66	80	62.68	6.80	17.29	✓	0.39	0.98	0.94	0.92	✓
F.I.C. 112 to F.I.C. 113	7	98	98	150	65.46	54	60	64.56	3.84	19.99	✓	0.19	1.13	0.78	0.88	✓
F.I.C. 113 to F.I.C. 114	5	70	168	150	64.56	85	80	63.50	4.40	17.29	✓	0.25	0.98	0.84	0.82	✓

Title: Housing scheme at Capdoo Commons Client: Westar Investments Ltd. Subject: FOUL SEWER DESIGN	Job Ref.: 20017 Section 200 sheet 01 of 03	Calcs. By Brian Connolly	Drg. No. P- 20017-303	ks: 1.5 mm Discharge: 14 units per house Sewage @ 15 °C	brian connolly associates consulting engineers the studio, wood's way clane, co. kildare tel: (045) 892211; fax (045) 892420

Pipe Section	No. of Houses	Discharge (units)	Total Discharge (units)	Pipe Diam (mm)	U/S I.L. (m)	Length L_{pipe} (m)	Gradient 1 in ...	D/S I.L. (m)	Flow Q (l/s)	Pipe Cap. Q_{cap} (l/s)	CHECK Capacity of pipe. Qcap >Q	Proport. Flow Q/Qp	Velocity V_{pipe} (m/s)	Proport. Velocity V/Vp	Discharge. Velocity $V_{proportional}$ (m/s)	CHECK Self clean vel. V_p >0.75m/sec
F.I.C. 202 to F.I.C. 203	23	322	322	150	65.71	42	80	65.19	5.35	17.29	✓	0.31	0.98	0.88	0.87	✓
F.I.C. 203 to F.I.C. 204	24	336	658	225	65.19	68	150	64.73	6.91	37.18	✓	0.19	0.94	0.77	0.72	✗
F.I.C. 204 to F.I.C. 210	0	0	658	225	64.73	10	150	64.67	6.91	37.18	✓	0.19	0.94	0.77	0.72	✗
F.I.C. 210 to F.I.C. 211	64	896	1554	225	64.67	14	175	64.59	10.15	34.40	✓	0.30	0.87	0.87	0.76	✓
F.I.C. 211 to F.I.C. 213	17	238	1792	225	64.59	66	175	64.21	10.91	34.40	✓	0.32	0.87	0.89	0.78	✓
F.I.C. 213 to F.I.C. 215	26	364	2156	225	64.21	60	200	63.91	12.04	32.17	✓	0.37	0.81	0.93	0.76	✓
F.I.C. 215 to F.I.C. 216	15	210	2366	225	63.91	60	200	63.61	12.68	32.17	✓	0.39	0.81	0.94	0.76	✓
F.I.C. 216 to F.I.C. 218	0	0	2366	225	63.61	7	200	63.57	12.68	32.17	✓	0.39	0.81	0.94	0.76	✓
F.I.C. 218 to F.I.C. 223	10	140	2506	225	63.57	52	225	63.34	13.09	30.31	✓	0.43	0.76	0.96	0.74	✗
F.I.C. 223 to F.I.C. 225	14	196	2702	225	63.34	23	225	63.24	13.67	30.31	✓	0.45	0.76	0.97	0.74	✗
F.I.C. 225 to F.I.C. 226	6	84	2786	225	63.24	25	225	63.13	13.92	30.31	✓	0.46	0.76	0.98	0.75	✓
F.I.C. 226 to F.I.C. B	2	28	2814	225	63.13	28	225	63.00	14.00	30.31	✓	0.46	0.76	0.98	0.75	✓
F.I.C. 201 to F.I.C. 203	0	0	0	225	65.40	26	125	65.19				FOR FUTURE DEVELOPMENT				

Title: Housing scheme at Capdoo Commons	Job Ref.: 20017	Calcs. By	Drg. No.		
Client: Westar Investments Ltd	Section 200	Brian Connolly	P- 20017-303	ks: 1.5 mm Discharge: 14 units per house Sewage @ 15 °C	brian connolly associates consulting engineers the studio, wood's way clane, co. kildare tel: (045) 892211: fax (045) 892420
Subject: FOUL SEWER DESIGN	sheet 02 of 03				

Pipe Section	No. of Houses	Discharge (units)	Total Discharge (units)	Pipe Diam (mm)	U/S I.L. (m)	Length L_{pipe} (m)	Gradient 1 in ...	D/S I.L. (m)	Flow Q (l/s)	Pipe Cap. Q_{cap} (l/s)	CHECK Capacity of pipe. Qcap >Q	Proport. Flow Q/Qp	Velocity V_{pipe} (m/s)	Proport. Velocity V/Vp	Discharge. Velocity $V_{proportional}$ (m/s)	CHECK Self clean vel. V_p >0.75m/sec
F.I.C. 205 to F.I.C. 206	24	336	336	150	65.79	29	80	65.43	5.42	17.29	✓	0.31	0.98	0.89	0.87	✓
F.I.C. 206 to F.I.C. 207	0	0	336	150	65.43	18	125	65.28	5.42	13.81	✓	0.39	0.78	0.94	0.74	✗
F.I.C. 207 to F.I.C. 209	24	336	672	150	65.28	57	125	64.83	6.97	13.81	✓	0.50	0.78	1.00	0.78	✓
F.I.C. 209 to F.I.C. 210	0	0	672	150	64.83	23	150	64.67	6.97	12.60	✓	0.55	0.71	1.02	0.74	✗
F.I.C. 208 to F.I.C. 209	16	224	224	150	65.49	53	80	64.83	4.78	17.29	✓	0.28	0.98	0.86	0.84	✓
F.I.C. 212 to F.I.C. 213	23	322	322	150	65.15	75	80	64.21	5.35	17.29	✓	0.31	0.98	0.88	0.87	✓
F.I.C. 214 to F.I.C. 215	13	182	182	150	64.86	76	80	63.91	4.50	17.29	✓	0.26	0.98	0.84	0.83	✓
F.I.C. 217 to F.I.C. 218	4	56	56	150	63.84	22	80	63.57	3.38	17.29	✓	0.20	0.98	0.78	0.77	✓
F.I.C. 224 to F.I.C. 225	2	28	28	150	63.82	35	60	63.24	2.95	19.99	✓	0.15	1.13	0.72	0.82	✓

Title: Housing scheme at Capdoo Commons Client: Westar Investments Ltd. Subject: FOUL SEWER DESIGN	Job Ref.: 20017 section 200 sheet 03 of 03	Calcs. By Brian Connolly	Drg. No. P- 20017-303	ks: 1.5 mm Discharge: 14 units per house Sewage @ 15 °C	brian connolly associates consulting engineers the studio, wood's way clane, co. kildare tel: (045) 892211; fax (045) 892420

Pipe Section	No. of Houses	Discharge (units)	Total Discharge (units)	Pipe Diam (mm)	U/S I.L. (m)	Length L_{pipe} (m)	Gradient 1 in ...	D/S I.L. (m)	Flow Q (l/s)	Pipe Cap. Q_{cap} (l/s)	CHECK Capacity of pipe. Qcap >Q	Proport. Flow Q/Qp	Velocity V_{pipe} (m/s)	Proport. Velocity V/Vp	Discharge. Velocity $V_{proportional}$ (m/s)	CHECK Self clean vel. V_p >0.75m/sec
F.I.C. 219 to F.I.C. 220	9	126	126	150	64.82	74	80	63.90	4.08	17.29	✓	0.24	0.98	0.82	0.80	✓
F.I.C. 220 to F.I.C. 222	0	0	126	150	63.90	12	100	63.78	4.08	15.46	✓	0.26	0.87	0.85	0.74	✗
F.I.C. 222 to F.I.C. 223	2	28	154	150	63.78	44	100	63.34	4.30	15.46	✓	0.28	0.87	0.86	0.75	✓
F.I.C. 221 to F.I.C. 222	2	28	28	150	64.11	20	60	63.78	2.95	19.99	✓	0.15	1.13	0.72	0.82	✓

Title:	Job Ref.:	Calcs. By	Drg. No.	
Housing scheme at Capdoo Commons **Client: WESTAR INVESTMENTS LTD** **Subject: FOUL SEWER DESIGN**	**sheet 006**	**Brian Connolly**	**P-** 20017-303	brian connolly associates consulting engineers the studio, wood's way clane, co. kildare tel: (045) 892211: fax (045) 892420

ABBEYPARK PUMPING STATION CAPACITY

Existing Houses	Total Units
Abbeypark	121
Brooklands	164
The Oaks	20
Private Houses	4
The Cloisters	32
Abbeywood	44
Total No of units	385

Allow 500 litres per dwelling per day = 500l. x 385 dwellings = 192,500 litres/day

Capacity of tank :
Diameter 13.5 m
depth 2.8m (64.23-61.43) lowest I.L. at end of line
Volume 400.95 m3 = 400,950 litres/day
at 500 litres per dwelling
Tank Capacity 400,950 / 500 = 802 dwellings

Spare Capacity of Abbeylands Tank = 802 - 385 = 417 dwellings.

Check: Tank to service 333 dwellings + Creche from proposed development.

Appendix E

IRISH WATER PRE-CONNECTION ENQUIRY FORM

Pre-connection enquiry form

Business developments, mixed use developments, housing developments

This form is to be filled out by applicants enquiring about the feasibility of a water and/or wastewater connection to Irish Water infrastructure. If completing this form by hand, please use BLOCK CAPITALS and black ink.

Please refer to the **Guide to completing the pre-connection enquiry form** on page 13 of this document when completing the form.

*** Denotes mandatory/ required field. Please note, if mandatory fields are not completed the application will be returned.**

Section A | Applicant details

1 ***Applicant details:**

Registered company name (if applicable): Westar Investments Limited

Trading name (if applicable):

Company registration number (if applicable): 132382

If you are not a registered company/business, please provide the applicant's name:

*Contact name: William Fadden

*Postal address: Dublin Road
Clane
Co Kildare

*Eircode: W91FPW2

*Telephone: 0879325254

Mobile:

*Email: williamj@westargroup.ie

2 **Agent details (if applicable):**

Contact name: Brian Connolly

Company name (if applicable): BCA Assoc Engineers

Postal address: Woods Way
Clane
Co Kildare

Eircode: W91V256

Telephone: 045892211

Email: bca.brianc@gmail.com

3 ***Please indicate whether it is the applicant or agent who should receive future correspondence in relation to the enquiry:**

Applicant [x] Agent [ ]

Section B | Site details

4 ***Site address:** Capdoo & Abbeylands
Clane
Co Kildare

5 ***Irish Grid co-ordinates of site:** Eastings (X) 688309 Northings (Y) 727982

Eg. co-ordinates of GPO, O'Connell St., Dublin: E(X) 315,878 N(Y) 234,619

6 ***Local Authority:**

Local Authority that granted planning permission (if applicable):

Kildare County Council

7 ***Has full planning permission been granted?** Yes [ ] No [x]

If 'Yes', please provide the current or previous planning reference number:

Section C | Development details

8 **Please outline the domestic and/or industry/business use proposed:**

Property type	Number of units	Property type	Number of units	Property type	Number of units
House	215	Apartments	90	Agricultural	0
Office	0	School	0	Retail unit	0
Residential care home	0	Institution	0	Industrial unit	0
Hotel	0	Factory	0	Other	Creche - 1
Other (please specify type)					

9 ***Approximate start date of proposed development:** 0 1 / 0 1 / 2 0 2 1

10 ***Is the development multi-phased?** Yes [x] No [ ]

If 'Yes', application must include a master-plan identifying the development phases and the current phase number.

If 'Yes', please provide details of variations in water demand volumes and wastewater discharge loads due to phasing requirements.

11 ***Please indicate the type of connection required by ticking the appropriate box below:**

Water [ ] Please go to Section D

Wastewater [ ] Please go to Section E

Both [x] Please complete both Sections D and E

Section D | Water connection and demand details

12 ***Is there an existing connection to public water mains at the site?** Yes [ ] No [x]

12.1 If yes, is this enquiry for an additional connection to one already installed? Yes [ ] No [ ]

12.2 If yes, is this enquiry to increase the size of an existing connection? Yes [ ] No [ ]

13 **Approximate date water connection is required:** 01/02/2021

14 ***What diameter of water connection is required to service the development?** 100 mm

15 ***Is more than one connection required to the public infrastructure to service this development?** Yes [ ] No [x]

If 'Yes', how many? [ ]

16 **Please indicate the business water demand (shops, offices, schools, hotels, restaurants, etc.):**

Post-development peak hour water demand	0	**l/s**
Post-development average hour water demand	0	**l/s**

Please include calculations on the attached sheet provided. Where there will be a daily/weekly/seasonal variation in the water demand profile, please provide all such details.

17 **Please indicate the industrial water demand (industry-specific water requirements):**

Post-development peak hour water demand	0	**l/s**
Post-development average hour water demand	0	**l/s**

Please include calculations on the attached sheet provided. Where there will be a daily/weekly/seasonal variation in the water demand profile, please provide all such details.

