Project

Residential Development,
Capdoo,
Clane,
Co. Kildare

Report Title

Infrastructure Design Report

May 2019

Document Control

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Author:	Emma Daly
Reviewed By:	Brendan Keogh
Approved By:	
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DBFL Consulting Engineers

Dublin Office
Ormond House
Upper Ormond Quay
Dublin 7

Tel 01 4004000
Fax 01 4004050
Email info@dbfl.ie
Web www.dbfl.ie

Waterford Office
Unit 2
The Chandlery
1-2 O'Connell Street, Waterford

Tel 051 309500
Fax 051 844913
Email info@dbfl.ie
Web www.dbfl.ie

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-	Sep 2018	For ABP Pre-App Meeting	ED	BK	
A	Sep 2018	For ABP Pre-App Meeting -update	ED	BK	
B	**May 2019**	**For SHD Application**	**ED**	**BK**	

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1. INTRODUCTION

1.1 Background

DBFL have been instructed to prepare an Infrastructure Design Report to accompany a planning application for a proposed residential development at Capdoo, Clane, Co. Kildare.

The proposed development (“the site”) comprises of 366 residential dwellings and a one-storey childcare facility on a 11.442 Ha site (approximately 0.7km north of Clane Town Centre).

The Net Developable Area is approximately 9.6778 Ha (omitting Capdoo Link Road, upgrade of Brooklands / Capdoo Link Junction and construction of the site’s surface water outfall).

The site is identified as “Key Development Area 2” (KDA) in the Clane Local Area Plan (2017-2023) and is zoned “New Residential / Infill”.

1.2 Objectives

This report provides information regarding the existing site and addresses the infrastructural demands of the proposed development including the following:

- Site Access and Road Layout
- Surface Water Drainage
- Flood Risk
- Foul Drainage
- Water Supply

1.3 Location

The site (currently greenfield) is situated in the northern environs of Clane town (refer to Figure 1.1) and is currently in agricultural use. A farm-house and stables are located adjacent to the eastern boundary.

Capdoo Park is located to the south of the site and Mainham Woods and College Road East are located to the west of the site. Rural roads are located to the north and east of the site (“Capdoo Common”). Several existing residential dwellings are located along these rural roads.

The proposed route of the Capdoo Link Road (refer to Figure 1.2) traverses the site (linking the Kilcock Road to Celbridge Road).

Figure 1.1 Extract from myplan.ie viewer (Site Boundary Indicative Only).

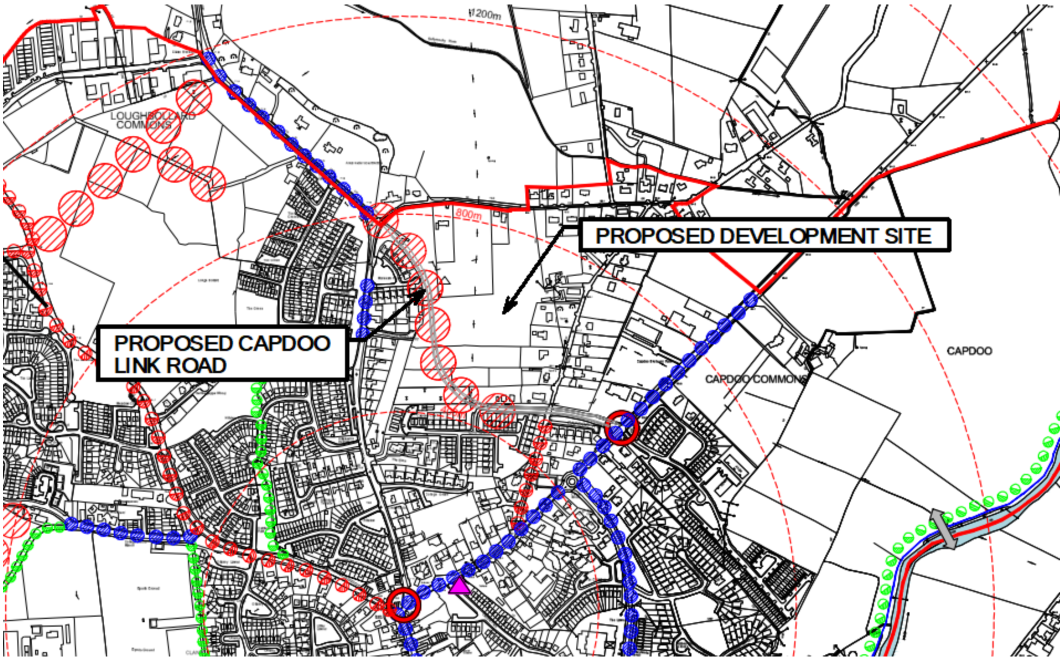


Figure 1.2 Extract from Clane LAP (Map Ref. 8.1 Capdoo Link Road)

1.4 Topography

The site generally falls from west to east at gradients ranging from 1/15 to 1/100. (refer to Appendix A for Topographic Survey Plans prepared by Land Surveys).

The north west corner of the site is elevated above the adjacent R407 road but also below the central area of the site. As such, existing surface gradients across the site have been a key factor in regard to design of roads levels, finished floor levels, surface water drainage and foul drainage.

Existing topographic survey information is shown in the background of the Proposed Road Layout Plans (refer to DBFL Drawing No's. 162074-2000, 162074-2001, 162074-2002 and 162074-2003).

1.5 Proposed Development

The proposed development comprises of 366 residential dwellings and a one-storey childcare facility. Refer to McCrossan O Rourke Manning's Schedule of Accommodation and Site Layout Plans for further detail.

The development will also include the following associated engineering infrastructure:

- Construction of the Capdoo Link Road (which will also facilitate primary access to the proposed development) and associated roundabout on the R407 (Kilcock Road).
- Provision of pedestrian and cycle facilities at the junction of Capdoo Park / Capdoo Lane.
- A secondary site access to the proposed development off the rural road to the north of the site (including upgrade of the local road from the proposed roundabout on the Kilcock Road to the proposed site access).
- Facilitation of potential future pedestrian links through adjacent lands (refer to DBFL Drawing 162074-2020).
- Provision of internal site road network including associated footpaths.
- Provision of surface water drainage, foul drainage and water supply connections.
- Provision of a foul pumping station discharging to the existing 225mm diameter public foul drain located south-east of the site (adjacent to Capdoo Avenue).

2. LAP MOVEMENT OBJECTIVES, SITE ACCESS AND STREET LAYOUT

2.1 Capdoo Link Road

The proposed Capdoo Link Road traverses the site linking the Kilcock Road R407 at the north west corner of the site to Capdoo park at the south east corner of the site (refer to Figure 2.1). This road scheme is listed as a "Priority Road Scheme" in the Kildare County Council Development Plan 2017 – 2023 (Priority Road and Bridge Projects, Table 6.1) and forms part of the proposed strategic road network. It is proposed to deliver this roads objective as part of the proposed development (as it will facilitate access to the site).

DBFL Drawing 162074-2000 outlines a preliminary alignment (vertical and horizontal) for the Capdoo Link Road. A typical cross section is also shown and has been discussed and agreed with KCC's Roads Department (7.0m wide carriageway, 2.0m wide cycleway adjacent to carriageway and 2.0m wide footpath adjacent to cycleway). A pedestrian crossing point is also proposed adjacent to the creche (linking the south-west corner of the site to the portion of the site east of the link road). Potential pedestrian / cycle link can also be created from the link road to College Road East and from the development to the rural road to the north.

The proposed alignment shown on DBFL Drawing 162074-2000 is based on KCC's Part 8 Public Display Drawings (refer to Appendix E).

Figure 2.1 Alignment of Capdoo Link Road (Site Boundary Indicative Only)

2.2 Other Movement Objectives from Clane LAP

Capdoo Park / Brooklands Junction

Upgrade of the Capdoo Park / Brooklands Junction (on the Clane to Celbridge Road) will be delivered independently of the development in conjunction with Kildare County Council and as such does not fall within the redline boundary (noted as a Specific Project in Section 8.6 of the Clane LAP). This upgrade will include activation of the existing traffic signals and improvements to existing facilities for Vulnerable Road Users (provision of tactile paving, reduction of corner radii, modifications to line marking etc.).

A concept design for this junction upgrade is shown on DBFL Drawings 162074-2004 and 162074-2005.

Improved Pedestrian and Cycle Access to Clane Town Centre via Capdoo Lane

An existing laneway ("Capdoo Lane") runs from Capdoo Park to the Clane / Celbridge Road via the rear of the Tesco supermarket (see Figure 2.2 below).

DBFL Drawing 162074-2006 shows proposed upgrades to pedestrian and cycle facilities at the junction of Capdoo Park / Capdoo Lane. This will facilitate pedestrian and cycle access from the proposed development and the Capdoo Link Road to Clane Town Centre via Capdoo Lane.

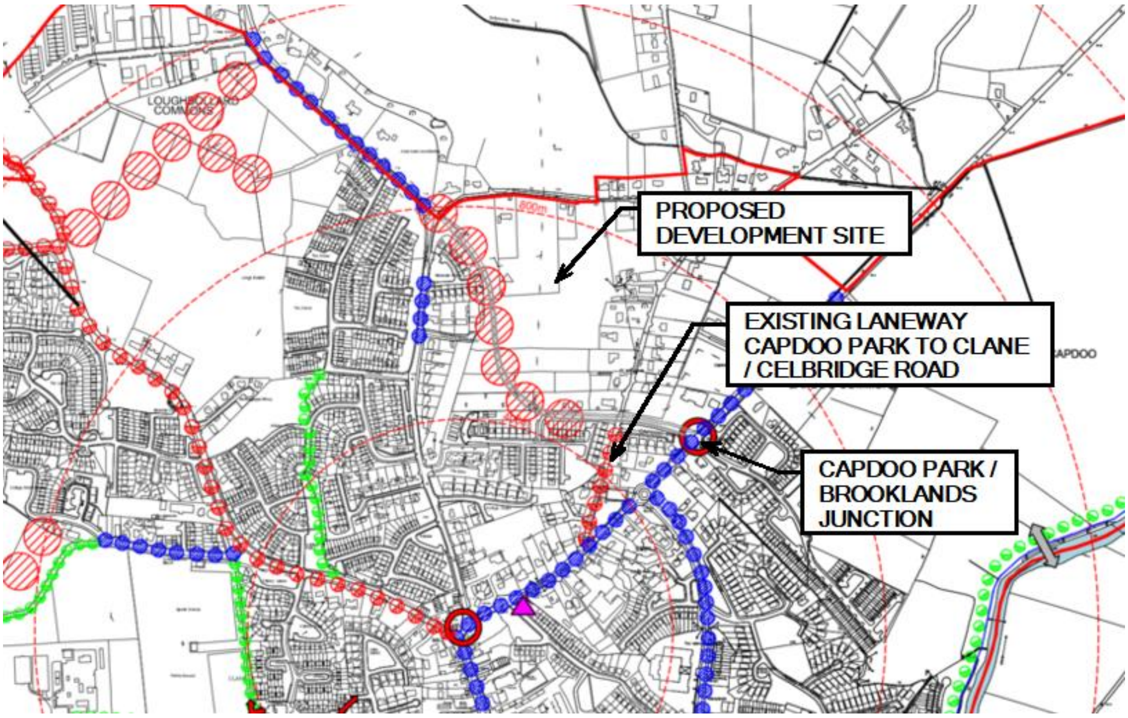


Figure 2.2 Other Movement Objectives from Clane LAP

2.3 Site Access Layout

Primary Site Access

As noted previously, Capdoo Link Road is to be delivered as part of the proposed development and will facilitate the primary access points.

Refer to Figure 2.3 and DBFL Drawing 162074-2000. Access points will be required off both sides of the Capdoo Link Road as it traverses the site.

Secondary Site Access

The site is irregular in shape due to a number of plots that have been developed along its northern boundary. As a result, there is a portion of the site that is isolated from the main development.

This portion of the site is being provided with an independent site access off the rural road to the north of the proposed development. Refer to Figure 2.3 and DBFL Drawings 162074-2001.

Houses Adjacent to the Site's Eastern Boundary

Two stand-alone houses (semi-detached) are located adjacent to the site's eastern boundary (refer to McCrossan O Rourke Manning's Site Layout Plan and DBFL Drawing 162074-2002).

These houses are accessed directly from the rural road east of the site (i.e. not via the developments internal road network). Pedestrian connectivity is provided from these houses to other parts of the proposed development.

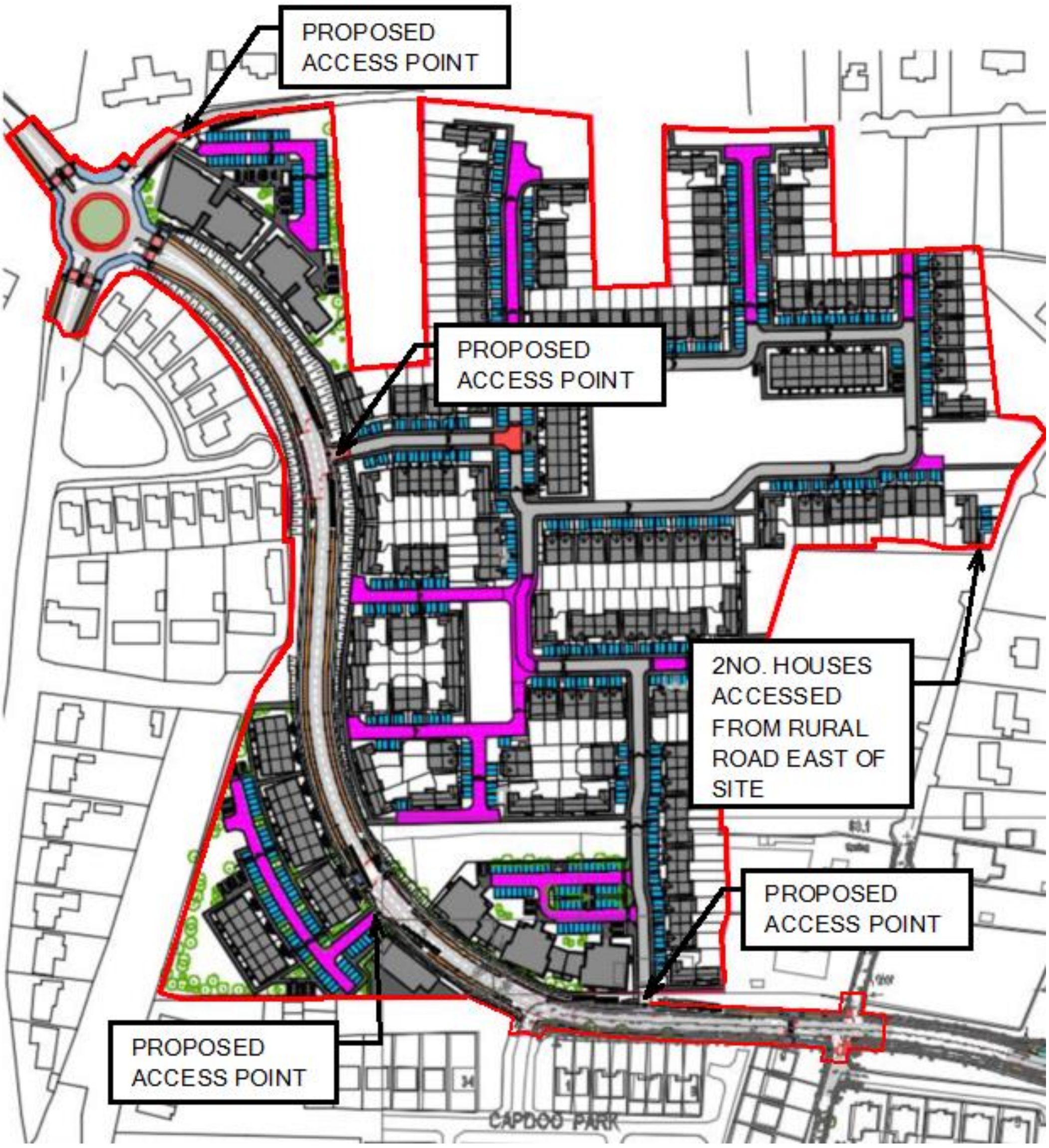


Figure 2.3 Proposed Access Points (Site Boundary Indicative Only)

2.4 Street Layout Design

The site’s street layout is shown on DBFL Drawing No’s. 162074-2001, 162074-2002 and 162074-2003.

DMURS Street Design guidelines incorporated in the site’s road layout including the following:

- Local Streets – 5.5m wide
- Footpaths – 2.0m wide
- Corner Radii at junctions within the site – Typically 3.0m
- Typical Longitudinal Gradient –vary from 1/20 - 1/100
- Cross Fall – 1/40

A design speed limit of 30 km/hour has been applied throughout the development in accordance with the Design Manual for Urban Roads and Streets (pedestrian priority, function – local road, context – neighbourhood).

2.5 Vehicle Tracking

The proposed street layout has been tracked to demonstrate that the site’s proposed corner radii and turning heads will accommodate larger vehicles such as refuse trucks (refer to DBFL Drawing No’s. 162074-2001, 162074-2002 and 162074-2003).

2.6 Access Driveways

Access driveways are set to accommodate a targeted gradient of 1:40.

The design allows for dropped kerbs and an increased concrete pavement thickness of 150mm where access driveways cross footpaths.

Access driveways (outside road and footpath areas to be taken in charge by Kildare County Council) are designed as permeable type pavements.

2.7 Pavement Design Standards

Local Streets within the site are designed in accordance with the Department of the Environment Recommendations for Site Development Works, the Design Manual for Urban Roads and Streets (DMURS) and Local Authority requirements.

Proposed road construction materials and thicknesses are based on an existing minimum subsoil CBR of 2.0% at road formation level.

Actual CBR values and ground conditions are to be confirmed by site specific investigations prior to road construction.

2.8 Traffic & Transportation

A separate Traffic and Transportation Assessment has been prepared as part of this planning application (refer to DBFL Report No. 162074-DBFL-RP-D-0001).

3. SURFACE WATER DRAINAGE

3.1 Existing Surface Water Drainage

As noted in Section 1.4, Topography, the site generally falls from west to east at gradients ranging from 1/15 to 1/100.

A network of open drains is located to the east of the site which ultimately discharge to the Gollymochy Stream (see Figure 3.1 below).

The site currently drains to the Gollymochy Stream via the network of open drains noted above. Surface water also drains from the site via infiltration. Varied infiltration rates were observed during Soakaway Testing carried out by IGSL in July 2017 (e.g. moderate levels of infiltration were observed where granular soils were present but very low levels of infiltration were observed where underlying clays were encountered). Refer to Appendix F for relevant extracts from IGSL's SI report.

Existing public surface water drains are located to the south and north-west of the site (refer to Irish Water's Network Plan included in Appendix B). As the site naturally falls from west to east, it is proposed to construct a surface water outfall along the roads north east of the site and discharge to the Gollymochy Stream north (refer to DBFL Drawing 162074-3002). The majority of the site will discharge to this outfall with the link road and an isolated section north west of the site draining to the public surface water drains to the south and north-west as mentioned above.

Figure 3.1 Extract from Irish Water Network Map

3.2 Basis of Design

3.2.1 General Description of Surface Water Design

The proposed developments surface water drainage network is shown on DBFL Drawings 162074-3001, 162074-3002 and 162074-3003.

It is proposed to construct a surface water outfall along the rural roads north east of the site and discharge to the Gollymochy Stream. This will serve the majority of the site.

The north west section and the upper link road will discharge to an existing surface water manhole north west of the site on College Road and the lower link road will discharge to an existing surface water manhole south east of the site adjacent to Capdoo Avenue. Refer to figure 3.1 above.

The proposed surface water drainage network will collect surface water runoff from the site via a piped network prior to discharging off site via the attenuation tank, flow control device and separator arrangement.

Surface water runoff from the site’s road network will be directed to the proposed pipe network via conventional road gullies while surface water runoff from driveways will be captured by permeable paving.

Surface water runoff from roofs will be routed to the proposed surface water pipe network via the porous aggregates beneath permeable paved driveways (providing an additional element of attenuation). Each surface water catchment has been assessed separately and will be stored in underground attenuation tanks (Stormtech Chambers).

Surface water discharge rates from the proposed surface water drainage network will be controlled by a vortex flow control device (Hydrobrake or equivalent) and will pass via a full retention fuel / oil separator (sized in accordance with permitted discharge from the site).

The proposed link road is treated as a completely separate drainage network. The surface water runoff from the road will drain through a distinct piped network before discharging to the public sewer via an attenuation tank, flow control and interceptor arrangement.

3.2.2 Compliance with Surface Water Drainage Policy

The site's surface water management infrastructure has been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS).

The GDSDS (Vol. 2, Chapter 6.3.4) requires that the following design criteria are applied to all sites:

- Criterion 1:

  River Water Quality Protection – Satisfied by providing interception storage and treatment of surface water run-off by SUDS features such as permeable paving of driveways, underground attenuation tanks and full retention fuel / oil separators at surface water discharge points.

- Criterion 2:

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

- Criterion 3:

  Level of Service (Flooding) for the Site – Satisfied by reviewing available flood hazard information (e.g. Eastern CFRAM Study) relating to the sites proximity to fluvial flood plains (up to 1 in 100-year flood event).

  Also refer to DBFL Report No. 162085-rep-003 (Site Specific Flood Risk Assessment).

- Criterion 4:

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

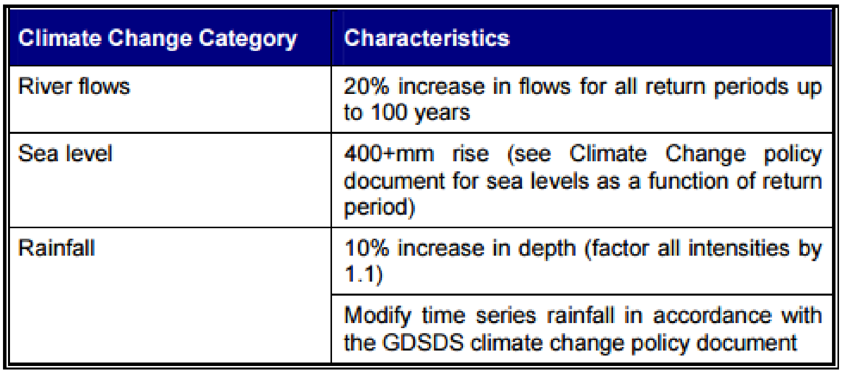
3.2.3 Design Standards

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

Design Criteria:

• Return period for pipe work design	5 years
• Return period for attenuation design	100 years
• Soil Type	2
• Allowable Outflow	2.0 l/sec/ha
• Time of entry	4 minutes
• M5 - 60	15.6 mm
• Ratio “r”	0.25
• Pipe Friction (Ks)	0.6 mm
• Minimum Velocity (based on pipe flowing full)	1.0 m/s
• Rainfall Runoff from Roads and Footpaths	100%
• Rainfall Runoff from Roofs (draining via SuDS feature)	70%
• Rainfall Runoff from Driveways (draining via SuDS feature)	50%
• Rainfall Depth Factored for Climate Change (as per GDSDS)	20%

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



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

Table 6.2 Climate Change Factors to be Applied to Drainage Design

Refer to Appendix C for attenuation design calculations.

Refer Appendix G for Surface Water Network Design Calculations.

Surface water calculations have been carried out using Microdrainage WinDes analysis software.

3.2.4 SuDS

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

- Permeable paving in driveway / in curtilage areas
- Surface water runoff from roofs will be routed to the proposed surface water pipe network via the stone reservoir beneath permeable paved driveways. Note, this detail does not rely on infiltration (although some degree if infiltration will occur), the stone reservoir is intended to provide an additional element of attenuation storage
- Attenuation for the 30 year and 100 year return period storms within Stormtech Attenuation Chambers.
- Installation of a vortex flow control device (Hydrobrake or equivalent), limiting surface water discharge from the site to 2.0 l/sec/ha
- Surface water discharge will also pass via a Class 1 full retention fuel / oil separator (sized in accordance with permitted discharge from the site)

3.2.5 Attenuation Calculation

Attenuation volumes have been calculated based on an allowable outflow / greenfield runoff rate of 2.00 l/sec/ha.

Run-off from the proposed development will be controlled / attenuated using vortex type flow control devices (Hydrobrake or equivalent).

The resultant storage system types, discharge limits and storage volumes for each catchment are detailed in Table 3.1. It is noted that runoff from the Capdoo Link Road has also been allowed for in the attenuation volumes outlined in Table 3.1.

Catchment/ Attenuation Area	Storage System Type	Catchment Area (Total) Ha	Impermeable Catchment Area (Total) Ha	Allowable Outflow (Max) l/s	Storage Volume Required (100yr) m^3	Storage Volume Provided (100yr) m^3
Site						
A	Stormtech Underground Chamber	7.62	3.07	15.2	1890	1957
B	Stormtech Underground Chamber	1.47	0.42	2.9	197	197
C	Stormtech Underground Chamber	0.73	0.34	2	192	193
Link Road						
U	Stormtech Underground Chamber	0.43	0.31	2	162	166
L	Stormtech Underground Chamber	0.74	0.59	2	415	459
		10.99	4.73		2856	2972

Table 3.1 – Surface Water Attenuation Storage and Discharge Limits

Refer to Appendix C for preliminary attenuation design calculations (Stormtech Chamber Sizing).

In total, 2,972m^3 of storm-water storage is proposed.

The locations of proposed attenuation systems are shown on DBFL Drawings 162074-3001, 162074-3002 and 162074-3003.

3.2.6 Interception Volume

The GDSDS (Vol. 2, Table 6.3) requires interception storage to be incorporated into surface water drainage design in order to limit discharge of sediment and pollutants into the downstream surface water drainage network and receiving water courses.

This interception storage is designed to capture surface water run-off from rainfall depths of 5mm (and up to 10mm if possible).

The SuDS features included in the development (refer to Section 3.2.4) will provide the necessary interception volume required by the GDSDS (within stone reservoirs beneath permeable paved driveways and within the Stormtech Attenuation Chambers).

3.3 Flood Risk

A separate Site Specific Flood Risk Assessment has been prepared as part of this planning application (refer to DBFL Report No. 162074-rep-003).

This flood risk assessment has been undertaken by reviewing information from the Office of Public Works (OPW) National Flood Hazard Mapping (www.floodmaps.ie) and the Eastern CFRAM Study and has been carried out in accordance with the OPW's Guidelines for Planning Authorities – The Planning System and Flood Risk Management (November 2009).

3.4 Surface Water Quality Impact

Run-off rates from the site are controlled by flow control devices.

Surface water management proposals for the development also incorporate the following impact reduction measures;

- Surface water network designed in accordance with GDSDS requirements
- Incorporates SUDS features e.g. permeable paving in the higher risk parking areas at the front of houses (i.e. treatment / filtration provided within the stone reservoir beneath permeable paved driveways)
- Surface water attenuation (i.e. treatment / filtration provided within the granular surround of the Stormtech Chambers) in conjunction with a final Class 1 fuel / oil separator prior to discharge to the downstream surface water network.

4. FOUL DRAINAGE

4.1 Existing Foul Drainage

Existing 225mm diameter public foul sewers are located south east and north west of the site. For the location of the existing foul sewer refer to the Topographic Survey Plans included in Appendix A and Irish Water's Network Plan included in Appendix B.

An existing manhole is located on the foul sewer (adjacent to the entrance of Capdoo Avenue, refer to Figure 4.1) and is expected to provide a suitable foul drainage discharge point for the majority of proposed development.

The remaining isolated section to the north west of the site is to discharge into the existing foul sewer on College Road.

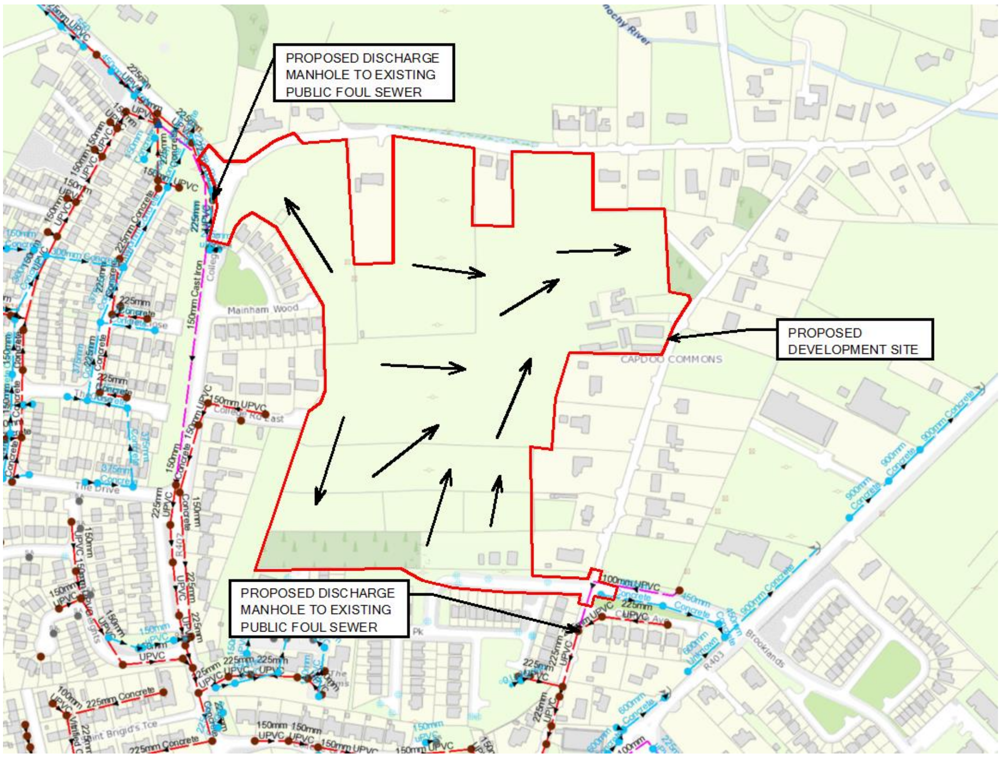


Figure 4.1 Extract from Irish Water Network Plan.

4.2 Design Strategy

As noted in Section 1.4, Topography, the site generally falls from the western boundary to the east at gradients ranging from 1/15 to 1/100 i.e. foul drainage flows by gravity towards the site's eastern boundary.

The majority of the foul drainage will connect to an existing foul sewer south east of the site with a small isolated section connecting north west of the site. The proposed foul drainage discharge point south east of the site is slightly elevated above the north-eastern corner of the site. As such, a foul pumping station, rising main and associated rising main discharge (header) manhole will be required to service this section of the development (185 out of 366 units located in the north east of the site). The north western and southern portions of the site will discharge by gravity into the appropriate discharge manholes.

The proposed foul pumping station is to be located along the eastern side of the proposed development.

The proposed foul drainage network comprises of a series of 225mm diameter pipes with each residential unit serviced by an individual 100mm diameter connection.

Refer to DBFL Drawing No.'s 162074-3001, 162074-3002 and 162074-3003 for the proposed foul drainage layout.

Pre-connection enquiry feedback has been received from Irish Water (included in Appendix D). Irish Water have advised as follows:

- "Based upon the details you have provided with your pre-connection enquiry and on the capacity currently available as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place and the condition listed below, your proposed connection to the Irish Water network can be facilitated"
- A condition is listed in relation to Contract 2B of the Upper Liffey Valley Sewerage Scheme i.e. it is feasible for 205 units to connect prior to the Upper Liffey Valley Sewerage Scheme (Contract 2B) and associated upgrades in Clane being completed in 2021, thereafter the balance of units may be accommodated.

An indicative timeline for occupation of the proposed development is outlined below:

- 2020 – 100 houses
- 2021 – 100 houses
- 2022 – 100 houses
- 2023 – 66 houses

This timeline aligns with Irish Water's advice that it is feasible for 205 connections prior to delivery of Contract 2B of the Upper Liffey Valley Sewerage Scheme (completed by 2021) with the remaining units being connected thereafter.

4.3 Design Calculations

The foul drainage network for the proposed development has been designed in accordance with the following guidelines:

- Irish Water Code of Practice for Wastewater Infrastructure
- Department of the Environment's Recommendations for Site Development Works for Housing Areas
- Department of the Environment's Building Regulations "Technical Guidance Document Part H Drainage and Waste Water Disposal"
- BS EN 752: 2008 Drain and Sewer Systems Outside Buildings
- IS EN 12056: Part 2 (2000) Gravity Drainage Systems Inside Buildings

Foul drainage network design has been carried out using Microstation WinDes analysis software (refer to Appendix H for foul drainage network calculation).

Design Criteria:

Demand	446 l/dwelling/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 (1:18 maximum pipe gradient)
Frequency Factor	0.5 for domestic use
Manhole Depths	< 4.0m

4.4 Foul Drainage – Environmental Impacts

Waste Water Discharge Calculation

(as outlined in Irish Water's Pre-Connection Enquiry Application Form)

No. of Housing Units	366
Post Development Average Discharge	1.89 l/sec
Post Development Peak Discharge	11.3 l/sec
Daily Foul Discharge Volume (446l per dwelling)	163,236 l

Biochemical Oxygen Demand – BOD

(as outlined in EPA Waste Water Treatment Manual)

No. of Housing Units	366
Occupancy per Dwelling	3
BOD Loading (60g per person per day)	65,880 g

5. WATER SUPPLY AND DISTRIBUTION

5.1 Existing Public Water Mains

An existing 400mm diameter ductile iron watermain and a 2” diameter uPVC watermain are located along the rural roads adjacent to the site’s northern and eastern boundaries. An existing watermain (6” diameter uPVC) is also located east of the site along College Road.

Refer to the Irish Water’s Network Plan included in Appendix B for the location of the existing public watermains described above (extract also shown in Figure 5.1).

Pre-connection enquiry feedback has been received from Irish Water (included in Appendix D). No issues are noted in relation to the existing public water supply network.

Figure 4.1 Extract from Irish Water Network Plan.

5.2 Proposed Water Main Layout

The site's proposed water main layout is shown on DBFL Drawings 162074-3005, 162074-3006 and 162074-3007.

It is proposed to link the existing 400mm diameter watermains (north-west and south-east of the site) via a 200mm diameter watermain running along the proposed Capdoo Link Road. This new watermain will then service the proposed development.

A 150mm diameter looped water main will then be provided (generally along the site's arterial roads) with a number of 100mm diameters looped branch mains provided elsewhere.

As noted elsewhere in this report, the site is irregular in shape due to a number of plots that have been developed along its northern boundary. As a result, there is a portion of the site that is isolated from the main development (north-west corner). A separate connection off the existing watermain running along the rural road north of the site is proposed in order to serve this isolated portion of the site.

The proposed water main layout has been designed in accordance with Irish Water Standard Detail STD-W-02.

Sluice Valves have been arranged in accordance with Irish Water Standard Detail STD-W-02, Note 6 ("*valves shall be arranged in such a manner to allow the network to be managed to ensure that no more than 40 properties lose water from a burst on the system, at any one time*").

Individual houses will have their own connections (25mm O.D. PE pipe) to distribution water mains via service connections and boundary boxes.

Individual connections are to be installed in accordance with Irish Water Standard Detail STD-W-03.

5.3 Hydrants

The proposed water main layout is arranged such that all buildings are a maximum of 46.0m from a hydrant in accordance with the Department of the Environment's Building Regulations "Technical Guidance Document Part B Fire Safety".

Hydrants shall comply with the requirements of BS 750:2012 and shall be installed in accordance with Irish Water's Code of Practice and Standard Details.

5.4 Materials

Proposed water mains and connections to individual houses are to be PE100 SDR17.

5.5 Water Demand & Conservation

Water Demand has been calculated in accordance with the guidelines outlined in Irish Water’s Pre-Connection Enquiry Application Form:

No. of Housing Units	366
Average Occupancy Ration (Persons Per Dwelling)	2.7
Per-Capita Consumption (l/person/day)	150
Average Domestic Daily Demand (l/sec)	1.72
Post Development Average Hour Water Demand (l/sec) (1.25 x Average Domestic Daily Demand)	2.15
Post Development Peak Hour Water Demand (l/sec) (5.0 x Post Development Average Hour Water Demand)	10.75

Individual houses will provide water storage in header tanks (in accordance with the requirements of Irish Water’s Code of Practice) and include provision of water conservation measures such as dual flush water cisterns and low flow taps.

APPENDIX A – TOPOGRAPHIC SURVEY

NOTE:

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LAND SURVEYS
22 Mellifont Avenue, Dun Laoghaire, Co. Dublin.
Ph: 2805212 Fax: 2302535 info@landsurveys.ie

Site at:
Capdoo, Clane, Co. Kildare

Client:
Ardstone Residential

Scale:	1:500 (A1)
Contour:	0.5m Interval
Datum:	O.S. Malin Hd.
Issued:	04.04.2017
Ref:	D15468-F2D

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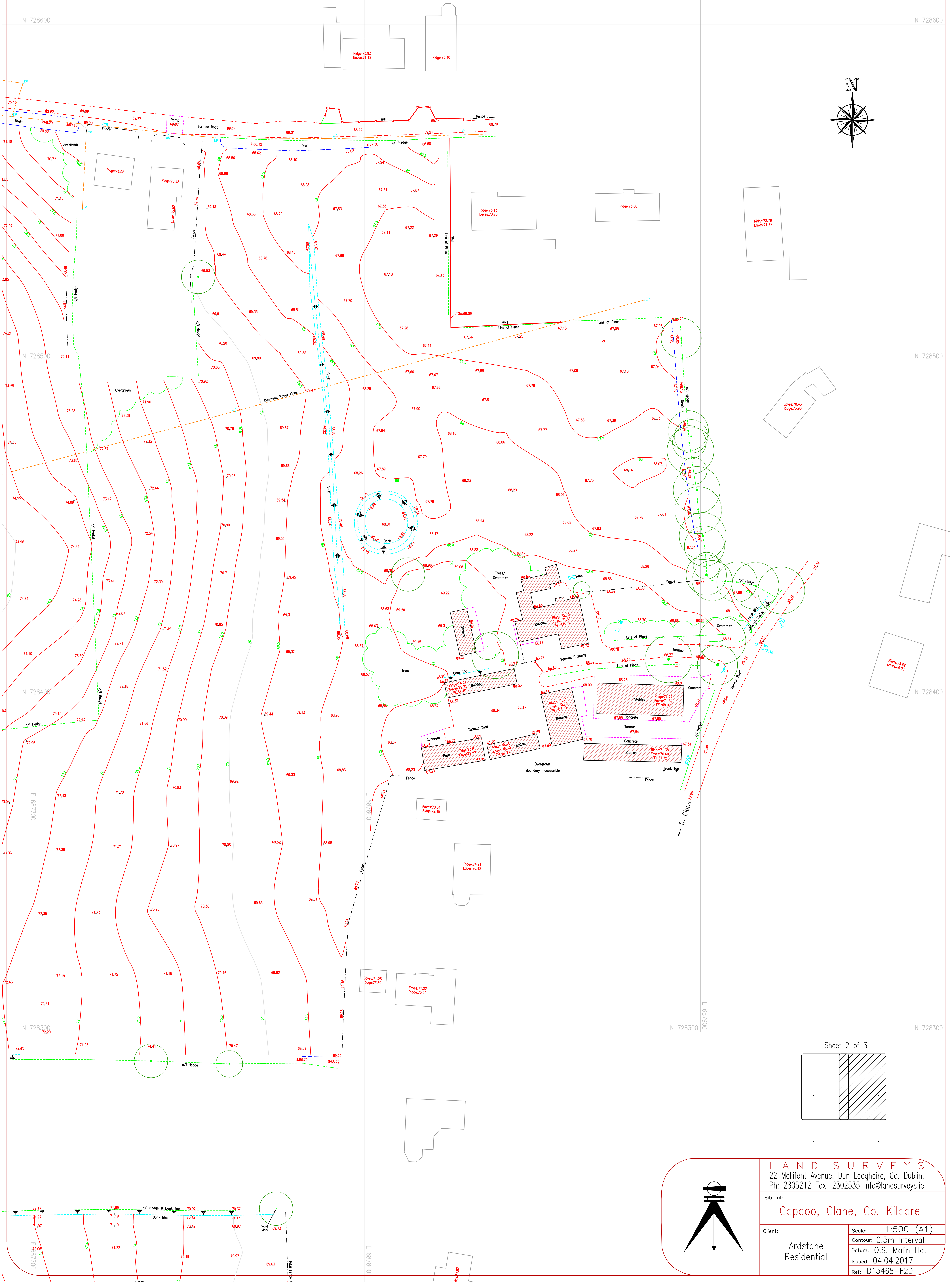


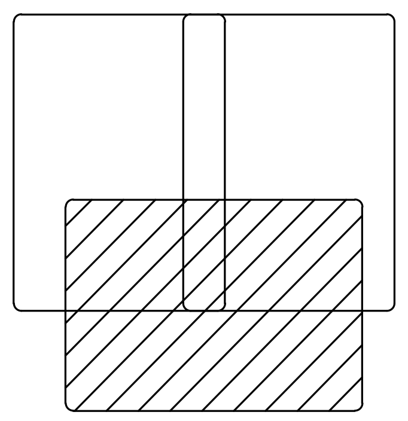
L A N D   S U R V E Y S
22 Mellifont Avenue, Dun Laoghaire, Co. Dublin.
Ph: 2805212 Fax: 2302535 info@landsurveys.ie

Site at:
Capdoo, Clane, Co. Kildare

Client:
Ardstone
Residential

Scale: 1:500 (A1)
Contour: 0.5m Interval
Datum: O.S. Malin Hd.
Issued: 04.04.2017
Ref: D15468–F2D

Sheet 3 of 3



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L A N D S U R V E Y S
22 Mellifont Avenue, Dun Laoghaire, Co. Dublin.
Ph: 2805212 Fax: 2302535 info@landsurveys.ie

Site at:

Capdoo, Clane, Co. Kildare

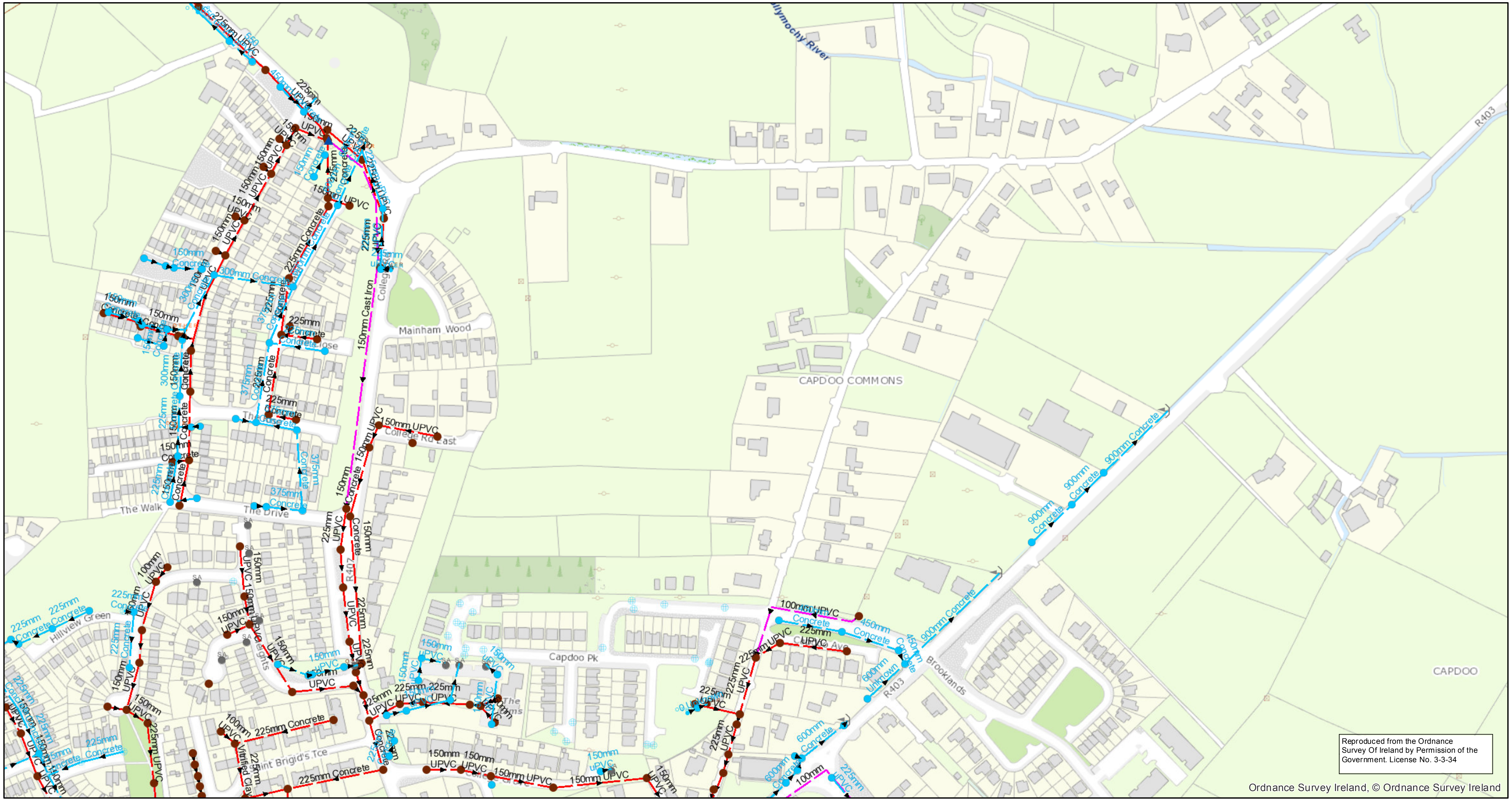
Client:

Ardstone
Residential

Scale: 1:500 (A1)
Contour: 0.5m Interval
Datum: O.S. Malin Hd.
Issued: 04.04.2017
Ref: D15468-F2D

APPENDIX B – IRISH WATER NETWORK PLANS

Irish Water Web Map



August 31, 2016

1:5,793

0 0.05 0.1 0.2 mi

0 0.1 0.2 0.4 km

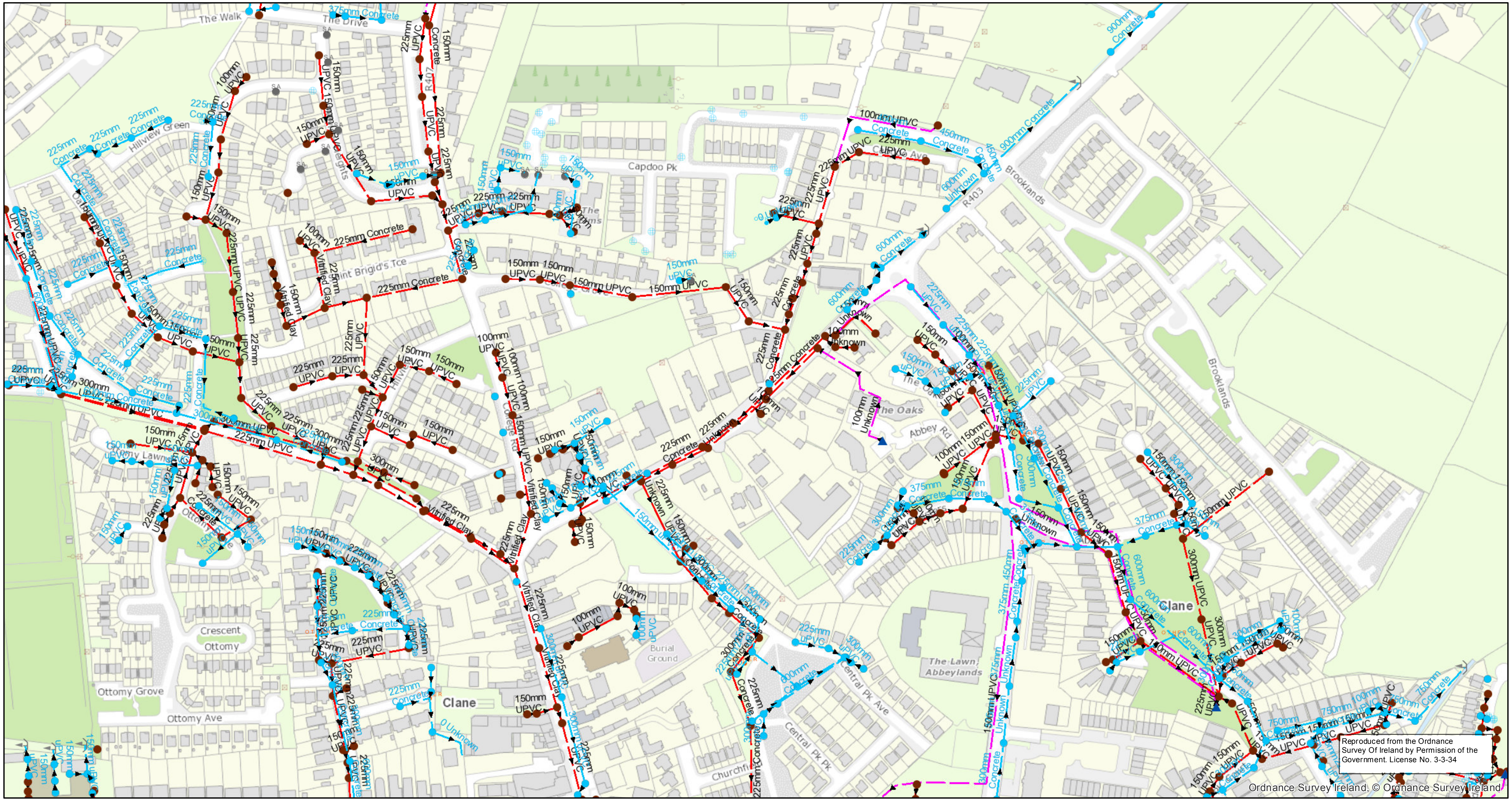
Legend

- Surface
- Surface
- Cascade
- CP Catchpit
- H Hatchbox
- LH Lamphole
- Standard
- OTHER Other; Unknown
- Gully
- Standard
- OTHER Other; Unknown
- VC Vent/Col
- OTHER Other; Unknown
- Outfall
- OC Overflow
- Soakaway
- OTHER Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Outfall
- OC Overflow
- SA Soakaway
- Standard Outlet
- OTHER Other; Unknown
- RE Rodding Eye
- Flushing Structure
- OTHER Other; Unknown
- Sewer Flow Control Valves
- WTP Treatment plant
- Pump station
- CP Catchpit
- Gully
- Standard
- OTHER Other; Unknown
- Cascade
- CP Catchpit
- H Hatchbox
- LH Lamphole
- Standard
- OTHER Other; Unknown
- VC Vent/Col
- OTHER Other; Unknown
- Combined
- Foul
- Overflow
- Unknown
- Combined
- Foul
- Overflow
- Unknown
- Combined
- Foul
- Overflow
- Unknown

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.