18 **What is the existing ground level at the property boundary at connection point (if known) above Malin Head Ordnance Datum?** 65.25 m

19 **What is the highest finished floor level of the proposed development above Malin Head Ordnance Datum?** 65.48 m

20 **Is on-site water storage being provided?** Yes [ ] No [x]

Please include calculations on the attached sheet provided.

21 **Are there fire flow requirements?** Yes [x] No [ ]

Additional fire flow requirements over and above those identified in Q16-17	22.5	**l/s**

Please include calculations on the attached sheet provided, and include confirmation of requirements from the Fire Authority.

22 **Do you propose to supplement your potable water supply from other sources?** Yes [ ] No [x]

If 'Yes', please indicate how you propose to supplement your potable water supply from other sources (see **Guide to completing the application form** on page 12 of this document for further details):

Section E | Wastewater connection and discharge details

23 ***Is there an existing connection to a public sewer at the site?** Yes [ ] No [x]

23.1 If yes, is this enquiry for an additional connection to the one already installed? Yes [ ] No [ ]

23.2 If yes, is this enquiry to increase the size of an existing connection? Yes [ ] No [ ]

24 ***Approximate date that wastewater connection is required:** 01/02/2021

25 ***What diameter of wastewater connection is required to service the development?** 225 mm

26 ***Is more than one connection required to the public infrastructure to service this development?** Yes [x] No [ ]

If 'Yes', how many? 02

27 **Please indicate the commercial wastewater hydraulic load (shops, offices, schools, hotels, restaurants, etc.):**

Post-development peak discharge	0	**l/s**
Post-development average discharge	0	**l/s**

Please include calculations on the attached sheet provided.

28 **Please indicate the industrial wastewater hydraulic load (industry-specific discharge requirements):**

Post-development peak discharge	0	**l/s**
Post-development average discharge	0	**l/s**

Please include calculations on the attached sheet provided.

29 **Wastewater organic load:**

Characteristic	Max concentration (mg/l)	Average concentration (mg/l)	Maximum daily load (kg/day)
Biochemical oxygen demand (BOD)			
Chemical oxygen demand (COD)			
Suspended solids (SS)			
Total nitrogen (N)			
Total phosphorus (P)			
Other			

Temperature range	
pH range	

30 ***Storm water run-off will only be accepted from brownfield sites that already have a storm/surface water connection to a combined sewer. In the case of such brownfield sites, please indicate if the development intends discharging surface water to the combined wastewater collection system:**

Yes [ ] No [x]

If 'Yes', please give reason for discharge and comment on adequacy of SUDS/attenuation measures proposed.

31 ***Do you propose to pump the wastewater?** Yes [ ] No [x]

If 'Yes', please include justification for your pumped solution with this application.

32 **What is the existing ground level at the property boundary at connection point (if known) above Malin Head Ordnance Datum?**

65.25 m

33 **What is the lowest finished floor level on site above Malin Head Ordnance Datum?** 65.48 m

34 **What is the proposed invert level of the pipe exiting the property to the public road?**

62.65 m

Section F | Supporting documentation

Please provide the following additional information (all mandatory):

> Site location map: A site location map to a scale of 1:1000, which clearly identifies the land or structure to which the enquiry relates. The map shall include the following details: [x]

i. The scale shall be clearly indicated on the map.

ii. The boundaries shall be delineated in red.

iii. The site co-ordinates shall be marked on the site location map.

> Details of planning and development exemptions (if applicable). [ ]

> Calculations (calculation sheets provided below). [x]

> Site layout map to a scale of 1:500 showing layout of proposed development, water network and wastewater network layouts, additional water/wastewater infrastructure if proposed, connection points to Irish Water infrastructure. [x]

> Conceptual design of the connection asset from the proposed development to the existing Irish Water infrastructure, including service conflicts, gradients, pipe sizes and invert levels. [x]

> Any other information that might help Irish Water assess this pre-connection enquiry. [x]

Section G | Declaration

I/We hereby make this application to Irish Water for a water and/or wastewater connection as detailed on this form.

I/We understand that any alterations made to this application must be declared to Irish Water.

The details that I/we have given with this application are accurate.

I/We have enclosed all the necessary supporting documentation.

Any personal data you provide will be stored and processed by Irish Water and may be transferred to third parties for the purposes of the water and/or wastewater connection process. I hereby give consent to Irish Water to store and process my personal data and to transfer my personal data to third parties, if required, for the purposes of the connection process.

If you wish to revoke consent at any time or wish to see Irish Water's full Data Protection Notice, please see **https://www.water.ie/privacy-notice/**

Signature: William Fadden Digitally signed by William Fadden Date: 2020.03.30 10:27:10 +01'00'

Date: 30/03/2020

Your full name (in BLOCK CAPITALS):

WILLIAM FADDEN

Irish Water will carry out a formal assessment based on the information provided on this form. Any future connection offer made by Irish Water will be based on the information that has been provided here.

Please submit the completed form to **newconnections@water.ie** or alternatively, post to:

Irish Water
PO Box 860
South City Delivery Office
Cork City

Please note that if you are sending us your application form and any associated documentation by email, the maximum file size that we can receive in any one email is 35MB.

Please note, if mandatory fields are not completed the application will be returned.

Irish Water is subject to the provisions of the Freedom of Information Act 2014 ("FOIA") and the codes of practice issued under FOIA as may be amended, updated or replaced from time to time. The FOIA enables members of the public to obtain access to records held by public bodies subject to certain exemptions such as where the requested records may not be released, for example to protect another individual's privacy rights or to protect commercially sensitive information. Please clearly label any document or part thereof which contains commercially sensitive information. Irish Water accepts no responsibility for any loss or damage arising as a result of its processing of freedom of information requests.

Calculations

Water demand

The average and peak water demand rates are calculated in accordance with Irish Water pre-connection enquiry form which assumes:
- Load rating of 150L/person/day and,
- Average occupancy ratio of 2.7 persons per dwelling.

The average day, peak week demand is taken as 1.25 times the average day, peak week demand.

Number of Properties = 305

Average Daily Domestic Demand (ADDD) = 150 L/Day x No. Houses x Occupancy
= 123,525 L/Day
= 1.4 L/sec

Average Day Peak Week Demand (ADPWD) = ADDD x 1.25
= 1.75 L/sec

Peak Demand = ADPWD x 2.1
= 3.675 L/sec

Normal Demand (assuming principle of water usage over 8 hours) = ADPWD x 24/8
= 5.25 L/sec

PHASE BREAKDOWN:

PHASE A = 80 Units
Phase A Peak Demand = 0.96 L/sec
Phase A Normal Demand = 1.38 L/sec

PHASE B = 75 Units
Phase B Peak Demand = 0.9 L/sec
Phase B Normal Demand = 1.29 L/sec

PHASE C = 75 Units
Phase C Peak Demand = 0.9 L/sec
Phase C Normal Demand = 1.29 L/sec

PHASE D = 75 Units
Phase D Peak Demand = 0.9 L/sec
Phase D Normal Demand = 1.29 L/sec

On-site storage

Fire flow requirements

22.5 L/sec

The average and peak discharge rates are calculated using loading rates provided by Irish Water:

Dry Weather Flow (DWF) = 600 L per Dwelling

Number of Properties = 300

Total DWF = 600 x Number of Properties
= 183,000 L/day
= 2.11 L/sec

Peak Discharge = 6 x DWF
= 12.7 L/sec

PHASE BREAKDOWN:

PHASE A = 80 Units
Phase A Total DWF = 0.55 L/day
Phase A Peak Discharge = 3.33 L/sec

PHASE B = 75 Units
Phase B Total DWF = 0.52 L/day
Phase B Peak Discharge = 3.12 L/sec

PHASE C = 75 Units
Phase C Total DWF = 0.52 L/day
Phase C Peak Discharge = 3.12 L/sec

PHASE D = 75 Units
Phase D Total DWF = 0.52 L/day
Phase D Peak Discharge = 3.12 L/sec

Flow balancing and pumping

N/A

Guide to completing the pre-connection enquiry form

This form should be completed by applicants enquiring about the feasibility of a water and/or wastewater connection to Irish Water infrastructure.

The Irish Water Codes of Practice are available at **www.water.ie** for reference.

Section A | Applicant Details

Question 1: This question requires the applicant or company enquiring about the feasibility of a connection to identify themselves, their postal address, and to provide their contact details.

Question 2: If the applicant has employed a consulting engineer or an agent to manage the enquiry on their behalf, the agent's address and contact details should be recorded here.

Question 3: Please indicate whether it is the applicant or the agent who should receive future correspondence in relation to the enquiry.

Section B | Site details

Question 4: This is the address of the site requiring the water/wastewater service connection and for which this enquiry is being made.

Question 5: Please provide the Irish Grid co-ordinates of the proposed site. Irish grid positions on maps are expressed in two dimensions as Eastings (E or X) and Northings (N or Y) relative to an origin. You will find these coordinates on your Ordnance Survey map which is required to be submitted with an application.

Question 6: Please identify the Local Authority that is or will be dealing with your planning application, for example Cork City Council.

Question 7: Please indicate if planning permission has been granted for this application, and if so, please provide the planning permission reference number.

Section C | Development details

Question 8: Please specify the number of different property/premises types by filling in the tables provided.

Question 9: Please indicate the approximate commencement date of works on the development.

Question 10: Please indicate if a phased building approach is to be adopted when developing the site. If so, please provide details of the phase master-plan and the proposed variation in water demand/wastewater discharge as a result of the phasing of the development.

Question 11: Please indicate the type of connection required by ticking the appropriate box and proceed to complete the appropriate section or sections.

Section D | Water connection and demand details

Question 12: Please indicate if a water connection already exists for this site.

Question 12.1: Please indicate if this enquiry concerns an additional connection to one already installed on the site.

Question 12.2: Please indicate if you are proposing to upgrade the water connection to facilitate an increase in water demand. Irish Water will determine what impact this will have on our infrastructure.

Question 13: Please indicate the approximate date that the proposed connection to the water infrastructure will be required.

Question 14: Please indicate what diameter of water connection is required to service this development.

Question 15: Please indicate if more than one connection is required to service this development. Please note that the connection size provided may be used to determine the connection charge.

Question 16: If this connection enquiry concerns a business premises, please provide calculations for the water demand and include your calculations on the calculation sheet provided. Business premises include shops, offices, hotels, schools, etc. Demand rates (peak and average) are site specific. Average demand is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). For design purposes, please refer to the Irish Water Codes of Practice for Water Infrastructure.

Question 17: If this connection enquiry is for an industrial premises, please calculate the water demand and include your calculations on the calculation sheet provided. Demand rates (peak and average) are site specific. Average demand is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). The peak demand for sizing of the pipe network will be as per the specific business production requirements. For design purposes, please refer to the Irish Water Codes of Practice for Water Infrastructure.

Question 18: Please specify the ground level at the location where connection to the public water mains will be made. This is required in order to determine if there is sufficient pressure in the existing water infrastructure to serve your proposed development. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 19: Please specify the highest finished floor level on site. This is required in order to determine if there is sufficient pressure in the existing water infrastructure to serve your proposed development. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 20: If storage is required, water storage capacity of 24-hour water demand must usually be provided at the proposed site. In some cases, 24-hour storage capacity may not be required, for example 24-hour storage for a domestic house would be provided in an attic storage tank. Please calculate the 24-hour water storage requirements and include your calculations on the attached sheet provided. Please also confirm that on-site storage is being provided by ticking the appropriate box.

Question 21: The water supply system shall be designed and constructed to reliably convey the water flows that are required of the development including fire flow requirements by the Fire Authority. The Fire Authority will provide the requirement for fire flow rates that the water supply system will have to carry. Please note that while flows in excess of your required demand may be achieved in the Irish Water network and could be utilised in the event of a fire, Irish Water cannot guarantee a flow rate to meet your fire flow requirement. To guarantee a flow to meet the Fire Authority requirements, you should provide adequate fire storage capacity within your development. Please include your calculations on the attached sheet provided, and further provide confirmation of the Fire Authority requirements.

Question 22: Please identify proposed additional water supply sources, that is, do you intend to connect to the public water mains or the public mains and supplement from other sources? If supplementing public water supply with a supply from another source, please provide details as to how the potable water supply is to be protected from cross contamination at the premises.

Section E | Wastewater connection and discharge details

Question 23: Please indicate if a wastewater connection to a public sewer already exists for this site.

Question 23.1: Please indicate if this enquiry relates to an additional wastewater connection to one already installed.

Question 23.2: Please indicate if you are proposing to upgrade the wastewater connection to facilitate an increased discharge. Irish Water will determine what impact this will have on our infrastructure.

Question 24: Please specify the approximate date that the proposed connection to the wastewater infrastructure will be required.

Question 25: Please indicate what diameter of wastewater connection is required to service this development.

Question 26: Please indicate if more than one connection is required to service this development. Please indicate number required.

Question 27: If this enquiry relates to a business premises, please provide calculations for the wastewater discharge and include your calculations on the attached sheet provided. Business premises include shops, offices, hotels, schools, etc. Discharge rates (peak and average) are site specific. Average discharge is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). For design purposes, please refer to the Irish Water Codes of Practice for Wastewater Infrastructure.

Question 28: If this enquiry relates to an industrial premises, please provide calculations for the wastewater discharge and include your calculations on the calculation sheet provided. Discharge rates (peak and average) are site specific. Average discharge is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). The peak discharge for sizing of the pipe network will be as per the specific business production requirements. For design purposes, please refer to the Irish Water Codes of Practice for Wastewater Infrastructure.

Question 29: Please specify the maximum and average concentrations and the maximum daily load of each of the wastewater characteristics listed in the wastewater organic load table (if not domestic effluent), and also specify if any other significant concentrations are expected in the effluent. Please complete the table and provide additional supporting documentation if relevant. Note that the concentration shall be in mg/l and the load shall be in kg/day. Note that for business premises (shops, offices, schools, hotels, etc.) for which only domestic effluent will be discharged (excluding discharge from canteens/restaurants which would require a Trade Effluent Discharge licence), there is no need to complete this question.

Question 30: In exceptional circumstances, such as brownfield sites, where the only practical outlet for storm/surface water is to a combined sewer, Irish Water will consider permitting a restricted attenuated flow to the combined sewer. Storm/surface water will only be accepted from brownfield sites that already have a storm/surface water connection to a combined sewer and the applicant must demonstrate how the storm/surface water flow from the proposed site is minimised using sustainable urban drainage system (SUDS). This type of connection will only be considered on a case by case basis. Please advise if the proposed development intends discharging surface water to the combined wastewater collection system.

Question 31: Please specify if the development needs to pump its wastewater discharge to gain access to Irish Water infrastructure.

Question 32: Please specify the ground level at the location where connection to the public sewer will be made. This is required to determine if the development can be connected to the public sewer via gravity discharge. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 33: Please specify the lowest floor level of the proposed development. This is required in order to determine if the development can be connected to the public sewer via gravity discharge. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 34: Please specify the proposed invert level of the pipe exiting the property to the public road.

Section F | Supporting documentation

Please provide additional information as listed.

Section G | Declaration

Please review the declaration, sign, and return the completed application form to Irish Water by email or by post using the contact details provided in Section G.

Notes

Notes

UISCE ÉIREANN : IRISH WATER

William Fadden

Dublin Road,
Clane,
Co. Kildare
W91FPW2

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

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

www.water.ie

3 July 2020

Re: CDS20002208 pre-connection enquiry - Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 306 units at Capdoo & Abbeylands, Clane, Kildare

Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Capdoo & Abbeylands, Clane, Kildare (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	**OUTCOME OF PRE-CONNECTION ENQUIRY** **THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.**
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	• On site storage for the average day peak week demand of the commercial section (crèche) is required to supply this demand for 24 hours and have a re-fill time of 12 hours.
Wastewater Connection	• Irish Water has a project underway to relieve capacity constraints in Clane (Upper Liffey Valley Sewerage Scheme Contract 2B – ULVSS). Connections of units can be facilitated during the commissioning phase scheduled for Q3/2021 (this may be subject to change). Connection of Phase A in advance of Q3/2021 will be subject to a Connection Agreement with Irish Water. • Connection of the Development should be via the private wastewater infrastructure in Abbeylands Housing Estate. At connection application stage the Developer has to demonstrate that the Third Party infrastructure is in compliance with requirements of

	Irish Water Code of Practice and Standard Details and has adequate capacity and integrity to cater for the additional load.

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 that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.

The map included below outlines the current Irish Water infrastructure adjacent to your site:

Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network 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.

General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**
2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.
3) The feedback provided is subject to a Connection Agreement/contract being signed at a later date.
4) A Connection Agreement will be required to commencing the connection works associated with the enquiry this can be applied for at https://www.water.ie/connections/get-connected/
5) A Connection Agreement cannot be issued until all statutory approvals are successfully in place.
6) Irish Water Connection Policy/ Charges can be found at https://www.water.ie/connections/information/connection-charges/
7) Please note the Confirmation of Feasibility does not extend to your fire flow requirements.
8) Irish Water is not responsible for the management or disposal of storm water or ground waters. You are advised to contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges
9) To access Irish Water Maps email datarequests@water.ie
10) All works to the Irish Water infrastructure, including works in the Public Space, shall have to be carried out by Irish Water.

If you have any further questions, please contact Marina Zivanovic Byrne from the design team on 01 89 25991 or email mzbyrne@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,

M O'Dwyer

Maria O'Dwyer

Connections and Developer Services

Appendix F

IGSL INFILTRATON REPORT

Appendix F

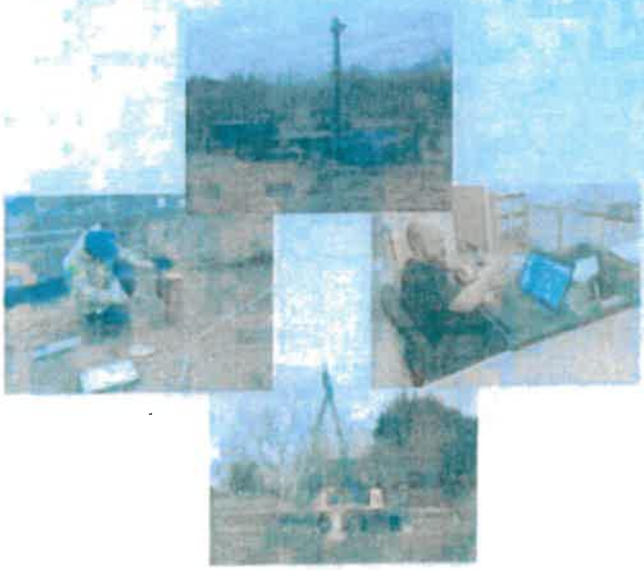
IGSL INFILTRATON REPORT

IGSL Limited

Westar Group

Dublin Road, Clane

Infiltration Test Report



Project No. 21680

April 2019

IGSL

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JSSL

Document Verification

Project: Dublin Road, Clane

Project No. 21680

Revision	Date	Title		
Rev 0	15/04/2019	Report		
	Copies	Document Format	Prepared By	Reviewed By
	1	Digital	Brian Green Chartered Engineer	David Green Chartered Engineer
	To	Westar Group		
Revision	Date	Title		
	Copies	Document Format	Prepared By	Reviewed By
	To			
Revision	Date	Title		
	Copies	Document Format	Prepared By	Reviewed By
	To			
Revision	Date	Title		
	Copies	Document Format	Prepared By	Reviewed By
	To			

IGSL Ltd.

Report on Infiltration Testing
At
Housing Development
Dublin Road, Clane
On behalf of
Westar Group

Report No. 21680

Contents

Appendices

Identity Code DO

Report on Infiltration Testing
At
Housing Development
Dublin Road, Clane
On behalf of
Westar Group

Report No. 21680 Date April 2019

1.0 Introduction

The proposed new housing development at Dublin Road, Clane will include a system for the storage and dispersion of storm water. Infiltration tests were, therefore, carried out to ascertain the suitability of the sub-soils for permeable pavement purposes.

2.0 Sub-soil conditions

The test pits revealed brown sandy clay with occasional gravel to the excavated depth of 0.65 metres. No groundwater was encountered during the course of excavation operations

3.0 Infiltration Testing

The infiltration tests were performed in accordance with BRE Digest 365 'Soakaway Design'.

To obtain a measure of the infiltration rate of the sub-soils, water was poured into each of the three test pits, and records taken of the fall in water level against time. This procedure was repeated twice more to ensure saturation of the sub-soils.

The infiltration rate is the volume of water dispersed per unit exposed area per unit of time, and is generally expressed as metres/minute or metres/second. Designs are based on the slowest infiltration rate, which is generally calculated from the final cycle.

The results for the final two stages of testing, following the saturation periods, are enclosed in appendix1.

4.0 Principles of Permeable Pavement

Permeable paving systems are designed to provide temporary storage of water in a reservoir of crushed stone underlying the paved area. In an attenuation system where the sub-soils are relatively impermeable the base and sides of the reservoir are lined with an impermeable membrane and the stored water is discharged through an outflow pipe to a suitable surface water system. Where the sub-soils can provide infiltration a geotextile replaces the impermeable liner. As an added precaution an overflow pipe can be installed to avoid flooding of the paved area in extreme storm conditions.

5.0 Results

The infiltration rates indicated by the field tests are shown in Table 1.

Location	Infiltration Rate (f-value)	
	* (First Cycle) (m/min)	* (Second Cycle) (m/min)
SA01	0.0003	0.0001
SA02	0.00007	0
SA03	0.00006	0
SA04	0.0002	0.00008
SA05	0.0023	0.002
SA06	0	
SA07	0	

* First and second measured cycles were preceded by saturation stages

Table 1

The results indicate that the soils in the vicinity of SA02, SA03, SA06 and SA07 are relatively impermeable.

Appendix 1 Infiltration Test Results

Soakaway Design f -value from field tests IGSL

Contract: Capdoo, Clane, Co. Kildare — Contract No. 21680
Test No. SA01 (First Cycle)
Engineer Westar Group
Date: 05.04.2019

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL	Dry
0.20	0.65	Firm brown/light brown sandy CLAY with rare gravel, locally very sandy	

Field Data

Depth to Water (m)	Elapsed Time (min)
0.220	0.00
0.220	1.00
0.230	2.00
0.230	3.00
0.230	4.00
0.230	5.00
0.230	6.00
0.230	7.00
0.230	8.00
0.230	9.00
0.230	10.00
0.230	12.00
0.230	14.00
0.230	16.00
0.230	18.00
0.240	20.00
0.250	25.00
0.250	30.00
0.260	40.00
0.270	50.00
0.270	60.00

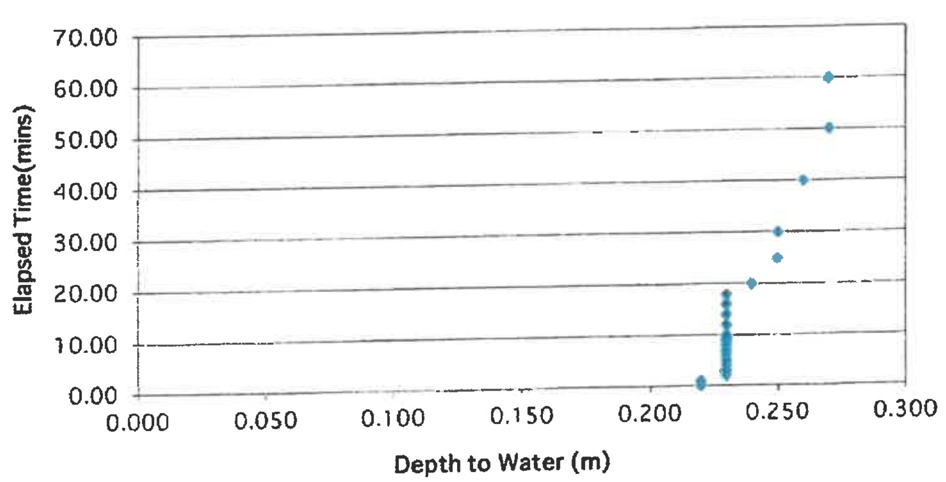
Field Test

Depth of Pit (D)	0.65	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.20	m
Initial depth to Water =	0.22	m
Final depth to water =	0.270	m
Elapsed time (mins)=	60.00	
Top of permeable soil	0.20	m
Base of permeable soil	0.65	m
Base area=	0.72	m2
*Av. side area of permeable stratum over test perio	1.458	m2
Total Exposed area =	2.178	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.0003 m/min or 4.59137E-06 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f -value from field tests IGSL

Contract: Capdoo, Clane, Co. Kildare — Contract No. 21680
Test No. SA01 (Second Cycle)
Engineer Westar Group
Date: 05.04.2019

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL	Dry
0.20	0.65	Firm brown/light brown sandy CLAY with rare gravel, locally very sandy	