UISCE ÉIREANN : IRISH WATER

Irish Water Web Map



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August 31, 2016

1:5,793

0 0.05 0.1 0.2 mi

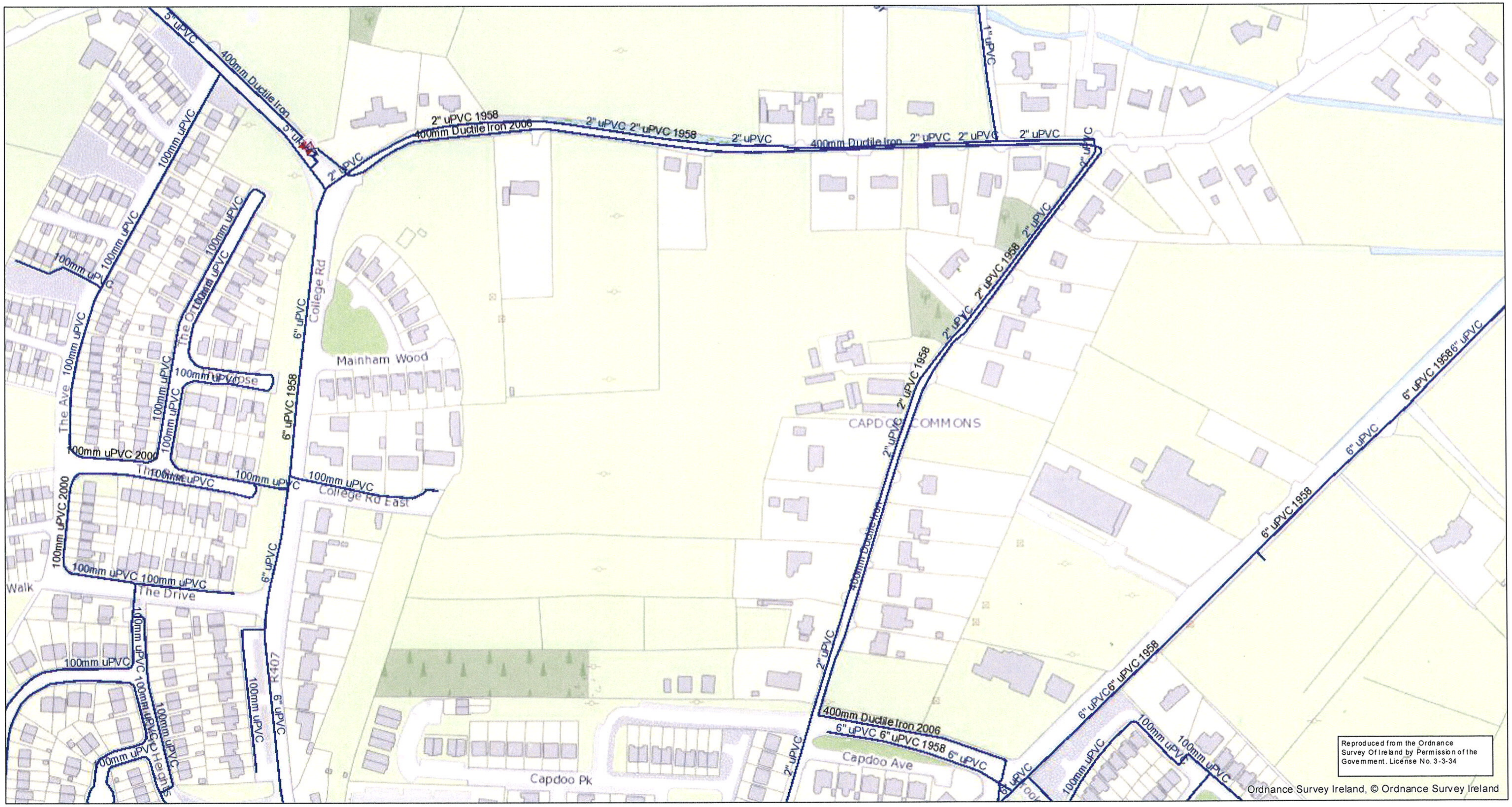
0 0.1 0.2 0.4 km

Legend

- Surface
- Surface
- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other; Unknown
- Gully
- Standard
- Other; Unknown
- Vent/Col
- Other; Unknown
- Outfall
- Overflow
- Soakaway
- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown
- Rodding Eye
- Flushing Structure
- Other; Unknown
- Sewer Flow Control Valves
- Treatment plant
- Pump station
- Catchpit
- Gully
- Standard
- Other; Unknown
- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other; Unknown
- Vent/Col
- Other; Unknown
- Combined
- Foul
- Overflow
- Unknown
- Combined
- Foul
- Overflow
- Unknown
- Combined
- Foul
- Overflow
- Unknown

UISCE ÉIREANN : IRISH WATER

Irish Water Web Map



September 1, 2016

1:4,514

0 0.05 0.1 0.2 mi

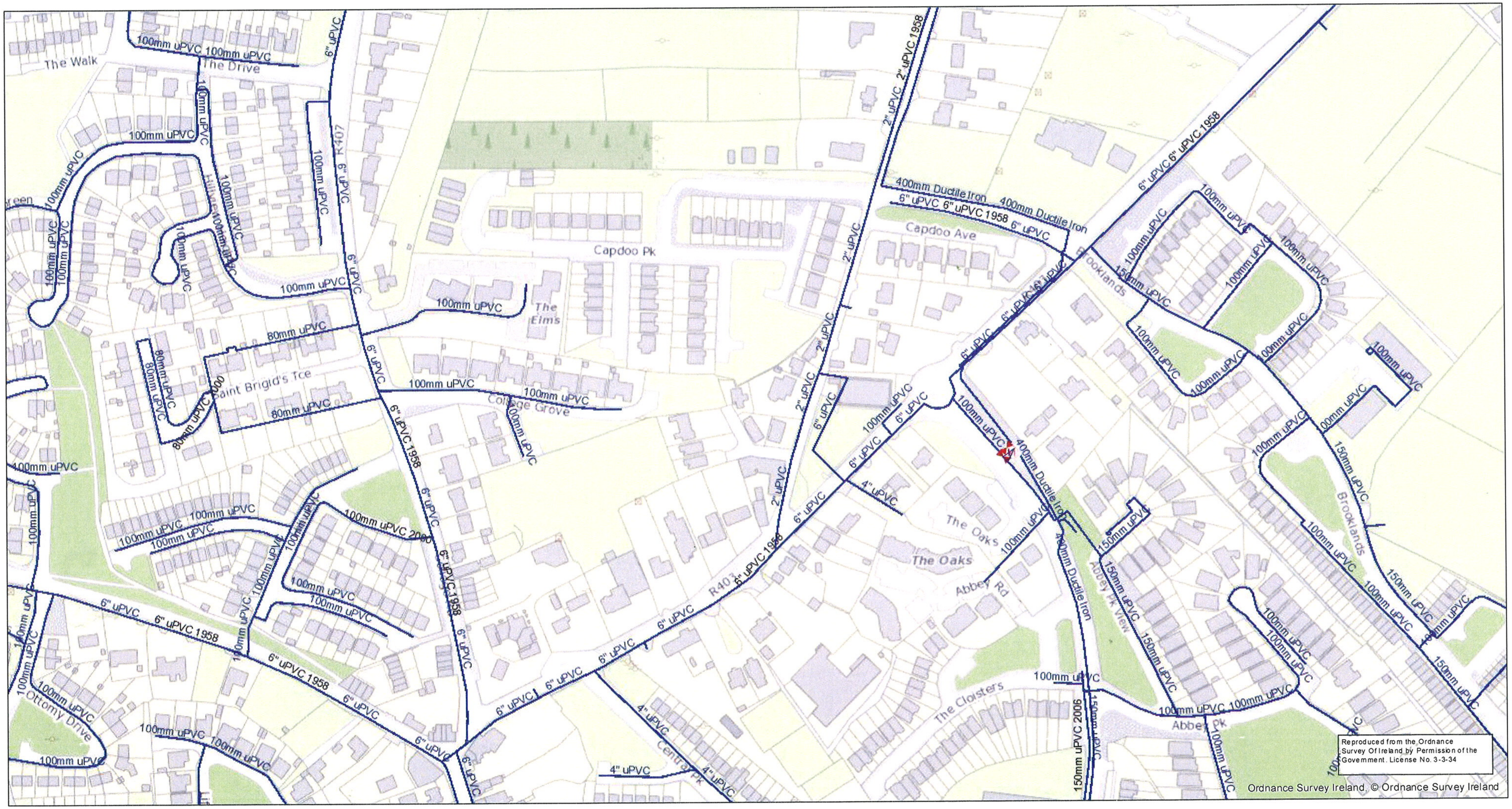
0 0.075 0.15 0.3 km

Legend

Non-return	Other	Treatment Plant	Potable Water	Water Abandoned Lines
Hydro	Open	Potable	Untreated	Water Casings
Orifice Plate	Closed	Raw Water	Potable Water	
PRV	Part Closed	Pump Stations	Irish Water	
PSV	District (Boundary Meter)	Untreated	Non IW	

UISCE
ÉIREANN : IRISH
WATER

Irish Water Web Map



September 1, 2016

1:4,514

0 0.05 0.1 0.2 mi

0 0.075 0.15 0.3 km

Legend

- ▶ Non-return
- ○ Hydro
- ⊟ Orifice Plate
- PRV
- ▷ PSV
- ○ Other
- ⋈ Open
- ⋈ Closed
- ⋈ Part Closed
- M District (Boundary Meter)
- Treatment Plant
- ■ Potable
- ■ Raw Water
- ▲ Pump Stations
- --- Untreated
- — Potable Water
- --- Untreated
- — Potable Water
- — Irish Water
- — Non IW
- --- Water Abandoned Lines
- ☰ Water Casings

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.

UISCE
ÉIREANN : IRISH
WATER

APPENDIX C – PRELIMINARY ATTENUATION CALCULATION

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

Half Drain Time : 1037 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 Summer	67.363	0.263	0.0	14.7	14.7	461.3	O K
30 min Summer	67.467	0.367	0.0	15.2	15.2	644.2	O K
60 min Summer	67.579	0.479	0.0	15.3	15.3	840.1	O K
120 min Summer	67.698	0.598	0.0	15.3	15.3	1050.5	O K
180 min Summer	67.770	0.670	0.0	15.3	15.3	1177.0	O K
240 min Summer	67.822	0.722	0.0	15.3	15.3	1267.3	O K
360 min Summer	67.891	0.791	0.0	15.3	15.3	1388.7	O K
480 min Summer	67.936	0.836	0.0	15.3	15.3	1467.3	O K
600 min Summer	67.967	0.867	0.0	15.3	15.3	1521.3	O K
720 min Summer	67.988	0.888	0.0	15.3	15.3	1559.0	O K
960 min Summer	68.013	0.913	0.0	15.3	15.3	1602.6	O K
1440 min Summer	68.033	0.933	0.0	15.3	15.3	1638.3	O K
2160 min Summer	68.029	0.929	0.0	15.3	15.3	1630.3	O K
2880 min Summer	68.005	0.905	0.0	15.3	15.3	1588.6	O K
4320 min Summer	67.936	0.836	0.0	15.3	15.3	1467.8	O K
5760 min Summer	67.860	0.760	0.0	15.3	15.3	1333.9	O K
7200 min Summer	67.785	0.685	0.0	15.3	15.3	1202.2	O K
8640 min Summer	67.714	0.614	0.0	15.3	15.3	1077.3	O K
10080 min Summer	67.648	0.548	0.0	15.3	15.3	962.2	O K
15 min Winter	67.395	0.295	0.0	14.9	14.9	517.2	O K

Storm Event	**Rain (mm/hr)**	**Flooded Volume (m³)**	**Discharge Volume (m³)**	**Time-Peak (mins)**
15 min Summer	81.599	0.0	418.1	19
30 min Summer	57.450	0.0	600.0	33
60 min Summer	38.020	0.0	846.2	64
120 min Summer	24.385	0.0	1089.6	122
180 min Summer	18.636	0.0	1250.3	182
240 min Summer	15.373	0.0	1375.3	242
360 min Summer	11.683	0.0	1565.9	362
480 min Summer	9.602	0.0	1712.0	482
600 min Summer	8.242	0.0	1830.7	600
720 min Summer	7.273	0.0	1929.6	720
960 min Summer	5.969	0.0	2080.0	932
1440 min Summer	4.517	0.0	2155.6	1184
2160 min Summer	3.413	0.0	2802.7	1576
2880 min Summer	2.795	0.0	3055.3	1964
4320 min Summer	2.106	0.0	3429.6	2768
5760 min Summer	1.721	0.0	3797.4	3576
7200 min Summer	1.472	0.0	4056.9	4328
8640 min Summer	1.295	0.0	4278.9	5096
10080 min Summer	1.163	0.0	4467.9	5848
15 min Winter	81.599	0.0	471.9	19

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

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
30 min Winter	67.512	0.412	0.0	15.3	15.3	723.2	O K
60 min Winter	67.638	0.538	0.0	15.3	15.3	944.2	O K
120 min Winter	67.774	0.674	0.0	15.3	15.3	1183.4	O K
180 min Winter	67.857	0.757	0.0	15.3	15.3	1329.3	O K
240 min Winter	67.917	0.817	0.0	15.3	15.3	1435.2	O K
360 min Winter	68.001	0.901	0.0	15.3	15.3	1582.7	O K
480 min Winter	68.059	0.959	0.0	15.3	15.3	1683.8	O K
600 min Winter	68.099	0.999	0.0	15.3	15.3	1753.3	O K
720 min Winter	68.126	1.026	0.0	15.3	15.3	1801.8	O K
960 min Winter	68.159	1.059	0.0	15.3	15.3	1859.6	O K
1440 min Winter	68.176	1.076	0.0	15.3	15.3	1889.5	O K
2160 min Winter	68.164	1.064	0.0	15.3	15.3	1867.9	O K
2880 min Winter	68.130	1.030	0.0	15.3	15.3	1808.3	O K
4320 min Winter	68.018	0.918	0.0	15.3	15.3	1611.5	O K
5760 min Winter	67.879	0.779	0.0	15.3	15.3	1368.0	O K
7200 min Winter	67.753	0.653	0.0	15.3	15.3	1147.2	O K
8640 min Winter	67.642	0.542	0.0	15.3	15.3	951.0	O K
10080 min Winter	67.546	0.446	0.0	15.3	15.3	783.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	57.450	0.0	674.5	33
60 min Winter	38.020	0.0	949.8	62
120 min Winter	24.385	0.0	1221.8	122
180 min Winter	18.636	0.0	1401.0	180
240 min Winter	15.373	0.0	1539.9	238
360 min Winter	11.683	0.0	1750.1	356
480 min Winter	9.602	0.0	1907.9	472
600 min Winter	8.242	0.0	2032.2	586
720 min Winter	7.273	0.0	2129.8	700
960 min Winter	5.969	0.0	2240.8	922
1440 min Winter	4.517	0.0	2169.0	1340
2160 min Winter	3.413	0.0	3137.3	1668
2880 min Winter	2.795	0.0	3416.3	2136
4320 min Winter	2.106	0.0	3814.1	3068
5760 min Winter	1.721	0.0	4254.0	3864
7200 min Winter	1.472	0.0	4545.5	4616
8640 min Winter	1.295	0.0	4795.3	5360
10080 min Winter	1.163	0.0	5010.1	6048

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)	16.100	Shortest Storm (mins)	15
Ratio R	0.251	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 3.073

Time From:	**(mins) To:**	**Area (ha)**
0	4	3.073

STORMTECH Stormwater Management System Design Tool

ver: Jun14

PROJECT REF: 162074
LOCATION: Capdoo, Clane
DATE: 04/02/2019
CREATED BY: E Daly

Instructions:
Fill in blue highlighted cells
Set width to maximum allowance
Adjust site parameters and system dimension until volume achieved
For Rectangular systems only, for irregular shape dig contact Microstrain

SYSTEM PARAMETERS

Required Total Storage	**1889.5**	m^3
Stormtech chamber model	**MC3500**	
Number of Isolator Rows for TSS Removal	1	

SITE PARAMETERS

			Minimum Requirement
Maximum Width at Excavation Base	27	m	
Stone Porosity	40%		
Excavation Batter Angle (degrees)	60	°	
Stone Below Chambers	0.23	m	*0.23*
Stone Above Chambers	0.3	m	*0.30*
Additional Storage. E.g manholes, pipe	0	m^3	

CALCULATED CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted	
Number of Rows	12		ea
Number of units per Row	30		ea
Number of MC3500 Chambers	360		ea
Number of MC3500 Endcaps	24		ea
System Installed Storage Depth (effective storage depth)	1.675		m
Tank overall installed Width at base	26.59	27	m
Tank overall installed Length at Base	67.14	67.5	m
Total Effective System Storage	**1939.8**	**1965.3**	m^3

STORMTECH SYSTEM DETAIL

StormTech Chamber Model	MC3500	
Unit Width	1.955	m
Unit Length	2.18	m
Unit Height	1.145	m
Min Cover Over System	0.3	m
Max Cover Over Chamber	2.4	m
Internal Storage Vol. (Chamber only)	3.11	m^3

STONE AND EXCAVATION DETAIL

Volume of Dig for System	3209	
Area of Dig at Base of System	1823	m^2
Area of Dig at Top of System	2009	m^2
Void Ratio	61%	
Stone Requirement - tonne	3407	tonne

StormTech®
Detention • Retention • Recharge
Subsurface Stormwater Management℠

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

Half Drain Time : 557 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 Summer	67.313	0.213	0.0	2.7	2.7	61.7	O K
30 min Summer	67.396	0.296	0.0	2.7	2.7	85.7	O K
60 min Summer	67.481	0.381	0.0	2.8	2.8	110.4	O K
120 min Summer	67.565	0.465	0.0	2.9	2.9	134.7	O K
180 min Summer	67.609	0.509	0.0	2.9	2.9	147.5	O K
240 min Summer	67.636	0.536	0.0	3.0	3.0	155.3	O K
360 min Summer	67.662	0.562	0.0	3.0	3.0	162.9	O K
480 min Summer	67.669	0.569	0.0	3.0	3.0	164.8	O K
600 min Summer	67.669	0.569	0.0	3.0	3.0	164.9	O K
720 min Summer	67.668	0.568	0.0	3.0	3.0	164.6	O K
960 min Summer	67.665	0.565	0.0	3.0	3.0	163.8	O K
1440 min Summer	67.655	0.555	0.0	3.0	3.0	160.7	O K
2160 min Summer	67.627	0.527	0.0	3.0	3.0	152.8	O K
2880 min Summer	67.593	0.493	0.0	2.9	2.9	142.9	O K
4320 min Summer	67.520	0.420	0.0	2.9	2.9	121.6	O K
5760 min Summer	67.448	0.348	0.0	2.8	2.8	101.0	O K
7200 min Summer	67.383	0.283	0.0	2.7	2.7	82.1	O K
8640 min Summer	67.326	0.226	0.0	2.7	2.7	65.6	O K
10080 min Summer	67.277	0.177	0.0	2.6	2.6	51.3	O K
15 min Winter	67.340	0.240	0.0	2.7	2.7	69.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	81.599	0.0	64.5	19
30 min Summer	57.450	0.0	90.7	33
60 min Summer	38.020	0.0	120.2	62
120 min Summer	24.385	0.0	154.1	122
180 min Summer	18.636	0.0	176.9	182
240 min Summer	15.373	0.0	194.6	242
360 min Summer	11.683	0.0	221.6	360
480 min Summer	9.602	0.0	243.1	448
600 min Summer	8.242	0.0	260.8	506
720 min Summer	7.273	0.0	276.1	570
960 min Summer	5.969	0.0	302.2	702
1440 min Summer	4.517	0.0	342.9	982
2160 min Summer	3.413	0.0	389.0	1404
2880 min Summer	2.795	0.0	424.7	1816
4320 min Summer	2.106	0.0	479.6	2596
5760 min Summer	1.721	0.0	522.6	3400
7200 min Summer	1.472	0.0	559.0	4112
8640 min Summer	1.295	0.0	589.8	4848
10080 min Summer	1.163	0.0	618.3	5552
15 min Winter	81.599	0.0	72.1	18

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

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
30 min Winter	67.434	0.334	0.0	2.8	2.8	96.7	O K
60 min Winter	67.531	0.431	0.0	2.9	2.9	124.9	O K
120 min Winter	67.629	0.529	0.0	3.0	3.0	153.4	O K
180 min Winter	67.684	0.584	0.0	3.0	3.0	169.1	O K
240 min Winter	67.718	0.618	0.0	3.0	3.0	179.2	O K
360 min Winter	67.757	0.657	0.0	3.1	3.1	190.4	O K
480 min Winter	67.774	0.674	0.0	3.1	3.1	195.2	O K
600 min Winter	67.778	0.678	0.0	3.1	3.1	196.5	O K
720 min Winter	67.775	0.675	0.0	3.1	3.1	195.6	O K
960 min Winter	67.766	0.666	0.0	3.1	3.1	193.1	O K
1440 min Winter	67.744	0.644	0.0	3.1	3.1	186.5	O K
2160 min Winter	67.694	0.594	0.0	3.0	3.0	172.1	O K
2880 min Winter	67.635	0.535	0.0	3.0	3.0	155.0	O K
4320 min Winter	67.515	0.415	0.0	2.9	2.9	120.2	O K
5760 min Winter	67.406	0.306	0.0	2.8	2.8	88.5	O K
7200 min Winter	67.311	0.211	0.0	2.7	2.7	61.1	O K
8640 min Winter	67.232	0.132	0.0	2.6	2.6	38.3	O K
10080 min Winter	67.169	0.069	0.0	2.5	2.5	19.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	57.450	0.0	101.7	33
60 min Winter	38.020	0.0	134.7	62
120 min Winter	24.385	0.0	172.8	120
180 min Winter	18.636	0.0	198.1	178
240 min Winter	15.373	0.0	217.9	236
360 min Winter	11.683	0.0	248.4	350
480 min Winter	9.602	0.0	272.2	460
600 min Winter	8.242	0.0	292.1	566
720 min Winter	7.273	0.0	309.3	658
960 min Winter	5.969	0.0	338.3	750
1440 min Winter	4.517	0.0	384.0	1066
2160 min Winter	3.413	0.0	435.7	1516
2880 min Winter	2.795	0.0	475.2	1960
4320 min Winter	2.106	0.0	537.5	2808
5760 min Winter	1.721	0.0	585.9	3576
7200 min Winter	1.472	0.0	625.8	4320
8640 min Winter	1.295	0.0	661.3	5016
10080 min Winter	1.163	0.0	692.0	5648

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)	16.100	Shortest Storm (mins)	15
Ratio R	0.251	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.422

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.422

STORMTECH Stormwater Management System Design Tool

ver: Jun14

PROJECT REF: 162074
LOCATION: Capdoo, Clane
DATE: 04/02/2019
CREATED BY: E Daly

Instructions:
Fill in blue highlighted cells
Set width to maximum allowance
Adjust site parameters and system dimension until volume achieved
For Rectangular systems only, for irregular shape dig contact Microstrain

SYSTEM PARAMETERS

Required Total Storage	**196.5**	m^3
Stormtech chamber model	**SC740**	
Number of Isolator Rows for TSS Removal	1	

SITE PARAMETERS

			Minimum Requirement
Maximum Width at Excavation Base	6.3	m	
Stone Porosity	40%		
Excavation Batter Angle (degrees)	60	°	
Stone Below Chambers	0.15	m	*0.15*
Stone Above Chambers	0.15	m	*0.15*
Additional Storage. E.g manholes, pipe	0	m^3	

CALCULATED CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted	
Number of Rows	4		ea
Number of units per Row	20		ea
Number of SC740 Chambers	80		ea
Number of SC740 Endcaps	8		ea
System Installed Storage Depth (effective storage depth)	1.060		m
Tank overall installed Width at base	6.23	6.3	m
Tank overall installed Length at Base	44.1	45	m
Total Effective System Storage	**192.7**	**196.6**	m^3

STORMTECH SYSTEM DETAIL

StormTech Chamber Model	SC740	
Unit Width	1.295	m
Unit Length	2.17	m
Unit Height	0.76	m
Min Cover Over System	0.3	m
Max Cover Over Chamber	2.4	m
Internal Storage Vol. (Chamber only)	1.3	m^3

STONE AND EXCAVATION DETAIL

Volume of Dig for System	335	
Area of Dig at Base of System	284	m^2
Area of Dig at Top of System	348	m^2
Void Ratio	59%	
Stone Requirement - tonne	377	tonne

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

Half Drain Time : 849 minutes.

Storm Event	**Max Level (m)**	**Max Depth (m)**	**Max Infiltration (l/s)**	**Max Control (l/s)**	**Σ Max Outflow (l/s)**	**Max Volume (m³)**	**Status**
15 min Summer	71.845	0.195	0.0	1.8	1.8	50.5	O K
30 min Summer	71.921	0.271	0.0	1.9	1.9	70.4	O K
60 min Summer	72.003	0.353	0.0	1.9	1.9	91.5	O K
120 min Summer	72.089	0.439	0.0	1.9	1.9	113.7	O K
180 min Summer	72.139	0.489	0.0	1.9	1.9	126.8	O K
240 min Summer	72.175	0.525	0.0	1.9	1.9	136.0	O K
360 min Summer	72.222	0.572	0.0	1.9	1.9	148.3	O K
480 min Summer	72.252	0.602	0.0	1.9	1.9	156.0	O K
600 min Summer	72.269	0.619	0.0	1.9	1.9	160.7	O K
720 min Summer	72.279	0.629	0.0	1.9	1.9	163.2	O K
960 min Summer	72.288	0.638	0.0	1.9	1.9	165.4	O K
1440 min Summer	72.291	0.641	0.0	1.9	1.9	166.2	O K
2160 min Summer	72.278	0.628	0.0	1.9	1.9	162.9	O K
2880 min Summer	72.255	0.605	0.0	1.9	1.9	156.9	O K
4320 min Summer	72.190	0.540	0.0	1.9	1.9	140.1	O K
5760 min Summer	72.124	0.474	0.0	1.9	1.9	123.0	O K
7200 min Summer	72.063	0.413	0.0	1.9	1.9	107.2	O K
8640 min Summer	72.008	0.358	0.0	1.9	1.9	92.9	O K
10080 min Summer	71.961	0.311	0.0	1.9	1.9	80.6	O K
15 min Winter	71.868	0.218	0.0	1.9	1.9	56.6	O K

Storm Event	**Rain (mm/hr)**	**Flooded Volume (m³)**	**Discharge Volume (m³)**	**Time-Peak (mins)**
15 min Summer	81.599	0.0	49.6	19
30 min Summer	57.450	0.0	70.2	33
60 min Summer	38.020	0.0	95.3	64
120 min Summer	24.385	0.0	122.4	122
180 min Summer	18.636	0.0	140.3	182
240 min Summer	15.373	0.0	154.3	242
360 min Summer	11.683	0.0	175.9	362
480 min Summer	9.602	0.0	192.6	482
600 min Summer	8.242	0.0	206.4	600
720 min Summer	7.273	0.0	218.3	720
960 min Summer	5.969	0.0	237.9	854
1440 min Summer	4.517	0.0	263.0	1110
2160 min Summer	3.413	0.0	310.5	1516
2880 min Summer	2.795	0.0	338.9	1932
4320 min Summer	2.106	0.0	382.4	2724
5760 min Summer	1.721	0.0	418.5	3512
7200 min Summer	1.472	0.0	447.3	4248
8640 min Summer	1.295	0.0	472.1	5008
10080 min Summer	1.163	0.0	493.8	5656
15 min Winter	81.599	0.0	55.7	19

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

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
30 min Winter	71.955	0.305	0.0	1.9	1.9	79.1	O K
60 min Winter	72.047	0.397	0.0	1.9	1.9	103.0	O K
120 min Winter	72.145	0.495	0.0	1.9	1.9	128.5	O K
180 min Winter	72.205	0.555	0.0	1.9	1.9	143.9	O K
240 min Winter	72.248	0.598	0.0	1.9	1.9	155.1	O K
360 min Winter	72.305	0.655	0.0	1.9	1.9	169.8	O K
480 min Winter	72.339	0.689	0.0	1.9	1.9	178.8	O K
600 min Winter	72.361	0.711	0.0	1.9	1.9	184.5	O K
720 min Winter	72.376	0.726	0.0	1.9	1.9	188.2	O K
960 min Winter	72.389	0.739	0.0	1.9	1.9	191.5	O K
1440 min Winter	72.387	0.737	0.0	1.9	1.9	191.1	O K
2160 min Winter	72.366	0.716	0.0	1.9	1.9	185.8	O K
2880 min Winter	72.330	0.680	0.0	1.9	1.9	176.3	O K
4320 min Winter	72.228	0.578	0.0	1.9	1.9	149.8	O K
5760 min Winter	72.111	0.461	0.0	1.9	1.9	119.6	O K
7200 min Winter	72.015	0.365	0.0	1.9	1.9	94.7	O K
8640 min Winter	71.937	0.287	0.0	1.9	1.9	74.4	O K
10080 min Winter	71.876	0.226	0.0	1.9	1.9	58.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	57.450	0.0	78.8	33
60 min Winter	38.020	0.0	106.8	62
120 min Winter	24.385	0.0	137.1	120
180 min Winter	18.636	0.0	157.2	180
240 min Winter	15.373	0.0	172.8	238
360 min Winter	11.683	0.0	196.8	354
480 min Winter	9.602	0.0	215.4	470
600 min Winter	8.242	0.0	230.7	582
720 min Winter	7.273	0.0	243.7	694
960 min Winter	5.969	0.0	264.2	912
1440 min Winter	4.517	0.0	275.5	1154
2160 min Winter	3.413	0.0	347.8	1624
2880 min Winter	2.795	0.0	379.5	2100
4320 min Winter	2.106	0.0	428.0	2988
5760 min Winter	1.721	0.0	468.8	3744
7200 min Winter	1.472	0.0	501.0	4472
8640 min Winter	1.295	0.0	528.8	5184
10080 min Winter	1.163	0.0	553.3	5848

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)                 16.100 Shortest Storm (mins)    15
                Ratio R                  0.251  Longest Storm (mins) 10080
         Summer Storms                     Yes      Climate Change %   +20
```

Time Area Diagram

Total Area (ha) 0.338

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.338

STORMTECH Stormwater Management System Design Tool

ver: Jun14

PROJECT REF: 162074
LOCATION: Capdoo, Clane
DATE: 04/02/2019
CREATED BY: E Daly

Instructions:
Fill in blue highlighted cells
Set width to maximum allowance
Adjust site parameters and system dimension until volume achieved
For Rectangular systems only, for irregular shape dig contact Microstrain

SYSTEM PARAMETERS

Required Total Storage	**191.5**	m^3
Stormtech chamber model	**SC740**	
Number of Isolator Rows for TSS Removal	1	

SITE PARAMETERS

			Minimum Requirement
Maximum Width at Excavation Base	7.7	m	
Stone Porosity	40%		
Excavation Batter Angle (degrees)	60	°	
Stone Below Chambers	0.15	m	*0.15*
Stone Above Chambers	0.15	m	*0.15*
Additional Storage. E.g manholes, pipe	0	m^3	

CALCULATED CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted	
Number of Rows	5		ea
Number of units per Row	16		ea
Number of SC740 Chambers	80		ea
Number of SC740 Endcaps	10		ea
System Installed Storage Depth (effective storage depth)	1.060		m
Tank overall installed Width at base	7.68	7.7	m
Tank overall installed Length at Base	35.42	36	m
Total Effective System Storage	**189.7**	**192.1**	m^3

STORMTECH SYSTEM DETAIL

StormTech Chamber Model	SC740	
Unit Width	1.295	m
Unit Length	2.17	m
Unit Height	0.76	m
Min Cover Over System	0.3	m
Max Cover Over Chamber	2.4	m
Internal Storage Vol. (Chamber only)	1.3	m^3

STONE AND EXCAVATION DETAIL

Volume of Dig for System	323	
Area of Dig at Base of System	277	m^2
Area of Dig at Top of System	332	m^2
Void Ratio	59%	
Stone Requirement - tonne	357	tonne

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

Half Drain Time : 741 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 Summer	71.067	0.267	0.0	1.9	1.9	45.8	O K
30 min Summer	71.172	0.372	0.0	1.9	1.9	63.8	O K
60 min Summer	71.283	0.483	0.0	1.9	1.9	82.7	O K
120 min Summer	71.400	0.600	0.0	1.9	1.9	102.9	O K
180 min Summer	71.468	0.668	0.0	1.9	1.9	114.5	O K
240 min Summer	71.512	0.712	0.0	1.9	1.9	122.2	O K
360 min Summer	71.566	0.766	0.0	1.9	1.9	131.3	O K
480 min Summer	71.594	0.794	0.0	1.9	1.9	136.1	O K
600 min Summer	71.607	0.807	0.0	1.9	1.9	138.3	O K
720 min Summer	71.614	0.814	0.0	1.9	1.9	139.5	O K
960 min Summer	71.620	0.820	0.0	1.9	1.9	140.7	O K
1440 min Summer	71.617	0.817	0.0	1.9	1.9	140.1	O K
2160 min Summer	71.594	0.794	0.0	1.9	1.9	136.1	O K
2880 min Summer	71.560	0.760	0.0	1.9	1.9	130.4	O K
4320 min Summer	71.482	0.682	0.0	1.9	1.9	116.9	O K
5760 min Summer	71.388	0.588	0.0	1.9	1.9	100.9	O K
7200 min Summer	71.280	0.480	0.0	1.9	1.9	82.4	O K
8640 min Summer	71.198	0.398	0.0	1.9	1.9	68.2	O K
10080 min Summer	71.130	0.330	0.0	1.9	1.9	56.7	O K
15 min Winter	71.100	0.300	0.0	1.9	1.9	51.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	81.599	0.0	46.2	19
30 min Summer	57.450	0.0	65.2	33
60 min Summer	38.020	0.0	87.3	64
120 min Summer	24.385	0.0	112.1	122
180 min Summer	18.636	0.0	128.5	182
240 min Summer	15.373	0.0	141.4	242
360 min Summer	11.683	0.0	161.2	362
480 min Summer	9.602	0.0	176.6	480
600 min Summer	8.242	0.0	189.4	584
720 min Summer	7.273	0.0	200.5	640
960 min Summer	5.969	0.0	219.2	762
1440 min Summer	4.517	0.0	247.5	1026
2160 min Summer	3.413	0.0	283.5	1452
2880 min Summer	2.795	0.0	309.4	1872
4320 min Summer	2.106	0.0	349.5	2720
5760 min Summer	1.721	0.0	381.6	3520
7200 min Summer	1.472	0.0	407.8	4184
8640 min Summer	1.295	0.0	430.5	4928
10080 min Summer	1.163	0.0	450.6	5552
15 min Winter	81.599	0.0	51.8	18

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

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
30 min Winter	71.218	0.418	0.0	1.9	1.9	71.7	O K
60 min Winter	71.344	0.544	0.0	1.9	1.9	93.3	O K
120 min Winter	71.478	0.678	0.0	1.9	1.9	116.3	O K
180 min Winter	71.556	0.756	0.0	1.9	1.9	129.6	O K
240 min Winter	71.608	0.808	0.0	1.9	1.9	138.6	O K
360 min Winter	71.674	0.874	0.0	1.9	1.9	149.9	O K
480 min Winter	71.712	0.912	0.0	1.9	1.9	156.3	O K
600 min Winter	71.733	0.933	0.0	1.9	1.9	159.9	O K
720 min Winter	71.743	0.943	0.0	1.9	1.9	161.7	O K
960 min Winter	71.746	0.946	0.0	1.9	1.9	162.2	O K
1440 min Winter	71.739	0.939	0.0	1.9	1.9	161.0	O K
2160 min Winter	71.696	0.896	0.0	1.9	1.9	153.6	O K
2880 min Winter	71.638	0.838	0.0	1.9	1.9	143.7	O K
4320 min Winter	71.506	0.706	0.0	1.9	1.9	121.0	O K
5760 min Winter	71.334	0.534	0.0	1.9	1.9	91.5	O K
7200 min Winter	71.183	0.383	0.0	1.9	1.9	65.7	O K
8640 min Winter	71.078	0.278	0.0	1.9	1.9	47.6	O K
10080 min Winter	71.005	0.205	0.0	1.8	1.8	35.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	57.450	0.0	73.1	33
60 min Winter	38.020	0.0	97.9	62
120 min Winter	24.385	0.0	125.6	120
180 min Winter	18.636	0.0	144.0	180
240 min Winter	15.373	0.0	158.4	238
360 min Winter	11.683	0.0	180.5	352
480 min Winter	9.602	0.0	197.7	466
600 min Winter	8.242	0.0	212.1	576
720 min Winter	7.273	0.0	224.4	684
960 min Winter	5.969	0.0	245.1	866
1440 min Winter	4.517	0.0	274.4	1096
2160 min Winter	3.413	0.0	317.5	1560
2880 min Winter	2.795	0.0	346.6	2020
4320 min Winter	2.106	0.0	391.4	2936
5760 min Winter	1.721	0.0	427.4	3744
7200 min Winter	1.472	0.0	456.8	4392
8640 min Winter	1.295	0.0	482.2	5016
10080 min Winter	1.163	0.0	504.8	5648

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)	16.100	Shortest Storm (mins)	15
Ratio R	0.251	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.308

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.308

STORMTECH Stormwater Management System Design Tool

ver: Jun14

PROJECT REF: 162074
LOCATION: Capdoo, Clane
DATE: 04/02/2019
CREATED BY: E Daly

Instructions: Fill in blue highlighted cells
Set width to maximum allowance
Adjust site parameters and system dimension until volume achieved
For Rectangular systems only, for irregular shape dig contact Microstrain

SYSTEM PARAMETERS

Required Total Storage	**162.2**	m^3
Stormtech chamber model	**SC740**	
Number of Isolator Rows for TSS Removal	1	

SITE PARAMETERS

			Minimum Requirement
Maximum Width at Excavation Base	9.5	m	
Stone Porosity	40%		
Excavation Batter Angle (degrees)	60	°	
Stone Below Chambers	0.23	m	*0.15*
Stone Above Chambers	0.3	m	*0.15*
Additional Storage. E.g manholes, pipe	0	m^3	

CALCULATED CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted	
Number of Rows	6		ea
Number of units per Row	10		ea
Number of SC740 Chambers	60		ea
Number of SC740 Endcaps	12		ea
System Installed Storage Depth (effective storage depth)	1.290		m
Tank overall installed Width at base	9.12	9.5	m
Tank overall installed Length at Base	22.4	22.5	m
Total Effective System Storage	**165.5**	**170.5**	m^3

STORMTECH SYSTEM DETAIL

StormTech Chamber Model	SC740	
Unit Width	1.295	m
Unit Length	2.17	m
Unit Height	0.76	m
Min Cover Over System	0.3	m
Max Cover Over Chamber	2.4	m
Internal Storage Vol. (Chamber only)	1.3	m^3

STONE AND EXCAVATION DETAIL

Volume of Dig for System	308	
Area of Dig at Base of System	214	m^2
Area of Dig at Top of System	264	m^2
Void Ratio	55%	
Stone Requirement - tonne	375	tonne

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

Half Drain Time : 2118 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 Summer	71.574	0.240	0.0	1.7	1.7	89.1	O K
30 min Summer	71.670	0.336	0.0	1.7	1.7	124.8	O K
60 min Summer	71.774	0.440	0.0	1.7	1.7	163.6	O K
120 min Summer	71.890	0.556	0.0	1.7	1.7	206.8	O K
180 min Summer	71.963	0.629	0.0	1.7	1.7	234.0	O K
240 min Summer	72.017	0.683	0.0	1.7	1.7	254.0	O K
360 min Summer	72.093	0.759	0.0	1.7	1.7	282.1	O K
480 min Summer	72.145	0.811	0.0	1.7	1.7	301.6	O K
600 min Summer	72.184	0.850	0.0	1.7	1.7	315.9	O K
720 min Summer	72.213	0.879	0.0	1.7	1.7	326.8	O K
960 min Summer	72.253	0.919	0.0	1.7	1.7	341.8	O K
1440 min Summer	72.292	0.958	0.0	1.8	1.8	356.1	O K
2160 min Summer	72.309	0.975	0.0	1.8	1.8	362.5	O K
2880 min Summer	72.311	0.977	0.0	1.8	1.8	363.3	O K
4320 min Summer	72.298	0.964	0.0	1.8	1.8	358.3	O K
5760 min Summer	72.273	0.939	0.0	1.8	1.8	349.3	O K
7200 min Summer	72.245	0.911	0.0	1.7	1.7	338.7	O K
8640 min Summer	72.214	0.880	0.0	1.7	1.7	327.2	O K
10080 min Summer	72.182	0.848	0.0	1.7	1.7	315.4	O K
15 min Winter	71.603	0.269	0.0	1.7	1.7	99.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	81.599	0.0	84.0	19
30 min Summer	57.450	0.0	116.6	34
60 min Summer	38.020	0.0	164.7	64
120 min Summer	24.385	0.0	210.4	124
180 min Summer	18.636	0.0	238.9	184
240 min Summer	15.373	0.0	257.8	242
360 min Summer	11.683	0.0	269.0	362
480 min Summer	9.602	0.0	267.8	482
600 min Summer	8.242	0.0	265.5	602
720 min Summer	7.273	0.0	263.6	722
960 min Summer	5.969	0.0	260.9	962
1440 min Summer	4.517	0.0	261.5	1440
2160 min Summer	3.413	0.0	526.6	1796
2880 min Summer	2.795	0.0	526.1	2164
4320 min Summer	2.106	0.0	492.7	2984
5760 min Summer	1.721	0.0	729.7	3856
7200 min Summer	1.472	0.0	779.4	4680
8640 min Summer	1.295	0.0	821.5	5528
10080 min Summer	1.163	0.0	854.1	6352
15 min Winter	81.599	0.0	94.0	19

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

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
30 min Winter	71.710	0.376	0.0	1.7	1.7	140.0	O K
60 min Winter	71.828	0.494	0.0	1.7	1.7	183.7	O K
120 min Winter	71.960	0.626	0.0	1.7	1.7	232.7	O K
180 min Winter	72.042	0.708	0.0	1.7	1.7	263.3	O K
240 min Winter	72.103	0.769	0.0	1.7	1.7	286.1	O K
360 min Winter	72.191	0.857	0.0	1.7	1.7	318.5	O K
480 min Winter	72.252	0.918	0.0	1.7	1.7	341.3	O K
600 min Winter	72.298	0.964	0.0	1.8	1.8	358.4	O K
720 min Winter	72.334	1.000	0.0	1.8	1.8	371.7	O K
960 min Winter	72.385	1.051	0.0	1.8	1.8	390.8	O K
1440 min Winter	72.441	1.107	0.0	1.9	1.9	411.5	O K
2160 min Winter	72.464	1.130	0.0	1.9	1.9	420.1	O K
2880 min Winter	72.463	1.129	0.0	1.9	1.9	419.9	O K
4320 min Winter	72.440	1.106	0.0	1.9	1.9	411.1	O K
5760 min Winter	72.397	1.063	0.0	1.9	1.9	395.2	O K
7200 min Winter	72.347	1.013	0.0	1.8	1.8	376.6	O K
8640 min Winter	72.294	0.960	0.0	1.8	1.8	357.0	O K
10080 min Winter	72.241	0.907	0.0	1.7	1.7	337.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	57.450	0.0	128.3	33
60 min Winter	38.020	0.0	184.4	64
120 min Winter	24.385	0.0	234.1	122
180 min Winter	18.636	0.0	261.4	180
240 min Winter	15.373	0.0	270.6	240
360 min Winter	11.683	0.0	270.6	358
480 min Winter	9.602	0.0	268.9	474
600 min Winter	8.242	0.0	267.9	590
720 min Winter	7.273	0.0	267.7	706
960 min Winter	5.969	0.0	270.0	934
1440 min Winter	4.517	0.0	276.7	1384
2160 min Winter	3.413	0.0	551.8	2008
2880 min Winter	2.795	0.0	542.6	2280
4320 min Winter	2.106	0.0	524.2	3204
5760 min Winter	1.721	0.0	817.1	4152
7200 min Winter	1.472	0.0	872.5	5048
8640 min Winter	1.295	0.0	918.1	5968
10080 min Winter	1.163	0.0	926.3	6856

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)               16.100 Shortest Storm (mins)    15
                     Ratio R                 0.251  Longest Storm (mins) 10080
               Summer Storms                   Yes      Climate Change %   +20
```