Field Data

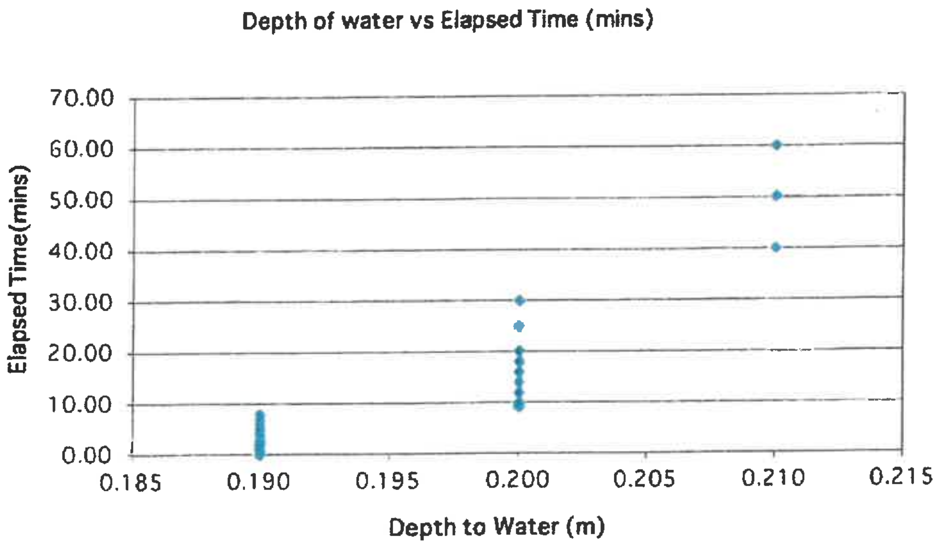
Depth to Water (m)	Elapsed Time (min)
0.190	0.00
0.190	1.00
0.190	2.00
0.190	3.00
0.190	4.00
0.190	5.00
0.190	6.00
0.190	7.00
0.190	8.00
0.200	9.00
0.200	10.00
0.200	12.00
0.200	14.00
0.200	16.00
0.200	18.00
0.200	20.00
0.200	25.00
0.200	30.00
0.210	40.00
0.210	50.00
0.210	60.00

Field Test

Depth of Pit (D)	0.65	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.20	m
Initial depth to Water =	0.19	m
Final depth to water =	0.210	m
Elapsed time (mins)=	60.00	
Top of permeable soil	0.20	m
Base of permeable soil	0.65	m
Base area=	0.72	m2
*Av. side area of permeable stratum over test perio	1.62	m2
Total Exposed area =	2.34	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.0001 m/min or 1.7094E-06 m/sec



Soakaway Design f -value from field tests IGSL

Contract: Capdoo, Clane, Co. Kildare — Contract No. 21680
Test No. SA02 (First Cycle)
Engineer Westar Group
Date: 05.04.2019

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL	Dry
0.20	0.60	Firm brown/light brown sandy CLAY with rare gravel	

Field Data

Depth to Water (m)	Elapsed Time (min)
0.300	0.00
0.300	1.00
0.310	2.00
0.310	3.00
0.310	4.00
0.310	5.00
0.310	6.00
0.310	7.00
0.310	8.00
0.310	9.00
0.310	10.00
0.310	12.00
0.310	14.00
0.310	16.00
0.310	18.00
0.310	20.00
0.310	25.00
0.310	30.00
0.310	40.00
0.310	50.00
0.310	60.00

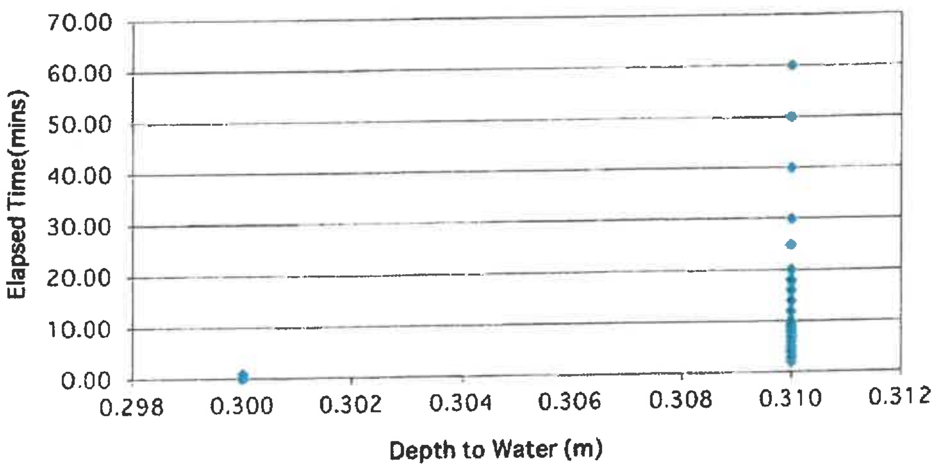
Field Test

Depth of Pit (D)	0.60	m
Width of Pit (B)	0.80	m
Length of Pit (L)	1.00	m
Initial depth to Water =	0.30	m
Final depth to water =	0.310	m
Elapsed time (mins)=	60.00	
Top of permeable soil	0.20	m
Base of permeable soil	0.60	m
Base area=	0.8	m2
*Av. side area of permeable stratum over test perio	1.062	m2
Total Exposed area =	1.862	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 7E-05 m/min or 1.19346E-06 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f -value from field tests IGSL

Contract: Capdoo, Clane, Co. Kildare — Contract No. 21680
Test No. SA02 (Second Cycle)
Engineer Westar Group
Date: 05.04.2019

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL	Dry
0.20	0.60	Firm brown/light brown sandy CLAY with rare gravel	

Field Data

Depth to Water (m)	Elapsed Time (min)
0.280	0.00
0.280	1.00
0.280	2.00
0.280	3.00
0.280	4.00
0.280	5.00
0.280	6.00
0.280	7.00
0.280	8.00
0.280	9.00
0.280	10.00
0.280	12.00
0.280	14.00
0.280	16.00
0.280	18.00
0.280	20.00
0.280	25.00
0.280	30.00
0.280	40.00
0.280	50.00
0.280	60.00

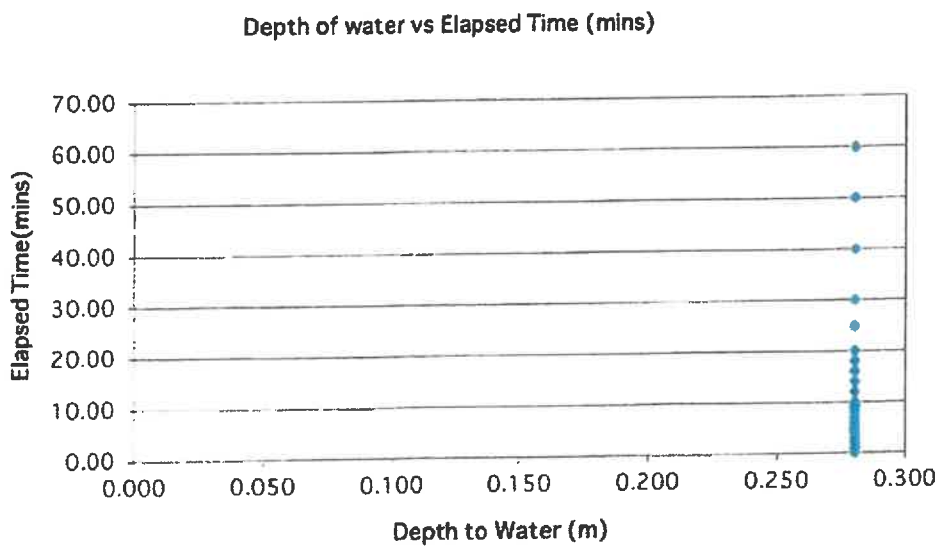
Field Test

Depth of Pit (D)	0.60	m
Width of Pit (B)	0.80	m
Length of Pit (L)	1.00	m
Initial depth to Water =	0.28	m
Final depth to water =	0.280	m
Elapsed time (mins)=	60.00	
Top of permeable soil	0.20	m
Base of permeable soil	0.60	m

Base area=	0.8	m2
*Av. side area of permeable stratum over test perio	1.152	m2
Total Exposed area =	1.952	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Soakaway Design f -value from field tests

IGSL

Contract: Capdoo, Clane, Co. Kildare — Contract No. 21680
Test No. SA03 (First Cycle)
Engineer Westar Group
Date: 04.04.2019

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL	Dry
0.20	0.65	Firm brown/brownish grey very sandy SILT with occasional gravel, gravel content increases with depth	

Field Data

Depth to Water (m)	Elapsed Time (min)
0.280	0.00
0.280	1.00
0.280	2.00
0.280	3.00
0.280	4.00
0.280	5.00
0.280	6.00
0.280	7.00
0.280	8.00
0.280	9.00
0.280	10.00
0.280	12.00
0.280	14.00
0.280	16.00
0.280	18.00
0.280	20.00
0.280	25.00
0.280	30.00
0.280	40.00
0.290	50.00
0.290	60.00

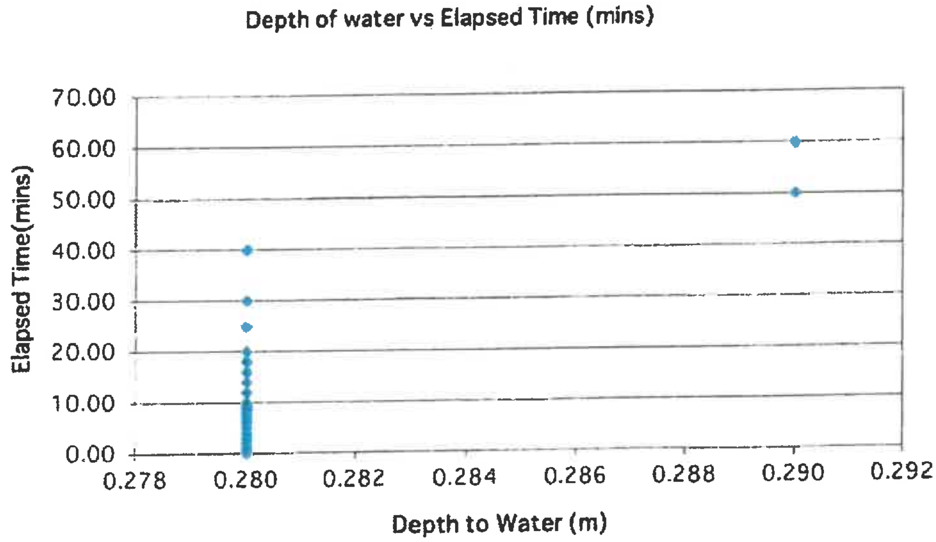
Field Test

Depth of Pit (D)	0.65	m
Width of Pit (B)	0.80	m
Length of Pit (L)	1.00	m
Initial depth to Water =	0.28	m
Final depth to water =	0.290	m
Elapsed time (mins)=	60.00	
Top of permeable soil	0.20	m
Base of permeable soil	0.65	m

Base area=	0.8	m2
*Av. side area of permeable stratum over test perio	1.314	m2
Total Exposed area =	2.114	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 6E-05 m/min or 1.05119E-06 m/sec



Soakaway Design f -value from field tests

IGSL

Contract: Capdoo, Clane, Co. Kildare
Contract No. 21680
Test No. SA03 (Second Cycle)
Engineer Westar Group
Date: 04.04.2019

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL	Dry
0.20	0.65	Firm brown/brownish grey very sandy SILT with occasional gravel, gravel content increases with depth	

Field Data

Depth to Water (m)	Elapsed Time (min)
0.260	0.00
0.260	1.00
0.260	2.00
0.260	3.00
0.260	4.00
0.260	5.00
0.260	6.00
0.260	7.00
0.260	8.00
0.260	9.00
0.260	10.00
0.260	12.00
0.260	14.00
0.260	16.00
0.260	18.00
0.260	20.00
0.260	25.00
0.260	30.00
0.260	40.00
0.260	50.00
0.260	60.00

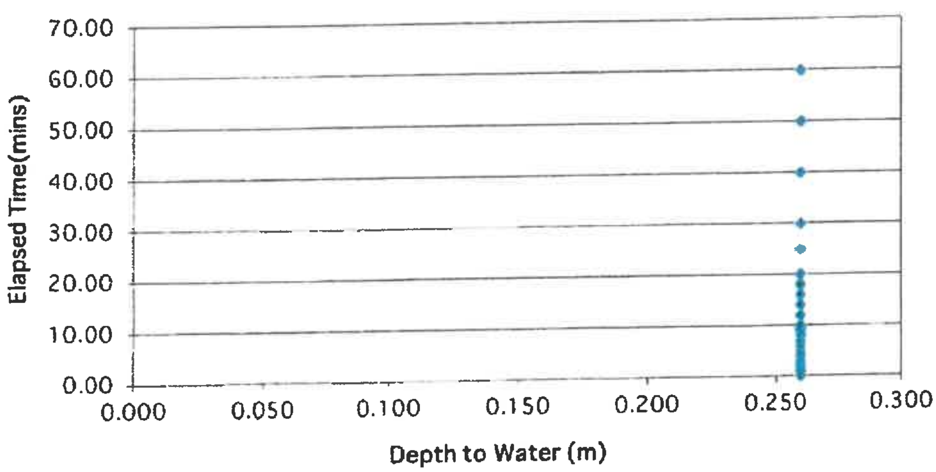
Field Test

Depth of Pit (D)	0.65	m
Width of Pit (B)	0.80	m
Length of Pit (L)	1.00	m
Initial depth to Water =	0.26	m
Final depth to water =	0.260	m
Elapsed time (mins)=	60.00	
Top of permeable soil	0.20	m
Base of permeable soil	0.65	m
Base area=	0.8	m2
*Av. side area of permeable stratum over test perio	1.404	m2
Total Exposed area =	2.204	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f -value from field tests

IGSL

Contract: Capdoo, Clane, Co. Kildare

Contract No. 21680

Test No. SA04 (First Cycle)

Engineer Westar Group

Date: 04.04.2019

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL	Dry
0.20	0.65	Firm brown slightly sandy SILT with rare gravel	

Field Data

Depth to Water (m)	Elapsed Time (min)
0.480	0.00
0.480	1.00
0.480	2.00
0.480	3.00
0.480	4.00
0.480	5.00
0.480	6.00
0.480	7.00
0.480	8.00
0.480	9.00
0.480	10.00
0.480	12.00
0.480	14.00
0.480	16.00
0.480	18.00
0.480	20.00
0.480	25.00
0.490	30.00
0.490	40.00
0.490	50.00
0.500	60.00

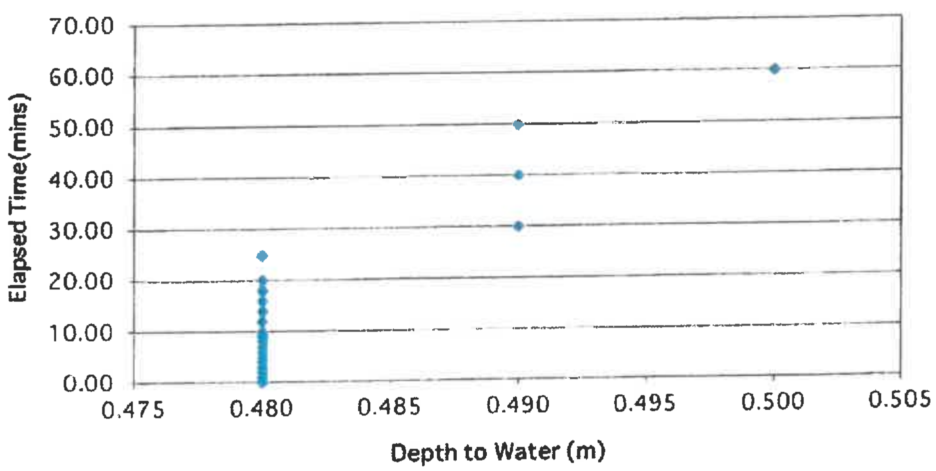
Field Test

Depth of Pit (D)	0.65	m
Width of Pit (B)	0.80	m
Length of Pit (L)	1.40	m
Initial depth to Water =	0.48	m
Final depth to water =	0.500	m
Elapsed time (mins)=	60.00	
Top of permeable soil	0.20	m
Base of permeable soil	0.65	m
Base area=	1.12	m2
*Av. side area of permeable stratum over test perio	0.704	m2
Total Exposed area =	1.824	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.0002 m/min or 3.41131E-06 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design   f -value from field tests   IGSL

Contract No. 21680

Contract: Capdoo, Clane, Co. Kildare
Test No. SA04 (Second Cycle)
Engineer Westar Group
Date: 04.04.2019

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL	Dry
0.20	0.65	Firm brown slightly sandy SILT with rare gravel	

Field Data

Depth to Water (m)	Elapsed Time (min)
0.360	0.00
0.360	1.00
0.360	2.00
0.360	3.00
0.360	4.00
0.360	5.00
0.360	6.00
0.360	7.00
0.360	8.00
0.360	9.00
0.360	10.00
0.360	12.00
0.360	14.00
0.360	16.00
0.360	18.00
0.360	20.00
0.360	25.00
0.360	30.00
0.360	40.00
0.360	50.00
0.370	60.00

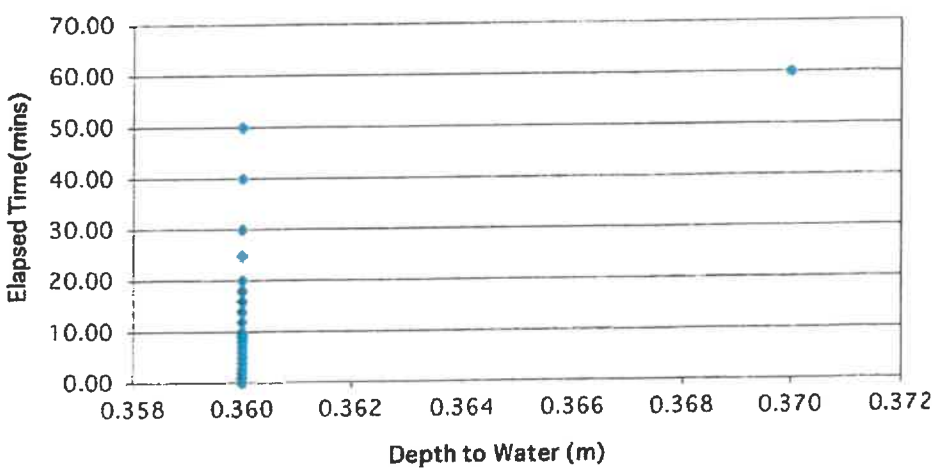
Field Test

Depth of Pit (D)	0.65	m
Width of Pit (B)	0.80	m
Length of Pit (L)	1.40	m
Initial depth to Water	0.36	m
Final depth to water	0.370	m
Elapsed time (mins)	60.00	
Top of permeable soil	0.20	m
Base of permeable soil	0.65	m
Base area=	1.12	m2
*Av. side area of permeable stratum over test perio	1.254	m2
Total Exposed area =	2.374	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 8E-05 m/min or 1.31049E-06 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f -value from field tests

IGSL

Contract: Capdoo, Clane, Co. Kildare

Contract No. 21680

Test No. SA05 (First Cycle)

Engineer Westar Group

Date: 04.04.2019

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Medium dense grey very silty GRAVELwith brick fragments	Dry
0.20	0.70	Firm brownish grey/grey sandy very gravelly SILT with rare cobbles up to 1	

Field Data

Depth to Water (m)	Elapsed Time (min)
0.440	0.00
0.450	1.00
0.450	2.00
0.450	3.00
0.450	4.00
0.450	5.00
0.450	6.00
0.460	7.00
0.460	8.00
0.460	9.00
0.470	10.00
0.470	12.00
0.480	14.00
0.490	16.00
0.490	18.00
0.500	20.00
0.520	25.00
0.550	30.00
0.590	40.00
0.630	50.00
0.670	60.00

Field Test

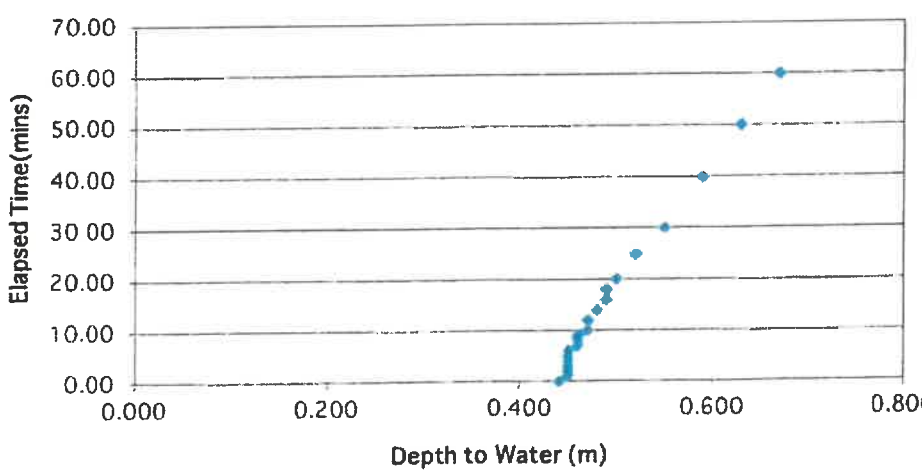
Depth of Pit (D)	0.70	m
Width of Pit (B)	0.80	m
Length of Pit (L)	1.00	m
Initial depth to Water =	0.44	m
Final depth to water =	0.670	m
Elapsed time (mins)=	60.00	
Top of permeable soil	0.20	m
Base of permeable soil	0.70	m

Base area=	0.8	m2
*Av. side area of permeable stratum over test perio	0.522	m2
Total Exposed area =	1.322	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.0023 m/min or 3.8662E-05 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f -value from field tests

IGSL

Contract No. 21680

Contract: Capdoo, Clane, Co. Kildare
Test No. SA05 (Second Cycle)
Engineer Westar Group
Date: 04.04.2019

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Medium dense grey very silty GRAVELwith brick fragments	Dry
0.20	0.70	Firm brownish grey/grey sandy very gravelly SILT with rare cobbles up to 1	

Field Data

Depth to Water (m)	Elapsed Time (min)
0.530	0.00
0.530	1.00
0.530	2.00
0.540	3.00
0.540	4.00
0.540	5.00
0.550	6.00
0.550	7.00
0.550	8.00
0.560	9.00
0.560	10.00
0.560	12.00
0.570	14.00
0.570	16.00
0.580	18.00
0.590	20.00
0.600	25.00
0.620	30.00
0.650	40.00
0.680	50.00
0.700	60.00

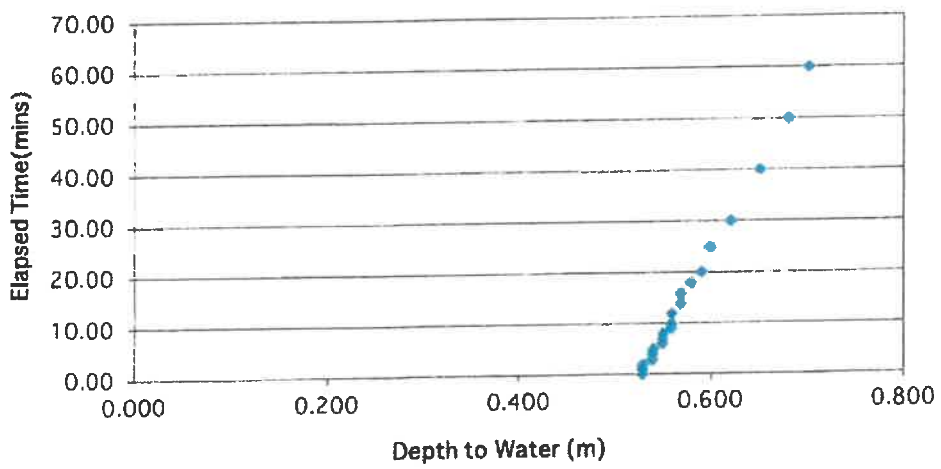
Field Test

Depth of Pit (D)	0.70	m
Width of Pit (B)	0.80	m
Length of Pit (L)	1.00	m
Initial depth to Water =	0.53	m
Final depth to water =	0.700	m
Elapsed time (mins)=	60.00	
Top of permeable soil	0.20	m
Base of permeable soil	0.70	m
Base area=	0.8	m2
*Av. side area of permeable stratum over test perio	0.306	m2
Total Exposed area =	1.106	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.002 m/min or 3.41571E-05 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f -value from field tests IGSL

Contract: Capdoo, Clane, Co. Kildare — Contract No. 21680
Test No. SA06 (First Cycle)
Engineer Westar Group
Date: 04.04.2019

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL	Seepage at 1.8m
0.20	0.70	Stiff brown/brownish grey sandy CLAY with rare to occasional gravel	
0.70	1.30	Firm brownsh grey very sandy CLAY with occasional gravel	
1.30	2.00	Firm light brownish grey clayey SAND with rare gravel	

Field Data

Depth to Water (m)	Elapsed Time (min)
1.410	0.00
1.400	1.00
1.400	2.00
1.390	3.00
1.380	4.00
1.370	5.00
1.370	6.00
1.360	7.00
1.360	8.00
1.350	9.00
1.350	10.00
1.340	12.00
1.330	14.00
1.320	16.00
1.310	18.00
1.300	20.00
1.290	25.00
1.280	30.00

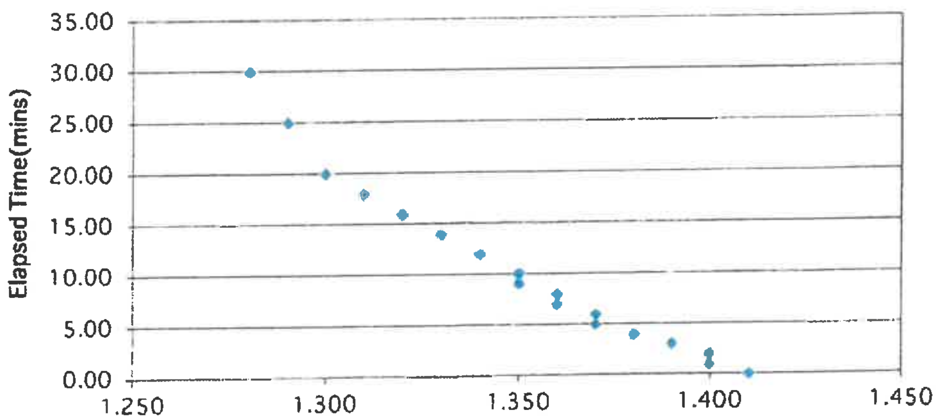
Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.80	m
Length of Pit (L)	1.50	m
Initial depth to Water =	1.41	m
Final depth to water =	1.280	m
Elapsed time (mins)=	30.00	
Top of permeable soil	0.20	m
Base of permeable soil	2.00	m
Base area=	1.2	m2
*Av. side area of permeable stratum over test perio	3.013	m2
Total Exposed area =	4.213	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f -value from field tests IGSL