Time Area Diagram

```
Total Area (ha) 0.590

 Time  (mins)  Area
From:   To:    (ha)

    0      4 0.590
```

STORMTECH Stormwater Management System Design Tool

ver: Jun14

PROJECT REF: 162074
LOCATION: Capdoo, Clane
DATE: 04/02/2019
CREATED BY: E Daly

Instructions:
- Fill in blue highlighted cells
- Set width to maximum allowance
- Adjust site parameters and system dimension until volume achieved
- For Rectangular systems only, for irregular shape dig contact Microstrain

SYSTEM PARAMETERS

Required Total Storage	**415**	m^3
Stormtech chamber model	**MC3500**	
Number of Isolator Rows for TSS Removal	1	

SITE PARAMETERS

			Minimum Requirement
Maximum Width at Excavation Base	5	m	
Stone Porosity	40%		
Excavation Batter Angle (degrees)	60	°	
Stone Below Chambers	0.23	m	*0.23*
Stone Above Chambers	0.3	m	*0.30*
Additional Storage. E.g manholes, pipe	0	m^3	

CALCULATED CHAMBER SYSTEM DIMENSIONS

	Calculated	**Adopted**	
Number of Rows	2		ea
Number of units per Row	34		ea
Number of MC3500 Chambers	68		ea
Number of MC3500 Endcaps	4		ea
System Installed Storage Depth (effective storage depth)	1.675		m
Tank overall installed Width at base	4.74	4.75	m
Tank overall installed Length at Base	75.86	76	m
Total Effective System Storage	**422.4**	**423.5**	m^3

STORMTECH SYSTEM DETAIL

StormTech Chamber Model	MC3500	
Unit Width	1.955	m
Unit Length	2.18	m
Unit Height	1.145	m
Min Cover Over System	0.3	m
Max Cover Over Chamber	2.4	m
Internal Storage Vol. (Chamber only)	3.11	m^3

STONE AND EXCAVATION DETAIL

Volume of Dig for System	739	
Area of Dig at Base of System	361	m^2
Area of Dig at Top of System	521	m^2
Void Ratio	57%	
Stone Requirement - tonne	859	tonne

StormTech®
Detention•Retention•Recharge
Subsurface Stormwater Management℠

APPENDIX D – IRISH WATER PRE-CONNECTION FEEDBACK

UISCE
ÉIREANN : IRISH
WATER

Uisce Eireann
Bosca OP 860
Oifig Sheachadta
na Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 860
South City
Delivery Office
Cork City

www.water.ie

Letter Ref: CDSCOF6

Mr Brendan Keogh,
Associate
DBFL Consulting Engineers,
Ormond House,
Upper Ormond Quay,
Dublin 7

24th Spetmeber 2018

Dear Sir/Madam,

Re: CUSTO16467 pre-connection enquiry – Subject to contract | Contract denied 323 Residential Units at Capdoo, Clane, Co. Kildare

Irish Water has reviewed your pre-connection enquiry in relation to water and wastewater connections at Capdoo (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on the capacity **currently available as assessed** by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place and the conditions listed below, your proposed connection to the Irish Water network can be facilitated.

Strategic Housing Development
Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. Therefore:

A. In advance of submitting your full application to An Bord Pleanala for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services.
B. You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed and appropriate connection fee paid at a later date.

Wastewater
It is feasible for 205 units to connect until the Upper Liffey Valley Sewerage Scheme (Contract 2B) and associated upgrades in Clane are completed in 2021 (programme subject to statutory process and change). Thereafter, the balance of units up to 181 units may be accommodated.

Stiúrthóirí / Directors: Brendan Murphy, Michael O'Sullivan, Jerry Grant, Cathal Marley
Oifig Chláraithe / Registered Office: Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86 / Colvill House, 24-26 Talbot Street, Dublin 1, D01 NP86
Is cuideachta ghníomhaíochta ainmnithe atá faoi theorainn scaireanna é Uisce Éireann / Irish Water is a designated activity company, limited by shares.
Uimhir Chláraithe in Éirinn / Registered in Ireland No.: 530363

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

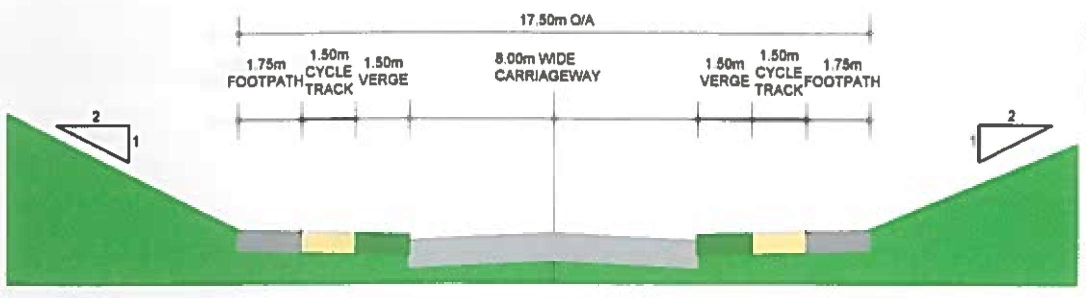
Should you wish to have any of the above progressed by Irish Water or if you have any further questions, please contact **1850 278 278 8.00am-4.30pm, Mon-Fri or email newconnections@water.ie.** For further information, visit **www.water.ie/connections**

Yours sincerely,

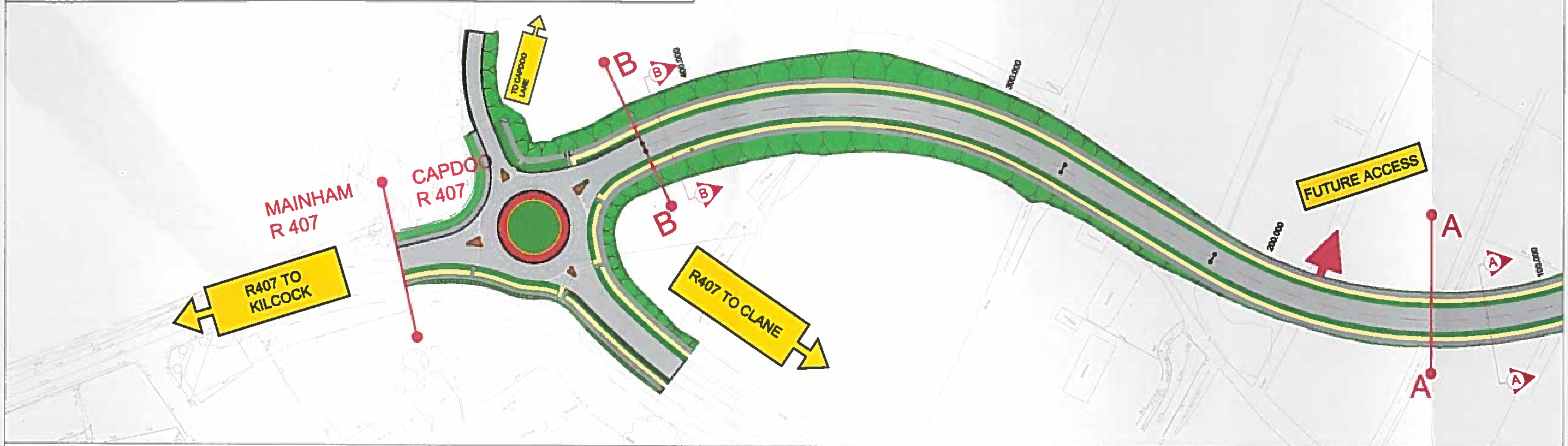
Maria O'Dwyer

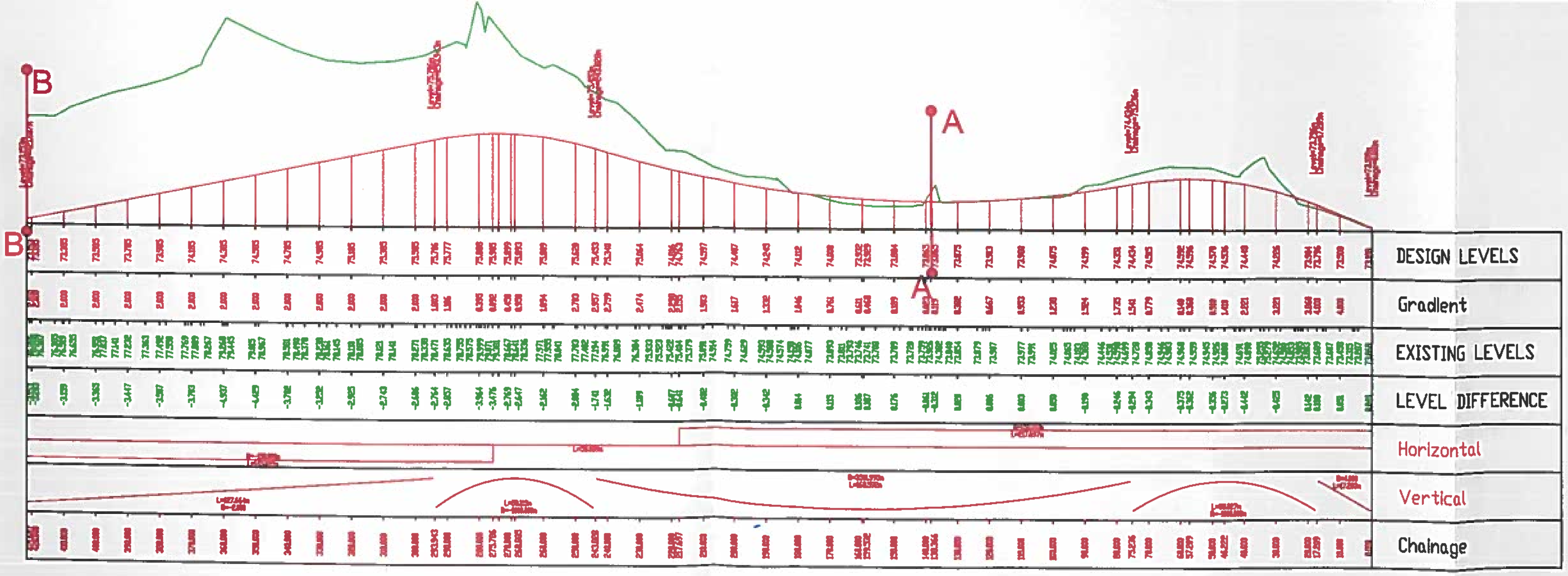
Connections and Developer Services

APPENDIX E – KCC PART 8 PUBLIC DISPLAY DRAWING



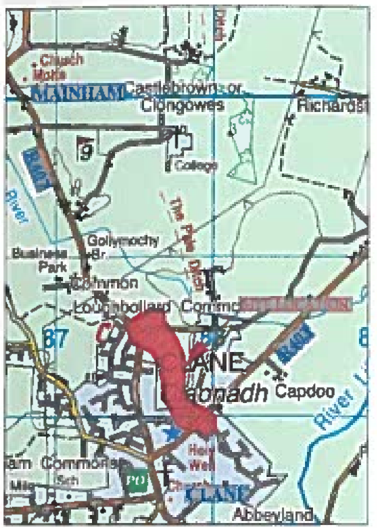
CROSS SECTION AT B-B (N.T.S.)





NOTES

For setting out refer to OCSC Alignments / drawings.
This drawing to be read in conjunction with all other Architectural and Engineering drawings and all other relevant drawings and Specifications.
DO NOT SCALE THIS DRAWING. Use figured dimensions only.
Levels shown are to Malin Hd. Datum.



SITE LOCATION PLAN
Clane Inner Relief Road
(Capdoo)
Not to Scale

Kildare County Council
St Mary's, Naas,
County Kildare.
Mr J. Lynch B.E., C.Eng, M.I.E.I.
Director of Services Transport
and Environment

O'CONNOR SUTTON CRONIN
9 PRUSSIA STREET, DUBLIN 7.
TELEPHONE 868 2000 FAX 8682100

KILDARE COUNTY COUNCIL

CLANE INNER RELIEF ROAD
(CAPDOO)

PART 8 PUBLIC
DISPLAY DRAWINGS

K72_016

APPENDIX F – EXTRACT FROM IGSL SI REPORT

PROPOSED HOUSING
DEVELOPMENT
CAPDOO CLANE
FOR ARDSTONE

DBFL
CONSULTING ENGS

CONTENTS

APPENDICES

FOREWORD

The following Conditions and Notes on Site Investigation Procedures should be read in conjunction with this report.

General.

Recommendations made, and opinions expressed in the report are based on the strata observed in the exploratory holes, together with the results of in-situ and laboratory tests. No responsibility can be held for conditions which have not been revealed by exploratory work, or which occur between exploratory hole locations. Whilst the report may suggest the likely configuration of strata, both between exploratory hole locations, or below the maximum depth of the investigation, this is only indicative, and liability cannot be accepted for its accuracy.

Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction below or close to the site.

Boring Procedures.

Unless otherwise stated, the 'Shell and Auger' technique of soft ground boring has been employed. All boring operations sampling and/or logging of soils and in-situ testing complies with the recommendations of the British Standard Code of Practice BS 5930 (1999), 'Site Investigation' and BS 1377:1990, 'Methods of test for soils for civil engineering purposes'.

Whilst the technique allows the maximum data to be obtained in soft ground, some disturbance and variation of soft and layered soils is unavoidable. Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

Where peat has been encountered during siteworks, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges Gologiska Undersoknings torvinventering och nogra av dess hittils vunna resultat (SGU peat inventory and some preliminary results) Svenska Mosskulturforeningens Tidskrift, Jonkoping, Swedden, 36, 1-37 & Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986).

Routine Sampling.

Undisturbed samples of soils, predominantly cohesive in nature are obtained unless otherwise stated by a 104mm diameter open-drive tube sampler. In granular soils, and where undisturbed sampling is inappropriate, disturbed samples are collected. Smaller disturbed samples are also recovered at intervals to allow a visual examination of the full strata section.

In-Situ Testing.

Standard penetration tests, utilising either the standard split spoon sampler or solid cone and automatic trip-hammer are conducted unless otherwise where required by instruction. Subsequent to a seating drive of 150mm, a summation for the number of blows for 300mm penetration is recorded on the boring records together with the blow count for each 75mm penetration. In cases where incomplete penetration is obtained, the numbers of blows for the recorded value of penetration are noted. In coarse granular soils, a cone end is fitted to the sampler and a similar procedure adopted.

Groundwater.

The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water
level.

Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage condition, tidal variation or other causes.

Retention of Samples.

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material is discarded. Unless a period of retention of samples is agreed, it is our normal practice to discard all soil samples one month after submission of our final report.

REPORT ON A SITE INVESTIGATION
FOR A HOUSING DEVELOPMENT
AT CAPDOO
CLANE
COUNTY KILDARE
FOR
ARDSTONE RESIDENTIAL

DBFL CONSULTING ENGINEERS

Report No 20159 **JULY 2017**

I Introduction

A major residential development is planned for a site located at Capdoo in Clane, County Kildare.

A comprehensive investigation of sub soil conditions in the area of development has been ordered by DBFL Consulting Engineers on behalf of Ardstone Residential Fund.

The programme of the field investigation included the construction of boreholes, trial pits and dynamic probes to establish geotechnical criteria on which to base foundation and infra-structural design. Work was carried out in accordance with BS 5930, Code of Practice for Site Investigations (1999).

In addition plate bearing tests were scheduled to determine in situ CBR values while soakaway testing was performed in several locations in accordance with BRE Digest 365.

A programme of laboratory testing to confirm geotechnical and environmental soil parameters followed site operations.

This report includes all factual data pertaining to the project and comments on the findings relative to foundation and infrastructural design.

II Fieldwork

The site is predominantly a green field one located at Capdoo in Clane. A site location map and a drawing indicating the exploratory positions are enclosed in Appendix VII. This has been provided by DBFL engineers.

The various exploratory positions have been determined by DBFL and set out by the site engineer. Locations have been referenced to national grid and O.D. levels have been established.

Each location was electronically scanned to ensure that underground services were not disrupted. At borehole locations a trial pit was opened by hand to a depth of 1.20 metres to confirm this.

The scope of the field investigation included the following elements:

* 3 nr. Conventional Boreholes
* 23 nr Machine Excavated Trial Pits
* 20 nr. Plate Bearing Tests (In Situ CBR)
* 50 nr H.D. Dynamic Probes
* 8 nr Percolation Tests to BRE Digest 365

Following the field operations samples were selected for laboratory analysis. This included standard geotechnical testing and detailed environmental analysis carried out by specialist laboratory.

a.Boreholes

The exploratory holes were bored with conventional 200mm cable-tool methods using a Dando 2000 Rig. One re-bore (BH02A) was carried out after shallow refusal in BH02.

Detailed geotechnical records are contained in Appendix I to this report - the records give details of stratification, sampling, in-situ testing and groundwater. Note is also taken of any obstructions to normal boring requiring the use of the heavy chisel for advancement.

Some variation in stratification was indicated. At BH01 surface top soil overlies a thin stratum of brown sandy gravelly CLAY. From 1.10 to 8.80 metres, medium dense to dense silty sandy GRAVEL is penetrated, with refusal noted at 8.80 metres. Ground water was observed at 4.20 metres BGL.

Boreholes BH02 and BH02A encountered stiff to very stiff brown sandy gravelly CLAY below top soil to respective refusal depths of 3.90 and 3.20 metres.

In BH03, very stiff brown gravelly CLAY extends from 0.20 to 2.20 metres with dense underlying GRAVEL 2.20 to 3.30 metres. Boulders at 3.30 metres prevented further advancement. No ground water was encountered in BH02, BH02A and BH03.

Both boreholes BH2 and BH3 were dry during the investigation period.

b. Trial Pits

Trial pits were scheduled at twenty five locations. Because of access restraints TP01 and TP02 were omitted. Trial Pitting was carried out using a light tracked excavator under geotechnical engineering supervision. Samples were recovered at intervals, ground water was noted where relevant and detailed trial pit records prepared. These records are contained in Appendix II to this report with supporting photographs.

Top soil varying in thickness from 300mm to 600mm overlies the site. In the majority of trial pit locations a thin stratum of firm gravelly SILT/CLAY is then noted. This continues to depths between 1.00 and 2.00 metres. Below this stratum and directly below the top soil in some locations a stratum of silty or clayey gravelly SAND or sandy GRAVEL is found. Trial Pits continued to completion in this stratum at depths between 2.50 and 3.00 metres.

Ground water was noted in Trial Pits TP07 to TP12, associated with collapse of side walls in some instances. Some minor wall collapse was also recorded in dry non-cohesive soils.

c. Plate Bearing Tests

In situ CBR values were established by Plate Bearing Test at twenty one specified locations. Testing was carried out directly below the top-soil zone at a depth of approximately 0.50 metres. Test locations were referenced CBR05 to CBR25. Four locations CBR01 to CBR04 were not accessible.

A 450mm diameter steel plate is loaded incrementally and deflection is recorded. The plate is then off loaded and recovery measured (Load Cycle). The process is then repeated (Re-Load Cycle).

The equivalent CBR value is calculated for both cycles. Detailed individual results are presented in Appendix III and the data is summarised in the following table.

TABLE A CBR SUMMARY DATA

Test No.	CBR at Load Cycle (%)	CBR at RE-Load (%)
05	54.9	68.7
06	2.8	3.7
07	1.5	3.4
08	0.2	0.2
09	1.0	1.5
10	3.7	5.0
11	5.1	7.1
12	2.5	3.6
13	1.0	3.1
14	N/A	N/A
15	4.3	6.1
16	1.2	3.1
17	2.6	5.5
18	4.1	6.0
19	8.1	9.8
20	1.2	2.2
21	1.4	3.9
22	2.5	10.0
23	1.1	2.6
24	1.0	1.7
25	1.6	4.6

The high CBR values noted at locations CBR05 and CBR 19 may reflect coarse dry surface material. The results over the remainder of the site reflect average CBR values on load cycle of 2.3% with an average CBR value of 3.6 % on reload.

A design CBR value of 3% would be appropriate for this site.

d. Dynamic Probes

Probing was scheduled at fifty locations to establish a pattern of soil strength with depth. Access was restricted at DP01 and DP02 and these probes were omitted. Forty-eight probes were completed.

Probing was in accordance with the heavy-duty probe specification of BS 1377: Part 9: 1990. In these tests, the soil resistance is measured in terms of the number of drop-hammer blows required to drive the test probe through each 100 mm increment of penetration. Probing is terminated when the blow count exceeds 25/100mm to avoid damage to the apparatus. Where loose material is present a single blow count may drive the apparatus in excess of 100mm. In this instance blow counts of zero may be recorded.

Some variation in probe resistances and associated soil strength were observed. Soft zones (defined by N_{100} values < 1) were noted in several locations. A dynamic probe resistance of $N_{100} = 3$ (with no dramatic underlying deterioration) would be the normal minimum requirement for conventional two storey house foundations.

Probe results are summarised with the depth to $N_{100} = 3$ indicated as well as soft unsuitable zones. Final probe refusal depths are also indicated, these depths are not indicative of rock horizon.

Probe No.	Soft Zones	Depth to $N_{100} = 3$	Final Depth
DP03	0 – 0.30	0.30	1.00
DP04	0.80 – 1.30	1.70	3.20
DP05	0 – 0.20	0.30	1.40
DP06	0.80 – 1.90	2.20	2.60
DP07	0 – 1.80	2.00	2.40
DP08	0 – 1.60	1.70	2.70
DP09	0 – 0.20	0.60	3.10
DP10	0 – 0.30	0.70	3.60
DP11	0 – 0.10	0.30	1.70
DP12	0.80 – 1.40	1.60	2.50
DP13	0 – 0.80	0.90	5.00
DP14	0 – 1.10	1.20	1.50
DP15	0 – 0.20	0.50	2.00
DP16	0 – 0.30	0.60	2.50
DP17	0 – 1.80	1.90	5.00
DP18	0 – 1.60	1.70	2.90
DP19	0 – 0.50	0.60	3.60
DP20	1.80 – 2.40	0.70	3.60
DP21	0 – 0.20	0.40	1.50
DP22	0 – 0.20	0.40	3.50
DP23	0 – 1.80	2.00	4.80
DP24	0 – 1.50	1.70	5.00
DP25	0 – 0.20	0.40	2.60
DP26	0 – 0.20	0.40	2.00
DP27	0 – 0.20	0.50	5.00
DP28	0 – 1.00	1.20	1.60
DP29	0 – 0.50	1.00	4.00
DP30		0.70	3.50
DP31	0 – 0.30	0.70	4.80
DP32		1.20	2.60
DP33	0 – 0.60	0.80	2.60
DP34	0 – 0.20	0.40	5.00
DP35		0.40	1.20
DP36	0 – 0.80	1.00	5.00
DP37	0 – 0.50	1.20	3.70
DP38	0 – 1.40	1.50	2.60
DP39	0 – 1.30	1.40	5.00
DP40	0 – 0.40	1.00	5.00
DP41	0 – 0.30	0.50	5.00
DP42	0 – 0.70	1.00	2.80
DP43	0 – 0.80	1.00	2.00
DP44	0 – 0.20	0.80	1.40
DP45	0 – 1.00	1.20	3.40
DP46	0 – 0.20	0.60	2.40
DP47	0 – 0.40	0.70	1.20
DP48	0 – 0.40	1.00	2.00
DP49	0 – 0.50	0.60	3.00
DP50	0 – 1.50	1.70	4.90

e. BRE Digest 365 Soakaway

A total of eight percolation tests were scheduled.

Infiltration testing was performed in accordance with BRE Digest 365 'Soakaway Design'. To obtain a measure of the infiltration rate of the sub-soils, water is poured into the test pit, and records taken of the fall in water level against time. This operation is generally performed over two cycles of soakage and dispersion following initial soakage.

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. In these calculations the exposed area is the sum of the base area and the average internal area of the pit sides over the test duration.

Records for each test are presented in Appendix V. The stratification and water table in each test pit is noted and a record of fall in water level with time is made.

Designs are based on the slowest infiltration rate, which is generally calculated from the final cycle. The infiltration rate (f) is calculated and the results for the individual tests indicate that the soils in the test areas are relatively impermeable with little or no infiltration recorded.

The results reflect the variation in ground conditions over the site area. In two locations a high water table was noted , precluding completion of the test. Impermeable clay matrix soils were also encountered and some percolation was achieved in the more granular soils.

The Infiltration Rate (f) for each location with brief comment is noted as follows:

Test No.	**Infiltration Rate (f) (metres / min)**	**Comment**
IT01	0.00000	Silt/Clay
IT02	0.00054	Silty SAND
IT03	0.00163	SAND
IT04	0.00094	Silty SAND
IT05	No Test Possible	Water Table @ 1.30m
IT06	No Test Possible	Water Table @ 0.90m
IT07	0.00238	Sandy GRAVEL
IT08	0.00014	Silty SAND

III Testing

(a) In-Situ :

Standard penetration tests were carried out at approximate 1.00 metre intervals in the geotechnical boreholes to measure relative in-situ soil strength. N values are noted in the right hand column of the boring records, representing the blow count required to drive the standard sampler 300mm into the soil, following initial seating blows. Where full test penetration was not achieved the blow count for a specific penetration is recorded, or refusal is indicated where appropriate

The results of the tests are summarised as follows:

STRATUM	N VALUE RANGE	COMMENT
Sandy GRAVEL	12 to 52	Medium Dense to Dense
Gravelly CLAY	23 to 32	Stiff

In several instances refusal of SPT apparatus was noted, probably on boulder obstructions and results are presented as blows for specific penetration and refusal.

(b) Geotechnical and Environmental Laboratory :

All samples from the boreholes and trial pits have been returned to the IGSL laboratory for initial visual inspection, a schedule of testing was prepared and tests as appropriate carried out. The programme of testing included the following elements and all results are presented in Appendix VI.

a. Moisture Content and Classification (Liquid and Plastic Limits)
b. Particle size distribution (Sieve Analysis / Hydrometer)
c. Sulphate and pH determination.
d. RILTA Environmental Suite

Geotechnical testing was carried out by IGSL in it's INAB accredited facility. Chemical and environmental testing was carried out by Chemtest Limited in their UKAS laboratory.

Classification

The liquid and plastic limits were established for several samples of the upper cohesive soils. Results reflect variation from clay matrix to silt matrix material, essentially material of similar origin. Moisture contents range from 9 to 18% and the material is of low plasticity and sensitivity to moisture content variation.

Grading

Grading tests were carried out on the main soil strata using wet sieve and hydrometer analysis as appropriate.

The grading curves reflect the variation in soil type over the site area. Clean sandy GRAVEL, finer silty SAND, gravelly SILT and gravelly CLAY have all been identified.

Sulphate and pH.

Three samples were selected for sulphate and pH analysis. Sulphate concentrations (SO4 2:1 extract) of from 0.010 to 0.017 g/l were established with an average pH of 8.3 No special precautions are necessary to protect foundation concrete from sulphate aggression. A sulphate design class of DS-1 (ACEC Classification for Concrete) is indicated for concentrations less than 0.5 g/l.

Environmental

Two soil samples were submitted for detailed environmental analysis to RILTA (WAC) parameters.

The results indicate that the soils can be classified as INERT with little or no elevated contaminant levels recorded. Material excavated from this site can be readily disposed of to a regular licensed landfill facility and no problems are anticipated with personnel operating on the site.

IV Discussion

The proposed residential development is for traditional housing on a site located at Capdoo in Clane, County Kildare.

The area is an undulating greenfield one with ground level varying from about 67.00 to 80.00 OD. Access to part of the site was restricted and a number of scheduled Trial Pits, CBR Tests and Probes were omitted following consultation with the client and engineer.

A comprehensive investigation of ground conditions has been carried out on the instructions of DBFL involving Borehole and Trial Pit investigation with supporting Dynamic Probes, Plate Bearing Tests and Percolation Tests.

It is assumed that the development will as far as possible follow existing contours, however some cut and fill operations may be required.

Ground water was noted at approximately 4.00 metres in one of the boreholes and in rare trial pits generally below 1.00 metres.

Foundations:

Soil strength has been determined by SPT tests in the three boreholes and by Dynamic Probe resistance in the fifty locations examined. Visual assessment of soil strength in the trial pits has also been used in assessing allowable bearing parameters.

Standard penetration tests in boreholes at 1.00 metre BGL were in excess of N = 20. This would suggest an allowable bearing pressure of 150 kN/sq.m. based on the lowest SPT value.

A Dynamic Probe resistance of $N_{100} = 3$ with an increasing underlying strength trend will permit an allowable bearing pressure of 100 kN/sq.m. Similarly a probe resistance of N100 = 5 will equate to 150 kN/sq.m.

Based on the data obtained we would suggest the use of traditional reinforced strip or pad foundations, founded at approximately 1.00 metre BGL and using an allowable bearing pressure of 100 kPa. This scenario will be applicable over most of the site. In about ten probe locations soft or weak soils were noted to depths in excess of the normal 1.00 metre. The relevant probes are DPs 4,6,7,8,12,17,18,23, 24 and 50. Apart from Probe 50, these are generally located in the northern section of the site.

Careful visual assessment of excavated formation will be essential to accurately define the soft zones which should be removed and replace with lean nix concrete up to base of reinforced foundation.

It is quite likely that variation from granular to cohesive soils will occur over relatively short distances. Ideally individual structures (detached or semi-detached) should be founded on similar material to ensure that differential settlement is avoided.

Settlement of foundations under the indicated loads will be of the order of 10 to 15mm. In the mainly granular soils settlement should be relatively rapid. Settlement in the clay soils will be mote long term.

Well-reinforced foundations will assist in bridging any local discontinuities in the formation soils.

Ground Floor Slabs

The sub soils below the top-soil at a depth of about 0.50 metres should readily support lightly loaded ground floor slabs. All organic soils and all FILL material should be removed and imported hardcore infill should fully comply with current building regulations.

Excavation

Ground water was not observed at proposed foundation depth and should not be of concern in shallow excavation. While trial pit excavations remained stable over the short term of the investigation, some instability may occur in longer term excavations.

Some ground water may however be encountered in deep service trench excavations.

Statutory safety regulations prohibit personnel entering unsupported excavations greater than 1.20 metre deep, irrespective of apparent stability.

Roads and Pavements

CBR tests at shallow depth indicate an average CBR of about 3%. Excavated road or pavement formation should be inspected to ensure that all organic or unsuitable material is removed.

Percolation

The variation in soil type over the site area has been outlined in the detailed test sheets with low percolation noted in clay based soils and test failure where high water table is present. Infiltration tests in the granular soils indicate that it should be suitable for dispersion of surface water.

Concrete

Tests indicates low sulphate concentration (< 0.017 g/l) and pH of 8.3. The results indicate a design classification of DS-1 (ACEC Classification). No special precautions are deemed necessary to protect foundation concrete.

Environmental

Tests carried out on samples from this site indicate that the soils can be classified as INERT with extremely low contamination levels.

Material excavated from this site can be disposed of to licensed landfill or utilised within the site for non-engineering purposes, landscaping etc.

SUMMARY

Conventional shallow reinforced strip or pad foundations are recommended for this housing development with allowable bearing pressures as follows:

100 kPa for foundations placed at about 1.00 metre BGL using a dynamic probe resistance of $N_{100} = 3$ as a baseline. In areas where soft deposits occur depth of excavation to a suitable formation will increase. In these areas lean mix concrete can be used as backfill up to underside of main foundation.

Variation in founding medium from cohesive material (gravelly CLAY or SILT) to non-cohesive (SAND / GRAVEL) to intermixed zones (gravelly CLAY / clayey GRAVEL) can be expected over the site area.

IGSL/JC
July 2017

Appendix II Trial Pit Records

TRIAL PIT RECORD

REPORT NUMBER 20159

CONTRACT Capdoo, Clane

TRIAL PIT NO. **TP03**

SHEET Sheet 1 of 1

LOGGED BY L. Daniels

CO-ORDINATES 687,618.36 E
728,452.58 N

GROUND LEVEL (m) 79.46

DATE STARTED 15/06/2017

DATE COMPLETED 15/06/2017

CLIENT Ardstone

ENGINEER DBFL

EXCAVATION METHOD 3.5 Ton Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.									
	Firm brown slightly gravelly SILT/CLAY. Gravel is fine to medium subangular to subrounded.		0.30	79.16						
1.0	Brown silty fine to coarse subangular to subrounded GRAVEL with a medium cobble content and a low boulder content. Cobbles are subangular to rounded.		0.60	78.86		AA78690	B	0.80		
2.0	Grey to black sandy fine to coarse subrounded GRAVEL.		1.70	77.76		AA78691	B	1.80		
	Grey slightly gravelly fine to medium SAND. Gravel is fine to coarse subangular to subrounded.		2.40	77.06		AA78692	B	2.50		
3.0	End of Trial Pit at 3.00m		3.00	76.46						

Groundwater Conditions

Stability

General Remarks

TRIAL PIT RECORD

REPORT NUMBER	20159		
CONTRACT	Capdoo, Clane	**TRIAL PIT NO.**	**TP04**
		SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels	**DATE STARTED**	15/06/2017
CO-ORDINATES	687,669.68 E 728,454.80 N	**DATE COMPLETED**	15/06/2017
GROUND LEVEL (m)	75.82	**EXCAVATION METHOD**	3.5 Ton Excavator
CLIENT	Ardstone		
ENGINEER	DBFL		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.									
	Firm brown slightly gravelly SILT/CLAY. Gravel is fine to medium subangular to subrounded.		0.30	75.52		AA78693	B	0.50		
1.0	Brown silty fine to coarse subangular to subrounded GRAVEL with a medium cobble content and a low boulder content. Cobbles are subangular to rounded.		1.00	74.82		AA78694	B	1.20		
2.0	Stiff brown gravelly SILT/CLAY with a medium cobble content and a low boulder content. Gravel is fine to coarse subangular. Cobbles are subrounded. Boulders up to 400mm subrounded.		1.90	73.92		AA78695	B	1.90		
	End of Trial Pit at 2.00m		2.00	73.82						
3.0										

Groundwater Conditions

Stability

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 20159

CONTRACT	Capdoo, Clane	**TRIAL PIT NO.**	**TP05**
		SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels	**CO-ORDINATES**	687,727.70 E 728,443.79 N
		GROUND LEVEL (m)	73.07
DATE STARTED	15/06/2017	**DATE COMPLETED**	15/06/2017
CLIENT	Ardstone	**EXCAVATION METHOD**	3.5 Ton Excavator
ENGINEER	DBFL		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.	▨								
	Grey slightly silty fine to coarse SAND.	▨	0.60	72.47		AA67769	B	0.60		
1.0										
	Grey silty gravelly fine to coarse SAND. Gravel is fine to coarse subangular to subrounded.	▨	1.60	71.47		AA67770	B	1.60		
2.0										
	End of Trial Pit at 2.50m		2.50	70.57		AA67771	B	2.50		
3.0										

Groundwater Conditions

Stability

General Remarks

TRIAL PIT RECORD

REPORT NUMBER	20159
CONTRACT	Capdoo, Clane
TRIAL PIT NO.	TP06
SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels
CO-ORDINATES	687,753.62 E 728,441.59 N
GROUND LEVEL (m)	71.06
DATE STARTED	15/06/2017
DATE COMPLETED	15/06/2017
CLIENT	Ardstone
ENGINEER	DBFL
EXCAVATION METHOD	3.5 Ton Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.									
	Grey slightly silty fine to coarse SAND.		0.50	70.56		AA67766	B	0.60		
1.0										
						AA67767	B	1.80		
2.0	Grey gravelly cobbly fine to coarse SAND. Gravel is fine to coarse subrounded. Cobles are subrounded.		1.90	69.16						
	End of Trial Pit at 2.50m		2.50	68.56		AA67768	B	2.50		
3.0										

Groundwater Conditions

Stability

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 20159

CONTRACT	Capdoo, Clane	**TRIAL PIT NO.**	**TP07**
		SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels	**CO-ORDINATES**	687,774.50 E 728,496.33 N
CLIENT	Ardstone	**GROUND LEVEL (m)**	69.55
ENGINEER	DBFL	**DATE STARTED**	15/06/2017
		DATE COMPLETED	15/06/2017
		EXCAVATION METHOD	3.5 Ton Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.									
1.0	Brown to grey silty fine to coarse subangular to subrounded GRAVEL with a medium cobble content.		0.30	69.25		AA78667	B	0.50		
	Grey slightly gravelly medium SAND. Gravel is fine subangular.		1.30	68.25		AA78668	B	1.40		
2.0	Black slightly gravelly fine to medium SAND. Gravel is fine subangular.		2.00	67.55		AA78669	B	2.50		
3.0	End of Trial Pit at 3.00m		3.00	66.55						

Groundwater Conditions

Slow seepage at 2.0m

Stability

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 20159

CONTRACT Capdoo, Clane

TRIAL PIT NO. TP08
SHEET Sheet 1 of 1

LOGGED BY L. Daniels

CO-ORDINATES 687,770.37 E
728,541.91 N

GROUND LEVEL (m) 68.38

DATE STARTED 15/06/2017
DATE COMPLETED 15/06/2017

CLIENT Ardstone
ENGINEER DBFL

EXCAVATION METHOD 3.5 Ton Excavator

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
					Sample Ref	Type	Depth		
TOPSOIL.	▨								
Soft to firm light brown slightly gravelly SILT/CLAY. Gravel is fine to medium subrounded.	▨	0.30	68.08		AA78664	B	0.50		
Grey slightly gravelly fine to medium SAND. Gravel is fine to coarse subangular to subrounded.	▨	0.80	67.58		AA78665	B	0.90		
Grey to black slightly gravelly medium to coarse SAND. Gravel is fine subangular.	▨	1.40	66.98		AA78666	B	1.60		
End of it due to wall collapse. End of Trial Pit at 2.20m		2.20	66.18						

Groundwater Conditions
Slow seepage at 1.4m

Stability
Wall collapse from 1.4m

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 20159

CONTRACT	Capdoo, Clane	**TRIAL PIT NO.**	**TP09**
		SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels	**DATE STARTED**	15/06/2017
CO-ORDINATES	687,813.53 E 728,508.36 N	**DATE COMPLETED**	15/06/2017
GROUND LEVEL (m)	67.21	**EXCAVATION METHOD**	3.5 Ton Excavator
CLIENT	Ardstone		
ENGINEER	DBFL		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.									
	Stiff dark brown very gravelly slightly sandy SILT/CLAY. Gravel is fine to coarse subangular to subrounded.		0.30	66.91		AA78662	B	0.50		
1.0										
	Dark grey clayey sandy fine to coarse subangular to subrounded GRAVEL.		1.20	66.01		AA78663	B	1.20		
	End of pit due to wall collapse. End of Trial Pit at 1.50m		1.50	65.71						
2.0										
3.0										