Contract: Capdoo, Clane, Co. Kildare — Contract No. 21680
Test No. SA07 (First Cycle)
Engineer Westar Group
Date: 05.04.2019

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL	Seepage at 1.75m
0.20	0.90	Firm brown/light brown sandy CLAY with rare gravel	
0.90	2.10	Firm grey/brownish grey very sandy CLAY with occasional gravel, contains very clayey sand pockets	

Field Data

Depth to Water (m)	Elapsed Time (min)
1.120	0.00
1.120	1.00
1.110	2.00
1.110	3.00
1.110	4.00
1.110	5.00
1.110	6.00
1.110	7.00
1.100	8.00
1.100	9.00
1.100	10.00
1.100	12.00
1.090	14.00
1.090	16.00
1.080	18.00
1.070	20.00
1.070	25.00
1.070	30.00

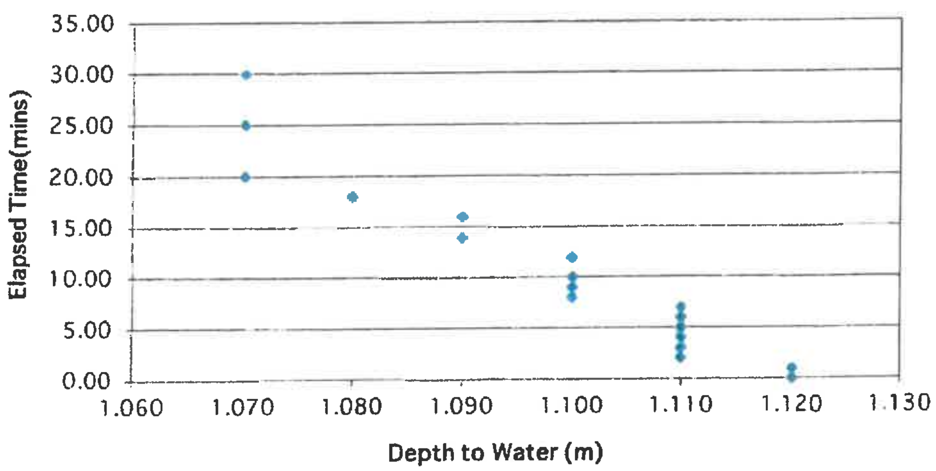
Field Test

Depth of Pit (D)	2.10	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.40	m
Initial depth to Water =	1.12	m
Final depth to water =	1.070	m
Elapsed time (mins)=	30.00	
Top of permeable soil	0.20	m
Base of permeable soil	2.10	m
Base area=	0.84	m2
*Av. side area of permeable stratum over test perio	4.02	m2
Total Exposed area =	4.86	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec

Depth of water vs Elapsed Time (mins)