Groundwater Conditions
Moderate seepage at 0.8m

Stability
Wall collapse from 1.2m

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 20159

CONTRACT Capdoo, Clane

TRIAL PIT NO. TP10

SHEET Sheet 1 of 1

LOGGED BY L. Daniels

CO-ORDINATES 687,818.29 E 728,452.90 N

GROUND LEVEL (m) 67.74

DATE STARTED 15/06/2017

DATE COMPLETED 15/06/2017

CLIENT Ardstone

ENGINEER DBFL

EXCAVATION METHOD 3.5 Ton Excavator

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
					Sample Ref	Type	Depth		
TOPSOIL.		0.30	67.44						
Firm brown slightly gravelly sandy SILT/CLAY. Sand is fine to medium. Gravel is fine to medium subangular to subrounded.		0.60	67.14		AA78655	B	0.50		
Grey to light brown gravelly medium to coarse SAND. Gravel is fine to coarse subangular to subrounded of limestone.		1.00	66.74		AA78656	B	0.70		
Firm grey to light brown sandy gravelly SILT with a low cobble content. Sand is fine to medium. Gravel is fine to coarse subangular to subrounded of limestone. Cobbles are subrounded of limestone.		1.50	66.24		AA78657	B	1.20		
Stiff dark brown gravelly CLAY with a medium cobble content and a low boulder content. Gravel is medium to coarse subrounded. Cobbles are subrounded. Boulders up to 400mm subrounded.		1.70	66.04		AA78658	B	1.60		
Black fine subrounded to subangular sandy GRAVEL.		2.30	65.44						
End of pit due to groundwater. End of Trial Pit at 2.30m									

Groundwater Conditions
Groundwater at 2.0m

Stability

General Remarks

TRIAL PIT RECORD

REPORT NUMBER	20159		
CONTRACT	Capdoo, Clane	**TRIAL PIT NO.**	**TP11**
		SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels	**DATE STARTED**	14/06/2017
CO-ORDINATES	687,869.45 E 728,445.76 N	**DATE COMPLETED**	14/06/2017
GROUND LEVEL (m)	68.02	**EXCAVATION METHOD**	3.5 Ton Excavator
CLIENT	Ardstone		
ENGINEER	DBFL		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.		0.40	67.62						
	Grey to light brown gravelly medium to coarse SAND. Gravel is fine to coarse subangular to subrounded of limestone.		0.70	67.32		AA78659	B	0.50		
	Stiff dark brown very gravelly slightly sandy SILT/CLAY. Gravel is fine to coarse subangular to subrounded.		1.40	66.62		AA78660	B	0.80		
1.0										
	Black gravelly coarse SAND. Gravel is fine to medium.		2.00	66.02		AA78661	B	1.50		
2.0	End of pit due to wall collapse. End of Trial Pit at 2.00m									
3.0										

Groundwater Conditions
Moderate seepage at 1.4m

Stability
Wall collapse from 1.4m

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 20159

CONTRACT	Capdoo, Clane	**TRIAL PIT NO.**	**TP12**
		SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels	**CO-ORDINATES**	687,784.26 E 728,411.11 N
CLIENT	Ardstone	**GROUND LEVEL (m)**	69.03
ENGINEER	DBFL	**DATE STARTED**	14/06/2017
		DATE COMPLETED	14/06/2017
		EXCAVATION METHOD	3.5 Ton Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	TOPSOIL.									
	Firm brown slightly gravelly sandy SILT/CLAY. Sand is fine to medium. Gravel is fine to medium subangular to subrounded.		0.40	68.63		AA78651	B	0.50		
1.0	Firm grey to light brown sandy gravelly SILT with a low cobble content. Sand is fine to medium. Gravel is fine to coarse subangular to subrounded of limestone. Cobbles are subrounded of limestone.		0.90	68.13		AA78652	B	1.00		
	Stiff dark brown gravelly CLAY with a medium cobble content and a low boulder content. Gravel is medium to coarse subrounded. Cobbles are subrounded. Boulders up to 400mm subrounded.		1.50	67.53		AA78653	B	1.60		
2.0	Dark brown to black fine to coarse subrounded to subangular GRAVEL with a medium cobble content and a low boulder content. Cobbles are subrounded. Boulders up to 400mm subrounded.		2.00	67.03		AA78654	B	2.00		
3.0	End of pit due to groundwater. End of Trial Pit at 2.50m		2.50	66.53						

Groundwater Conditions

Groundwater at 2.2m

Stability

General Remarks

TRIAL PIT RECORD

REPORT NUMBER	20159
CONTRACT	Capdoo, Clane
TRIAL PIT NO.	**TP13**
SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels
CO-ORDINATES	687,675.92 E 728,416.81 N
GROUND LEVEL (m)	75.27
DATE STARTED	14/06/2017
DATE COMPLETED	14/06/2017
CLIENT	Ardstone
ENGINEER	DBFL
EXCAVATION METHOD	3.5 Ton Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.									
	Firm brown slightly gravelly SILT/CLAY. Gravel is fine to medium subangular to subrounded.		0.30	74.97		AA78696	B	0.50		
	Brown silty fine to coarse subangular to subrounded GRAVEL with a medium cobble content and a low boulder content. Cobbles are subangular to rounded.		0.60	74.67						
1.0						AA78697	B	1.20		
2.0										
	Black sandy fine to coarse subounded to rounded GRAVEL.		2.50	72.77		AA78698	B	2.50		
3.0	End of Trial Pit at 2.50m		3.00	72.27						

Groundwater Conditions

Stability

General Remarks

TRIAL PIT RECORD

REPORT NUMBER	20159
CONTRACT	Capdoo, Clane
TRIAL PIT NO.	TP14
SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels
CO-ORDINATES	687,623.19 E 728,411.99 N
GROUND LEVEL (m)	78.03
DATE STARTED	14/06/2017
DATE COMPLETED	14/06/2017
CLIENT	Ardstone
ENGINEER	DBFL
EXCAVATION METHOD	3.5 Ton Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.									
	Firm brown slightly gravelly SILT/CLAY. Gravel is fine to medium subangular to subrounded.		0.40	77.63						
						AA78686	B	0.60		
1.0	Brown silty fine to coarse subangular to subrounded GRAVEL with a medium cobble content and a low boulder content. Cobbles are subangular to rounded.		0.90	77.13						
						AA78687	B	1.20		
2.0						AA78688	B	2.00		
	Grey sandy fine to coarse subrounded GRAVEL.		2.30	75.73						
						AA78689	B	2.50		
3.0	End of Trial Pit at 3.00m		3.00	75.03						

Groundwater Conditions

Stability

General Remarks

TRIAL PIT RECORD

REPORT NUMBER	20159		
CONTRACT	Capdoo, Clane	**TRIAL PIT NO.**	**TP15**
		SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels	**CO-ORDINATES**	687,619.03 E 728,356.62 N
GROUND LEVEL (m)	76.61	**DATE STARTED**	14/06/2017
		DATE COMPLETED	14/06/2017
CLIENT	Ardstone	**EXCAVATION METHOD**	3.5 Ton Excavator
ENGINEER	DBFL		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.									
	Firm brown slightly gravelly SILT/CLAY. Gravel is fine to medium subangular to subrounded.		0.40	76.21		AA78679	B	0.60		
1.0										
	Black gravelly coarse SAND. Gravel is fine to medium.		1.40	75.21		AA78680	B	1.60		
2.0										
	End of pit due to wall collapse. End of Trial Pit at 2.80m		2.80	73.81		AA78681	B	2.80		
3.0										

Groundwater Conditions

Stability

Minor wall collapse from 1.4m

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 20159

CONTRACT	Capdoo, Clane	**TRIAL PIT NO.**	**TP16**
		SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels	**DATE STARTED**	14/06/2017
CO-ORDINATES	687,667.37 E 728,360.19 N	**DATE COMPLETED**	14/06/2017
GROUND LEVEL (m)	74.06	**EXCAVATION METHOD**	3.5 Ton Excavator
CLIENT	Ardstone		
ENGINEER	DBFL		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.		0.40	73.66						
	Firm brown slightly gravelly SILT/CLAY. Gravel is fine to medium subangular to subrounded.		0.80	73.26		AA78682	B	0.60		
1.0 2.0	Brown silty fine to coarse subangular to rounded GRAVEL with a medium cobble content and a low boulder content. Cobbles are subrounded to rounded.		2.70	71.36		AA78683 AA78684	B B	1.20 2.50		
3.0	End of pit due to boulder. End of Trial Pit at 2.70m									

Groundwater Conditions

Stability

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 20159

CONTRACT	Capdoo, Clane	**TRIAL PIT NO.**	**TP17**
		SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels	**DATE STARTED**	14/06/2017
CO-ORDINATES	687,724.68 E 728,357.77 N	**DATE COMPLETED**	14/06/2017
GROUND LEVEL (m)	71.69	**EXCAVATION METHOD**	3.5 Ton Excavator
CLIENT	Ardstone		
ENGINEER	DBFL		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.									
	Grey silty fine to coarse rounded to subangular GRAVEL with a medium cobble content. Cobbles are subrounded to rounded.		0.40	71.29		AA78672	B	0.60		
1.0										
2.0	Grey slightly gravelly fine to coarse SAND. Gravel is fine to medium subrounded.		2.00	69.69		AA78673	B	2.00		
3.0	End of Trial Pit at 3.00m		3.00	68.69		AA78674	B	3.00		

Groundwater Conditions

Stability

General Remarks

TRIAL PIT RECORD

REPORT NUMBER	20159		
CONTRACT	Capdoo, Clane	**TRIAL PIT NO.**	**TP18**
		SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels	**DATE STARTED**	14/06/2017
CO-ORDINATES	687,776.84 E 728,364.82 N	**DATE COMPLETED**	14/06/2017
GROUND LEVEL (m)	69.26	**EXCAVATION METHOD**	3.5 Ton Excavator
CLIENT	Ardstone		
ENGINEER	DBFL		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.									
	Firm brown slightly gravelly SILT/CLAY. Gravel is fine to medium subangular to subrounded.		0.40	68.86		AA78670	B	0.50		
1.0	Grey to brown silty fine to coarse subangular to angular GRAVEL with a medium cobble content and a low boulder content. Cobbles subangular to subrounded. Boulders up to 400mm subrounded.		0.90	68.36		AA78671	B	1.10		
2.0	End of pit due to boulder. End of Trial Pit at 2.00m		2.00	67.26						
3.0										

Groundwater Conditions

Stability

General Remarks

TRIAL PIT RECORD

REPORT NUMBER	20159
CONTRACT	Capdoo, Clane
TRIAL PIT NO.	TP19
SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels
CO-ORDINATES	687,729.97 E 728,319.16 N
GROUND LEVEL (m)	71.49
DATE STARTED	16/06/2017
DATE COMPLETED	16/06/2017
CLIENT	Ardstone
ENGINEER	DBFL
EXCAVATION METHOD	3.5 Ton Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.		0.60	70.89						
1.0	Dark grey to black fine to coarse SAND.		1.50	69.99		AA78675	B	0.80		
2.0	Black sandy fine to coarse subounded to rounded GRAVEL with a low cobble content. Cobbles are subrounded.		2.60	68.89		AA78676	B	1.60		
3.0	End of pit due to wall collapse. End of Trial Pit at 2.60m									

Groundwater Conditions

Stability
Wall collapse from 1.5m

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 20159

CONTRACT	Capdoo, Clane	**TRIAL PIT NO.**	**TP20**
		SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels	**CO-ORDINATES**	687,622.57 E 728,313.25 N
CLIENT	Ardstone	**GROUND LEVEL (m)**	74.42
ENGINEER	DBFL		
DATE STARTED	16/06/2017	**DATE COMPLETED**	16/06/2017
EXCAVATION METHOD	3.5 Ton Excavator		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples Sample Ref	Samples Type	Samples Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	TOPSOIL.									
	Firm brown slightly gravelly SILT/CLAY. Gravel is fine to medium subangular to subrounded.		0.50	73.92						
						AA78677	B	0.70		
	Brown silty fine to coarse subrounded to angular GRAVEL.		0.90	73.52						
1.0						AA78678	B	1.00		
	End of pit due to wall collapse. End of Trial Pit at 1.80m		1.80	72.62						
2.0										
3.0										

Groundwater Conditions

Stability
Wall collapse from 0.9m

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 20159

CONTRACT	Capdoo, Clane	**TRIAL PIT NO.**	**TP21**
		SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels	**DATE STARTED**	16/06/2017
CO-ORDINATES	687,542.98 E 728,212.30 N	**DATE COMPLETED**	16/06/2017
GROUND LEVEL (m)	74.33	**EXCAVATION METHOD**	3.5 Ton Excavator
CLIENT	Ardstone		
ENGINEER	DBFL		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
					Sample Ref	Type	Depth		
TOPSOIL.		0.30	74.03						
Firm brown slightly gravelly SILT/CLAY. Gravel is fine to medium subangular to subrounded.		1.20	73.13		AA67758	B	0.50		
Grey slightly silty fine to coarse subangular to rounded GRAVEL with a medium cobble content. Cobbles are subrounded.		1.80	72.53		AA67759	B	1.30		
Grey sandy fine to coarse subrounded to rounded GRAVEL with a high cobble content. Cobbles are subrounded.		2.50	71.83		AA67760	B	2.00		
End of pit due to wall collapse. End of Trial Pit at 2.50m					AA67761	B	2.50		

Groundwater Conditions

Stability
Wall collapse from 1.8m

General Remarks

TRIAL PIT RECORD

REPORT NUMBER	20159		
CONTRACT	Capdoo, Clane	**TRIAL PIT NO.**	**TP22**
		SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels	**CO-ORDINATES**	687,595.01 E 728,187.92 N
CLIENT	Ardstone	**GROUND LEVEL (m)**	75.36
ENGINEER	DBFL		
DATE STARTED	16/06/2017	**DATE COMPLETED**	16/06/2017
EXCAVATION METHOD	3.5 Ton Excavator		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	TOPSOIL.									
	Firm brown slightly gravelly SILT/CLAY with tree rootlets. Gravel is fine to medium subangular to subrounded.		0.30	75.06						
	Stiff brown very gravelly SILT. Gravel is fine to coarse subangular to subrounded.		0.60	74.76						
						AA67762	B	0.80		
1.0										
						AA67763	B	1.20		
2.0	Brown silty gravelly fine to medium SAND. Gravel is fine to medium subrounded.		2.00	73.36						
						AA67764	B	2.10		
	Black coarse slightly gravelly fine to medium SAND. Gravel is fine subangular.		2.50	72.86						
						AA67765	B	2.60		
3.0	End of Trial Pit at 3.00m		3.00	72.36						

Groundwater Conditions

Stability

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 20159

CONTRACT Capdoo, Clane

TRIAL PIT NO. **TP23**

SHEET Sheet 1 of 1

LOGGED BY L. Daniels

CO-ORDINATES 687,634.91 E
728,214.75 N

GROUND LEVEL (m) 73.91

DATE STARTED 16/06/2017

DATE COMPLETED 16/06/2017

CLIENT Ardstone

ENGINEER DBFL

EXCAVATION METHOD 3.5 Ton Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.		0.30	73.61						
1.0	Light brown slightly silty gravelly fine to medium SAND. Gravel is fine to medium subrounded.		1.20	72.71		AA67755	B	0.50		
	Firm brown slightly gravelly sandy SILT.		1.60	72.31						
2.0	Dark grey to black very sandy fine to medium subrounded GRAVEL. Sand is medium to coarse.		3.00	70.91		AA67756 AA67757	B B	1.60 2.80		
3.0	End of Trial Pit at 3.00m									

Groundwater Conditions

Stability

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 20159

CONTRACT	Capdoo, Clane	**TRIAL PIT NO.**	**TP24**
		SHEET	Sheet 1 of 1
LOGGED BY	L. Daniels	**DATE STARTED**	16/06/2017
CO-ORDINATES	687,695.94 E 728,217.70 N	**DATE COMPLETED**	16/06/2017
GROUND LEVEL (m)	72.38	**EXCAVATION METHOD**	3.5 Ton Excavator
CLIENT	Ardstone		
ENGINEER	DBFL		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.		0.30	72.08						
	Firm brown slightly gravelly SILT/CLAY. Gravel is fine to medium subangular to subrounded.		0.60	71.78						
1.0	Brown silty fine to coarse subangular to subrounded GRAVEL with a medium cobble content and a low boulder content. Cobbles are subangular to rounded.		1.70	70.68		AA67752	B	0.80		
2.0	Black slightly gravelly coarse SAND. Gravel is fine subangular.		2.60	69.78		AA67753	B	1.70		
3.0	End of pit due to wall collapse. End of Trial Pit at 2.60m					AA67754	B	2.60		

Groundwater Conditions

Stability
Minor wall collapse from 1.7m

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 20159

CONTRACT Capdoo, Clane

TRIAL PIT NO. TP25

SHEET Sheet 1 of 1

LOGGED BY L. Daniels

CO-ORDINATES 687,732.04 E
728,216.34 N

DATE STARTED 16/06/2017

DATE COMPLETED 16/06/2017

GROUND LEVEL (m) 70.94

CLIENT Ardstone

ENGINEER DBFL

EXCAVATION METHOD 3.5 Ton Excavator

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL.									
	Firm brown slightly gravelly SILT/CLAY. Gravel is fine to medium subangular to subrounded.		0.40	70.54		AA78699	B	0.60		
1.0	Brown silty fine to coarse subangular to subrounded GRAVEL with a medium cobble content and a low boulder content. Cobbles are subangular to rounded.		0.80	70.14						
	Brown sandy fine to coarse subrounded GRAVEL.		1.20	69.74		AA78700	B	1.20		
2.0	Black slightly gravelly fine to medium SAND. Gravel is fine subangular.		1.60	69.34		AA67751	B	1.80		
3.0	End of Trial Pit at 3.00m		3.00	67.94						

Groundwater Conditions

Stability

General Remarks

Appendix III   Plate Bearing Tests

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

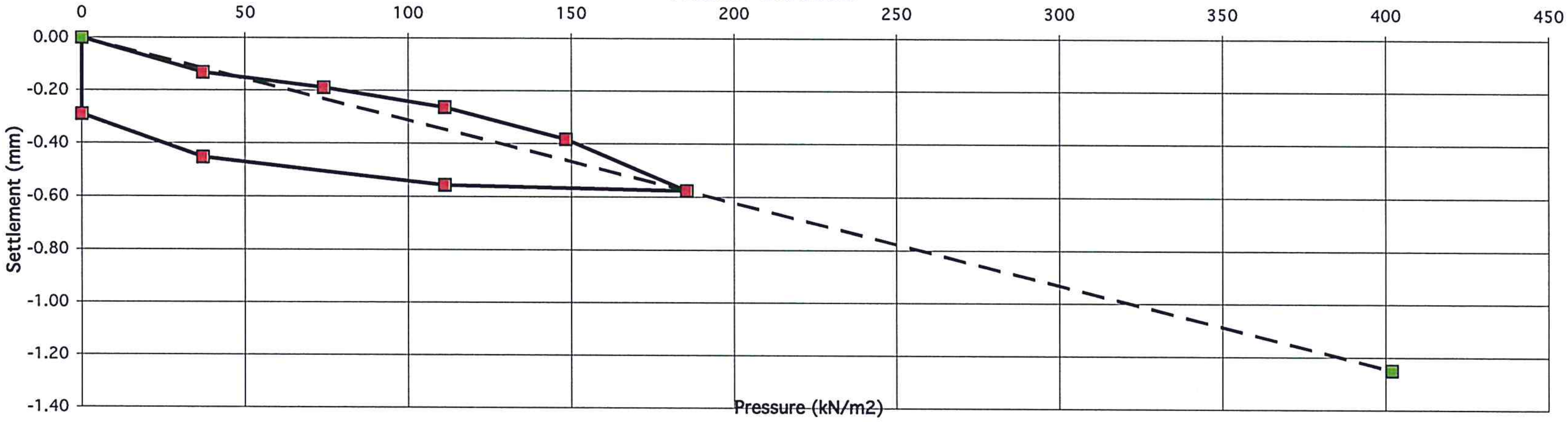
Reference No.	R80206
Contract	Capdoo Clane
Test No.	CBR05
Location	687675.325, 728552.346, 73.248
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	20-06-17

Description of soil under test
(natural soil, placed fill, sub-base)

Silty GRAVEL

Sample Ref No.	N/A
Depth	0.00 m bgl

Pressure / Settlement



Gradient at 1.25 mm settlement intersection = 322
Modulus of subgrade reaction = 147 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 54.9 %

PLATE TEST REPORT SHEET (F3.1)

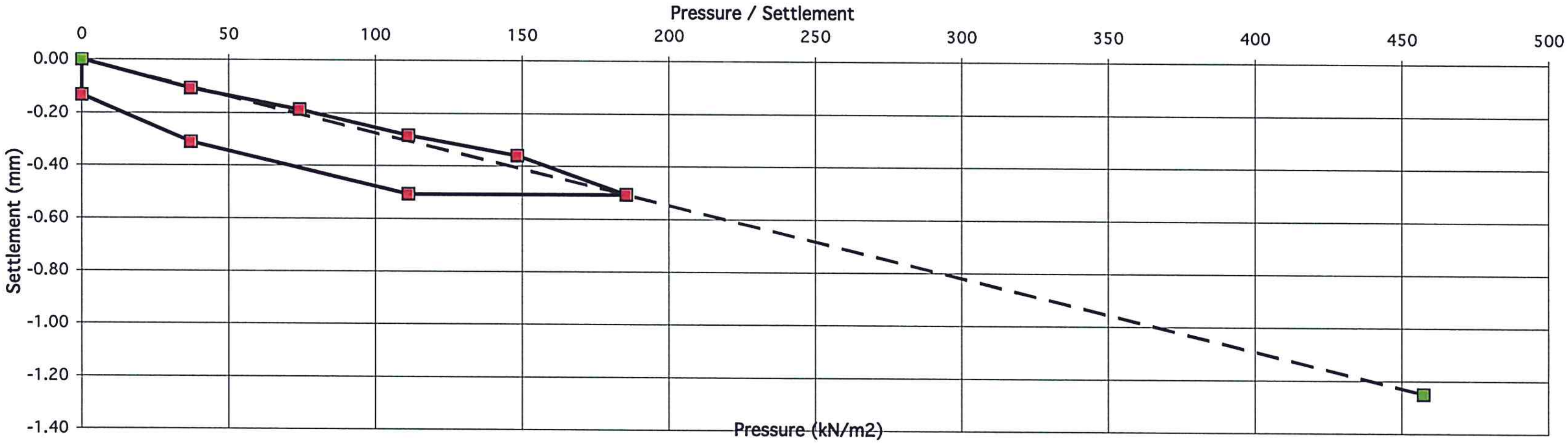
Applied Pressure/Settlement Curve

Reference No.	R80206
Contract	Capdoo Clane
Test No.	CBR05 reload
Location	687675.325, 728552.346, 73.248
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	20-06-17

Description of soil under test
(natural soil, placed fill, sub-base)

Silty GRAVEL

Sample Ref No.	N/A
Depth	0.00 m bgl



Gradient at 1.25 mm settlement intersection = 366
Modulus of subgrade reaction = 167 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 68.7 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

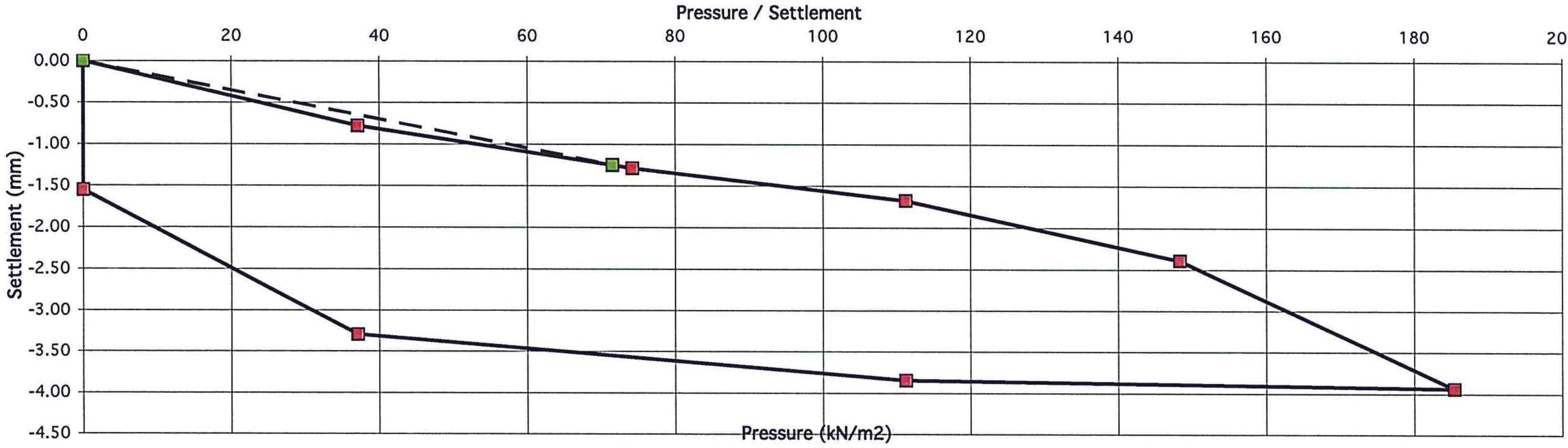
Reference No.	R80207
Contract	Capdoo Clane
Test No.	CBR06
Location	687672.781, 728492.900, 75.678
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	20-06-17

Description of soil under test
(natural soil, placed fill, sub-base)

Gravelly SILT

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 57

Modulus of subgrade reaction = 26 MPa/m

Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.8 %

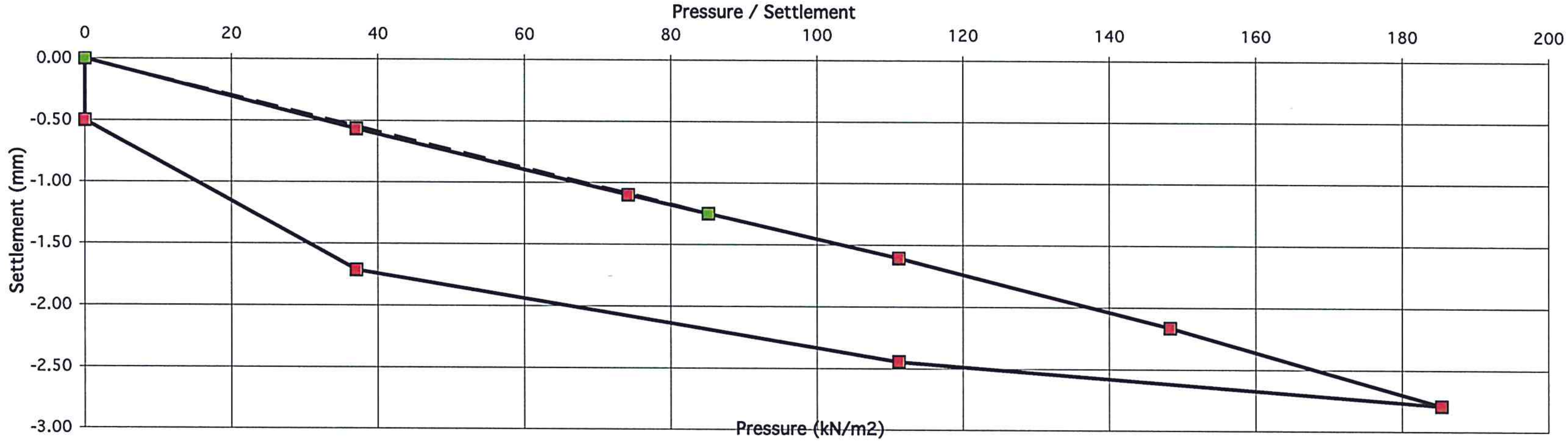
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No. R80207
Contract Capdoo Clane
Test No. 687672.781, 728492.900, 75.678
Location See Map
Depth 0.5m
Client Ardstone/DBFL
Plate Diameter: 300 mm
Test Method BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician L. Daniels
Authorised by
Date 20-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 68
Modulus of subgrade reaction = 31 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 3.7 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80208
Contract	Capdoo Clane
Test No.	CBR07
Location	687749.245, 728470.424, 71.281
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	20-06-17

Description of soil under test
(natural soil, placed fill, sub-base)

Gravelly SILT

Sample Ref No.	N/A
Depth	0.00 m bgl

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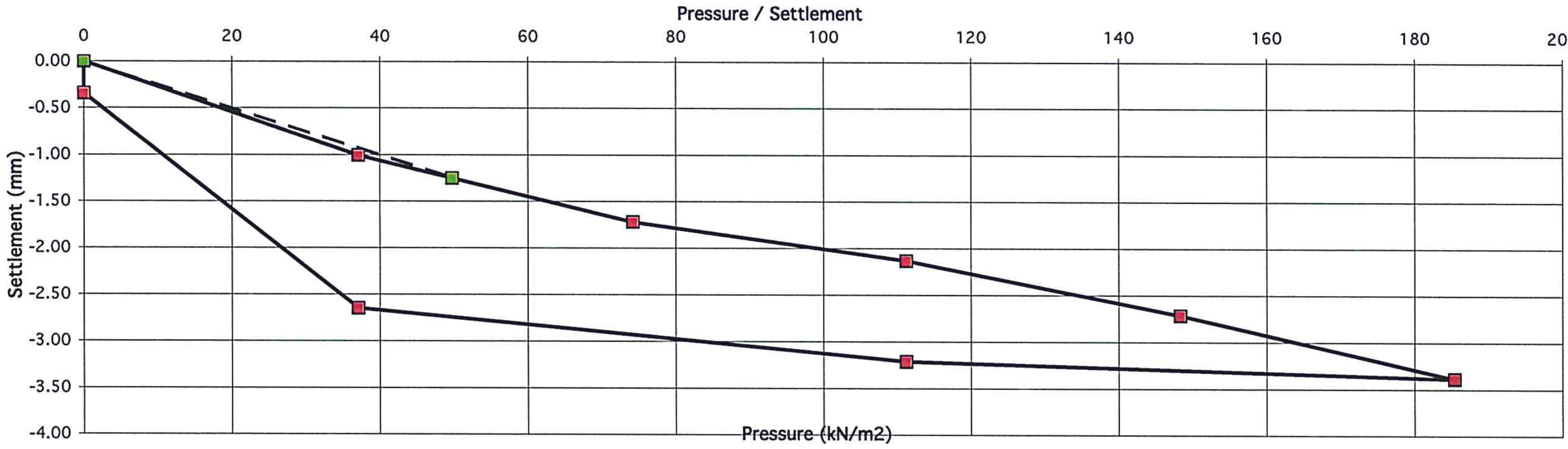
Pressure / Settlement



Gradient at 1.25 mm settlement intersection = 40
Modulus of subgrade reaction = 18 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.5 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80208
Contract	Capdoo Clane
Test No.	CBR07 reload
Location	687749.245, 728470.424, 71.281
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	20-06-17

Description of soil under test
(natural soil, placed fill, sub-base)

Gravelly SILT

Sample Ref No. N/A

Depth 0.00 m bgl

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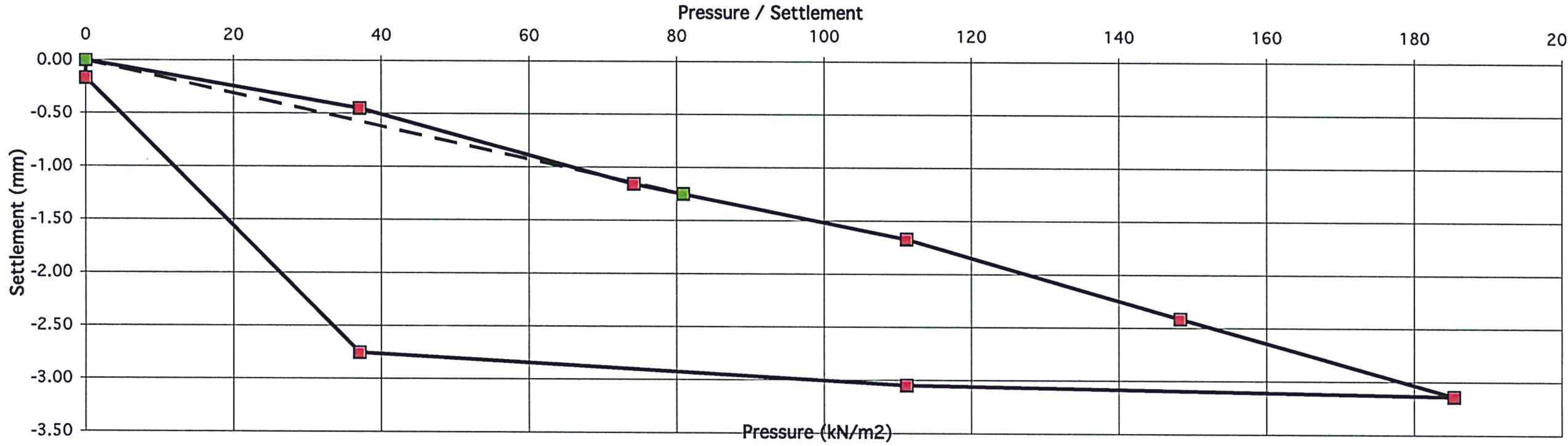

Gradient at 1.25 mm settlement intersection = 65
Modulus of subgrade reaction = 30 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 3.4 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80209
Contract	Capdoo Clane
Test No.	CBR08
Location	687797.840, 728530.324, 67.431
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Peaty SILT/CLAY

Sample Ref No. N/A
Depth 0.00 m bgl

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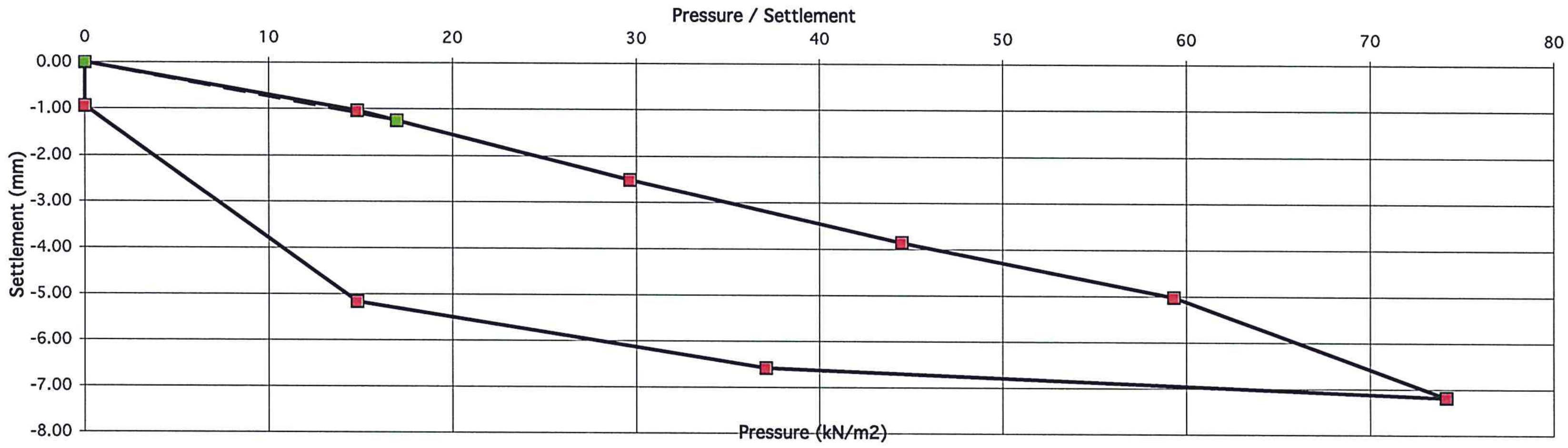


Gradient at 1.25 mm settlement intersection = 14
Modulus of subgrade reaction = 6 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 0.2 %

PLATE TEST REPORT SHEET (F3.1)

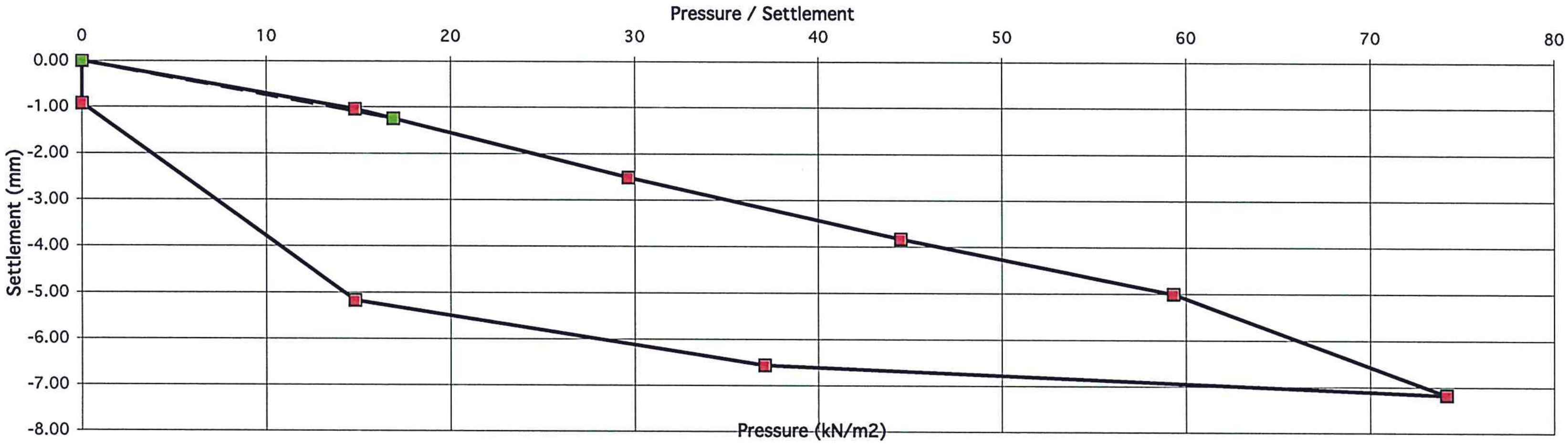
Applied Pressure/Settlement Curve

Reference No.	R80209
Contract	Capdoo Clane
Test No.	CBR08 reload
Location	687797.840, 728530.324, 67.431
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)

Peaty SILT/CLAY

Sample Ref No.	N/A
Depth	0.00 m bgl



Gradient at 1.25 mm settlement intersection = 14
Modulus of subgrade reaction = 6 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 0.2 %

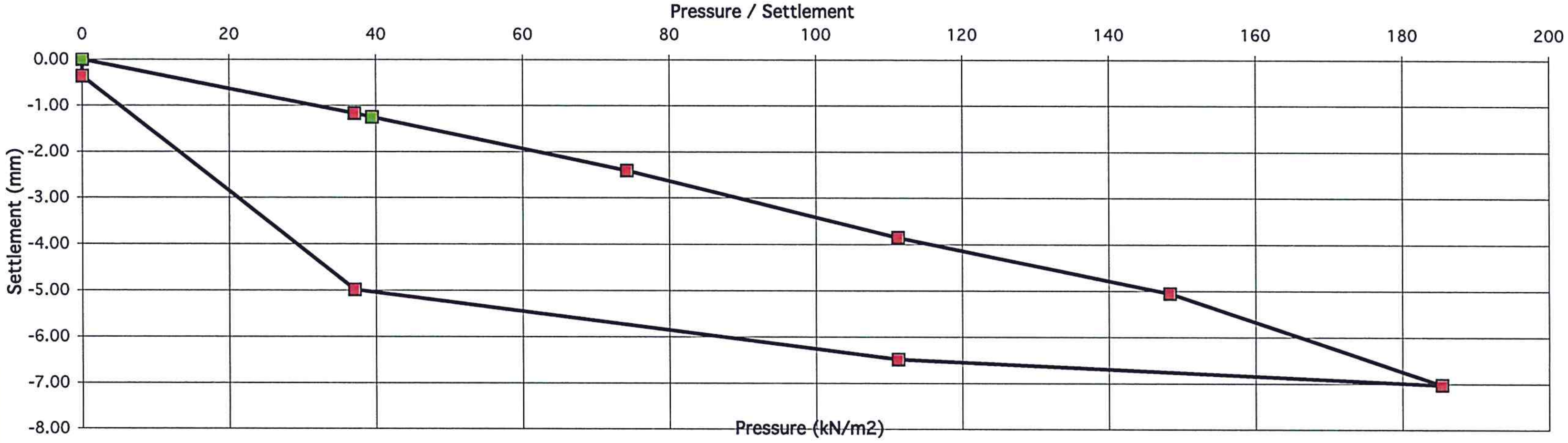
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80210
Contract	Capdoo Clane
Test No.	CBR09
Location	687803.717, 728468.047, 67.833
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No.	N/A
Depth	0.00 m bgl



Gradient at 1.25 mm settlement intersection = 32
Modulus of subgrade reaction = 14 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.0 %

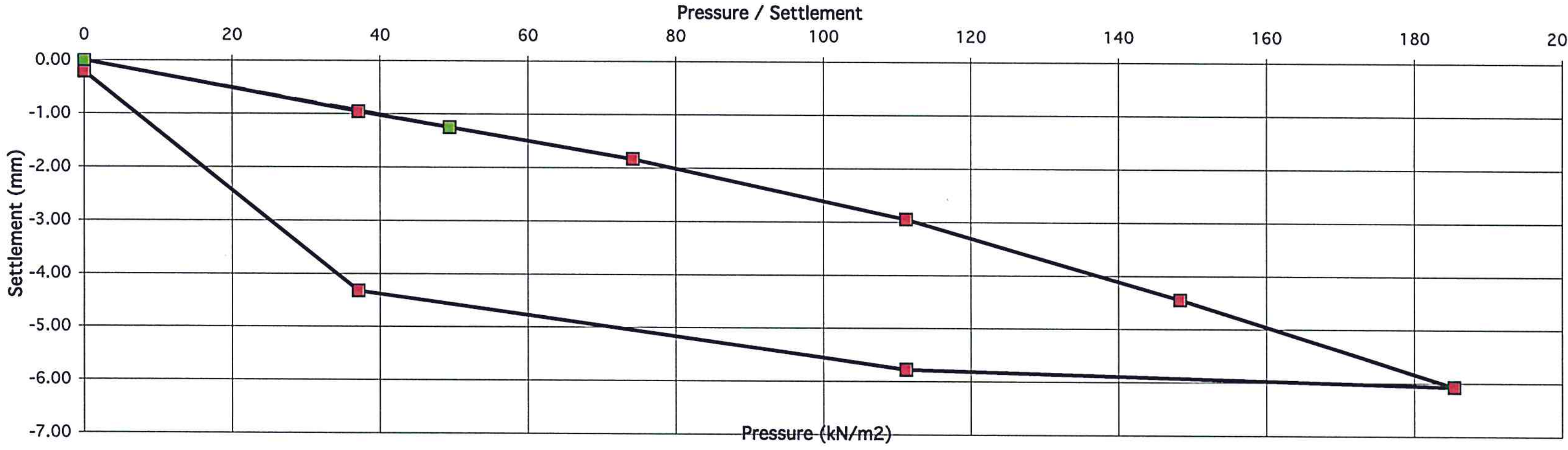
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80208
Contract	Capdoo Clane
Test No.	CBR09 reload
Location	687803.717, 728468.047, 67.833
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 40
Modulus of subgrade reaction = 18 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.5 %

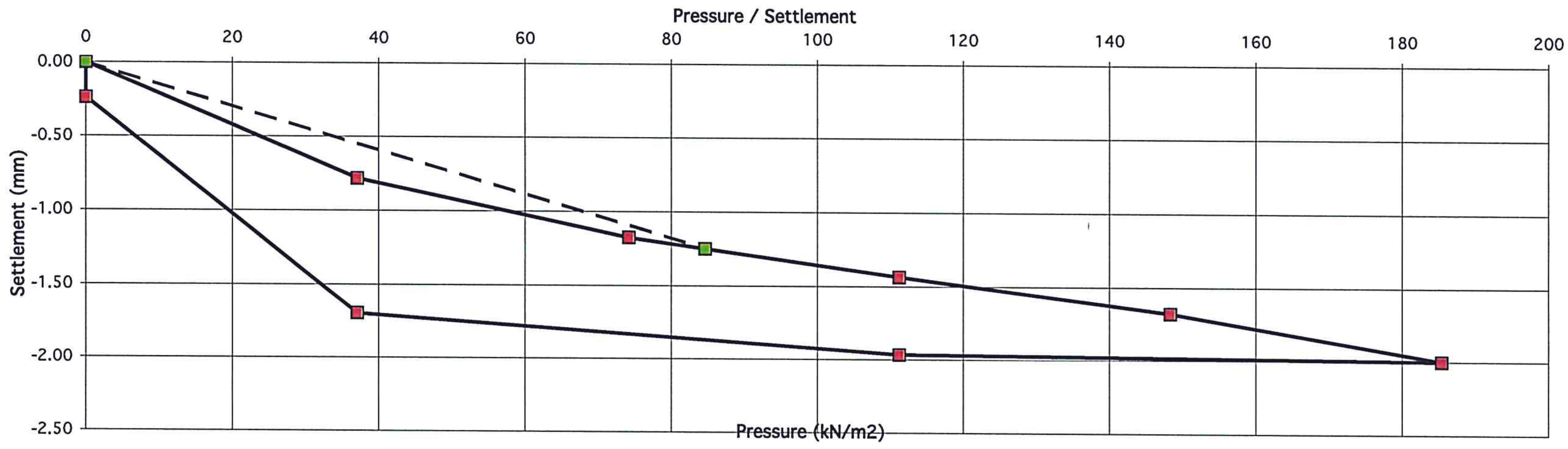
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80211
Contract	Capdoo Clane
Test No.	CBR10
Location	687877.151, 728463.847, 67.959
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 68
Modulus of subgrade reaction = 31 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 3.7 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80211
Contract	Capdoo Clane
Test No.	CBR10 reload
Location	687877.151, 728463.847, 67.959
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl

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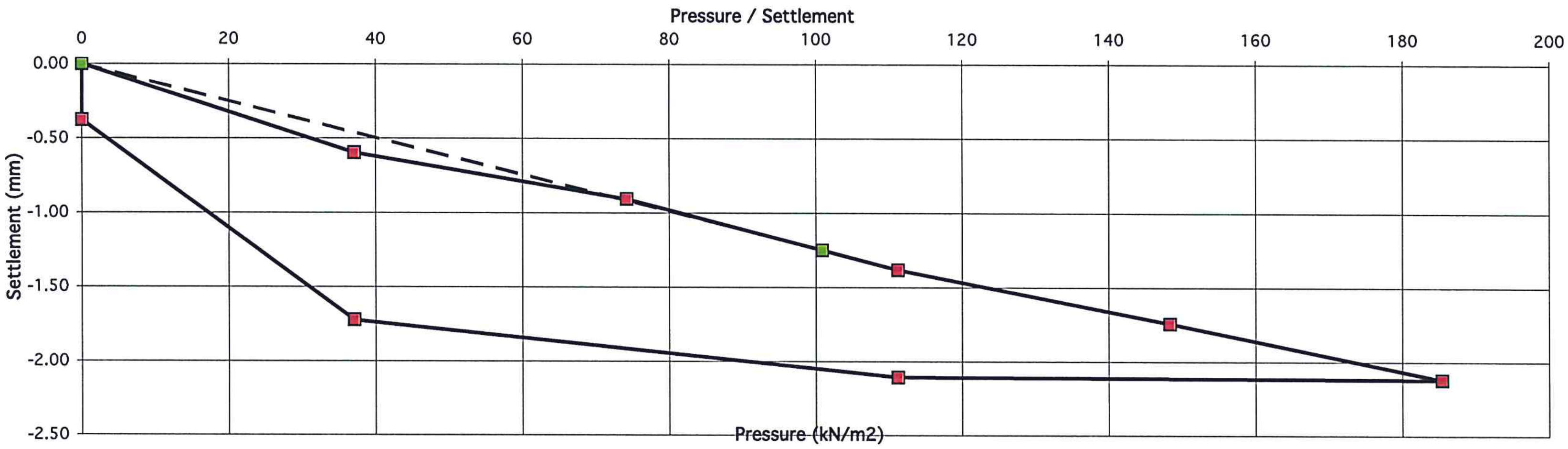


Gradient at 1.25 mm settlement intersection = 81
Modulus of subgrade reaction = 37 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 5.0 %

PLATE TEST REPORT SHEET (F3.1)

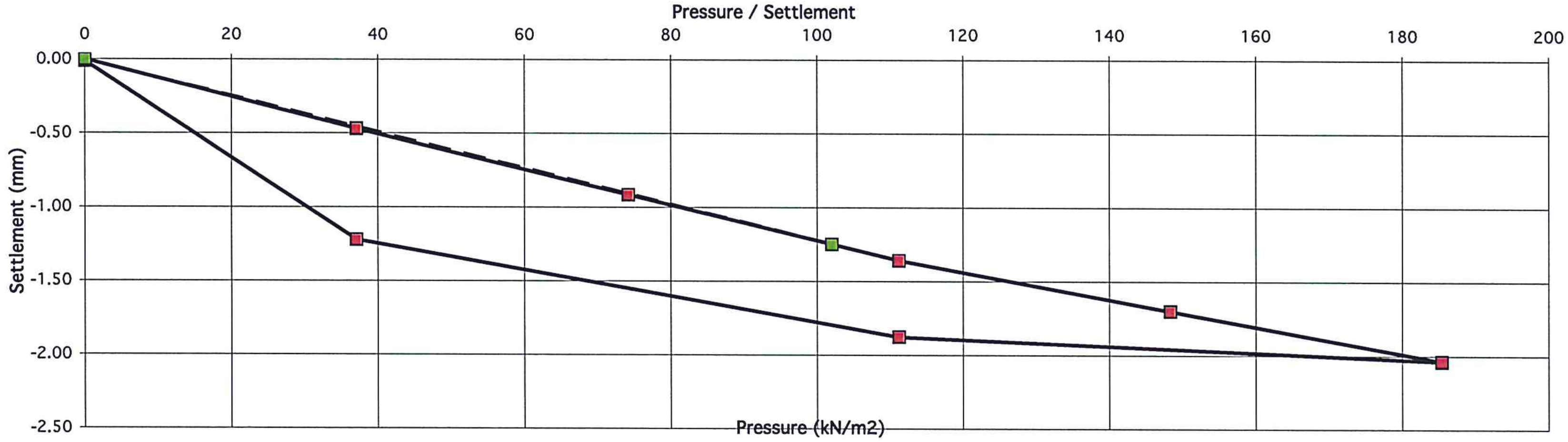
Applied Pressure/Settlement Curve

Reference No.	R80212
Contract	Capdoo Clane
Test No.	CBR11
Location	687789.531, 728406.658, 68.844
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No.	N/A
Depth	0.00 m bgl

Pressure / Settlement



Gradient at 1.25 mm settlement intersection = 82
Modulus of subgrade reaction = 37 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 5.1 %

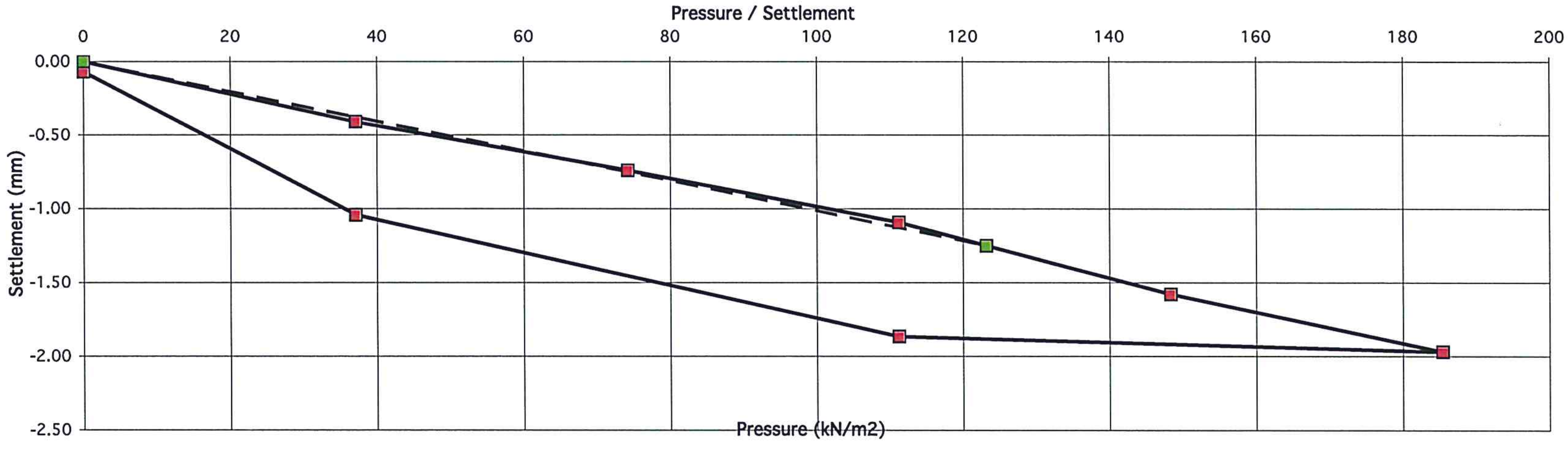
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80208
Contract	Capdoo Clane
Test No.	CBR11 reload
Location	687789.531, 728406.658, 68.844
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 99
Modulus of subgrade reaction = 45 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 7.1 %

PLATE TEST REPORT SHEET (F3.1)

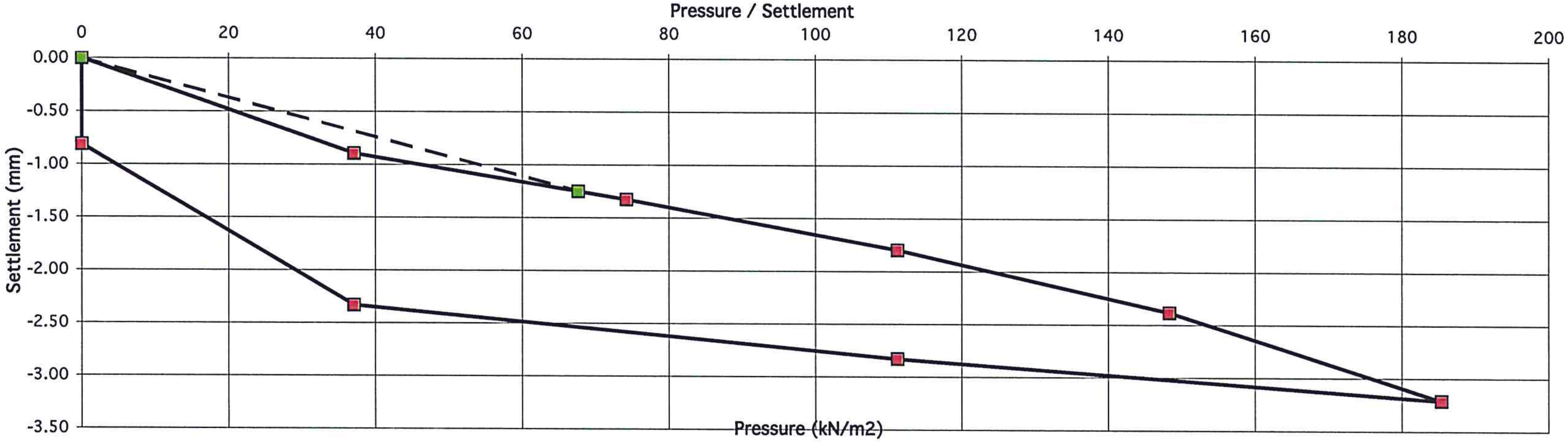
Applied Pressure/Settlement Curve

Reference No.	R80213
Contract	Capdoo Clane
Test No.	CBR12
Location	687730.464, 728407.565, 72.162
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	16-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No.	N/A
Depth	0.00 m bgl

IGSL Ltd.



Gradient at 1.25 mm settlement intersection = 54
Modulus of subgrade reaction = 25 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10	2.5 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

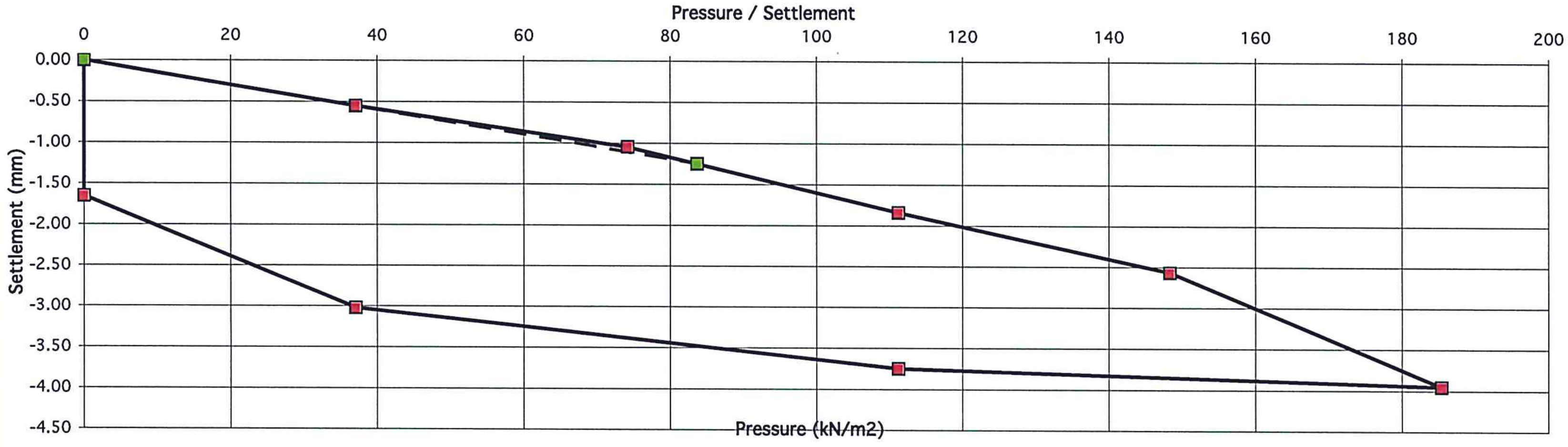
Reference No.	R80213
Contract	Capdoo Clane
Test No.	CBR12 reload
Location	687730.464, 728407.565, 72.162
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	16-06-17

Description of soil under test
(natural soil, placed fill, sub-base)

Gravelly SILT

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 67

Modulus of subgrade reaction = 31 MPa/m

Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 3.6 %

PLATE TEST REPORT SHEET (F3.1)

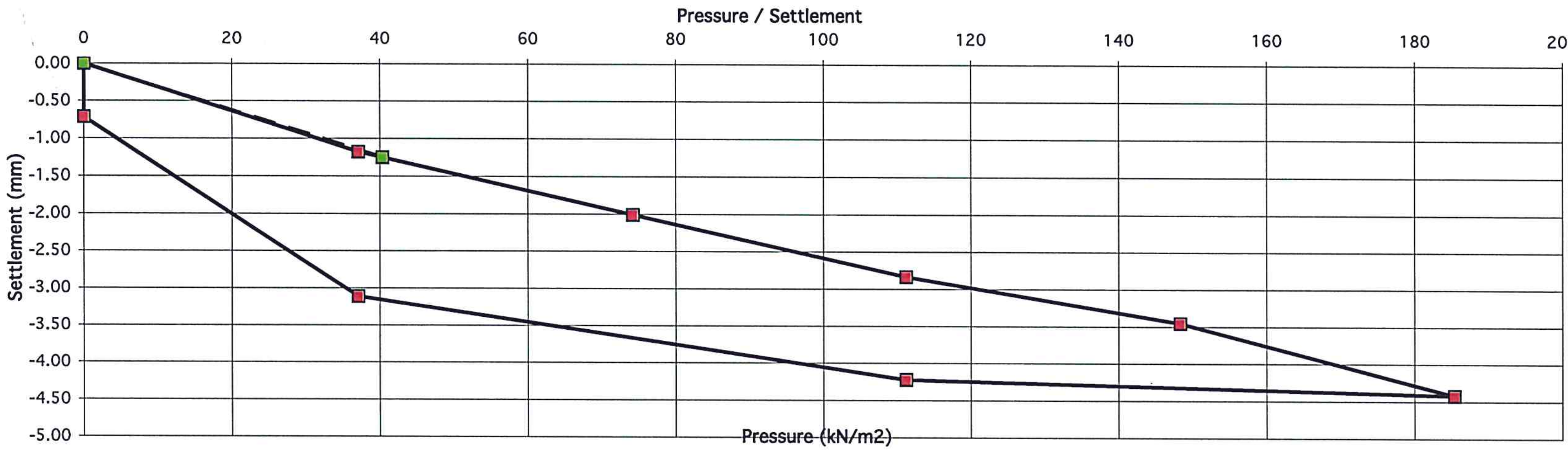
Applied Pressure/Settlement Curve

Reference No.	R80214
Contract	Capdoo Clane
Test No.	CBR13
Location	687654.908, 728465.015, 77.296
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	16-06-17

Description of soil under test
(natural soil, placed fill, sub-base)

Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl


Pressure / Settlement

Gradient at 1.25 mm settlement intersection = 32
Modulus of subgrade reaction = 15 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.0 %

PLATE TEST REPORT SHEET (F3.1)

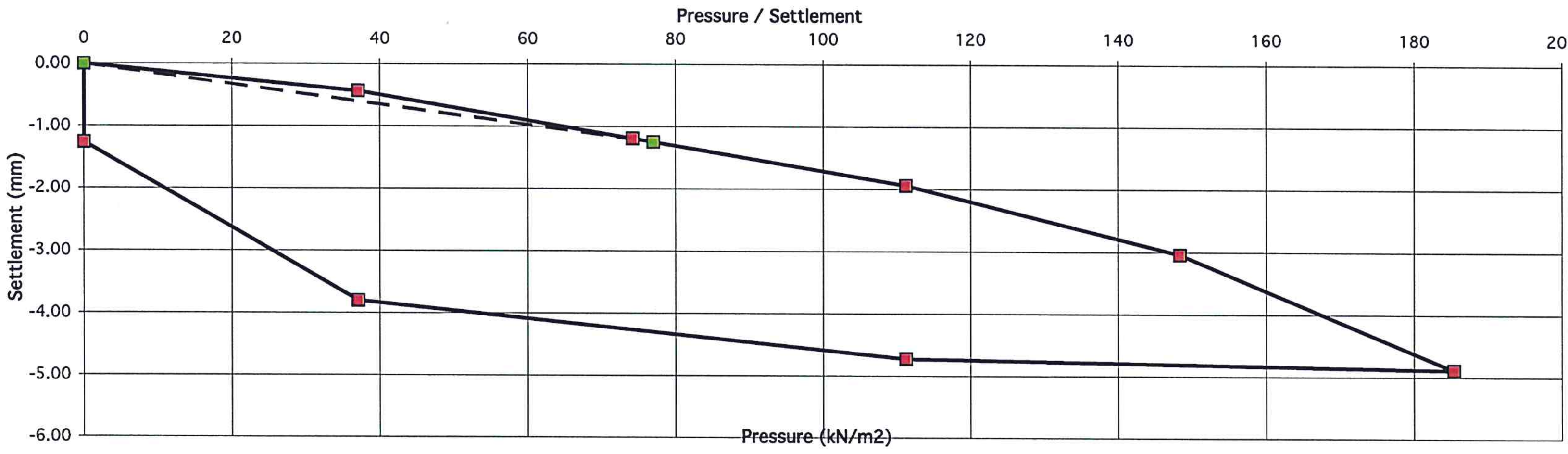
Applied Pressure/Settlement Curve

Reference No.	R80214
Contract	Capdoo Clane
Test No.	CBR13 reload
Location	687654.908, 728465.015, 77.296
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	16-06-17

Description of soil under test
(natural soil, placed fill, sub-base)

Gravelly SILT

Sample Ref No.	N/A
Depth	0.00 m bgl



Gradient at 1.25 mm settlement intersection = 62
Modulus of subgrade reaction = 28 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 3.1 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80215
Contract	Capdoo Clane
Test No.	CBR15
Location	687603.611, 728372.394, 78.113
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

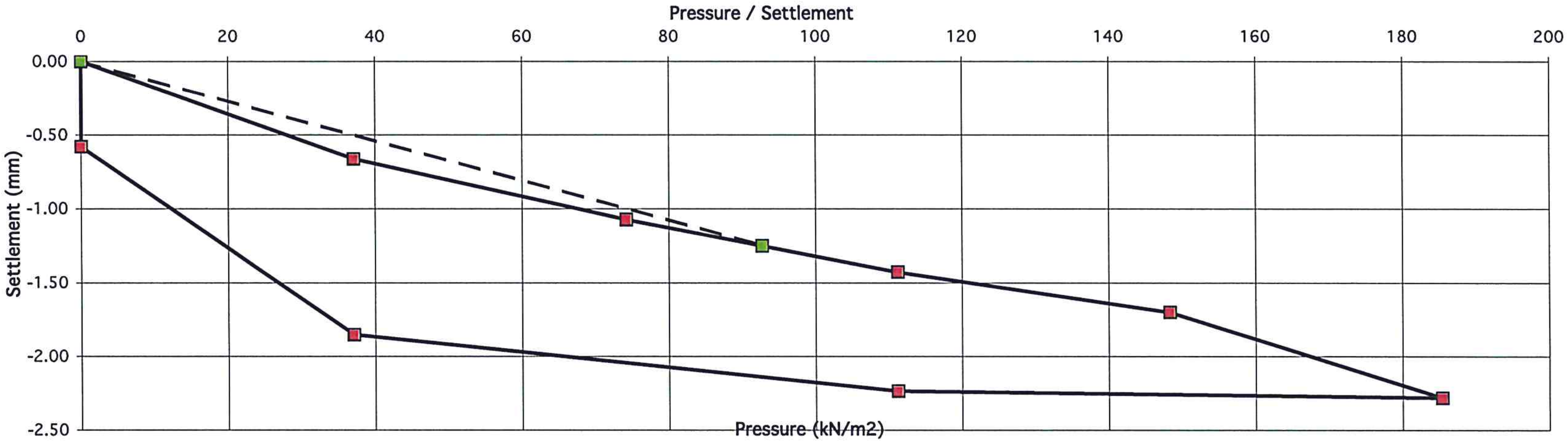
Description of soil under test
(natural soil, placed fill, sub-base)

Gravelly SILT

Sample Ref No.	N/A
Depth	0.00 m bgl

IGSL Ltd.

INAB ISO 17025 ACCREDITED TESTING DETAILED IN SCOPE REG NO 133T



Gradient at 1.25 mm settlement intersection = 74
Modulus of subgrade reaction = 34 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 4.3 %

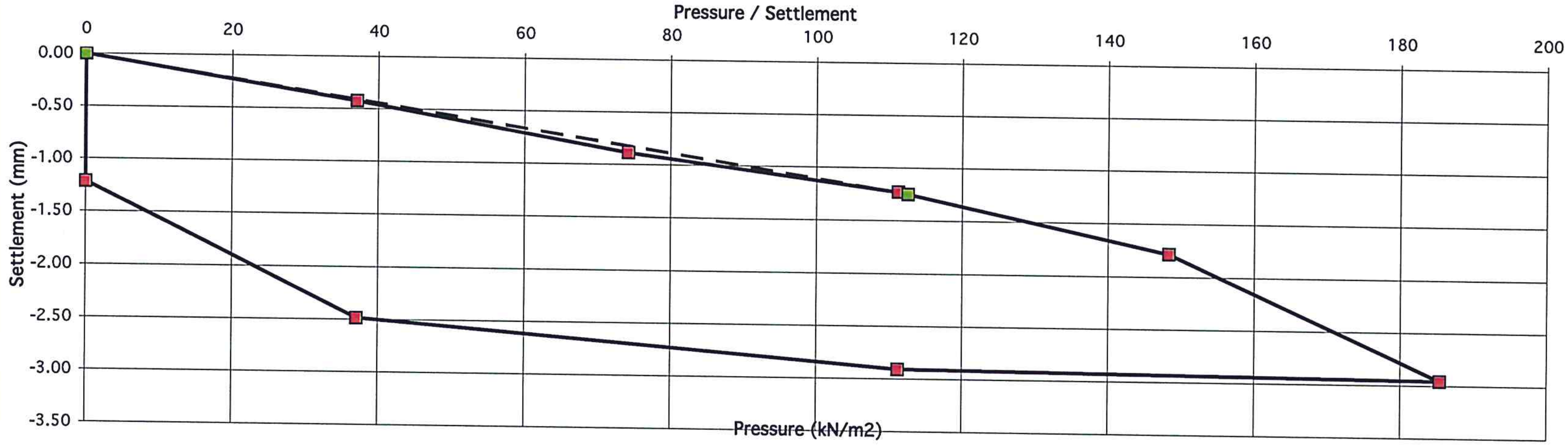
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80215
Contract	Capdoo Clane
Test No.	CBR15 reload
Location	687603.611, 728372.394, 78.113
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 90
Modulus of subgrade reaction = 41 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 6.1 %

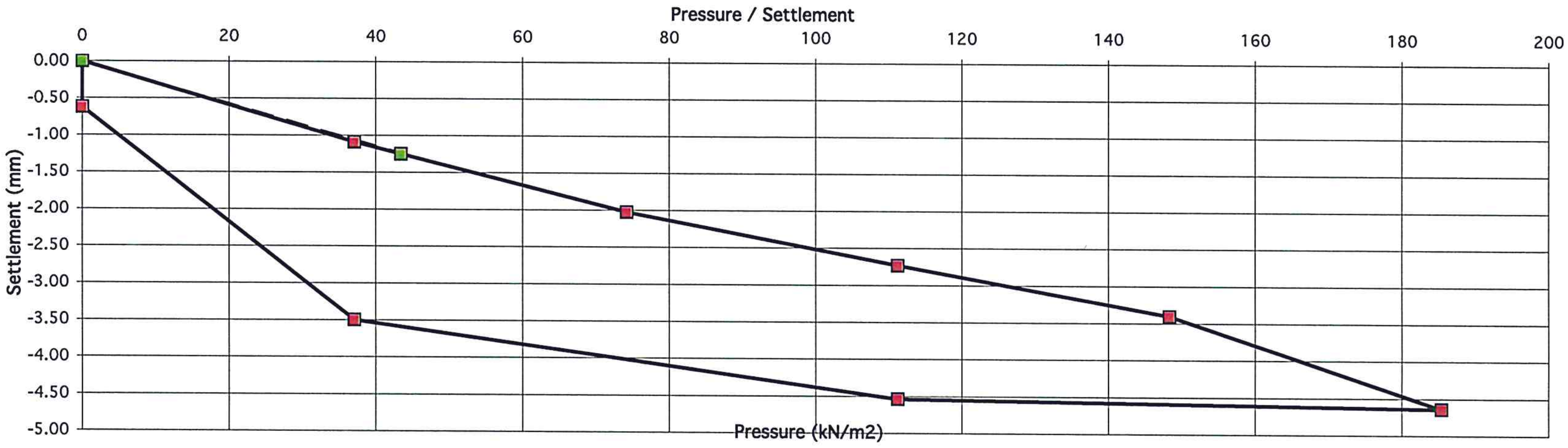
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80216
Contract	Capdoo Clane
Test No.	CBR16
Location	687648.389, 728374.574, 75.477
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No.	N/A
Depth	0.00 m bgl



Gradient at 1.25 mm settlement intersection = 35
Modulus of subgrade reaction = 16 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.2 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

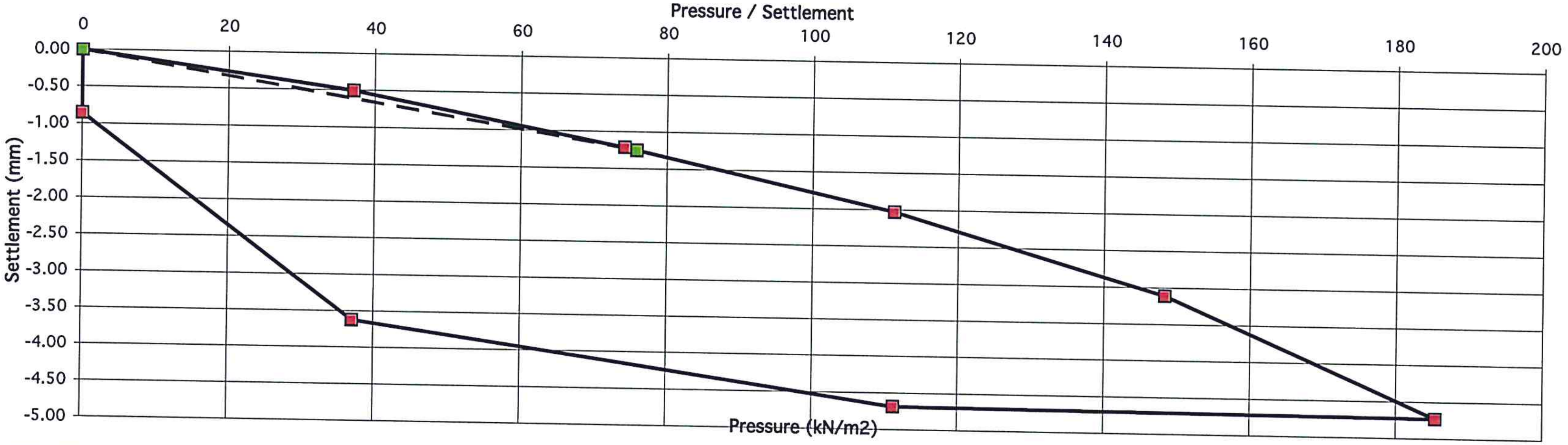
Reference No.	R80216
Contract	Capdoo Clane
Test No.	CBR16 reload
Location	687648.389, 728374.574, 75.477
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test (natural soil, placed fill, sub-base)

Gravelly SILT

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 61

Modulus of subgrade reaction = 28 MPa/m

Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 3.1 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

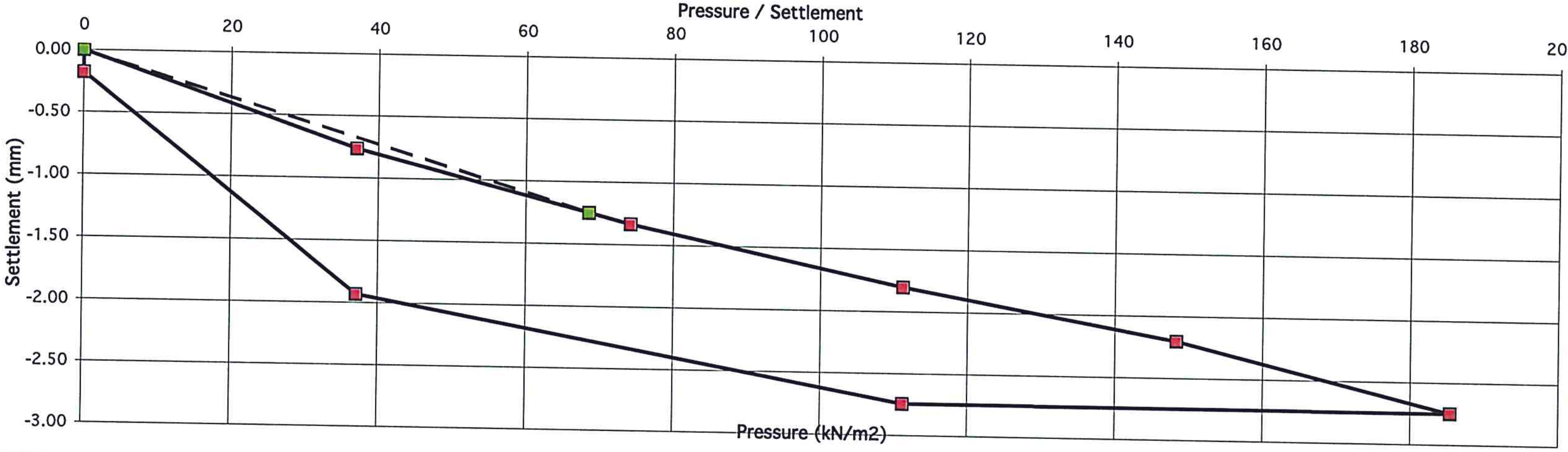
Reference No. R80217
Contract Capdoo Clane
Test No. CBR17
Location 687599.217, 728320.626, 75.167
Depth 0.5m
Client Ardstone/DBFL
Plate Diameter: 300 mm
Test Method BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician L. Daniels
Authorised by
Date 19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl

IGSL Ltd.

INAB TESTING



Gradient at 1.25 mm settlement intersection = 55
Modulus of subgrade reaction = 25 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.6 %

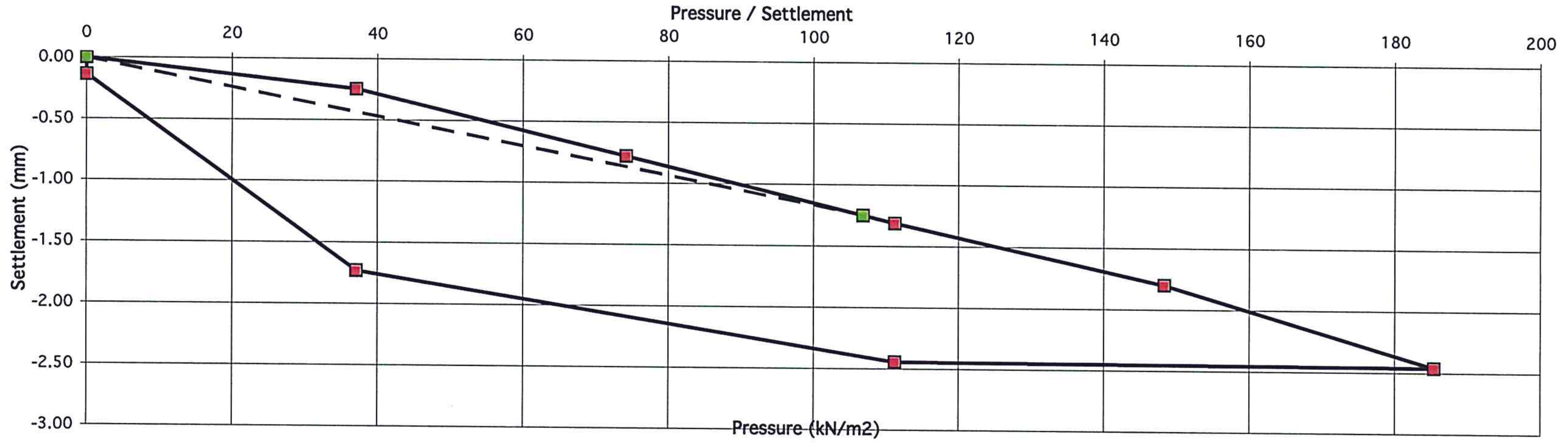
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80217
Contract	Capdoo Clane
Test No.	CBR17 reload
Location	687599.217, 728320.626, 75.167
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 85
Modulus of subgrade reaction = 39 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 5.5 %

PLATE TEST REPORT SHEET (F3.1)

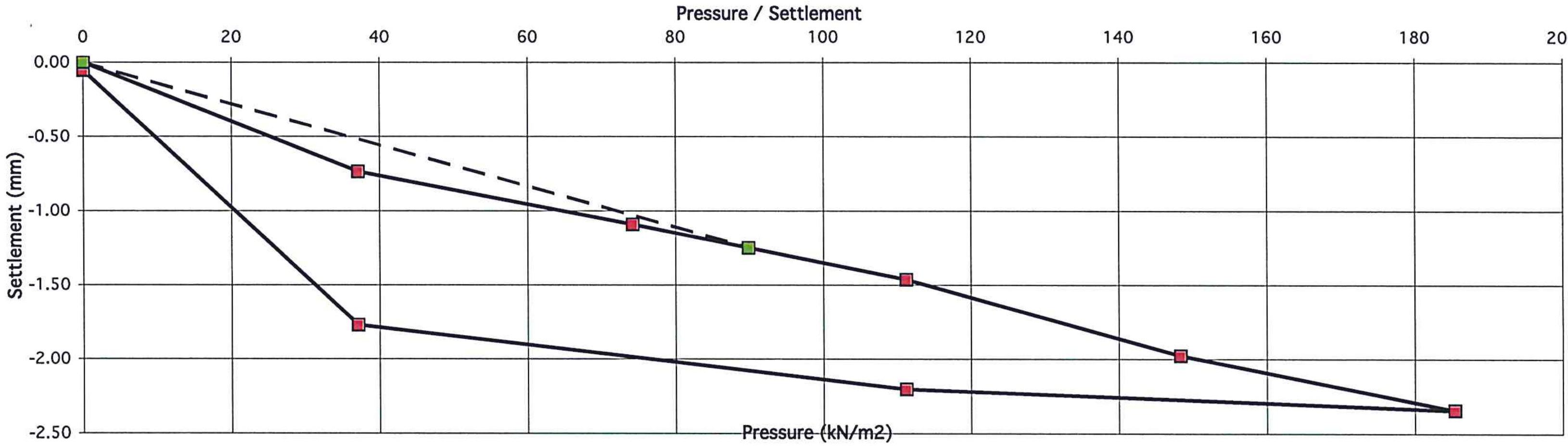
Applied Pressure/Settlement Curve

Reference No.	R80218
Contract	Capdoo Clane
Test No.	CBR18
Location	687662.505, 728326.399, 73.323
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)

Gravelly SILT

Sample Ref No.	N/A
Depth	0.00 m bgl



Gradient at 1.25 mm settlement intersection = 72
Modulus of subgrade reaction = 33 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 4.1 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

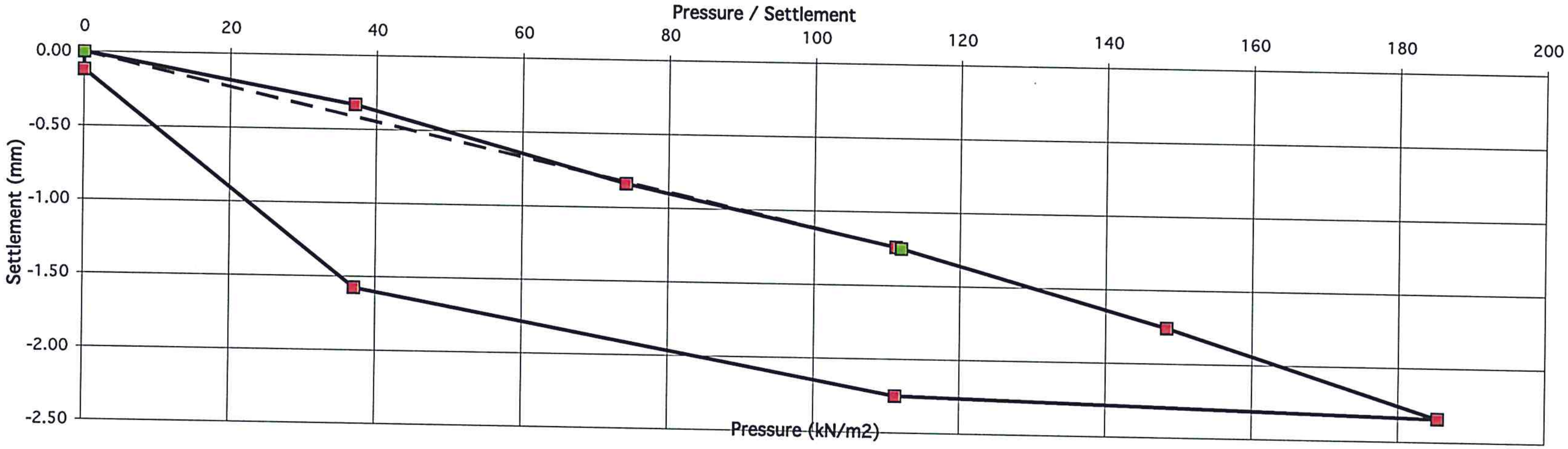
Reference No. R80218
Contract Capdoo Clane
Test No. CBR18 reload
Location 687662.505, 728326.399, 73.323
Depth 0.5m
Client Ardstone/DBFL
Plate Diameter: 300 mm
Test Method BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician L. Daniels
Authorised by
Date 19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl

IGSL Ltd.

INAB



Gradient at 1.25 mm settlement intersection = 90
Modulus of subgrade reaction = 41 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 6.0 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

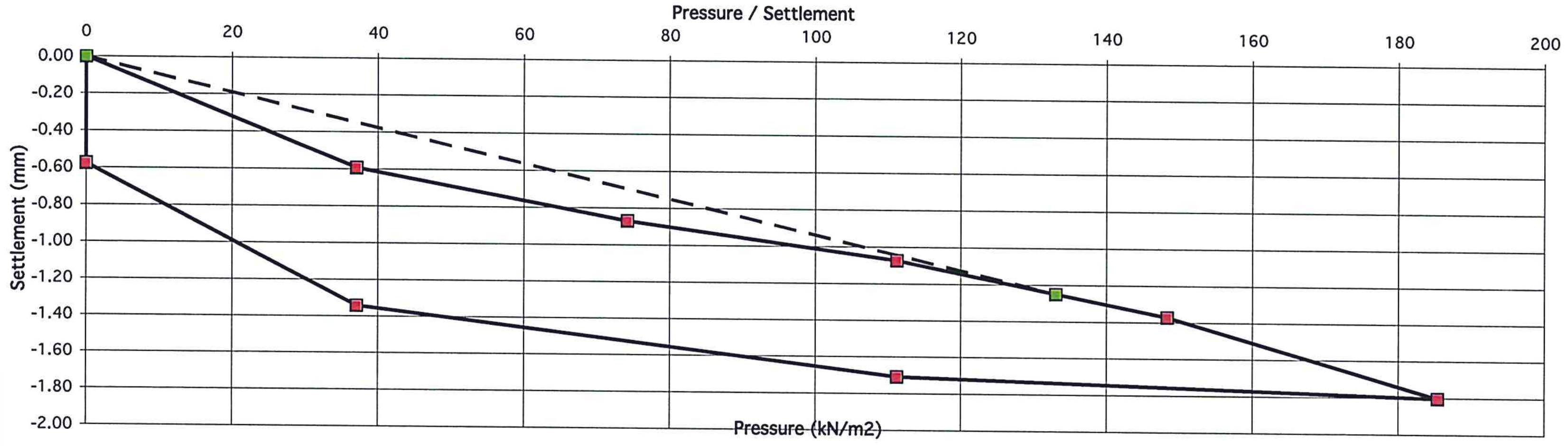
Reference No.	R80219
Contract	Capdoo Clane
Test No.	CBR19
Location	687726.137, 728330.736, 71.323
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl

IGSL Ltd.

INAB ACCREDITED TESTING



Gradient at 1.25 mm settlement intersection = 106
Modulus of subgrade reaction = 49 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 8.1 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

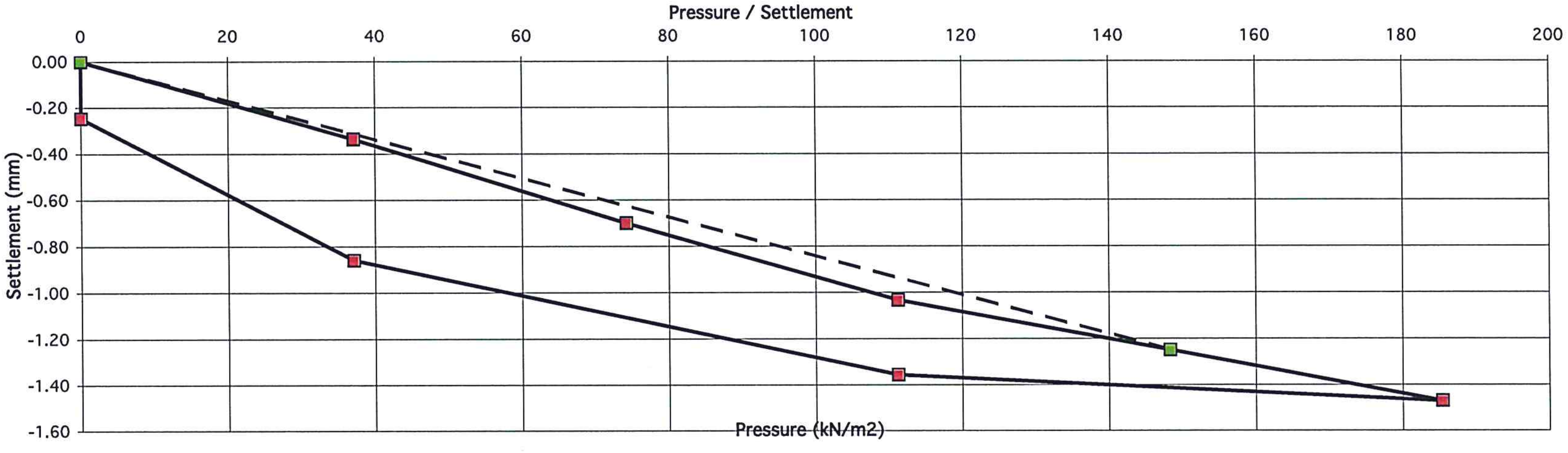
Reference No.	R80219
Contract	Capdoo Clane
Test No.	CBR19 reload
Location	687726.137, 728330.736, 71.323
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl

IGSL Ltd.