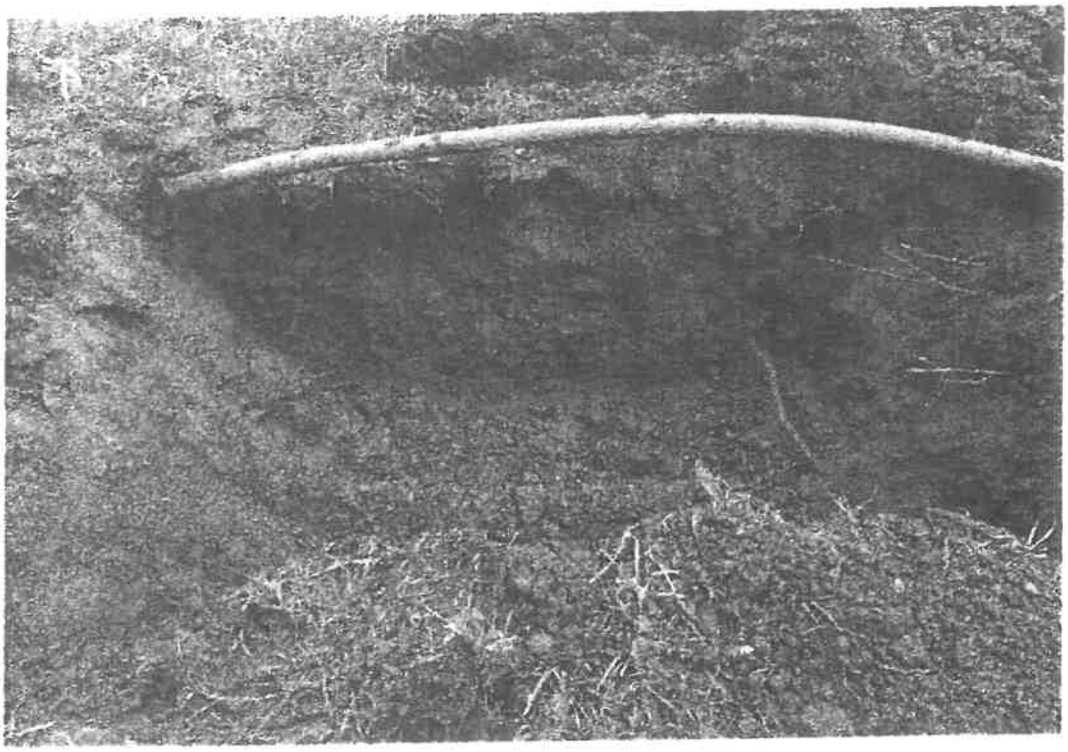


Appendix 2 Photographs

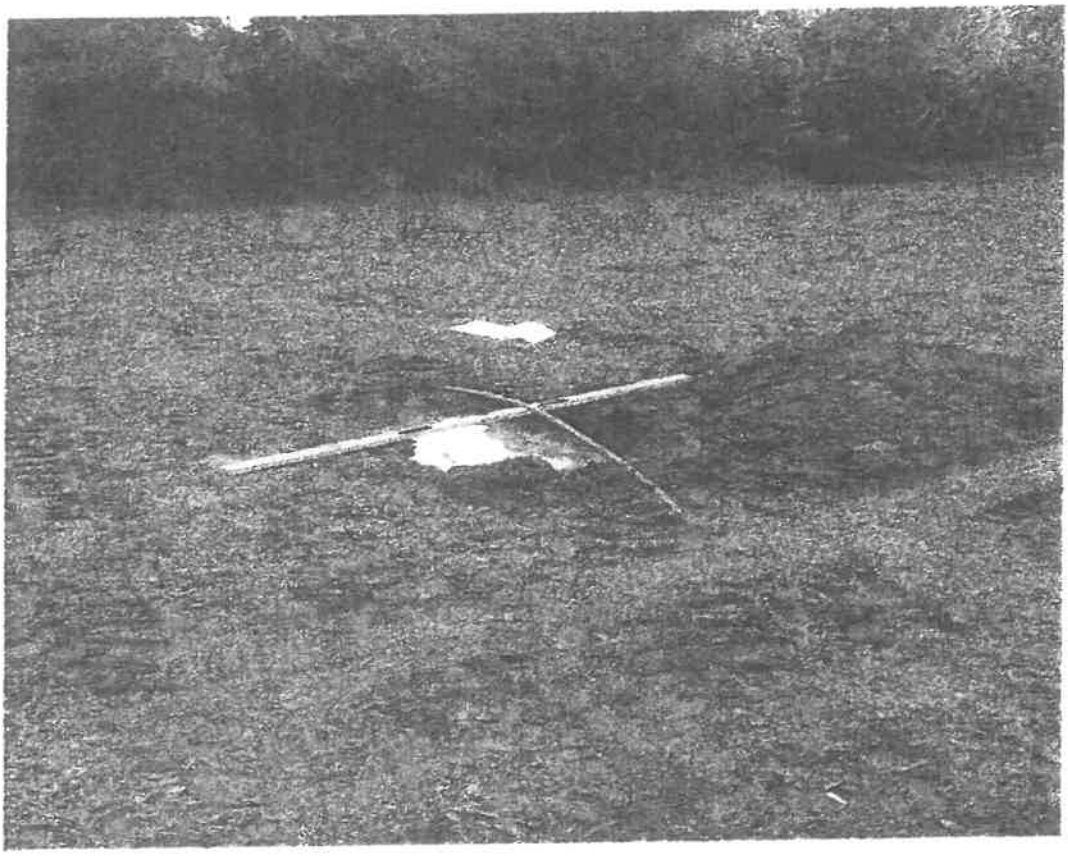
SA01 1 of 4

SA01 2 of 4

SA01 3 of 4



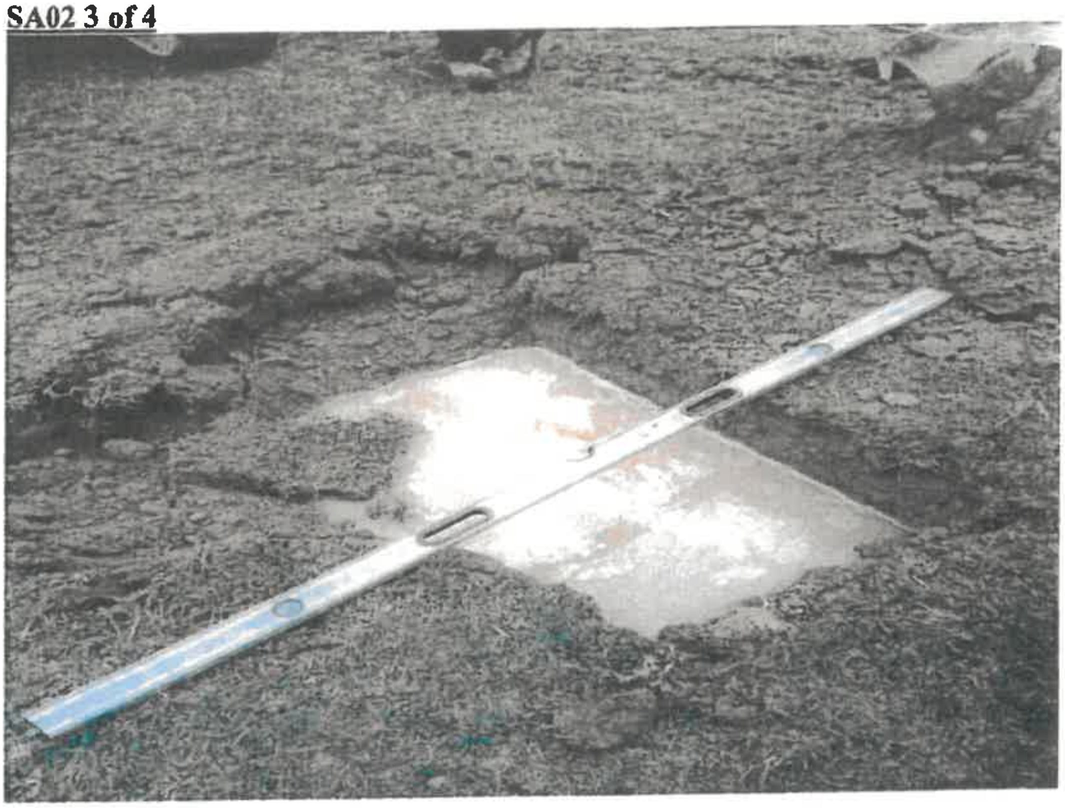
SA01 4 of 4



SA02 1 of 4

SA02 2 of 4

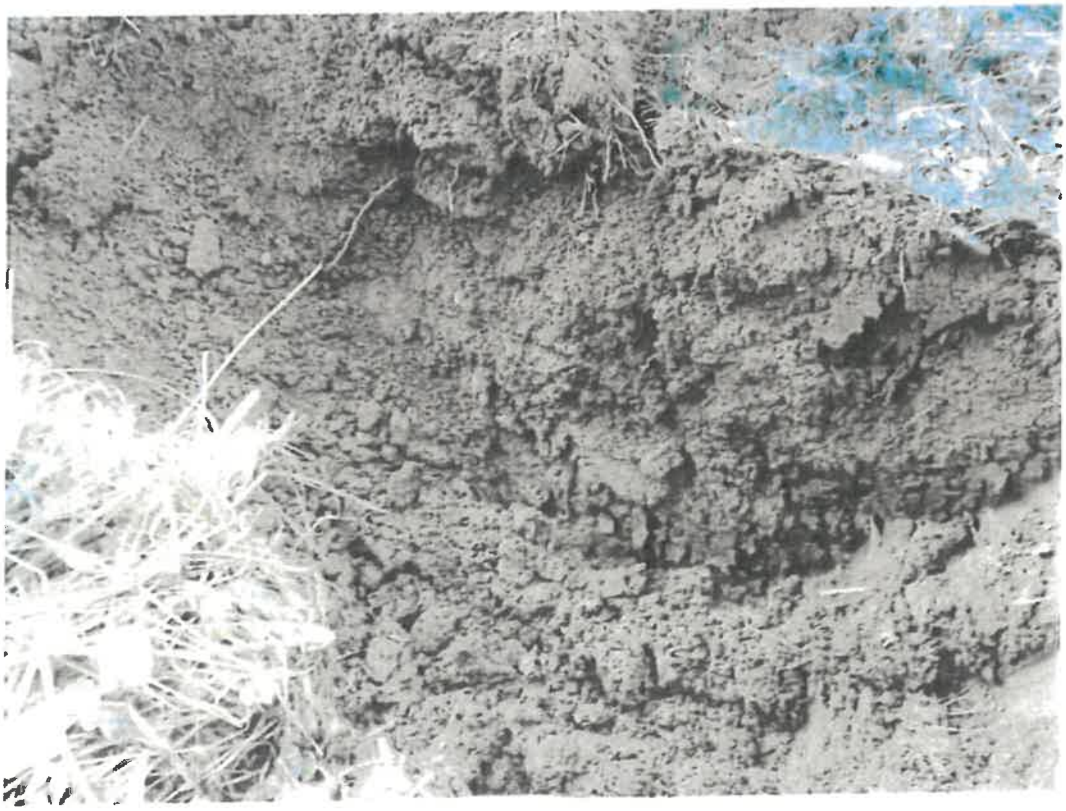
SA02 3 of 4



SA02 4 of 4

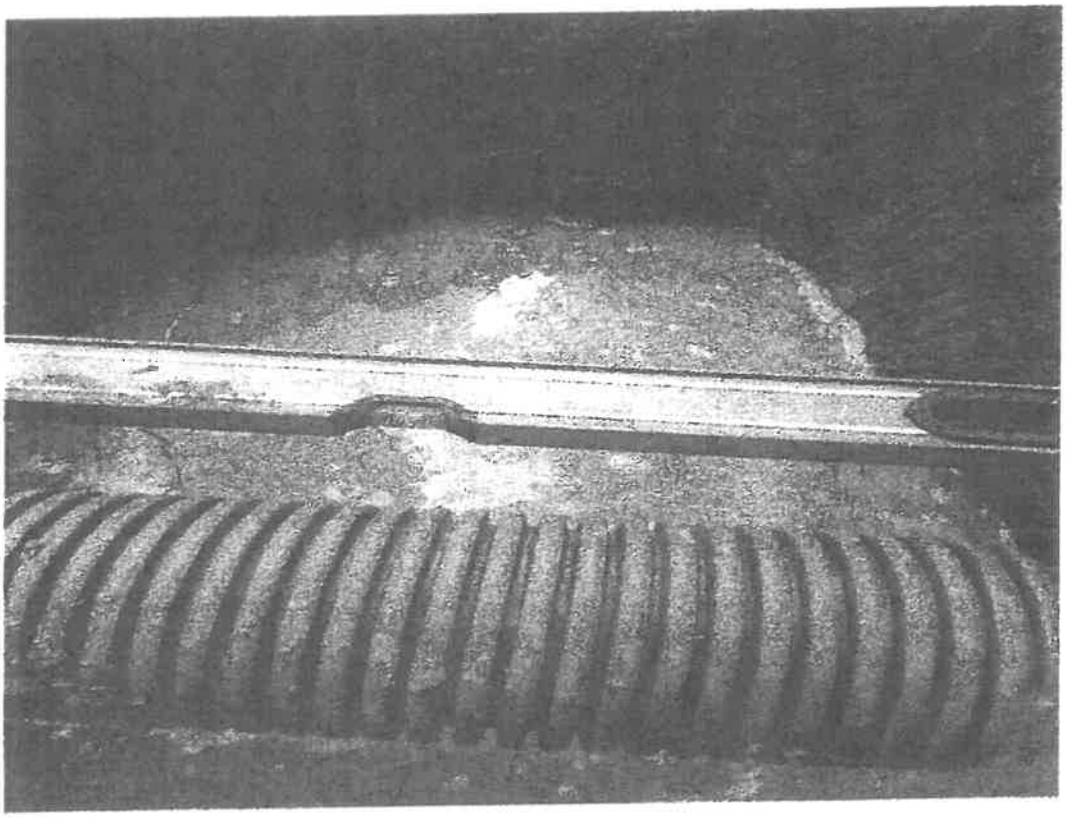
SA03 1 of 4

SA03 2 of 4



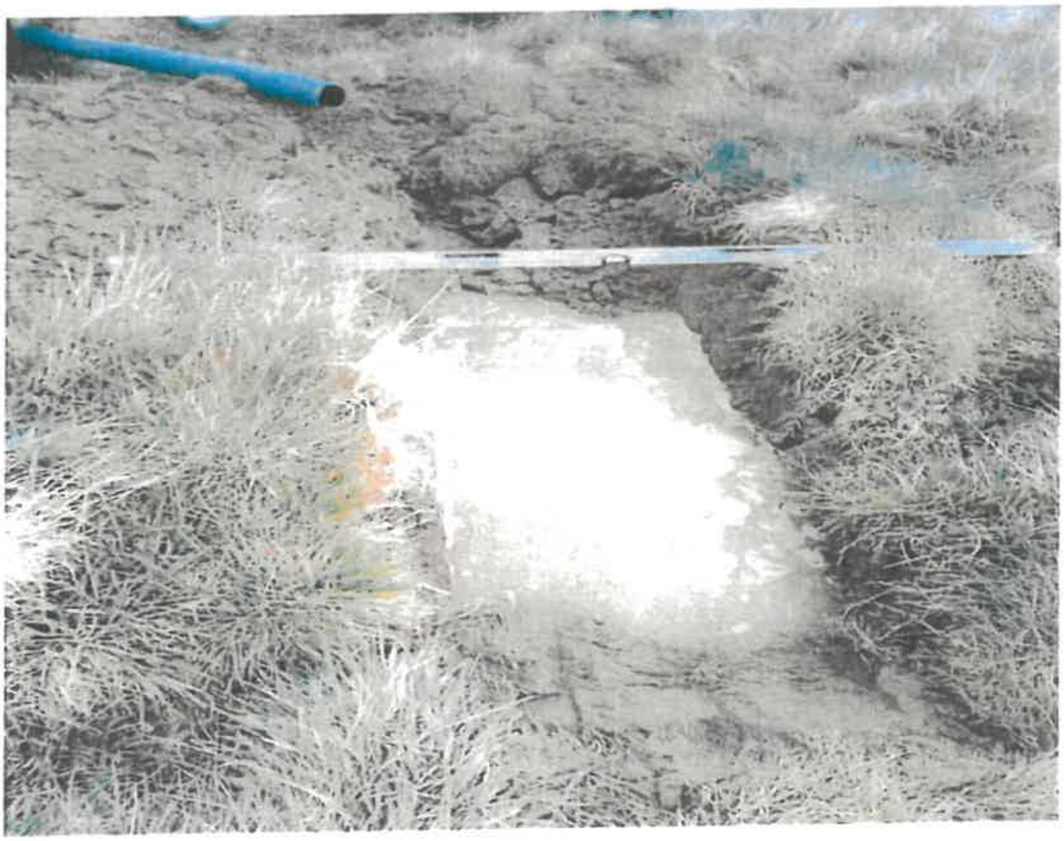
SA03 3 of 4

SA03 4 of 4



SA04 1 of 3

SA04 2 of 3

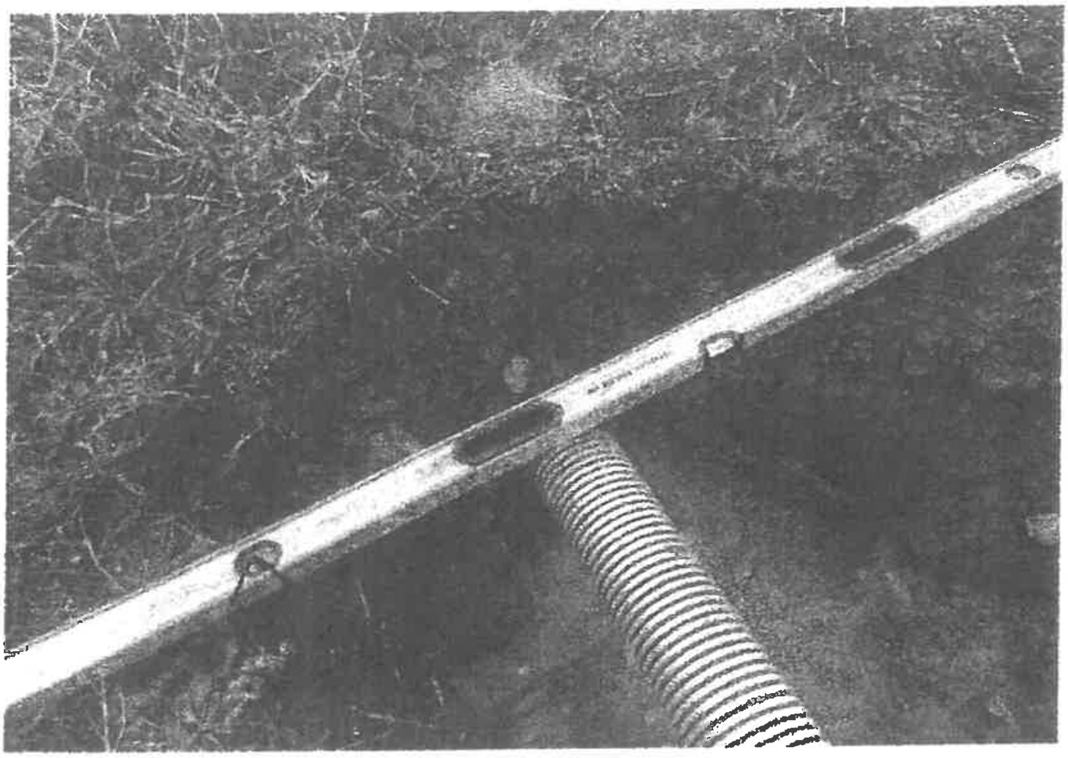


SA04 3 of 3

SA05 1 of 3

SA05 2 of 3

SA05 3 of 3



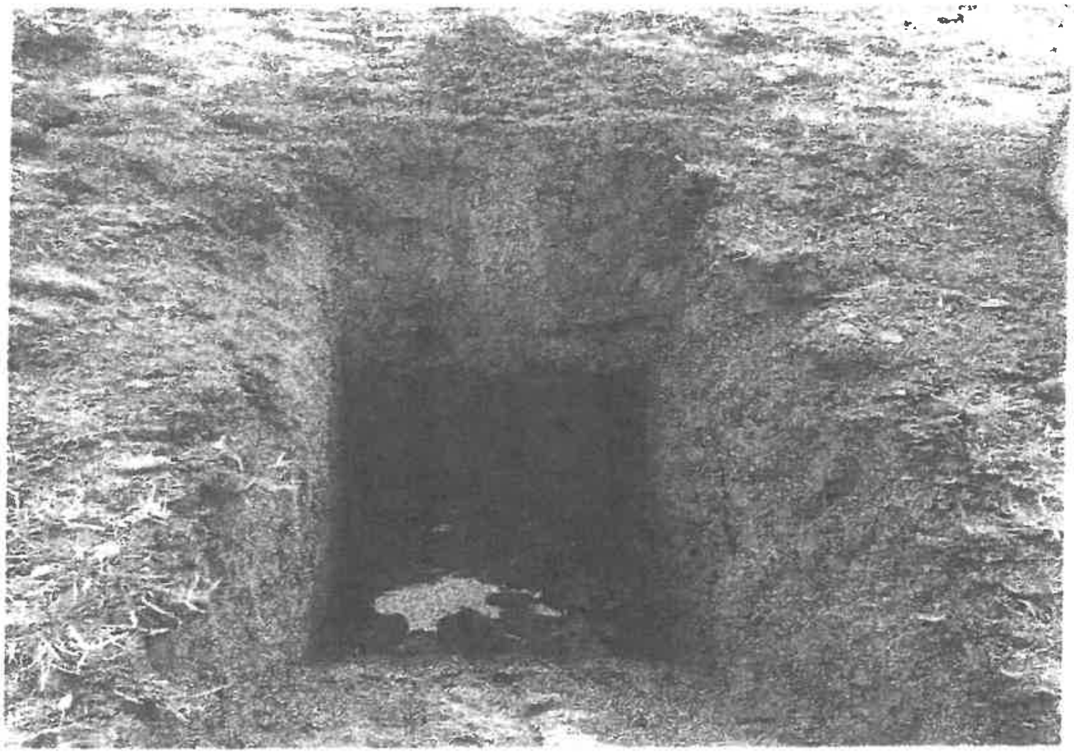
SA06 1 of 4

SA06 2 of 4

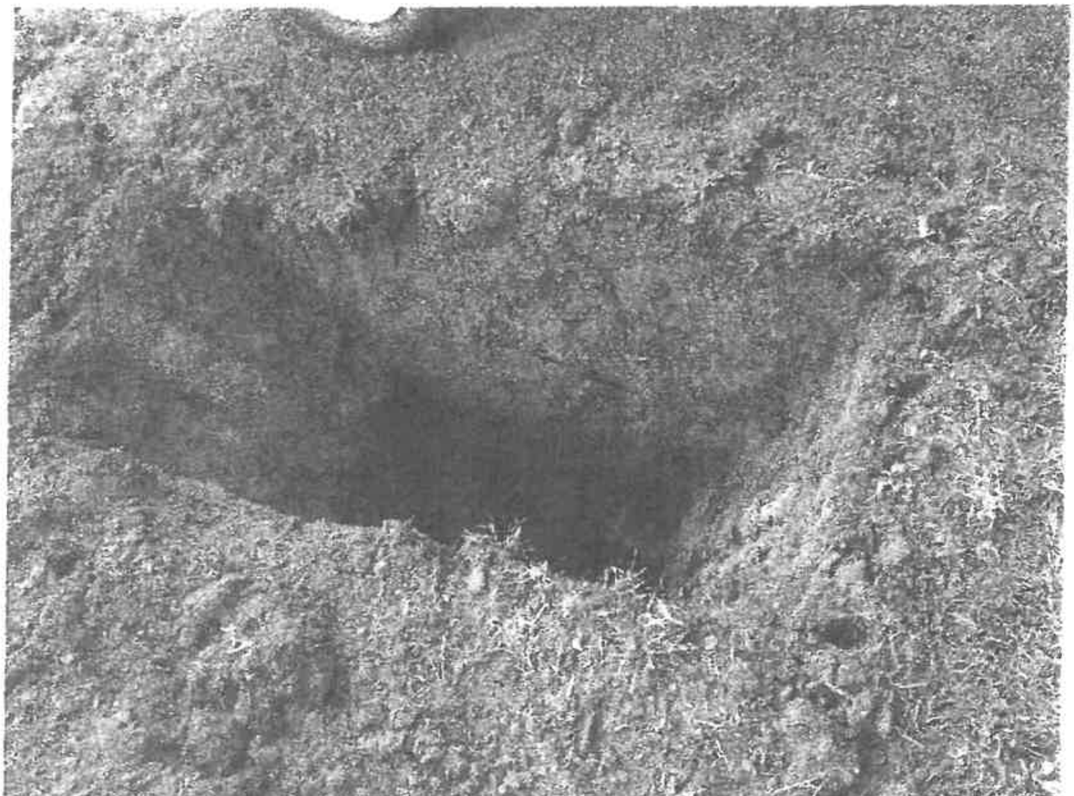
SA06 3 of 4

SA06 4 of 4

SA07 1 of 5

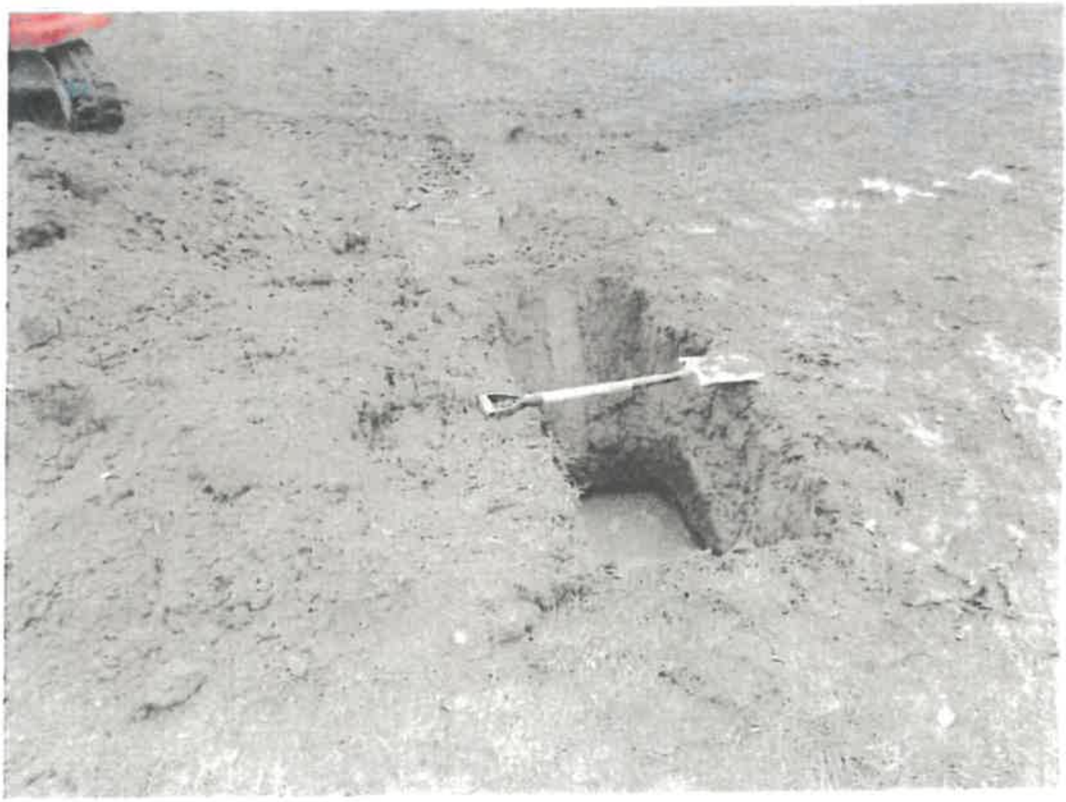


SA07 2 of 5



SA07 3 of 5

SA07 4 of 5



SA07 5 of 5

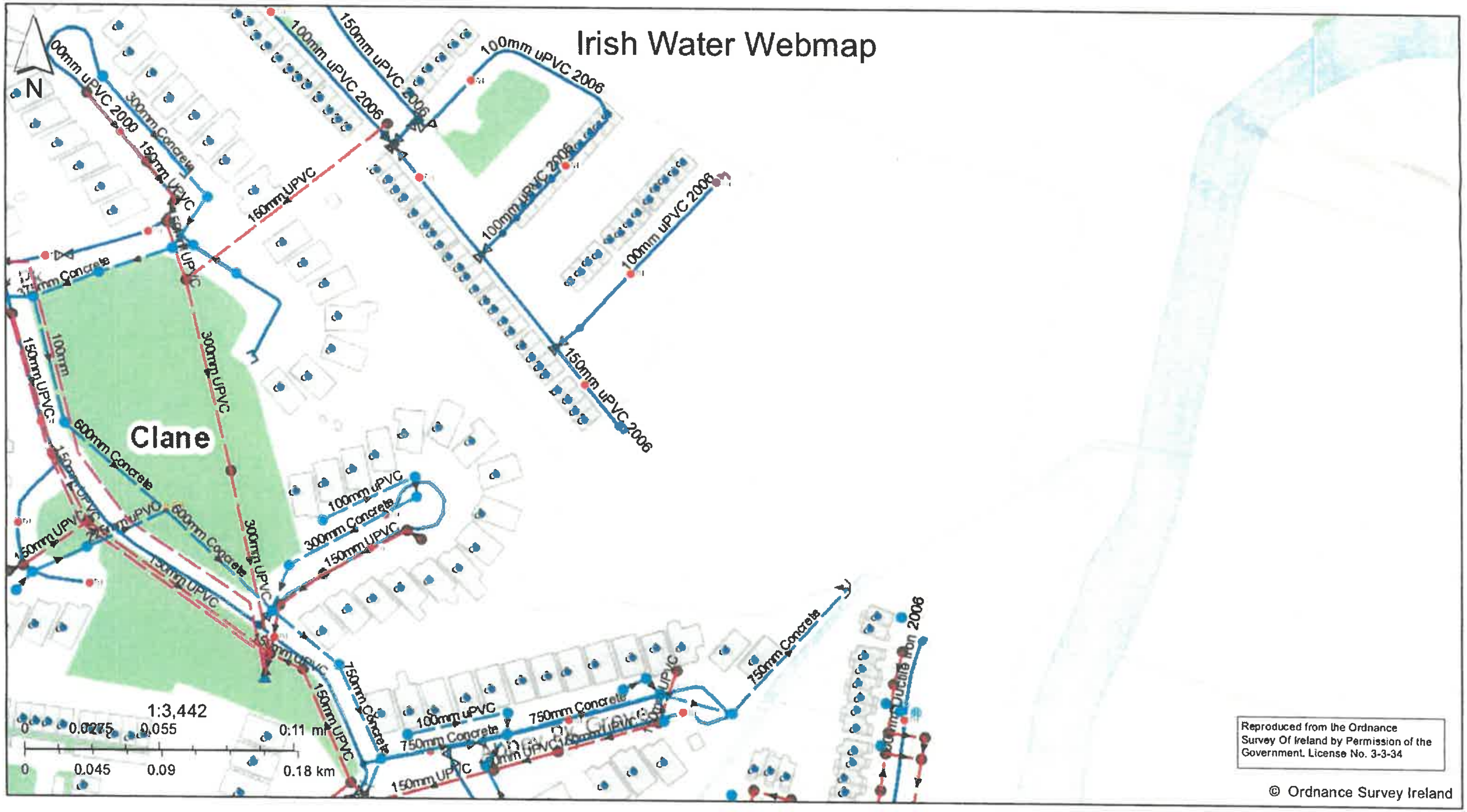
Appendix 3 Site Plan


Autoline Car Sales
Lidl
Maxol Behans
Capdoo Park
Capdoo Ave
Tesco Metro
Kinesicare
Clane Motor Factors
Clane Tennis Club
Central Park
Abbey Park View
Central Park Ave
SA1
SA2
SA3
SA4
SA5
SA6
SA7
3D
Google
Imagery ©2019 Google, Map data ©2019 Google
Ireland
Terms
Send feedback
100 m

Appendix G

IRISH WATER MAPS

Irish Water Webmap



4/24/2019 1:18:18 PM

Legend

Stormwater Gravity Mains (Irish Water Owned)

- Surface

Stormwater Gravity Mains (Non-Irish Water Owned)

- Surface

Storm Manholes

- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other; Unknown

UISCE ÉIREANN IRISH WATER

Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland. It should not be relied upon in the event of excavations or other works being carried out in the vicinity of the network. The onus is on the parties carrying out the works to ensure the exact location of the network is identified prior to mechanical works being carried out. Service pipes are not generally shown but their presence should be

"Gas Networks Ireland (GNI), their affiliates and assigns, accept no responsibility for any information contained in this document concerning location and technical designation of the gas distribution and transmission network ("the Information"). Any representations and warranties express or implied, are excluded to the fullest extent permitted by law. No liability shall be accepted for any loss or damage including, without limitation, direct, indirect, special, incidental, punitive