INAB ISO 17025 ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T



Gradient at 1.25 mm settlement intersection = 119
Modulus of subgrade reaction = 54 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 9.8 %

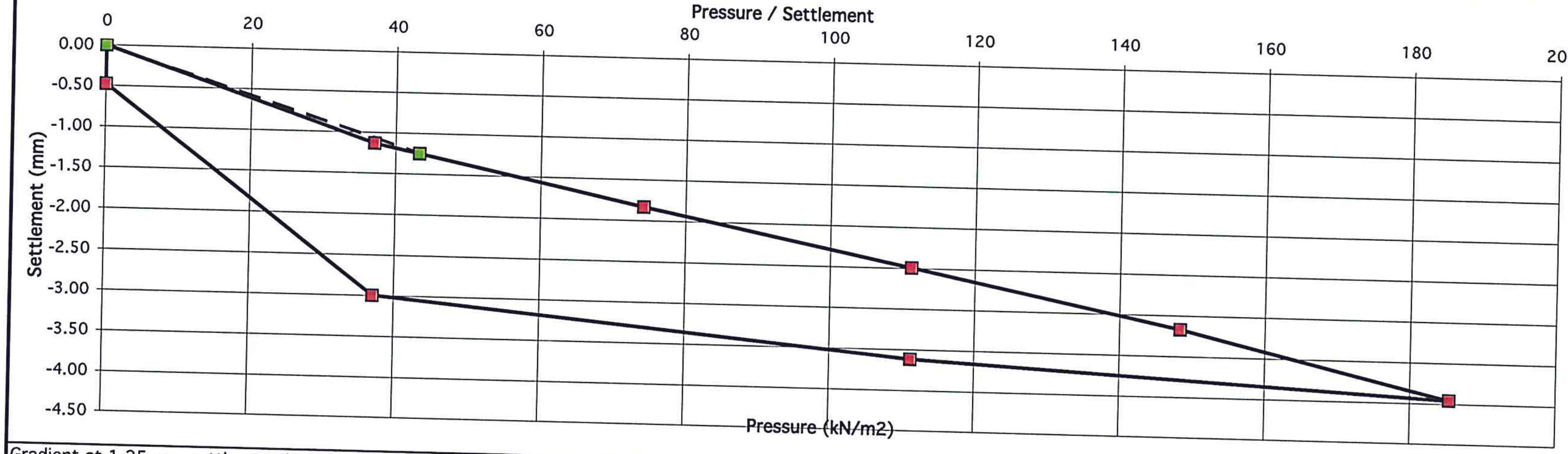
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80220
Contract	Capdoo Clane
Test No.	CBR20
Location	687776.122, 728319.541, 69.608
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 35
Modulus of subgrade reaction = 16 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.2 %

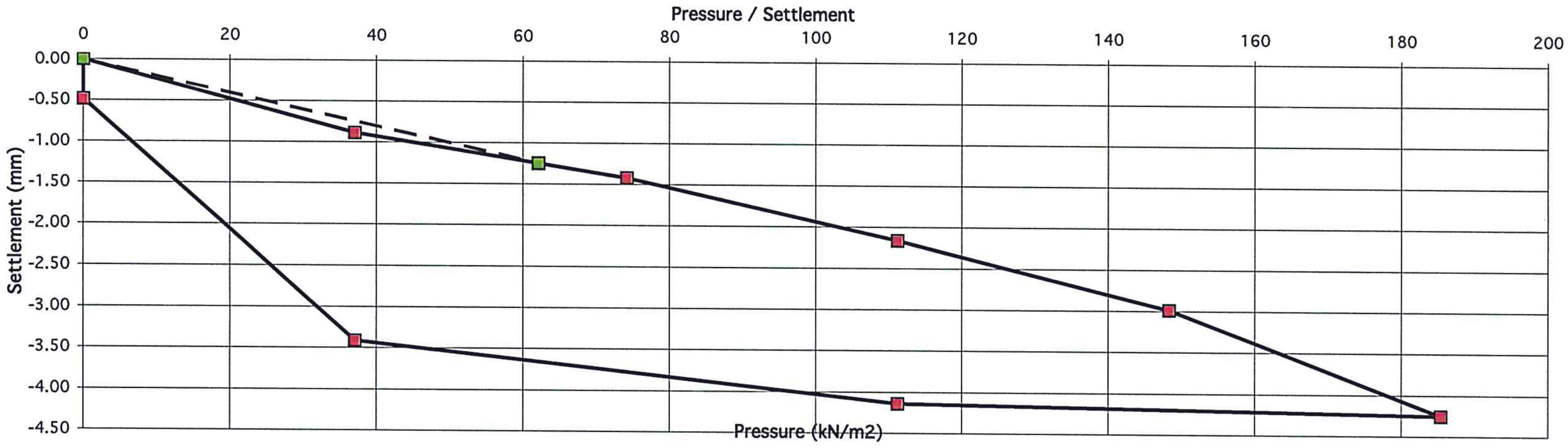
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80220
Contract	Capdoo Clane
Test No.	CBR20 reload
Location	687776.122, 728319.541, 69.608
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 50
Modulus of subgrade reaction = 23 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.2 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80221
Contract	Capdoo Clane
Test No.	CBR21
Location	687588.623, 728231.419, 73.716
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)

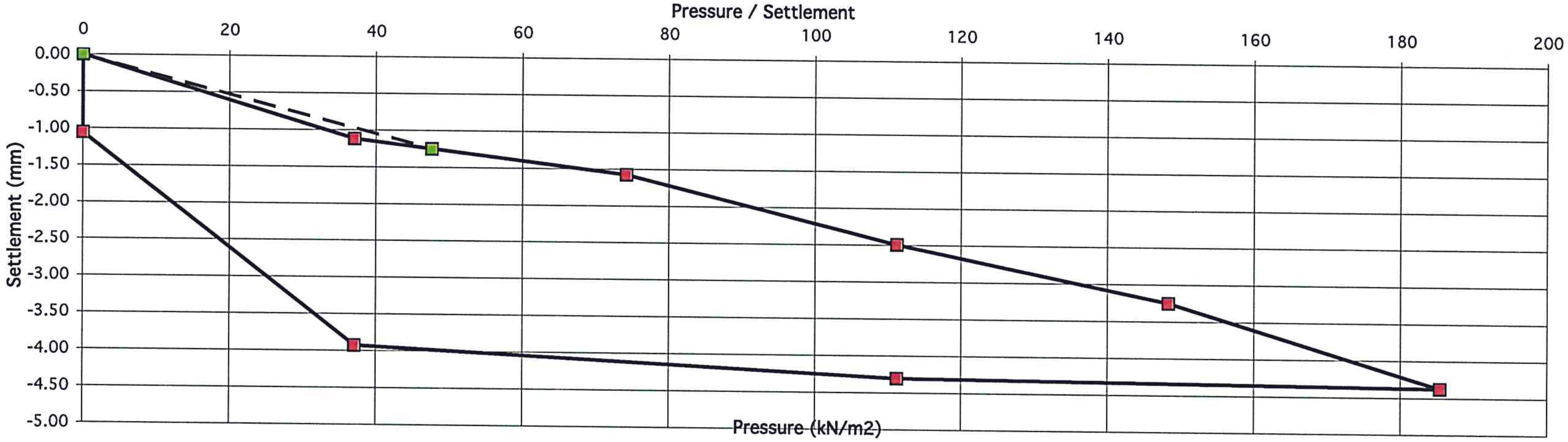
Gravelly SILT

Sample Ref No. N/A

Depth 0.00 m bgl

IGSL Ltd.

INAB Accredited Testing



Gradient at 1.25 mm settlement intersection = 38
Modulus of subgrade reaction = 17 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.4 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

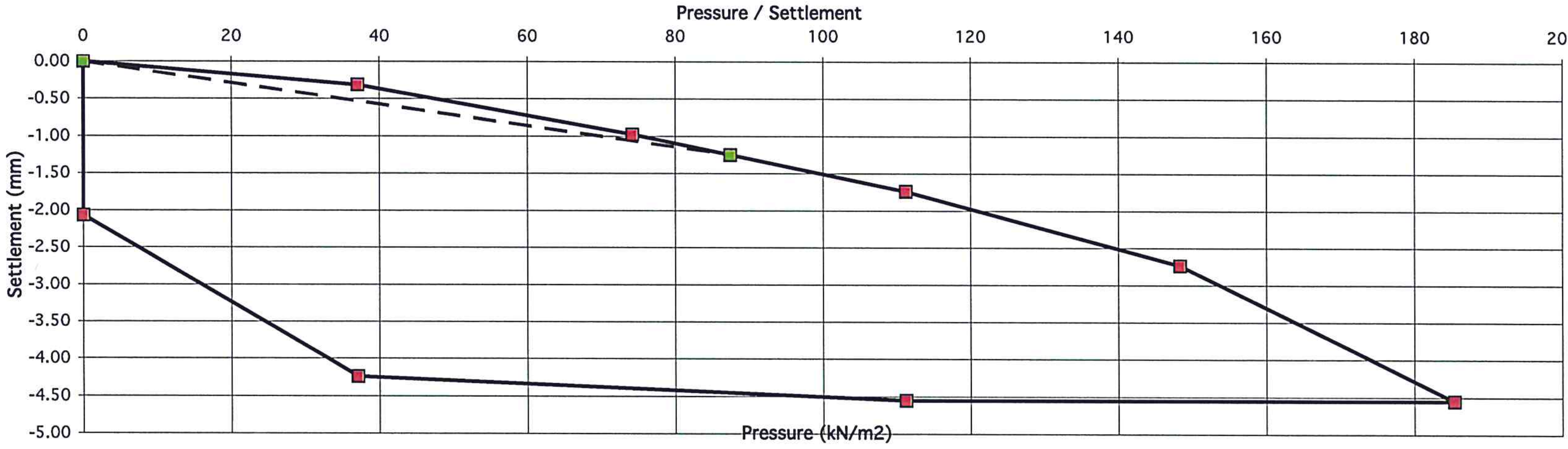
Reference No.	R80221
Contract	Capdoo Clane
Test No.	CBR21 reload
Location	687588.623, 728231.419, 73.716
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl

IGSL Ltd.

INAB ISO 17025 ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T



Gradient at 1.25 mm settlement intersection = 70
Modulus of subgrade reaction = 32 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 3.9 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80222
Contract	Capdoo Clane
Test No.	CBR22
Location	687577.681, 728212.567, 74.216
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)

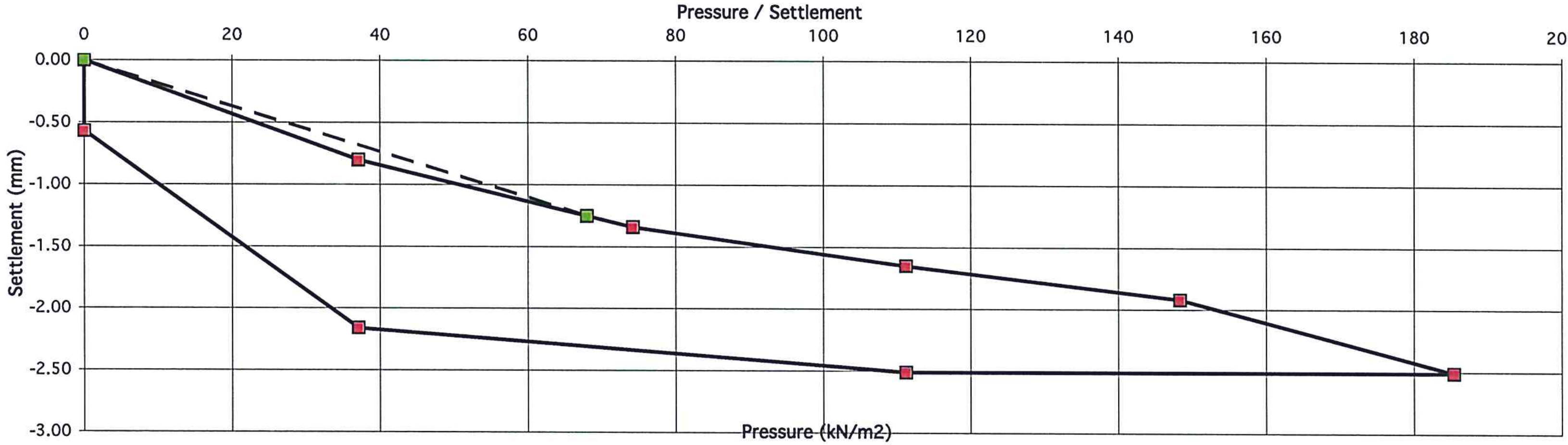
Gravelly SILT

Sample Ref No. N/A

Depth 0.00 m bgl

IGSL Ltd.

INAB



Gradient at 1.25 mm settlement intersection = 54
Modulus of subgrade reaction = 25 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.5 %

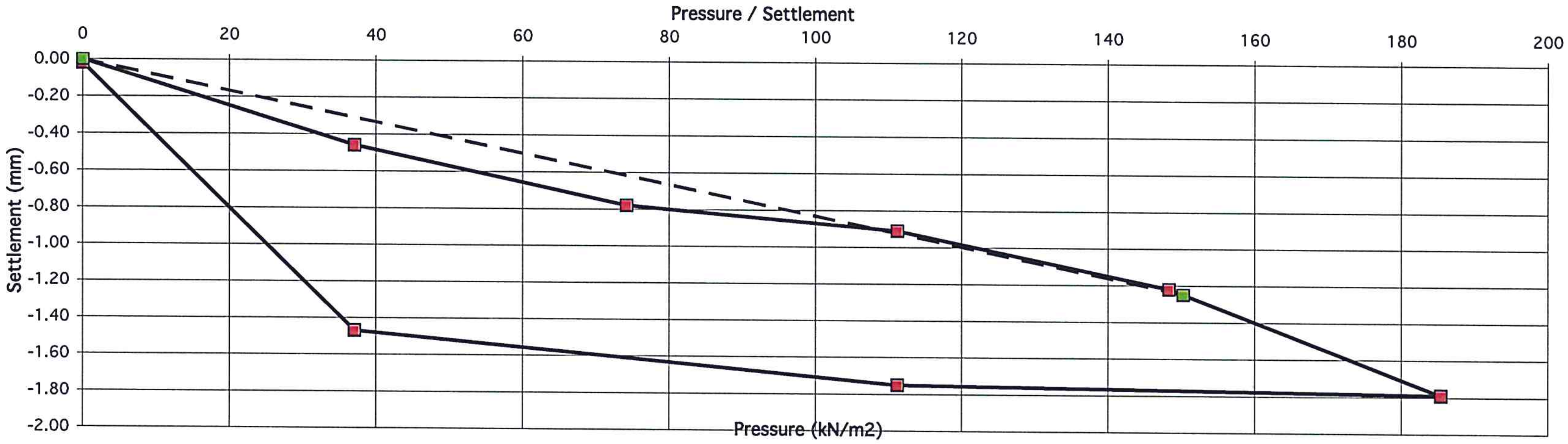
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80222
Contract	Capdoo Clane
Test No.	CBR22 reload
Location	687577.681, 728212.567, 74.216
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 120
Modulus of subgrade reaction = 55 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 10.0 %

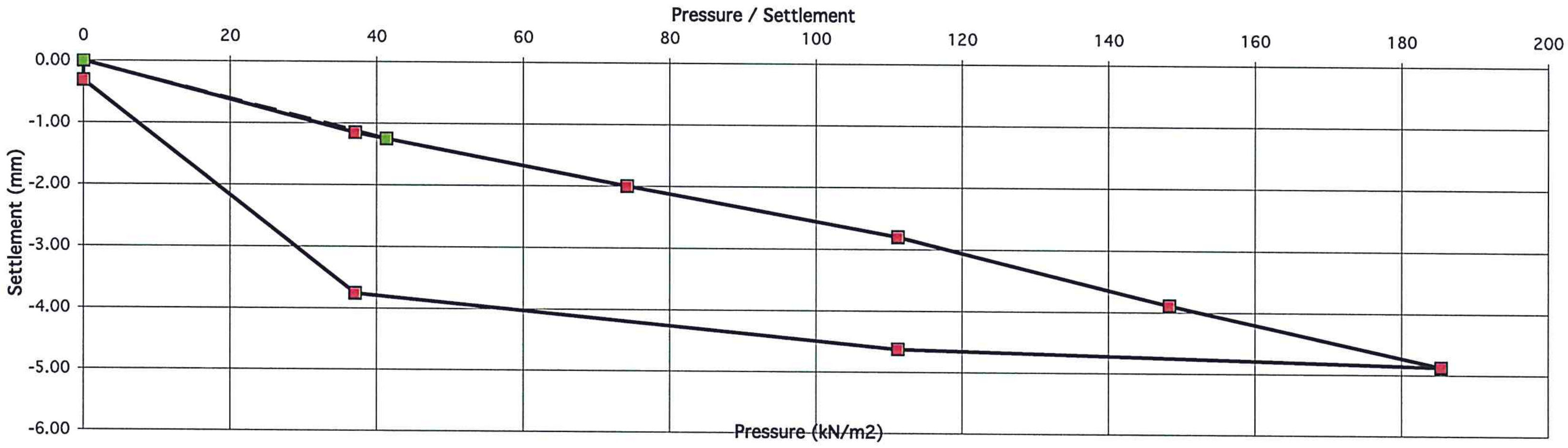
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80223
Contract	Capdoo Clane
Test No.	CBR23
Location	687718.138, 728235.801, 71.321
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 33
Modulus of subgrade reaction = 15 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.1 %

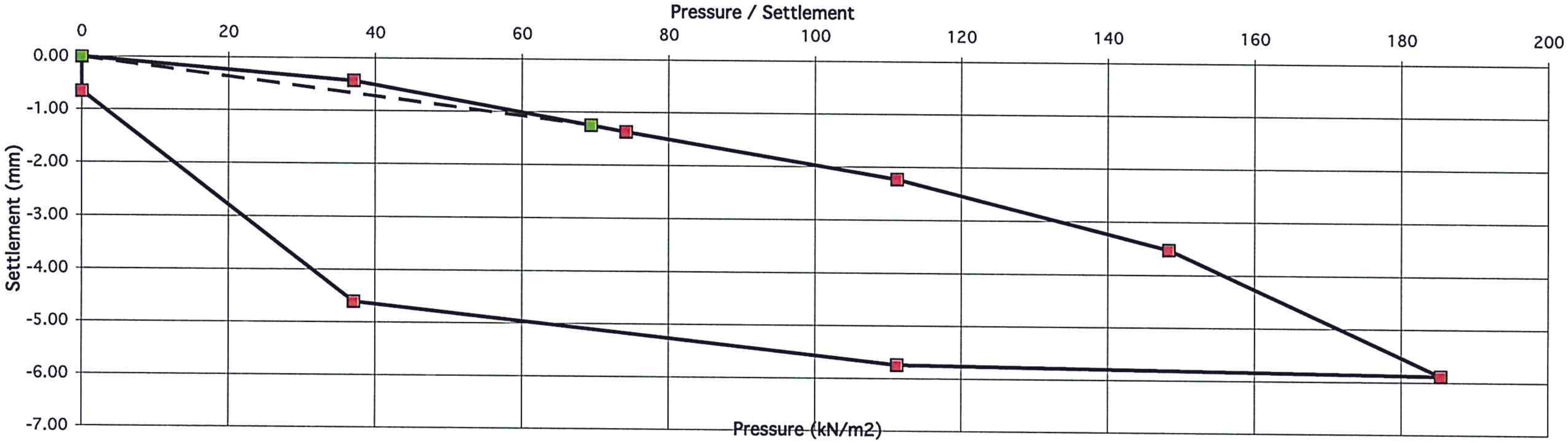
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80223
Contract	Capdoo Clane
Test No.	CBR23 reload
Location	687718.138, 728235.801, 71.321
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No.	N/A
Depth	0.00 m bgl



Gradient at 1.25 mm settlement intersection = 56
Modulus of subgrade reaction = 25 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.6 %

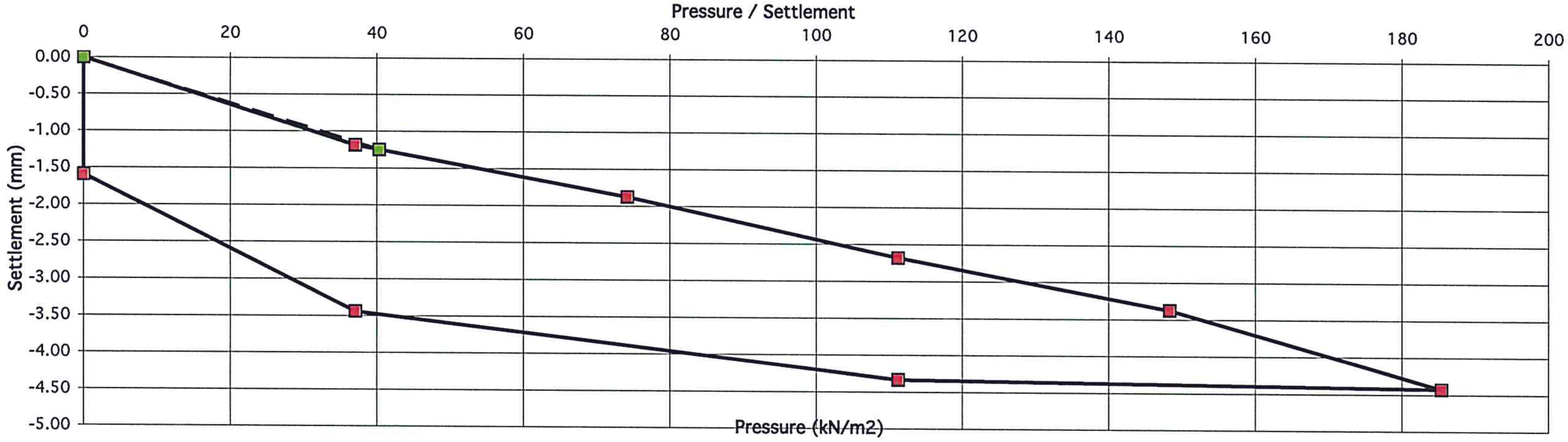
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80224
Contract	Capdoo Clane
Test No.	CBR24
Location	687676.704, 728195.476, 73.912
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 32
Modulus of subgrade reaction = 15 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.0 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

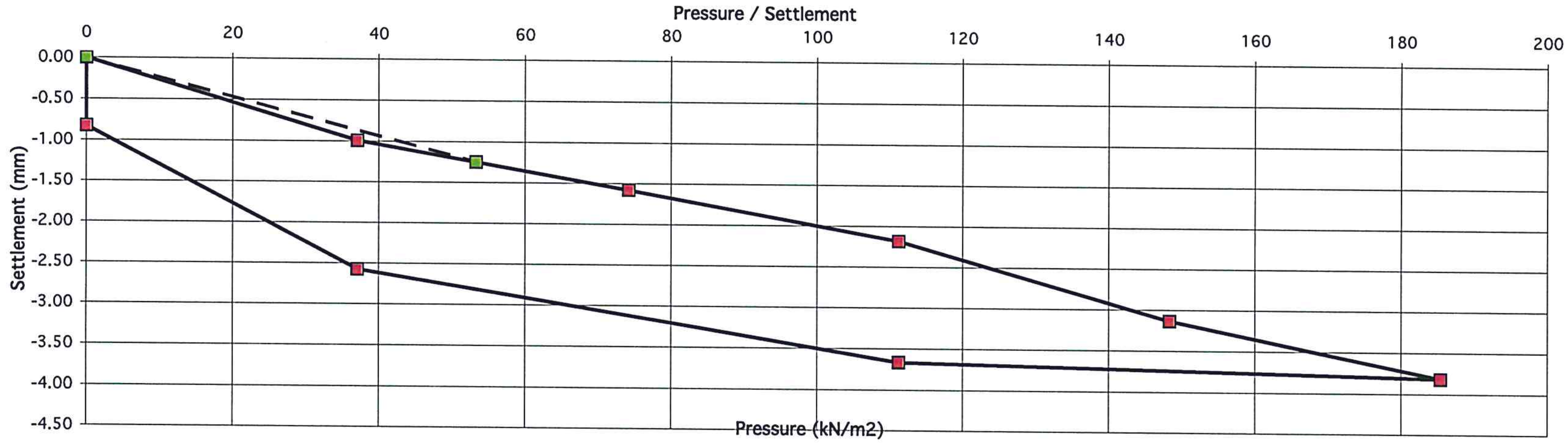
Reference No.	R80224
Contract	Capdoo Clane
Test No.	CBR24 reload
Location	687676.704, 728195.476, 73.912
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	19-06-17

Description of soil under test
(natural soil, placed fill, sub-base)

Gravelly SILT

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 43
Modulus of subgrade reaction = 19 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.7 %

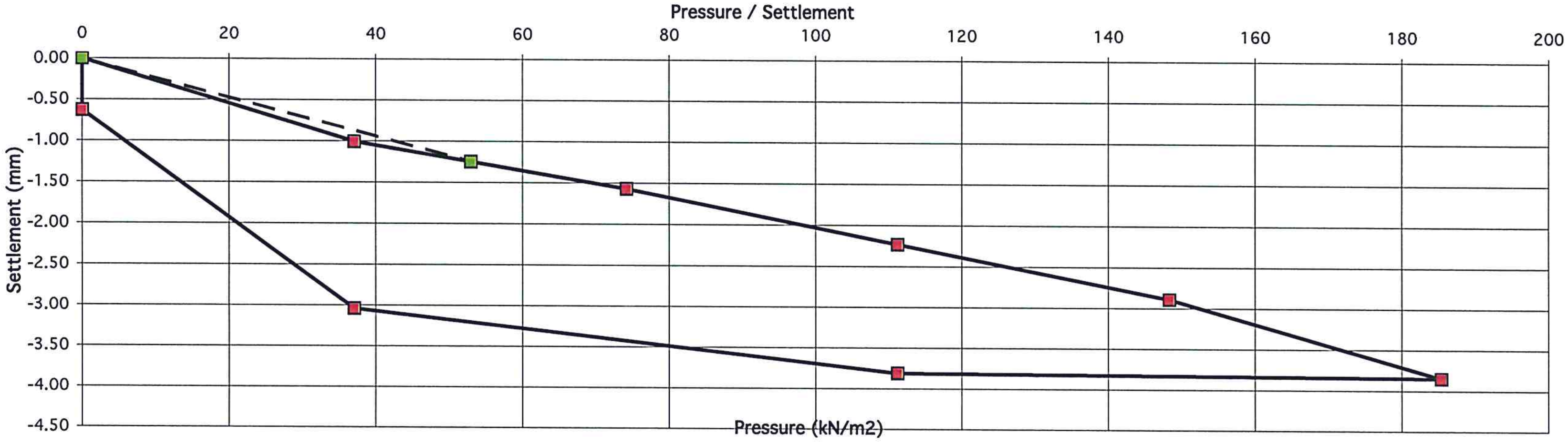
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80225
Contract	Capdoo Clane
Test No.	CBR25
Location	See map
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	16-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No.	N/A
Depth	0.00 m bgl



Gradient at 1.25 mm settlement intersection = 42
Modulus of subgrade reaction = 19 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.6 %

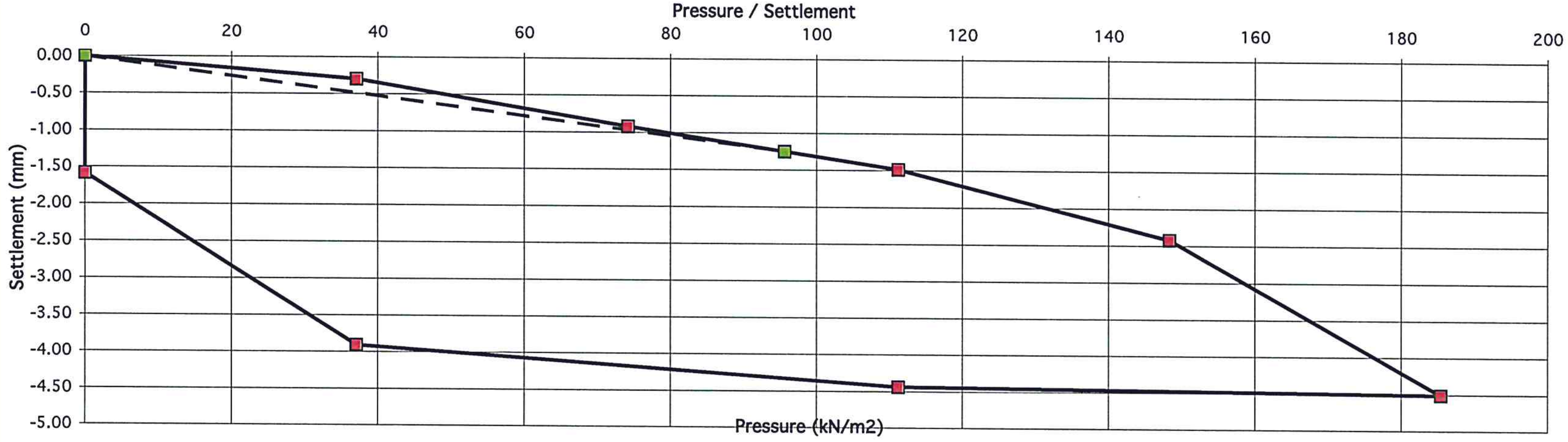
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R80225
Contract	Capdoo Clane
Test No.	CBR25 reload
Location	687631.745, 728185.586, 75.104
Depth	0.5m
Client	Ardstone/DBFL
Plate Diameter:	300 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	L. Daniels
Authorised by	
Date	16-06-17

Description of soil under test
(natural soil, placed fill, sub-base)
Gravelly SILT

Sample Ref No. N/A
Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 77
Modulus of subgrade reaction = 35 MPa/m
Correction factor applied = 0.46 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 4.6 %

Appendix V BRE Digest 365 Tests

Soakaway

IGSL

Contract: Capdoo, Clane
Contract No. 20159
Test No. IT01
Client Ardstone/DBFL
Date: 22/06/2017

Summary of ground conditions

from	to	Description	Ground water
0.00	0.50	TOPSOIL	
0.50	2.30	Brown gravelly SILT. Gravel fine to coarse subangular.	

Notes: Location: 687650.505, 728377.037, 75.419

Field Data

Depth to Water (m)	Elapsed Time (min)
1.65	0.00
1.65	1.00
1.65	2.00
1.65	3.00
1.65	4.00
1.65	5.00
1.65	10.00
1.65	15.00
1.65	20.00
1.65	30.00
1.65	40.00
1.65	60.00

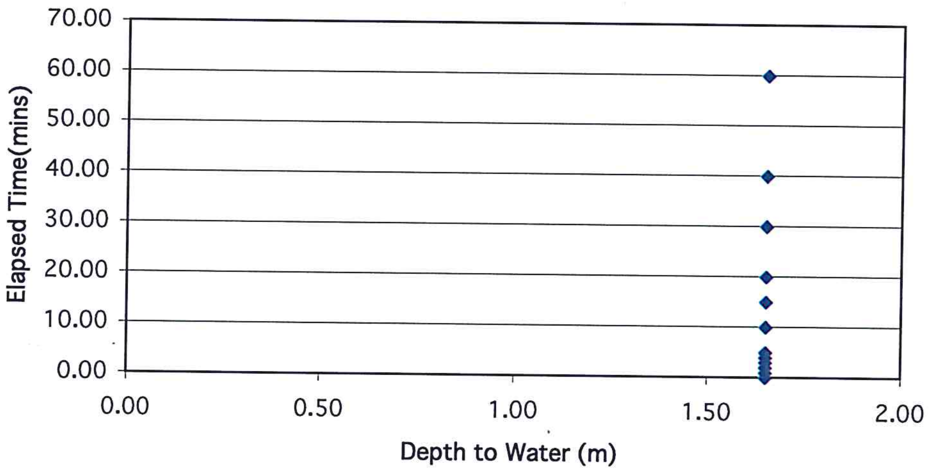
Field Test

Depth of Pit (D)	2.30	m
Width of Pit (B)	0.40	m
Length of Pit (L)	2.40	m
Initial depth to Water =	1.65	m
Final depth to water =	1.65	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.96	m2
*Av. side area of permeable stratum over test perio	3.64	m2
Total Exposed area =	4.6	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

IGSL

Contract: Capdoo, Clane
Test No. IT02
Client Ardstone/DBFL
Date: 22/06/2017

Contract No. 20159

Summary of ground conditions

from	to	Description	Ground water
0.00	0.50	TOPSOIL	
0.50	2.50	Black gravelly medium to coarse gritty SAND	

Notes: Location: 687758.740, 728337.281, 69.924

Field Data

Depth to Water (m)	Elapsed Time (min)
1.66	0.00
1.67	1.00
1.68	2.00
1.69	3.00
1.70	4.00
1.71	5.00
1.72	10.00
1.73	15.00
1.74	20.00
1.77	30.00
1.80	40.00
1.85	60.00
1.92	90.00

Field Test

Depth of Pit (D) 2.50 m
Width of Pit (B) 0.40 m
Length of Pit (L) 1.70 m

Initial depth to Water = 1.66 m
Final depth to water = 1.92 m
Elapsed time (mins)= 90.00

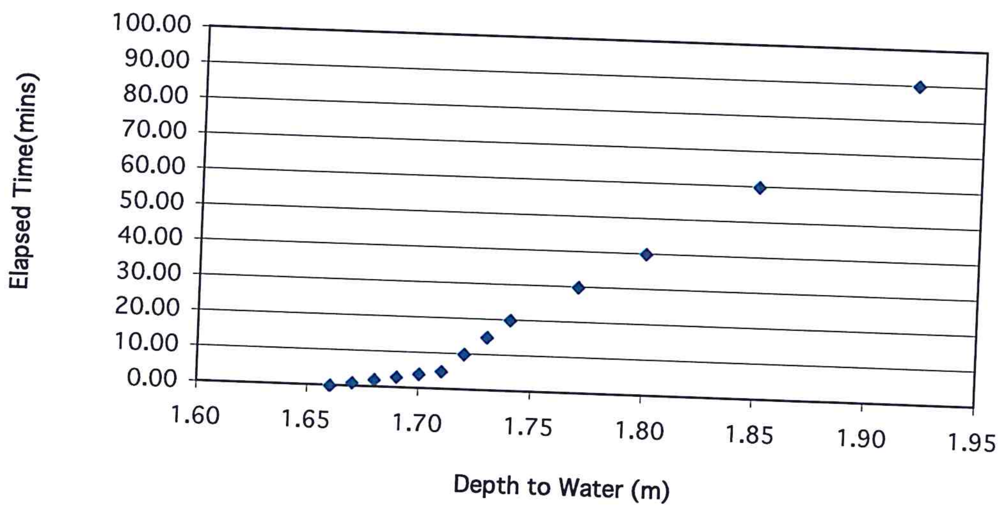
Top of permeable soil m
Base of permeable soil m

Base area= 0.68 m2
*Av. side area of permeable stratum over test perioc 2.982 m2
Total Exposed area = 3.662 m2

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

f= 0.00054 m/min or 8.941E-06 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway

IGSL

Contract: Capdoo, Clane
Test No. IT03
Client Ardstone/DBFL
Date: 21/06/2017

Contract No. 20159

Summary of ground conditions

from	to	Description	Ground water
0.00	0.60	TOPSOIL	
0.60	1.60	Grey silty fine to coarse SAND	
1.60	2.50	Grey silty gravelly fine to coarse SAND	

Notes: Location: 687729.310, 728440.316, 72.962

Field Data

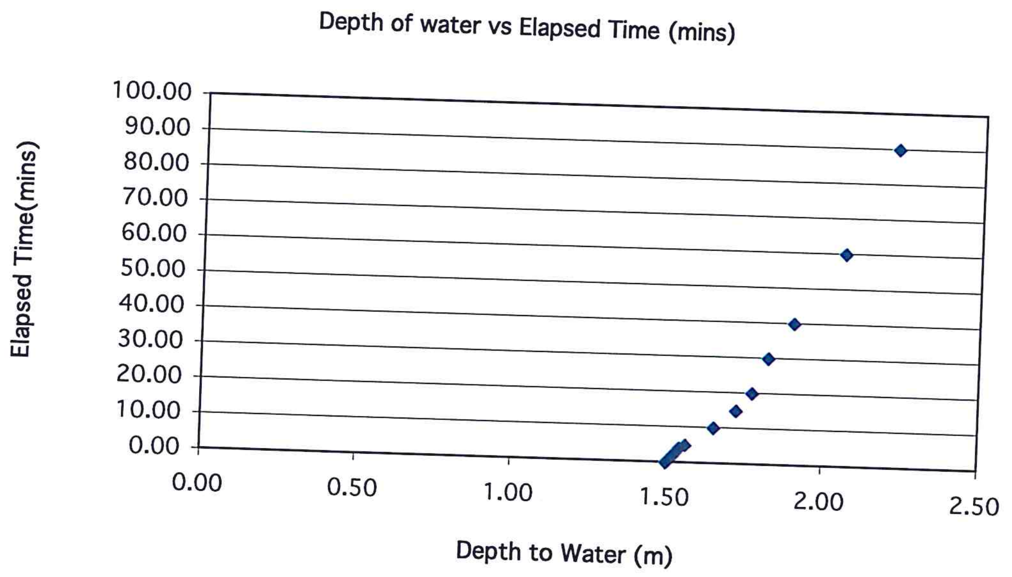
Depth to Water (m)	Elapsed Time (min)
1.50	0.00
1.51	1.00
1.52	2.00
1.53	3.00
1.54	4.00
1.56	5.00
1.65	10.00
1.72	15.00
1.77	20.00
1.82	30.00
1.90	40.00
2.06	60.00
2.22	90.00

Field Test

Depth of Pit (D)	2.50	m
Width of Pit (B)	0.40	m
Length of Pit (L)	1.80	m
Initial depth to Water =	1.50	m
Final depth to water =	2.22	m
Elapsed time (mins)=	90.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.72	m2
*Av. side area of permeable stratum over test perioc	2.816	m2
Total Exposed area =	3.536	m2

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

f= 0.00163 m/min or 2.715E-05 m/sec



Soakaway

IGSL

Contract:	Capdoo, Clane	Contract No.	20159
Test No.	IT04		
Client	Ardstone/DBFL		
Date:	21/06/2017		

Summary of ground conditions

from	to	Description	Ground water
0.00	0.50	TOPSOIL	
0.50	1.90	Grey slightly silty fine to coarse SAND	
1.90	2.50	Grey gravelly moderately cobbly fine to coarse SAND	

Notes: Location: 687749.826, 728441.334, 71.325

Field Data

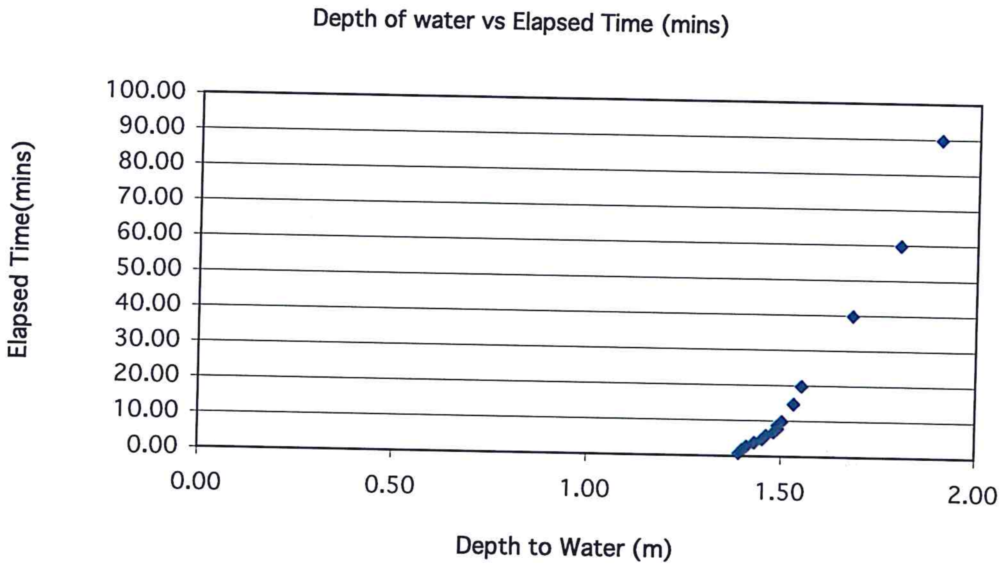
Depth to Water (m)	Elapsed Time (min)
1.38	0.00
1.39	1.00
1.40	2.00
1.41	3.00
1.43	4.00
1.45	5.00
1.46	6.00
1.48	7.00
1.49	8.00
1.49	9.00
1.50	10.00
1.53	15.00
1.55	20.00
1.68	40.00
1.80	60.00
1.90	90.00

Field Test

Depth of Pit (D)	2.50	m
Width of Pit (B)	0.40	m
Length of Pit (L)	2.10	m
Initial depth to Water =	1.38	m
Final depth to water =	1.90	m
Elapsed time (mins)=	90.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.84	m2
*Av. side area of permeable stratum over test perioc	4.3	m2
Total Exposed area =	5.14	m2

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

f= 0.00094 m/min or 1.574E-05 m/sec



Soakaway

IGSL

Contract: Capdoo, Clane
Contract No. 20159
Test No. IT05
Client Ardstone/DBFL
Date: 21/06/2017

Summary of ground conditions

from	to	Description	Ground water
0.00	0.50	TOPSOIL	1.30m
0.30	1.60	Grey silty fine to coarse subangular to subrounded GRAVEL	

Notes: Location: 687850.393, 728469.376 ,68.013
Moderate seepage at 1.50m. Groundwater settled at 1.30m after a period of 30 minutes.

Field Data

Depth to Water (m)	Elapsed Time (min)
NA	NA

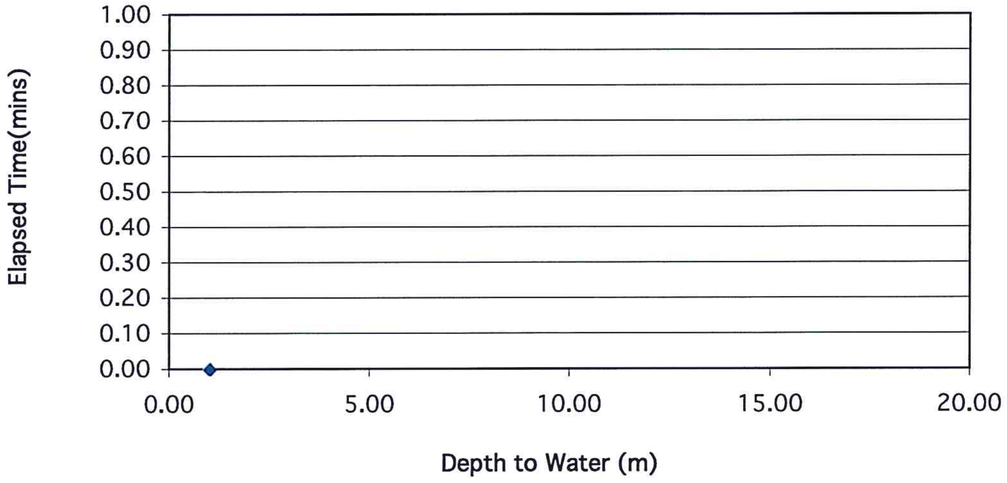
Field Test

Depth of Pit (D)	1.60	m
Width of Pit (B)	0.40	m
Length of Pit (L)	1.80	m
Initial depth to Water =	NA	
Final depth to water =	NA	m
Elapsed time (mins)=	NA	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.72	m2
*Av. side area of permeable stratum over test period	#VALUE!	m2
Total Exposed area =	#VALUE!	m2

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

f= #VALUE! m/min or #VALUE! m/sec

Depth of water vs Elapsed Time (mins)



Soakaway

IGSL

Contract: Capdoo, Clane
Test No. IT06
Client Ardstone/DBFL
Date: 21/06/2017

Contract No. 20159

Summary of ground conditions

from	to	Description	Ground water
0.00	0.30	TOPSOIL	0.90m
0.30	1.20	Grey silty fine to coarse subangular to subrounded GRAVEL	

Notes: Location: 687855.724, 728492.341, 67.366
Moderate seepage at 1.20m. Groundwater settled at 0.90m after a period of 30 minutes.