or consequential loss including loss of profits, arising out of or in connection with the use of the Information (including maps or mapping data). NOTE: DIAL BEFORE YOU DIG Phone 1850 427 747 or e-mail dig@gasnetworks.ie – The actual position of the gas/electricity distribution and transmission network must be verified on site before any mechanical excavating takes place. If any mechanical excavation is proposed, hard copy maps must be requested from GNI re gas. All work in the vicinity of the gas distribution and transmission network must be completed in accordance with the current edition of the Health & Safety Authority publication, 'Code of Practice For Avoiding Danger From Underground Services' which is available from the Health and Safety Authority (1890 28 93 89) or can be downloaded free of charge at www.hsa.ie."

Appendix H

IRISH WATER LETTER OF DESIGN ACCEPTANCE

UISCE ÉIREANN : IRISH WATER

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

Patrick Fadden
Capdoo
Dublin Road
Clane, Kildare W91NNK2

26 November 2020

Re: Design Submission for Capdoo Commons, Clane, Kildare (the "Development") (the "Design Submission") / Connection Reference No: CDS19006765

Dear Patrick Fadden,

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, Irish Water has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before you can connect to our network you must sign a connection agreement with Irish Water. This can be applied for by completing the connection application form at www.water.ie/connections. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities (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 Irish Water's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Irish Water does not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Irish Water representative:
Name: Kevin McManmon
Phone: 018230374
Email: kmcmanmon@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

- 20017 304-1-B Water Services Layout 201126 DC
- 20017 304-2-B Water Services Layout 201126 DC
- 20017 300 -Site Layout Services 201117 DC-303-1 Sewer Sections (100)
- 20017 300 -Site Layout Services 201117 DC-303-2 Sewer Sections (200)
- 20017 300 -Site Layout Services 201117 DC-304 Foul & Surface Layout

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 Irish Water will not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.