Field Data

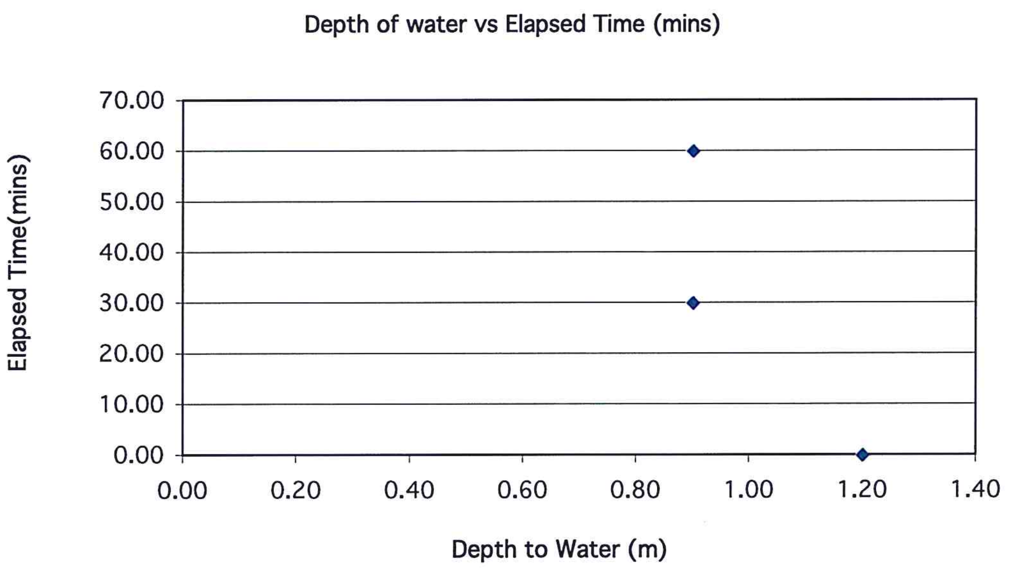
Depth to Water (m)	Elapsed Time (min)
1.20	0.00
0.90	30.00
0.90	60.00

Field Test

Depth of Pit (D)	1.20	m
Width of Pit (B)	0.40	m
Length of Pit (L)	1.50	m
Initial depth to Water =	1.20	m
Final depth to water =	0.90	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.6	m2
*Av. side area of permeable stratum over test perioc	0.57	m2
Total Exposed area =	1.17	m2

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

f= -0.0026 m/min or -4.274E-05 m/sec


Depth of water vs Elapsed Time (mins)

Soakaway

IGSL

Contract: Capdoo, Clane
Contract No. 20159
Test No. IT07
Client Ardstone/DBFL
Date: 22/06/2017

Summary of ground conditions

from	to	Description	Ground water
0.00	0.70	TOPSOIL	
0.70	1.30	Brown slightly sandy gravelly SILT	
1.30	1.80	Grey slightly silty sandy fine to coarse gritty GRAVEL	
1.80	2.30	Brown gravelly fine to medium SAND	

Notes:

Field Data

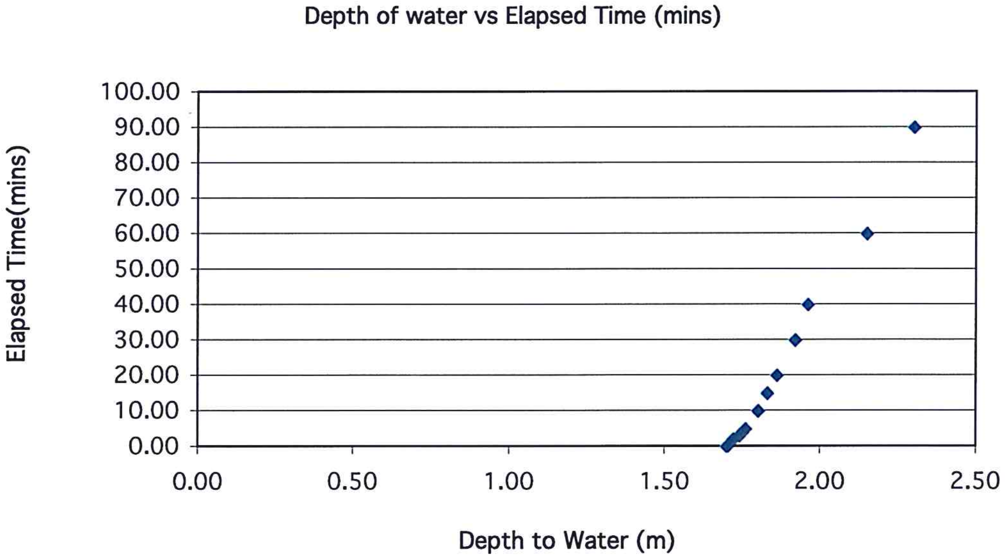
Depth to Water (m)	Elapsed Time (min)
1.70	0.00
1.71	1.00
1.72	2.00
1.74	3.00
1.75	4.00
1.76	5.00
1.80	10.00
1.83	15.00
1.86	20.00
1.92	30.00
1.96	40.00
2.15	60.00
2.30	90.00

Field Test

Depth of Pit (D)	2.30	m
Width of Pit (B)	0.40	m
Length of Pit (L)	2.00	m
Initial depth to Water =	1.70	m
Final depth to water =	2.30	m
Elapsed time (mins)=	90.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.8	m2
*Av. side area of permeable stratum over test period	1.44	m2
Total Exposed area =	2.24	m2

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

f= 0.00238 m/min or 3.968E-05 m/sec



Soakaway

IGSL

Contract: Capdoo, Clane

Contract No. 20159

Test No. IT08

Client Ardstone/DBFL

Date: 22/06/2017

Summary of ground conditions

from	to	Description	Ground water
0.00	0.50	TOPSOIL	
0.50	1.90	Brown gravelly SILT. Gravel fine to coarse subangular.	
1.90	2.40	Black gravelly coarse SAND.	

Notes: Location: IT08,687748.117,728233.974,70.390,,

Field Data

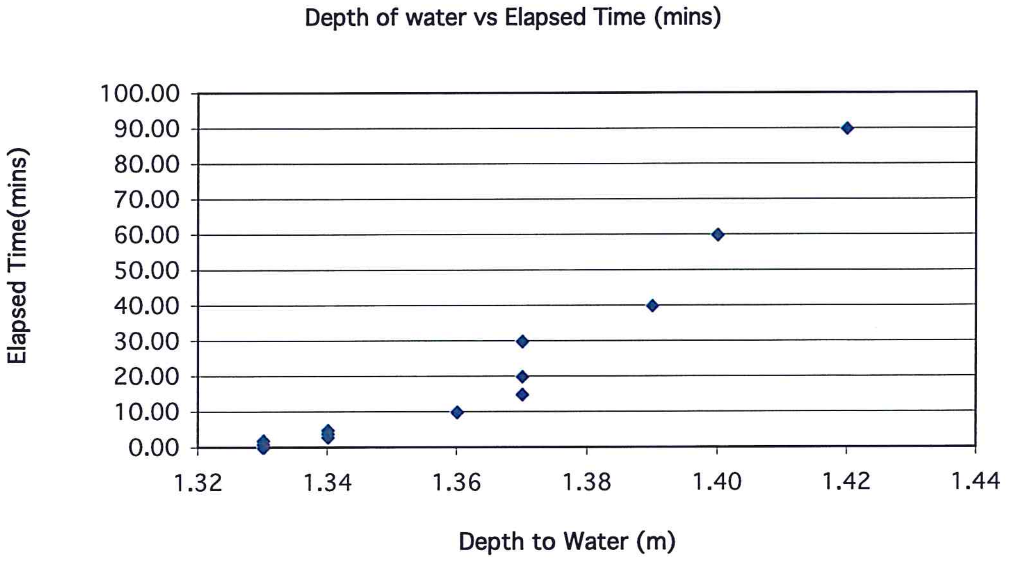
Depth to Water (m)	Elapsed Time (min)
1.33	0.00
1.33	1.00
1.33	2.00
1.34	3.00
1.34	4.00
1.34	5.00
1.36	10.00
1.37	15.00
1.37	20.00
1.37	30.00
1.39	40.00
1.40	60.00
1.42	90.00

Field Test

Depth of Pit (D)	2.40	m
Width of Pit (B)	0.40	m
Length of Pit (L)	2.00	m
Initial depth to Water =	1.33	m
Final depth to water =	1.42	m
Elapsed time (mins)=	90.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.8	m2
*Av. side area of permeable stratum over test period	4.92	m2
Total Exposed area =	5.72	m2

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

f= 0.00014 m/min or 2.331E-06 m/sec



Appendix VI Laboratory Data

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No. **R80600** Contract No. 20159 Contract Name: Capdoo , Clane

Customer DBFL Consulting Engineers,Ormond House, Upper Ormond Quay, Dublin 7, Ireland

Samples Received: 04-07-17 Date Tested: 05-07-17

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
BH01	AA56212	7.0	A17/3239	B	2.6		NP	NP					Grey/brown slightly silty, slightly sandy, GRAVEL with many cobbles
BH02	AA56214	1.0	A17/3240	B	12	30	17	13	57	WS	4.4	C L	Dark brown slightly sandy, gravelly, CLAY
BH03	AA56217	1.0	A17/3241	B	12	28	18	10	58	WS	4.4	C L	Brown sandy gravelly CLAY with roothairs
TP09	AA78622	0.5	A17/3245	B	14	24	NP	NP	40	WS	4.4		Dark brown very sandy very gravelly SILT
TP11	AA78660	0.8	A17/3246	B	8.9	20	NP	NP	51	WS	4.4		Dark brown sandy, gravelly, SILT
TP22	AA67763	1.2	A17/3250	B	18	28	18	10	72	WS	4.4	C L	Brown sandy gravelly CLAY

Notes: Preparation: WS - Wet sieved
AR - As received
NP - Non plastic
Liquid Limit Clause: 4.3 Cone Penetrometer definitive method
4.4 Cone Penetrometer one point method

Sample Type: B - Bulk Disturbed
U - Undisturbed

Remarks:

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
Opinions and interpretations are outside the scope of accreditation.
The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory	Persons authorized to approve reports	Approved by	Date	Page
	H Byrne (Laboratory Manager)	H Byrne	24-07-17	1 of 1

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025
INAB
TESTING
DETAILED IN SCOPE REG NO. 133T

particle size	% passing
75	86
63	75
50	65
37.5	53
28	44
20	35
14	29
10	26
6.3	22
5	20
3.35	17
2	13
1.18	10
0.6	8
0.425	7
0.3	6
0.15	5
0.063	4

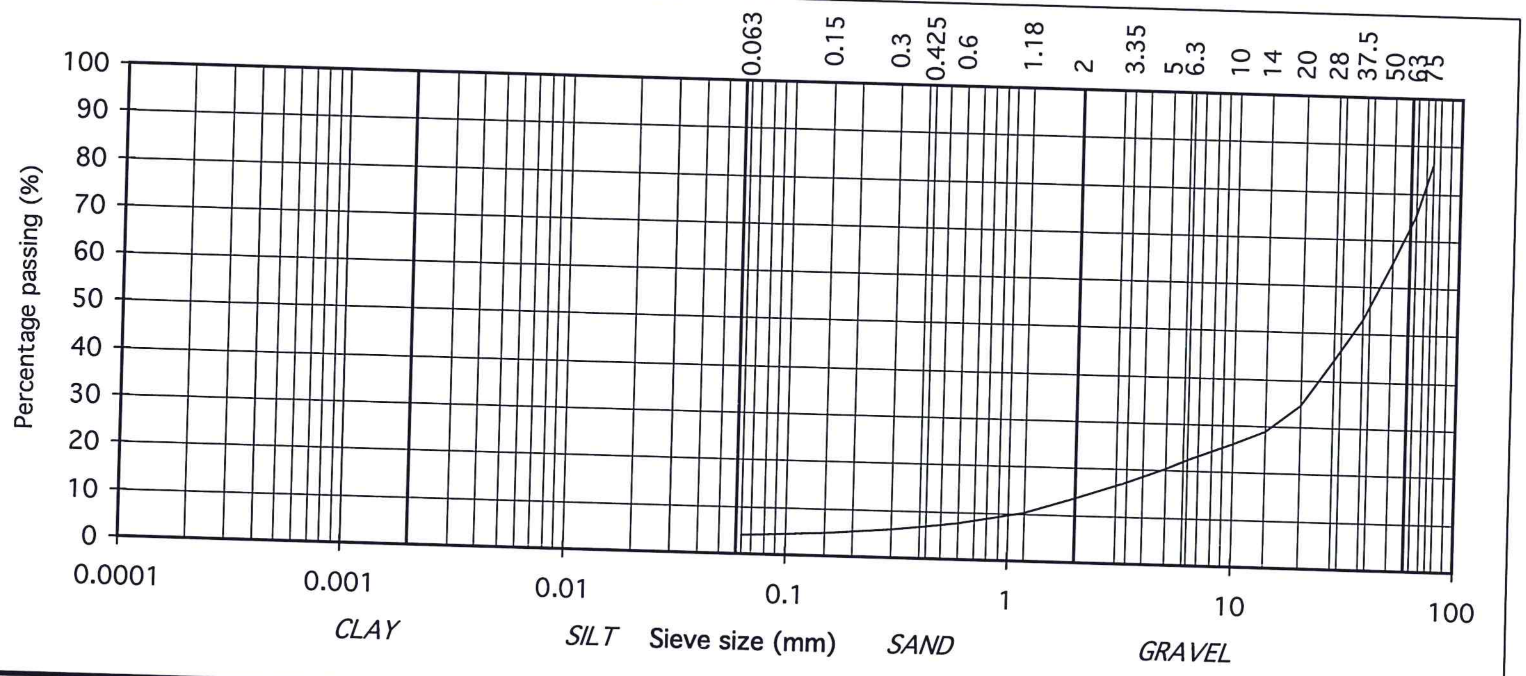
COBBLES
GRAVEL
SAND
SILT/CLAY

Contract No: 20159 Report No. R80628
Contract: Capdoo , Clane
BH/TP : BH01
Sample No. AA56207 Lab. Sample No. A17/3237
Sample Type: B
Depth (m) 2.00 Customer: DBFL Consulting Engineers,Ormond House, Upper Ormond Quay, Dublin 7, Ireland
Date Received 04-07-17 Date Testing started 05-07-17
Description: Grey/brown slightly clayey/silty, sandy, GRAVEL with many cobbles

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016

Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	11-07-17	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

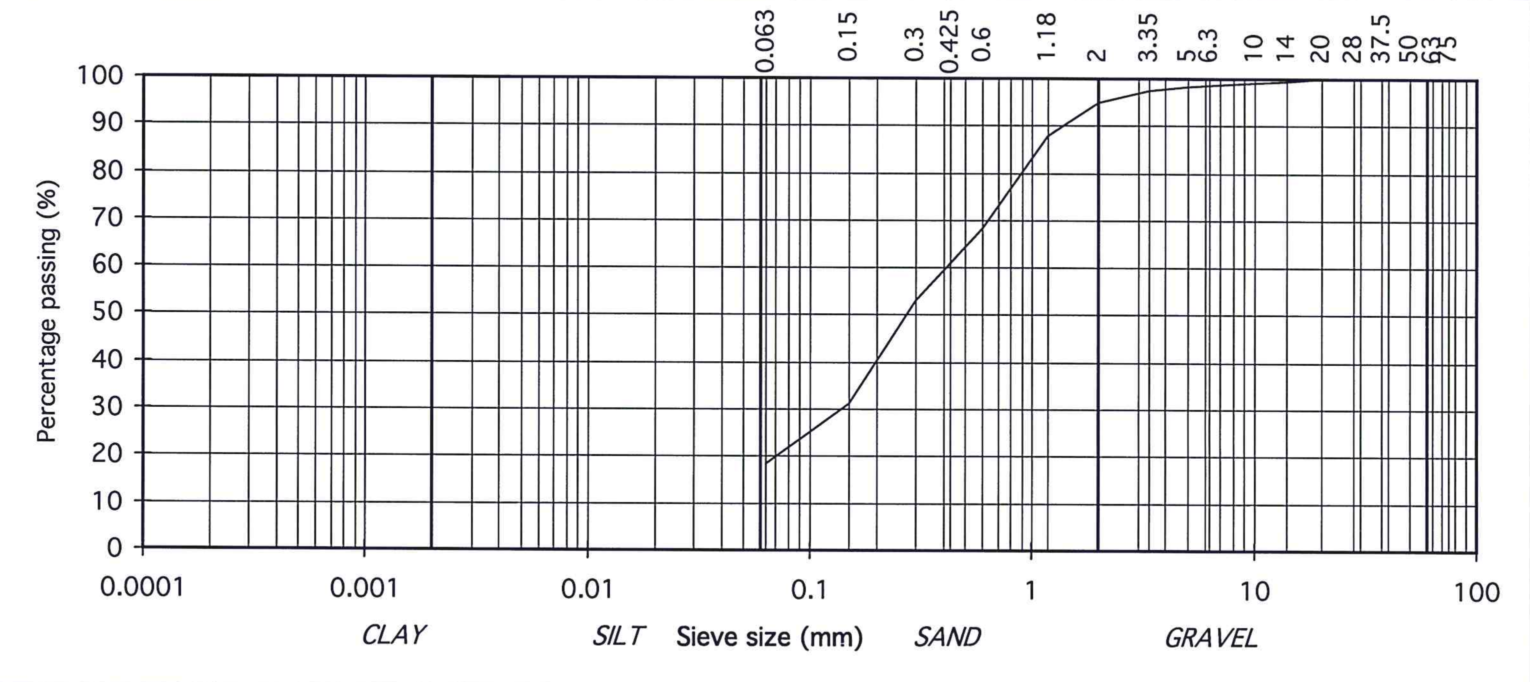
ISO 17025
INAB
TESTING
DETAILED IN SCOPE REG NO. 133T

Contract No:	20159	Report No.	R80664
Contract:	Capdoo , Clane		
BH/TP :	BH01		
Sample No.	AA56210	Lab. Sample No.	A17/3238
Sample Type:	B		
Depth (m)	5.00	Customer:	DBFL Consulting Engineers,Ormond House, Upper Ormond Quay, Dublin 7, Ireland
Date Received	04-07-17	Date Testing started	05-07-17
Description:	Dark brown clayey/silty, gravelly, SAND		

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	99	
10	99	
6.3	99	
5	98	
3.35	97	
2	95	
1.18	88	SAND
0.6	68	
0.425	61	
0.3	53	
0.15	31	
0.063	18	SILT/CLAY



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	24-07-17	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing
75	100
63	58
50	34
37.5	26
28	16
20	11
14	8
10	7
6.3	6
5	6
3.35	6
2	5
1.18	4
0.6	3
0.425	3
0.3	2
0.15	2
0.063	1

COBBLES

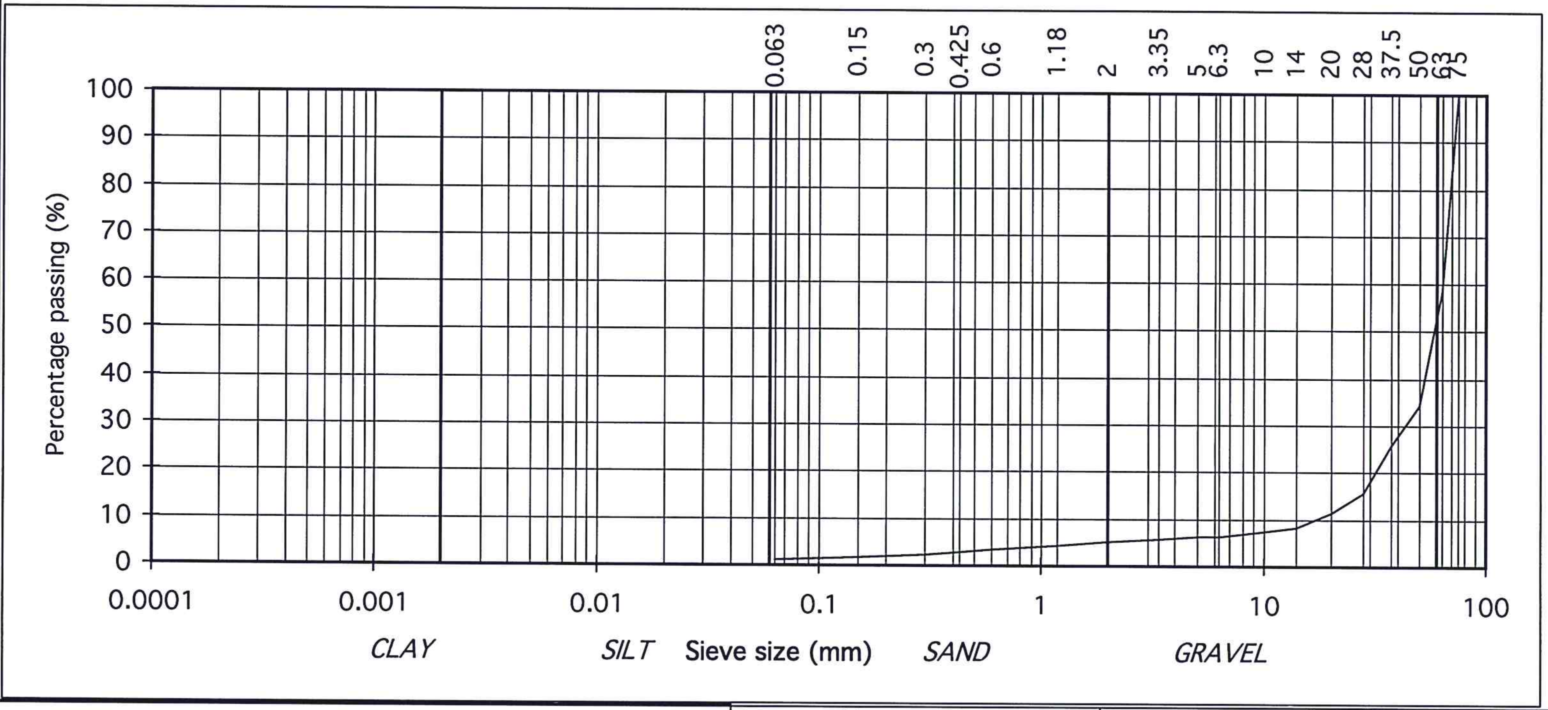
GRAVEL

SAND

SILT/CLAY

Contract No: 20159 Report No. R80838
Contract: Capdoo , Clane
BH/TP : BH01
Sample No. AA56212 Lab. Sample No. A17/3239
Sample Type: B
Depth (m) 7.00 Customer: DBFL Consulting Engineers,Ormond House, Upper Ormond Quay, Dublin 7, Ireland
Date Received 04-07-17 Date Testing started 05-07-17
Description: Grey/brown slightly silty, slightly sandy, GRAVEL with many cobbles

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	24-07-17	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT

Determination of Particle Size Distribution

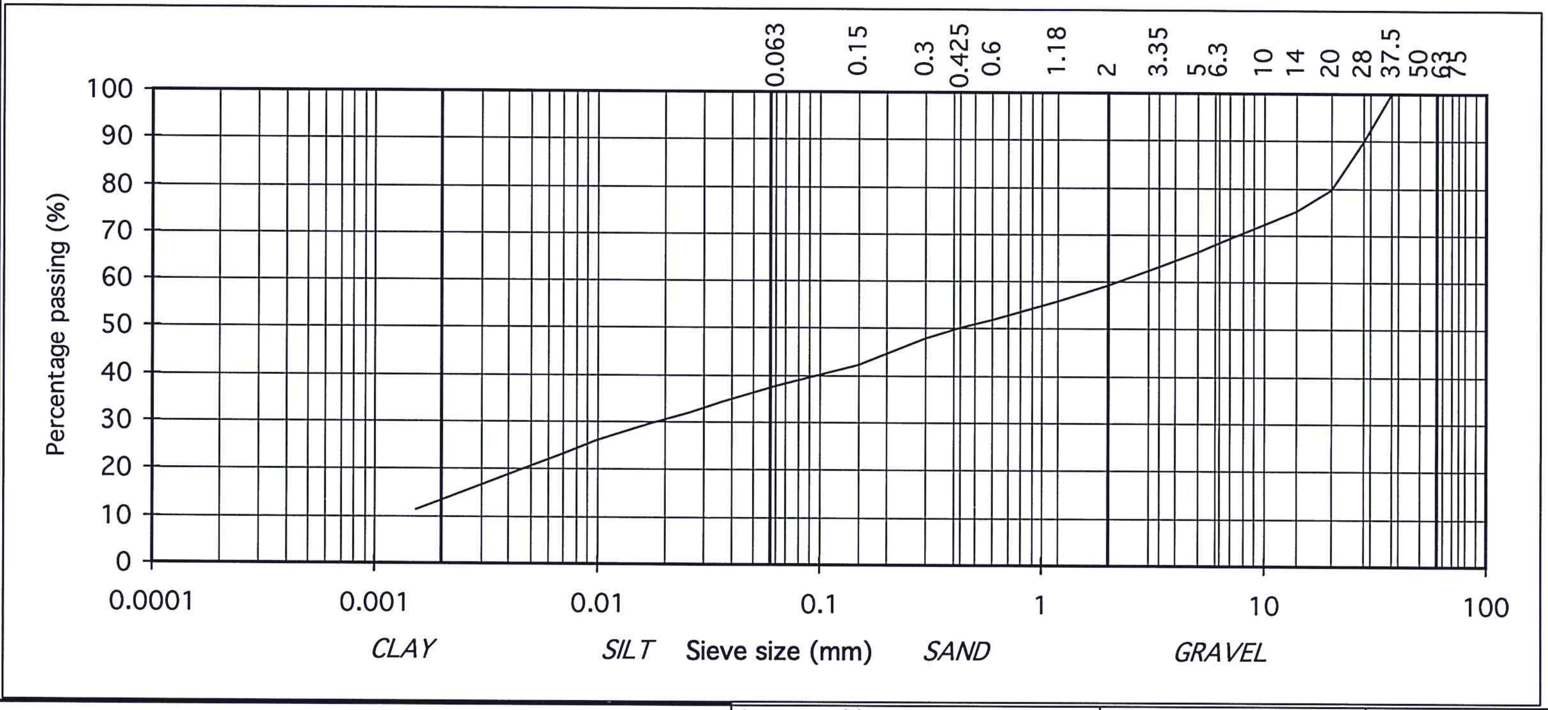
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB TESTING DETAILED IN SCOPE REG NO. 133T

Contract No: 20159 Report No. R80727
Contract: Capdoo , Clane
BH/TP : BH2
Sample No. AA56214 Lab. Sample No. A17/3240
Sample Type: B
Depth (m) 1.00 Customer: DBFL Consulting Engineers,Ormond House, Upper Ormond Quay, Dublin 7, Ireland
Date Received 04-07-17 Date Testing started 07-07-17
Description: Dark brown slightly sandy, gravelly, CLAY

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	90	
20	80	
14	75	
10	72	
6.3	68	
5	66	
3.35	63	
2	59	
1.18	56	SAND
0.6	52	
0.425	50	
0.3	48	
0.15	42	
0.063	38	SILT/CLAY
0.037	34	
0.026	32	
0.017	30	
0.010	26	
0.007	23	
0.005	21	
0.002	11	



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	24-07-17	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT

Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB TESTING DETAILED IN SCOPE REG NO. 133T

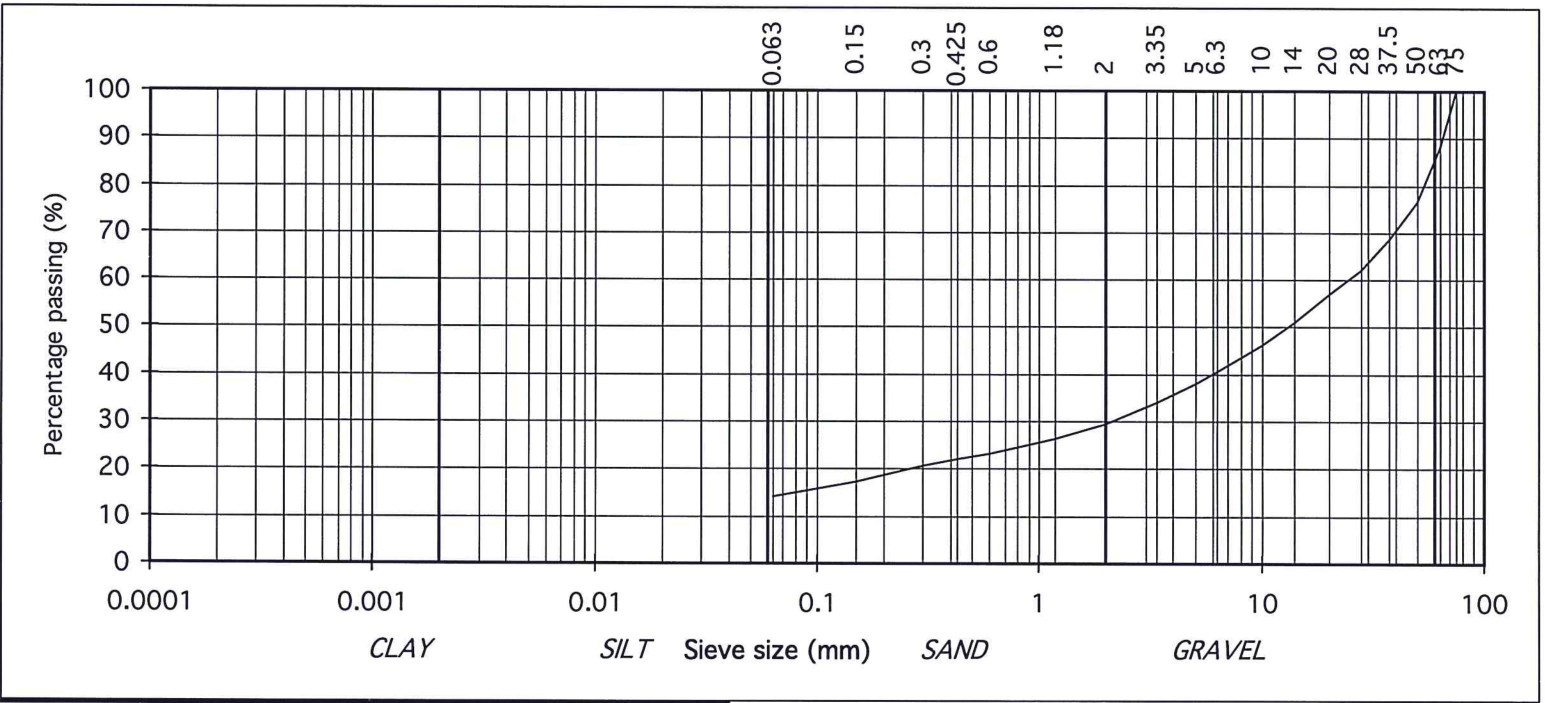
particle size	% passing	
75	100	COBBLES
63	88	
50	77	GRAVEL
37.5	69	
28	62	
20	57	
14	51	
10	46	
6.3	40	
5	38	
3.35	34	
2	29	SAND
1.18	26	
0.6	23	
0.425	22	
0.3	21	
0.15	17	
0.063	14	SILT/CLAY

Contract No:	20159	Report No.	R80630
Contract:	Capdoo , Clane		
BH/TP :	TP07		
Sample No.	AA78667	Lab. Sample No.	A17/3244
Sample Type:	B		
Depth (m)	0.50	Customer:	DBFL Consulting Engineers,Ormond House, Upper Ormond Quay, Dublin 7, Ireland
Date Received	04-07-17	Date Testing started	05-07-17
Description:	Brown clayey/silty, sandy, GRAVEL with some cobbles		

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016

Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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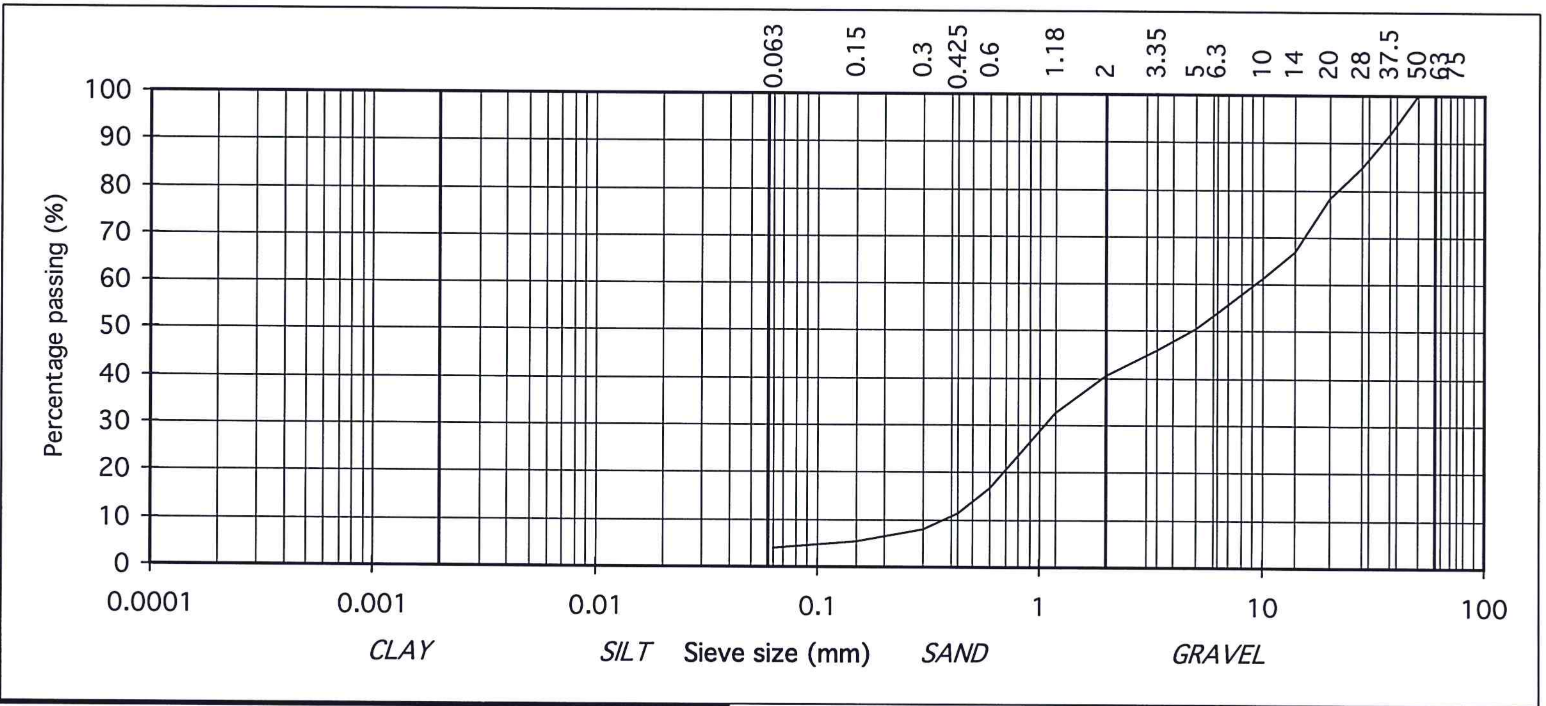
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	92	
28	85	
20	78	
14	67	
10	61	
6.3	54	
5	51	
3.35	46	
2	41	
1.18	33	SAND
0.6	17	
0.425	11	
0.3	8	
0.15	5	
0.063	4	SILT/CLAY

Contract No:	20159	Report No.	R80839
Contract:	Capdoo , Clane		
BH/TP :	TP05		
Sample No.	AA67770	Lab. Sample No.	A17/3243
Sample Type:	B		
Depth (m)	1.60	Customer:	DBFL Consulting Engineers,Ormond House, Upper Ormond Quay, Dublin 7, Ireland
Date Received	04-07-17	Date Testing started	07-07-17
Description:	Dark brown slightly clayey/silty, very sandy, GRAVEL		
Remarks	Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016		



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	19-07-17	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT

Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

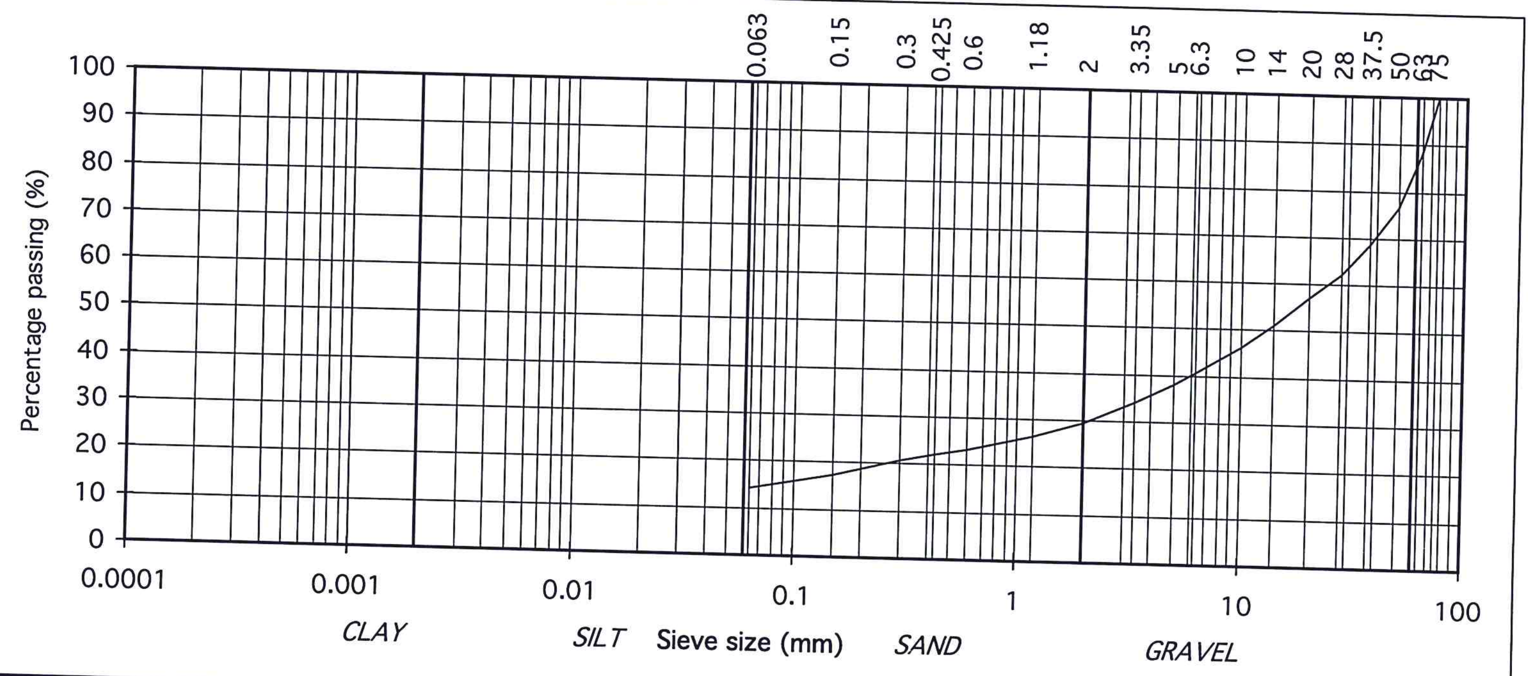
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	88	
50	77	GRAVEL
37.5	69	
28	62	
20	57	
14	51	
10	46	
6.3	40	
5	38	
3.35	34	
2	29	SAND
1.18	26	
0.6	23	
0.425	22	
0.3	21	
0.15	17	
0.063	14	SILT/CLAY

Contract No:	20159	Report No.	R80630
Contract:	Capdoo , Clane		
BH/TP :	TP07		
Sample No.	AA78667	Lab. Sample No.	A17/3244
Sample Type:	B		
Depth (m)	0.50	Customer:	DBFL Consulting Engineers,Ormond House, Upper Ormond Quay, Dublin 7, Ireland
Date Received	04-07-17	Date Testing started	05-07-17
Description:	Brown clayey/silty, sandy, GRAVEL with some cobbles		

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT

Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB TESTING DETAILED IN SCOPE REG NO. 133T

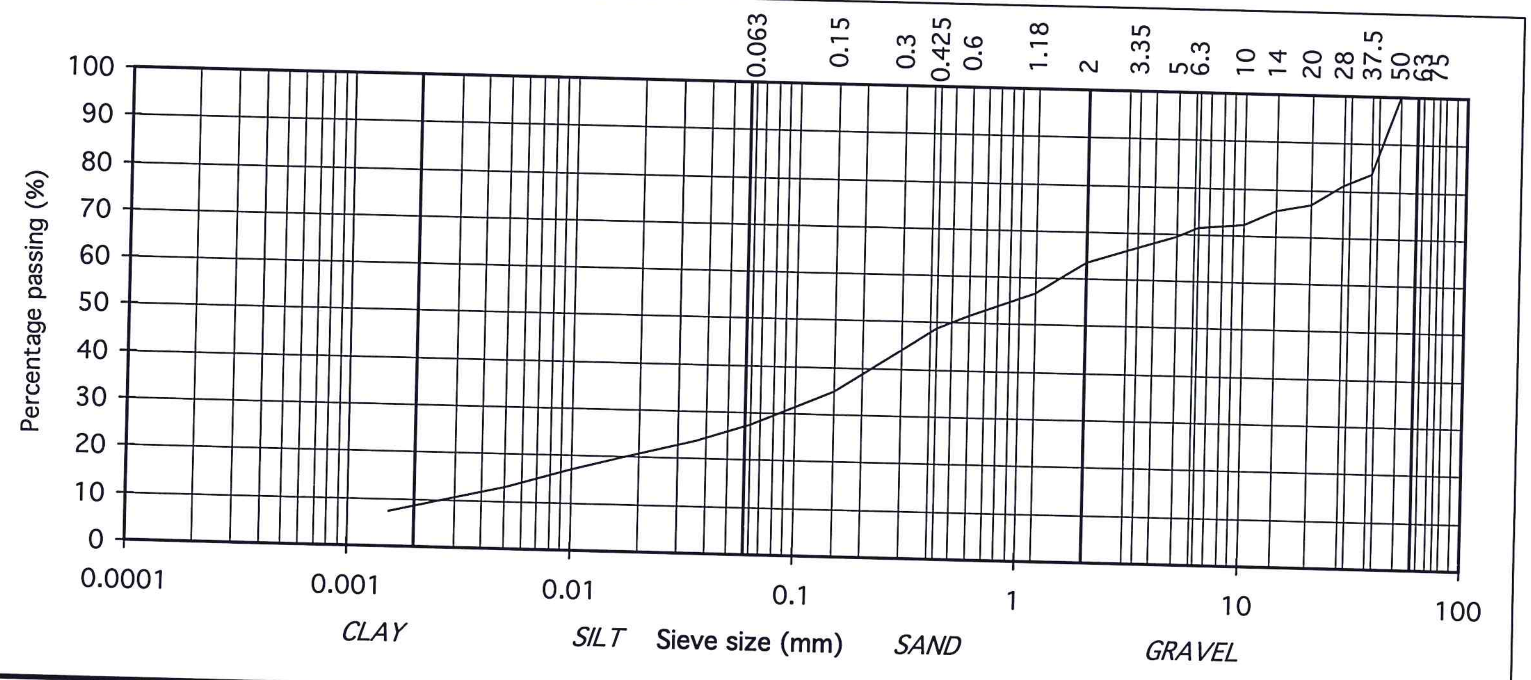
particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	84	
28	81	
20	77	
14	75	
10	72	
6.3	71	
5	70	
3.35	67	
2	63	SAND
1.18	57	
0.6	52	
0.425	49	
0.3	44	
0.15	35	
0.063	27	SILT/CLAY
0.037	24	
0.026	22	
0.017	20	
0.010	17	
0.007	15	
0.005	13	
0.002	7	

Contract No:	20159	Report No.	R80631
Contract:	Capdoo , Clane		
BH/TP :	TP11		
Sample No.	AA78666	Lab. Sample No.	A17/3246
Sample Type:	B		
Depth (m)	0.80	Customer:	DBFL Consulting Engineers,Ormond House, Upper Ormond Quay, Dublin 7, Ireland
Date Received	04-07-17	Date Testing started	05-07-17
Description:	Dark brown sandy, gravelly, SILT/CLAY		

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016

Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	24-07-17	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

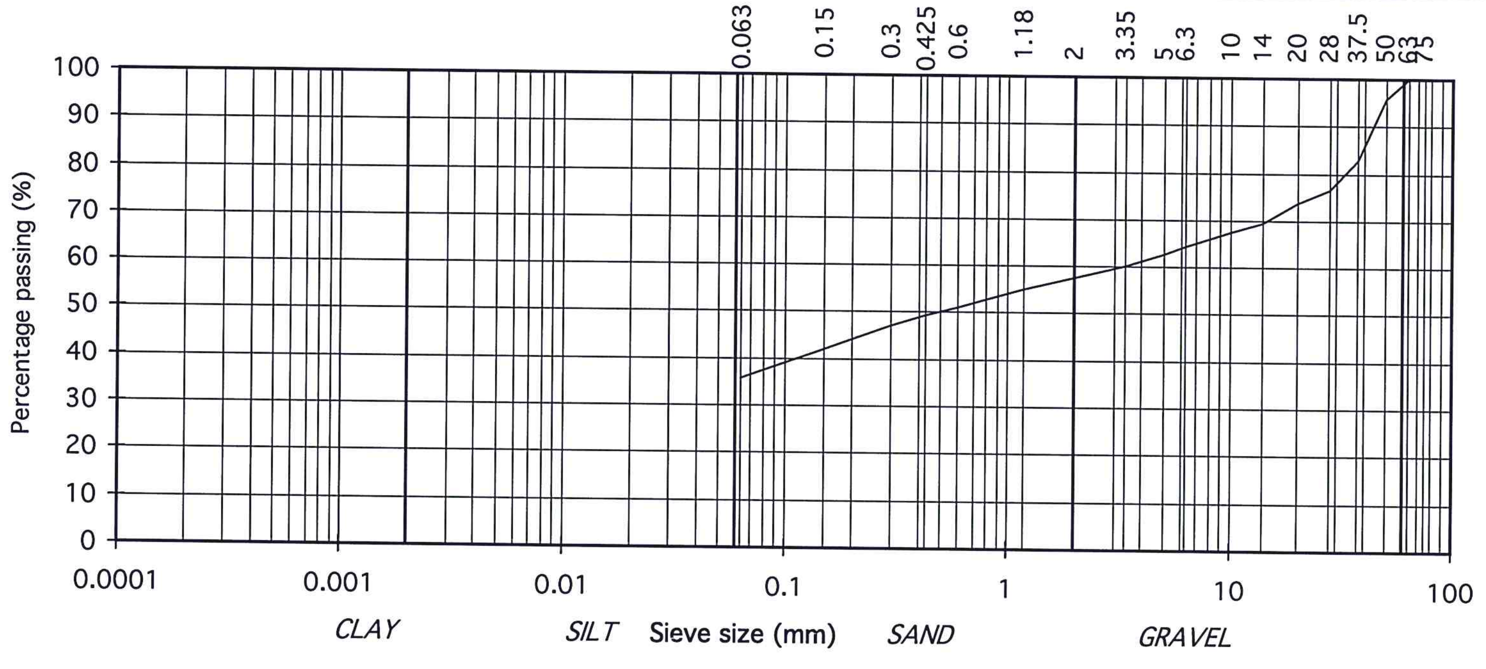
TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	96	GRAVEL
37.5	83	
28	77	
20	74	
14	69	
10	67	
6.3	64	
5	63	
3.35	60	
2	58	
1.18	55	SAND
0.6	51	
0.425	49	
0.3	47	
0.15	42	
0.063	36	SILT/CLAY

Contract No:	20159	Report No.	R80665
Contract:	Capdoo , Clane		
BH/TP :	TP14		
Sample No.	AA78687	Lab. Sample No.	A17/3247
Sample Type:	B		
Depth (m)	1.20	Customer:	DBFL Consulting Engineers,Ormond House, Upper Ormond Quay, Dublin 7, Ireland
Date Received	04-07-17	Date Testing started	05-07-17
Description:	Brown slightly sandy, gravelly, SILT/CLAY		

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	24-07-17	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT

Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

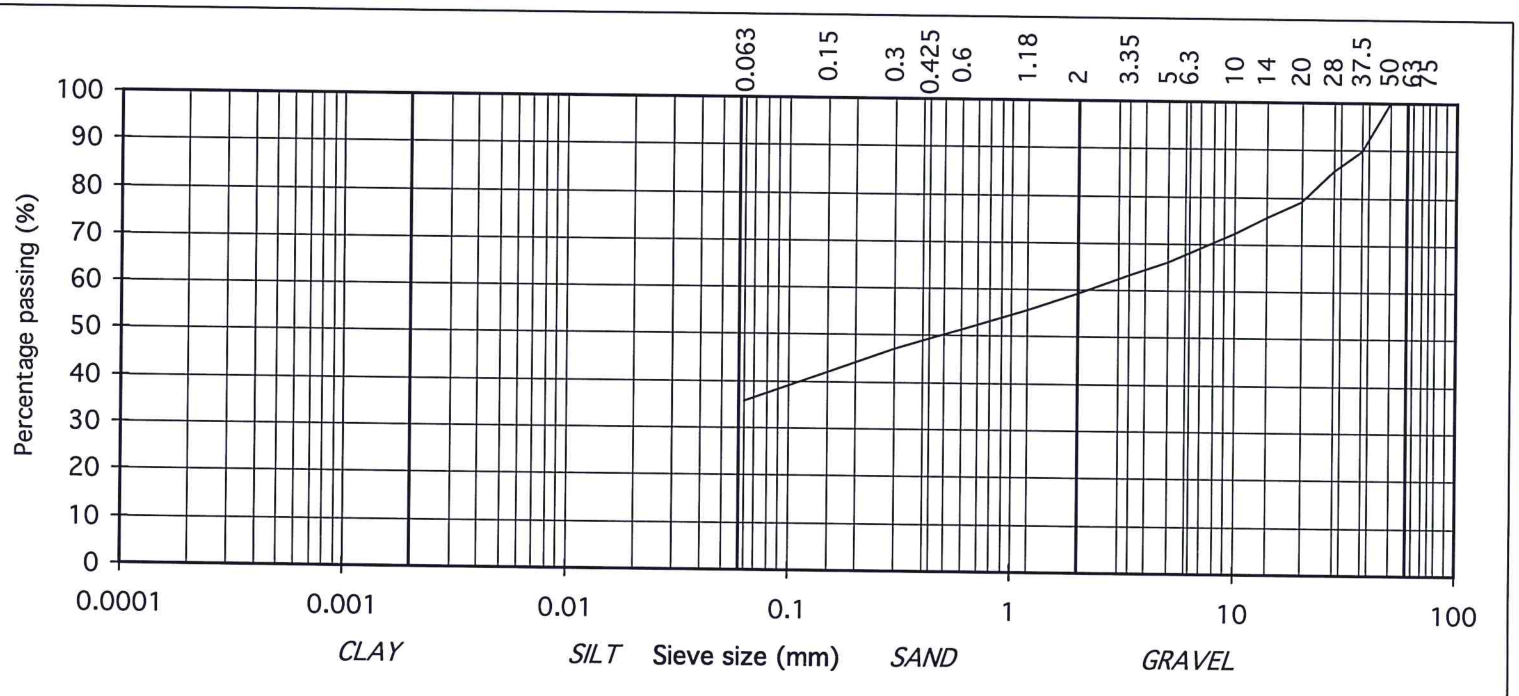
DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	90	
28	85	
20	79	
14	76	
10	72	
6.3	68	
5	66	
3.35	63	
2	59	
1.18	56	SAND
0.6	51	
0.425	49	
0.3	47	
0.15	42	
0.063	36	SILT/CLAY

Contract No:	20159	Report No.	R80666
Contract:	Capdoo , Clane		
BH/TP :	TP18		
Sample No.	AA78671	Lab. Sample No.	A17/3248
Sample Type:	B		
Depth (m)	1.10	Customer:	DBFL Consulting Engineers,Ormond House, Upper Ormond Quay, Dublin 7, Ireland
Date Received	04-07-17	Date Testing started	05-07-17
Description:	Mottled brown slightly sandy, gravelly, SILT/CLAY		

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT

Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

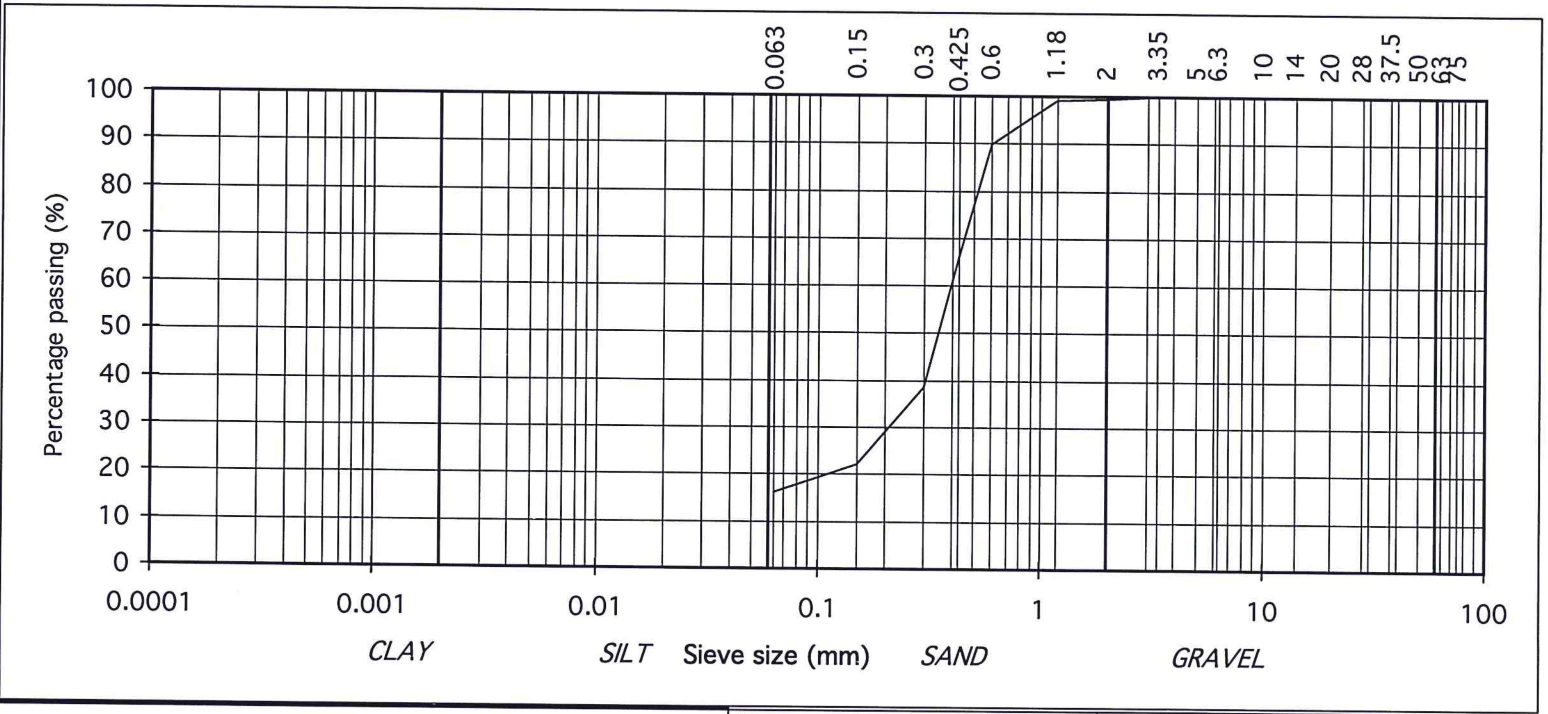
ISO 17025 INAB TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	100	
5	100	
3.35	100	
2	100	
1.18	99	SAND
0.6	90	
0.425	66	
0.3	39	
0.15	22	
0.063	16	SILT/CLAY

Contract No:	20159	Report No.	R80667
Contract:	Capdoo , Clane		
BH/TP :	TP19		
Sample No.	AA78765	Lab. Sample No.	A17/3249
Sample Type:	B		
Depth (m)	0.80	Customer:	DBFL Consulting Engineers,Ormond House, Upper Ormond Quay, Dublin 7, Ireland
Date Received	04-07-17	Date Testing started	05-07-17
Description:	Dark brown clayey/silty, SAND		

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	24-07-17	1 of 1

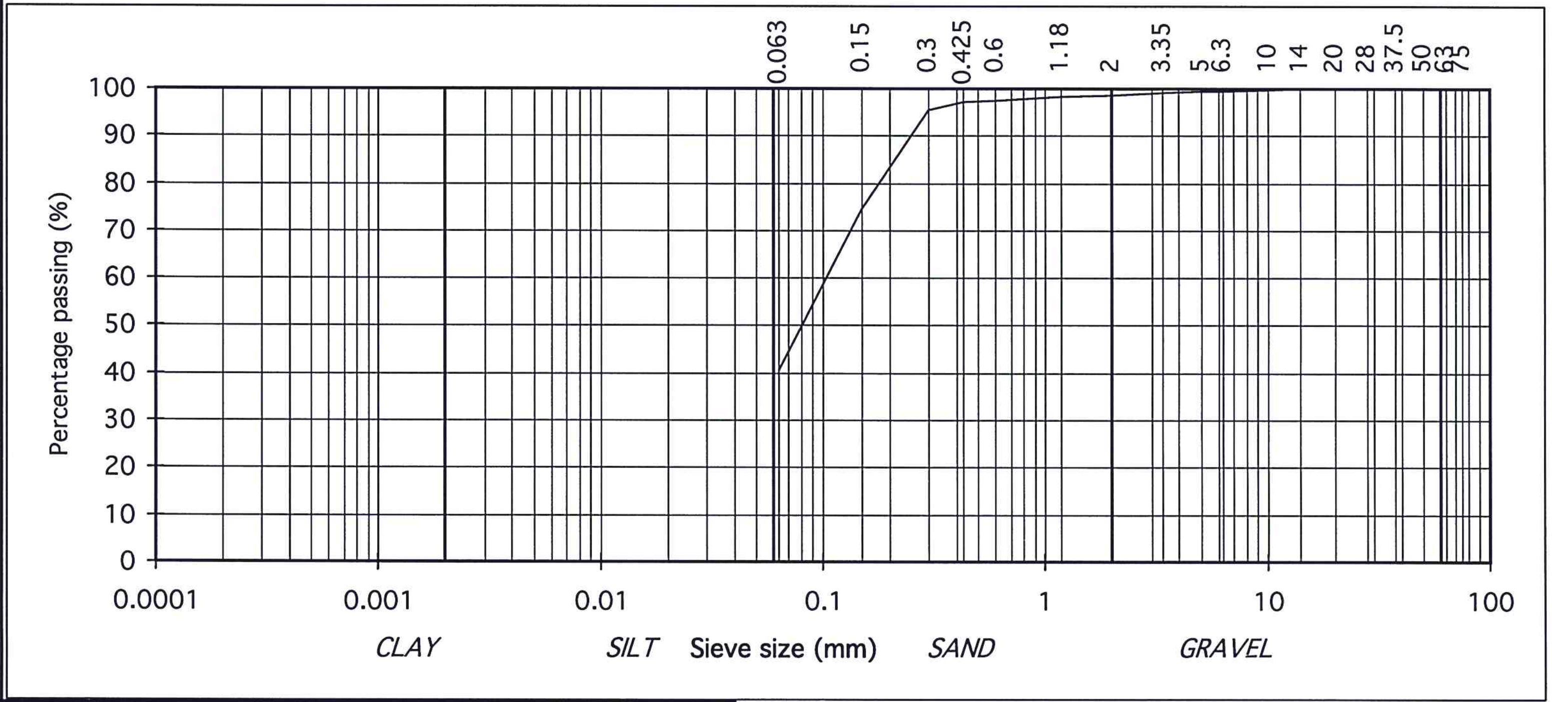
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

Contract No: 20159 Report No. R80632
Contract: Capdoo , Clane
BH/TP : TP23
Sample No. AA67755 Lab. Sample No. A17/3251
Sample Type: B
Depth (m) 0.50 Customer: DBFL Consulting Engineers,Ormond House, Upper Ormond Quay, Dublin 7, Ireland
Date Received 04-07-17 Date Testing started 05-07-17
Description: Brown sandy, slightly gravelly, SILT/CLAY

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	99	
5	99	
3.35	99	
2	99	
1.18	98	SAND
0.6	97	
0.425	97	
0.3	95	
0.15	74	
0.063	41	SILT/CLAY



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	24-07-17	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

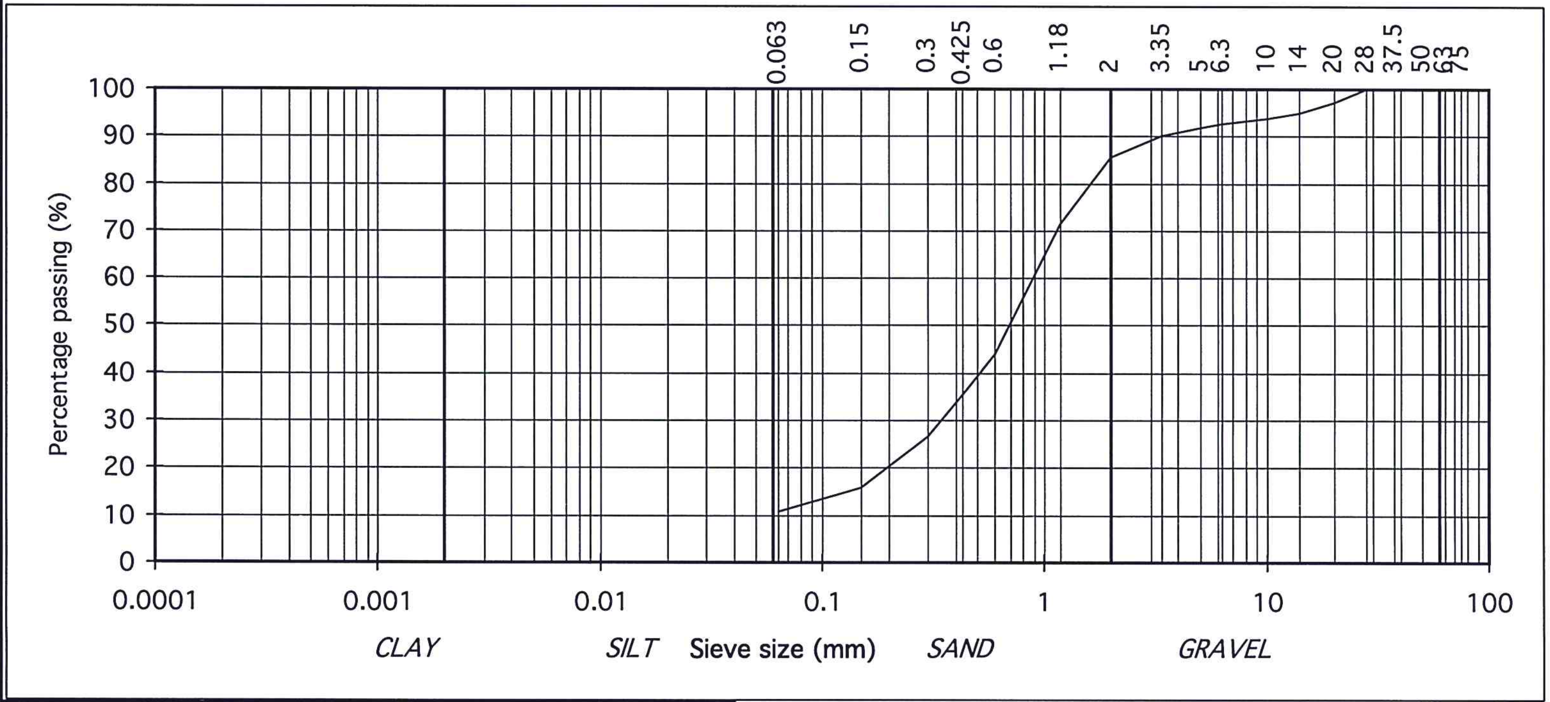
TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	97	
14	95	
10	94	
6.3	93	
5	92	
3.35	90	
2	86	
1.18	71	SAND
0.6	44	
0.425	35	
0.3	27	
0.15	16	
0.063	11	SILT/CLAY

Contract No: 20159 Report No. R80633
Contract: Capdoo , Clane
BH/TP : TP25
Sample No. AA67751 Lab. Sample No. A17/3252
Sample Type: B
Depth (m) 1.80 Customer: DBFL Consulting Engineers,Ormond House, Upper Ormond Quay, Dublin 7, Ireland
Date Received 04-07-17 Date Testing started 05-07-17
Description: Dark brown clayey/silty, gravelly, SAND

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	24-07-17	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING 2183

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Final Report

Report No.: 17-17340-1

Initial Date of Issue: 13-Jul-2017

Client IGSL

Client Address:
M7 Business Park
Naas
County Kildare
Ireland

Contact(s): Darren Keogh

Project 20159 - Capdoo Clane (DBFL)

Quotation No.: Q17-08989

Date Received: 05-Jul-2017

Order No.:

Date Instructed: 06-Jul-2017

No. of Samples: 5

Turnaround (Wkdays): 5

Results Due: 12-Jul-2017

Date Approved: 13-Jul-2017

Approved By:

Details: Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

Project: 20159 - Capdoo Clane (DBFL)

Results - Leachate

Client: IGSL	**Chemtest Job No.:**				17-17340	17-17340
Quotation No.: Q17-08989	**Chemtest Sample ID.:**				480025	480363
Order No.:	Client Sample Ref.:				78693	78679
	Client Sample ID.:				TP4	TP15
	Sample Type:				SOIL	SOIL
	Top Depth (m):				0.50	0.60
	Bottom Depth (m):				0.50	0.60
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Ammonium	U	1220	mg/l	0.010	0.17	0.18
Ammonium	N	1220	mg/kg	0.10	1.7	1.8
Boron (Dissolved)	U	1450	µg/l	20	< 20	< 20
Boron (Dissolved)	N	1450	mg/kg	0.20	< 0.20	< 0.20

Results - Soil

Project: 20159 - Capdoo Clane (DBFL)

Client: IGSL	**Chemtest Job No.:**				17-17340	17-17340	17-17340	17-17340	17-17340
Quotation No.: Q17-08989	**Chemtest Sample ID.:**				480022	480023	480024	480025	480363
Order No.:	Client Sample Ref.:				56214	78662	67763	78693	78679
	Client Sample ID.:				BH2	TP9	TP22	TP4	TP15
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				1.00	0.50	1.20	0.50	0.60
	Bottom Depth (m):				1.00	0.50	1.20	0.50	0.60
	Asbestos Lab:							COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
ACM Type	U	2192		N/A				-	-
Asbestos Identification	U	2192	%	0.001				No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	7.8	11	19	18	14
pH	M	2010		N/A	[A] 8.1	[A] 8.5	[A] 8.5		
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40				< 0.40	0.90
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	0.017	< 0.010		
Sulphur (Elemental)	M	2180	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Cyanide (Total)	M	2300	mg/kg	0.50				[A] < 0.50	[A] < 0.50
Sulphide (Easily Liberatable)	U	2325	mg/kg	0.50				[A] 3.8	[A] 3.9
Sulphate (Acid Soluble)	M	2430	%	0.010				[A] 0.036	[A] 0.026
Arsenic	M	2450	mg/kg	1.0				22	11
Barium	M	2450	mg/kg	10				79	63
Cadmium	M	2450	mg/kg	0.10				3.9	1.7
Chromium	M	2450	mg/kg	1.0				32	19
Copper	M	2450	mg/kg	0.50				69	22
Mercury	M	2450	mg/kg	0.10				0.28	0.16
Molybdenum	M	2450	mg/kg	2.0				3.8	3.3
Nickel	M	2450	mg/kg	0.50				91	32
Lead	M	2450	mg/kg	0.50				51	27
Antimony	N	2450	mg/kg	2.0				3.3	< 2.0
Selenium	M	2450	mg/kg	0.20				1.5	0.91
Zinc	M	2450	mg/kg	0.50				300	110
Chromium (Trivalent)	N	2490	mg/kg	5.0				32	19
Chromium (Hexavalent)	N	2490	mg/kg	0.50				< 0.50	< 0.50
Total Organic Carbon	M	2625	%	0.20				[A] 0.50	[A] 0.49
Mineral Oil	N	2670	mg/kg	10				< 10	< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0				[A] < 5.0	[A] < 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0

Results - Soil

Project: 20159 - Capdoo Clane (DBFL)

Client: IGSL	Chemtest Job No.:				17-17340	17-17340	17-17340	17-17340	17-17340
Quotation No.: Q17-08989	Chemtest Sample ID.:				480022	480023	480024	480025	480363
Order No.:	Client Sample Ref.:				56214	78662	67763	78693	78679
	Client Sample ID.:				BH2	TP9	TP22	TP4	TP15
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				1.00	0.50	1.20	0.50	0.60
	Bottom Depth (m):				1.00	0.50	1.20	0.50	0.60
	Asbestos Lab:							COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0				[A] < 1.0	[A] < 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0				[A] < 5.0	[A] < 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0				[A] < 10	[A] < 10
Benzene	M	2760	µg/kg	1.0				[A] < 1.0	[A] < 1.0
Toluene	M	2760	µg/kg	1.0				[A] < 1.0	[A] < 1.0
Ethylbenzene	M	2760	µg/kg	1.0				[A] < 1.0	[A] < 1.0
m & p-Xylene	M	2760	µg/kg	1.0				[A] < 1.0	[A] < 1.0
o-Xylene	M	2760	µg/kg	1.0				[A] < 1.0	[A] < 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0				[A] < 1.0	[A] < 1.0
Naphthalene	M	2800	mg/kg	0.10				< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10				< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10				< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10				< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10				< 0.10	< 0.10
Anthracene	M	2800	mg/kg	0.10				< 0.10	< 0.10
Fluoranthene	M	2800	mg/kg	0.10				< 0.10	< 0.10
Pyrene	M	2800	mg/kg	0.10				< 0.10	< 0.10
Benzo[a]anthracene	M	2800	mg/kg	0.10				< 0.10	< 0.10
Chrysene	M	2800	mg/kg	0.10				< 0.10	< 0.10
Benzo[b]fluoranthene	M	2800	mg/kg	0.10				< 0.10	< 0.10
Benzo[k]fluoranthene	M	2800	mg/kg	0.10				< 0.10	< 0.10
Benzo[a]pyrene	M	2800	mg/kg	0.10				< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10				< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10				< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10				< 0.10	< 0.10
Coronene	N	2800	mg/kg	0.10				< 0.10	< 0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0				< 2.0	< 2.0
PCB 28	M	2815	mg/kg	0.010				[A] < 0.010	[A] < 0.010
PCB 52	M	2815	mg/kg	0.010				[A] < 0.010	[A] < 0.010
PCB 90+101	M	2815	mg/kg	0.010				[A] < 0.010	[A] < 0.010
PCB 118	M	2815	mg/kg	0.010				[A] < 0.010	[A] < 0.010
PCB 153	M	2815	mg/kg	0.010				[A] < 0.010	[A] < 0.010
PCB 138	M	2815	mg/kg	0.010				[A] < 0.010	[A] < 0.010

Results - Soil

Project: 20159 - Capdoo Clane (DBFL)

Client: IGSL				**Chemtest Job No.:**	17-17340	17-17340	17-17340	17-17340	17-17340
Quotation No.: Q17-08989				**Chemtest Sample ID.:**	480022	480023	480024	480025	480363
Order No.:				Client Sample Ref.:	56214	78662	67763	78693	78679
				Client Sample ID.:	BH2	TP9	TP22	TP4	TP15
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	1.00	0.50	1.20	0.50	0.60
				Bottom Depth (m):	1.00	0.50	1.20	0.50	0.60
				Asbestos Lab:				COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
PCB 180	M	2815	mg/kg	0.010				[A] < 0.010	[A] < 0.010
Total PCBs (7 Congeners)	N	2815	mg/kg	0.10				[A] < 0.10	[A] < 0.10
Total Phenols	M	2920	mg/kg	0.30				< 0.30	< 0.30

Results - Single Stage WAC

Project: 20159 - Capdoo Clane (DBFL)

Chemtest Job No:	17-17340				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	480025						
Sample Ref:	78693				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID:	TP4						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	M	%	[A] 0.50	3	5	6
Loss On Ignition	2610	M	%	2.3	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.031	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0038	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0023	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0031	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.0022	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.38	3.8	10	150	500
Sulphate	1220	U	15	150	1000	20000	50000
Total Dissolved Solids	1020	N	66	660	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	9.2	92	500	800	1000

Soild Information	
Dry mass of test portion/kg	0.090
Moisture (%)	18

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 20159 - Capdoo Clane (DBFL)

Chemtest Job No:	17-17340				**Landfill Waste Acceptance Criteria Limits**		
Chemtest Sample ID:	480363				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample Ref:	78679						
Sample ID:	TP15						
Top Depth(m):	0.60						
Bottom Depth(m):	0.60						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	M	%	[A] 0.49	3	5	6
Loss On Ignition	2610	M	%	1.5	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.049	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0031	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	0.0011	< 0.050	0.5	10	70
Copper	1450	U	0.0012	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0068	0.068	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.0020	< 0.50	4	50	200
Chloride	1220	U	1.7	17	800	15000	25000
Fluoride	1220	U	0.20	2.0	10	150	500
Sulphate	1220	U	6.4	64	1000	20000	50000
Total Dissolved Solids	1020	N	71	710	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	9.2	92	500	800	1000

Soild Information	
Dry mass of test portion/kg	0.090
Moisture (%)	14

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample ID:	Sample Ref:	Sample ID:	Sampled Date:	Deviation Code(s):	Containers Received:
480022	56214	BH2		A	Amber Glass 250ml
480023	78662	TP9		A	Amber Glass 250ml
480024	67763	TP22		A	Amber Glass 250ml
480025	78693	TP4		A	Amber Glass 250ml
480025	78693	TP4		A	Amber Glass 60ml
480025	78693	TP4		A	Plastic Tub 500g
480363	78679	TP15		A	Amber Glass 250ml
480363	78679	TP15		A	Amber Glass 60ml
480363	78679	TP15		A	Plastic Tub 500g

Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2180	Sulphur (Elemental) in Soils by HPLC	Sulphur	Dichloromethane extraction / HPLC with UV detection
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection

Test Methods

SOP	Title	Parameters included	Method summary
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

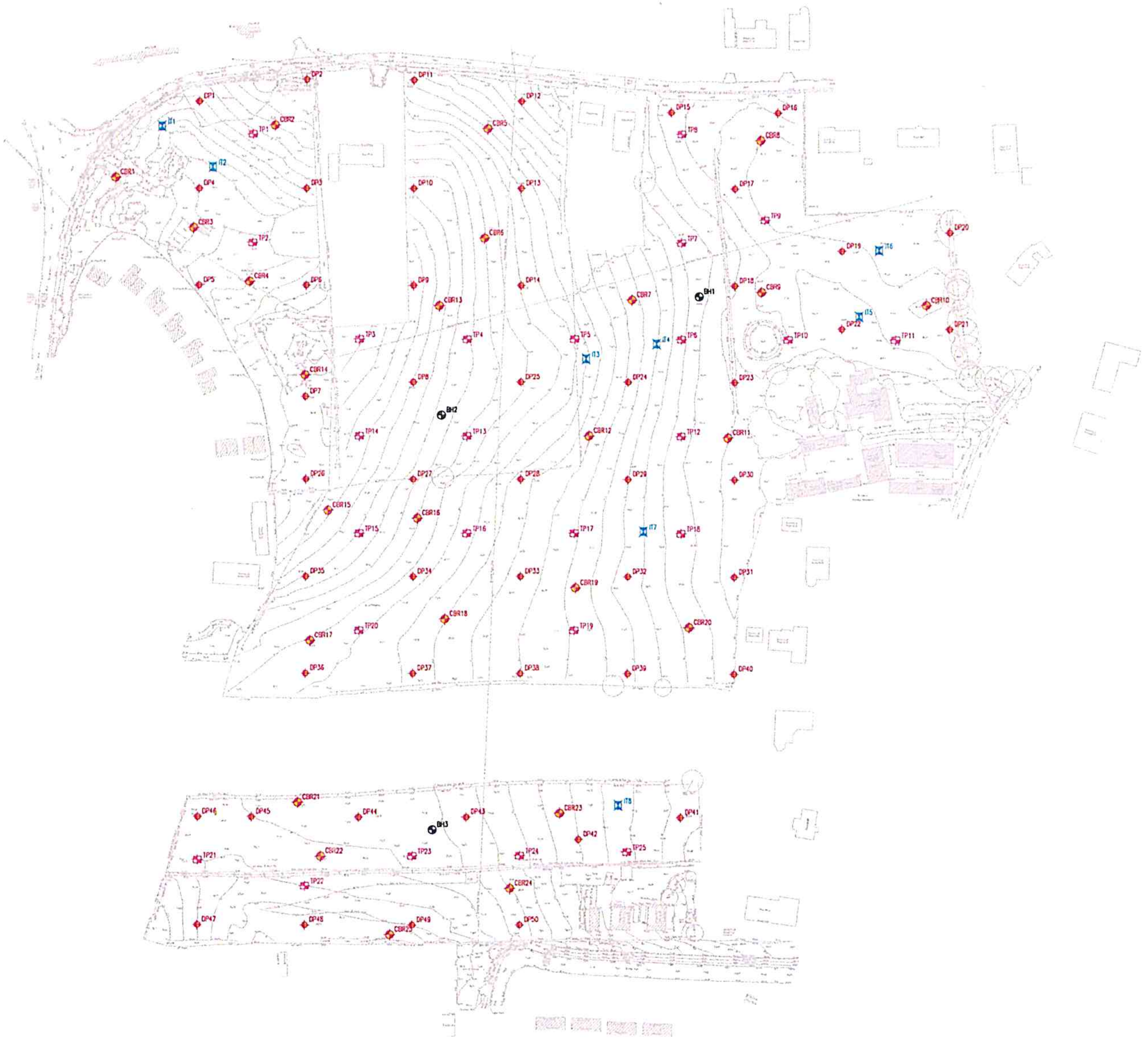
A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Appendix VII Site Plan



ON ORIGINAL

NOTES

1. ALL DRAWINGS TO BE CHECKED BY CONTRACTOR ON SITE AND ENGINEER INFORMED OF DISCREPANCIES BEFORE WORK COMMENCES.
2. ALL DIMENSIONS AND LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL LEVELS ARE IN METERS AND ARE RELATED TO ORDNANCE DATUM. CO-ORDINATES RELATE TO ITM.
4. CONTRACTOR TO UNDERTAKE INVESTIGATION IN THE VICINITY OF PROPOSED TEST LOCATIONS TO MINIMISE THE POTENTIAL FOR ENCOUNTERING EXISTING SERVICES DURING EXCAVATION (INCLUDING BUT NOT LIMITED TO USE OF CAT TYPE CABLE DETECTION DEVICE) AND OBTAIN AND REVIEW RELEVANT UTILITY OPERATOR RECORD DRAWINGS.
5. CBRs TO BE PLATE BEARING TESTS UNDERTAKEN AT SUBSOIL LEVEL. (I.E. TOPSOIL REMOVED FROM SURFACE.)
6. TRIAL PITS UP TO 3m DEPTH.
7. CONTRACTOR TO BACKFILL ALL EXCAVATIONS ON COMPLETION OF INVESTIGATIONS.
8. THIS DRAWING IS BASED ON TOPO SURVEY BY LAND SURVEYS DATED 04/04/2017

SITE INVESTIGATION LEGEND

CBR	CBR, PLATE BEARING TEST (25 No.)
DP	DYNAMIC PROBE LOCATION TARGET DEPTH 4.0m TO 5.0m BELOW GROUND LEVEL (50 No.)
TP	TRIAL PIT (25 No.) TARGET DEPTH 3.0m BELOW GROUND LEVEL
IT	INFILTRATION TRENCH (8 No.)
BH1	BOREHOLE TARGET DEPTH 6.0m BELOW GROUND LEVEL (3 No.)

ORDNANCE SURVEY IRELAND LICENCE
No EN 0017917
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GOVERNMENT OF IRELAND

DBFL CONSULTING ENGINEERS LTD
FOR INFORMATION
ORMOND HOUSE UPPER ORMOND QUAY DUBLIN 7

REV	DATE	DESCRIPTION	BY	CHKD

PLANNING

DESIGNED	BH	PREPARED	OMC
DATE	MAY 2017	CHECKED	BH

DBFL

DBFL Consulting Engineers

PROJECT
LANDS AT CAPDOO, CLANE, CO. KILDARE

DRG TITLE
SITE INVESTIGATION PLAN

CLIENT
ARDSTONE RESIDENTIAL FUND

SCALE	1:750 @A0	FILE REF	162074-1000
DRG NO	162074-1000		

IGSL LTD.
Unit F, M7 Business Park
Naas, Co. Kildare
Phone: 045 846176 Fax: 846187
info@igsl.ie

Report No. 20159 | July 2017

APPENDIX G – SURFACE WATER NETWORK DESIGN CALCULATION

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          Foul Sewage (l/s/ha) 0.000           Maximum Backdrop Height (m) 1.500
                          M5-60 (mm)  16.100      Volumetric Runoff Coeff. 0.750 Min Design Depth for Optimisation (m) 1.200
                             Ratio R   0.250                      PIMP (%)   100     Min Vel for Auto Design only (m/s)  1.00
            Maximum Rainfall (mm/hr)      50 Add Flow / Climate Change (%)    20       Min Slope for Optimisation (1:X)   500
  Maximum Time of Concentration (mins)    30   Minimum Backdrop Height (m) 0.200

                                 Designed with Level Soffits
```

Time Area Diagram for Storm

Time (mins)	**Area (ha)**	**Time (mins)**	**Area (ha)**	**Time (mins)**	**Area (ha)**	**Time (mins)**	**Area (ha)**
0-4	0.000	4-8	0.444	8-12	1.918	12-16	0.443

Total Area Contributing (ha) = 2.805

Total Pipe Volume (m³) = 221.037

Network Design Table for Storm

« - Indicates pipe capacity < flow

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	21.509	0.358	60.1	0.031	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.001	8.998	0.150	60.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.002	27.947	0.164	170.4	0.087	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.003	33.228	0.155	214.4	0.085	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.004	21.751	0.087	250.0	0.148	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.005	37.793	0.152	248.6	0.088	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S1.006	27.253	0.169	161.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S1.007	9.743	0.061	159.0	0.000	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)
S1.000	50.00	4.21	74.100	0.031	0.0	0.0	0.8	1.69	67.2	5.0
S1.001	50.00	4.30	73.744	0.031	0.0	0.0	0.8	1.69	67.3	5.0
S1.002	50.00	4.77	73.595	0.118	0.0	0.0	3.2	1.00	39.7	19.2
S1.003	50.00	5.39	73.430	0.203	0.0	0.0	5.5	0.89	35.3	33.0
S1.004	50.00	5.76	73.201	0.351	0.0	0.0	9.5	0.99	70.0	57.0
S1.005	50.00	6.31	73.039	0.439	0.0	0.0	11.9	1.14	126.4	71.3
S1.006	50.00	6.63	72.887	0.439	0.0	0.0	11.9	1.43	157.4	71.3
S1.007	50.00	6.74	72.717	0.439	0.0	0.0	11.9	1.43	158.4	71.3

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
S2.000	22.804	0.507	45.0	0.020	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S2.001	15.658	0.348	45.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.008	17.777	0.072	247.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S1.009	34.420	0.133	258.8	0.046	0.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S1.010	39.029	0.434	90.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S3.000	38.606	0.877	44.0	0.022	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S3.001	12.398	0.276	45.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S3.002	56.968	0.372	153.1	0.084	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)
S2.000	50.00	4.19	73.000	0.020	0.0	0.0	0.5	1.96	77.8	3.2
S2.001	50.00	4.33	72.498	0.020	0.0	0.0	0.5	1.96	77.7	3.2
S1.008	50.00	7.00	71.999	0.459	0.0	0.0	12.4	1.15	126.8	74.6
S1.009	50.00	7.51	71.927	0.505	0.0	0.0	13.7	1.12	123.9	82.1
S1.010	50.00	7.85	71.794	0.505	0.0	0.0	13.7	1.91	211.0	82.1
S3.000	50.00	4.33	74.300	0.022	0.0	0.0	0.6	1.98	78.6	3.6
S3.001	50.00	4.43	73.429	0.022	0.0	0.0	0.6	1.96	77.7	3.6
S3.002	50.00	5.33	73.160	0.106	0.0	0.0	2.9	1.05	41.9	17.2

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.000	44.051	0.979	45.0	0.021	4.00	0.0	0.600	○	225	Pipe/Conduit	🔒
S1.011	20.040	0.104	192.7	0.014	0.00	0.0	0.600	○	375	Pipe/Conduit	🔒
S1.012	29.123	0.145	200.8	0.019	0.00	0.0	0.600	○	375	Pipe/Conduit	🔒
S5.000	39.347	0.874	45.0	0.022	4.00	0.0	0.600	○	225	Pipe/Conduit	🔒
S5.001	12.331	0.280	44.0	0.000	0.00	0.0	0.600	○	225	Pipe/Conduit	🔓
S5.002	75.660	1.261	60.0	0.104	0.00	0.0	0.600	○	225	Pipe/Conduit	🔓
S5.003	32.627	0.544	60.0	0.028	0.00	0.0	0.600	○	225	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.000	50.00	4.38	72.500	0.021	0.0	0.0	0.6	1.96	77.7	3.4
S1.011	50.00	8.11	71.362	0.646	0.0	0.0	17.5	1.30	143.8	105.0
S1.012	50.00	8.49	71.258	0.665	0.0	0.0	18.0	1.27	140.8	108.1
S5.000	50.00	4.34	74.500	0.022	0.0	0.0	0.6	1.95	77.7	3.6
S5.001	50.00	4.44	73.625	0.022	0.0	0.0	0.6	1.98	78.6	3.6
S5.002	50.00	5.18	73.345	0.126	0.0	0.0	3.4	1.69	67.3	20.5
S5.003	50.00	5.51	72.085	0.154	0.0	0.0	4.2	1.69	67.3	25.0

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
S1.013	54.689	1.764	31.0	0.129	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S6.000	24.115	0.536	45.0	0.016	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S6.001	31.951	0.320	99.8	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S7.000	37.286	0.932	40.0	0.036	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S6.002	19.820	0.132	150.2	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.013	50.00	8.77	71.113	0.948	0.0	0.0	25.7	3.26	360.5	154.0
S6.000	50.00	4.21	70.775	0.016	0.0	0.0	0.4	1.96	77.7	2.6
S6.001	50.00	4.61	70.247	0.041	0.0	0.0	1.1	1.31	52.0	6.7
S7.000	50.00	4.30	71.100	0.036	0.0	0.0	1.0	2.07	82.5	5.8
S6.002	50.00	4.92	69.932	0.102	0.0	0.0	2.8	1.06	42.3	16.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S8.000	59.270	1.482	40.0	0.028	4.00	0.0	0.600	○	225	Pipe/Conduit	🔒
S6.003	23.251	0.156	149.0	0.035	0.00	0.0	0.600	○	225	Pipe/Conduit	🔒
S6.004	71.756	0.479	149.8	0.028	0.00	0.0	0.600	○	225	Pipe/Conduit	🔓
S1.014	53.192	0.665	80.0	0.151	0.00	0.0	0.600	○	375	Pipe/Conduit	🔒
S1.015	44.877	0.449	100.0	0.000	0.00	0.0	0.600	○	450	Pipe/Conduit	🔒
S1.016	26.668	0.267	100.0	0.000	0.00	0.0	0.600	○	450	Pipe/Conduit	🔒
S9.000	23.266	0.388	60.0	0.035	4.00	0.0	0.600	○	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)
S8.000	50.00	4.48	71.280	0.028	0.0	0.0	0.8	2.07	82.5	4.5
S6.003	50.00	5.29	69.799	0.165	0.0	0.0	4.5	1.07	42.5	26.8
S6.004	50.00	6.41	69.643	0.193	0.0	0.0	5.2	1.07	42.4	31.4
S1.014	50.00	9.20	69.014	1.292	0.0	0.0	35.0	2.03	223.9	209.9
S1.015	50.00	9.57	68.279	1.292	0.0	0.0	35.0	2.03	323.4	209.9
S1.016	50.00	9.79	67.830	1.292	0.0	0.0	35.0	2.03	323.4	209.9
S9.000	50.00	4.23	72.000	0.035	0.0	0.0	0.9	1.69	67.3	5.7

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
S9.001	24.031	0.240	100.1	0.059	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S10.000	26.476	0.441	60.0	0.035	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S9.002	15.476	0.088	175.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S9.003	71.408	0.238	300.0	0.178	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S9.004	33.908	0.097	349.6	0.092	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S11.000	25.162	0.629	40.0	0.020	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S11.001	22.635	0.226	100.0	0.045	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)
S9.001	50.00	4.54	71.612	0.094	0.0	0.0	2.5	1.31	52.0	15.3
S10.000	50.00	4.26	72.800	0.035	0.0	0.0	0.9	1.69	67.2	5.7
S9.002	50.00	4.80	71.441	0.129	0.0	0.0	3.5	0.99	39.2	21.0
S9.003	50.00	6.39	71.277	0.307	0.0	0.0	8.3	0.75	29.8«	49.9
S9.004	50.00	6.97	70.964	0.399	0.0	0.0	10.8	0.96	106.4	64.8
S11.000	50.00	4.20	75.000	0.020	0.0	0.0	0.5	2.07	82.5	3.2
S11.001	50.00	4.49	74.375	0.065	0.0	0.0	1.8	1.31	52.0	10.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S11.002	55.631	0.371	150.0	0.110	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S9.005	29.819	0.120	249.0	0.079	0.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S9.006	6.086	0.076	80.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S12.000	26.566	0.266	100.0	0.070	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S9.007	86.965	2.805	31.0	0.162	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S9.008	14.975	0.180	83.0	0.020	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)
S11.002	50.00	5.36	74.149	0.175	0.0	0.0	4.7	1.07	42.4	28.4
S9.005	50.00	7.41	70.867	0.653	0.0	0.0	17.7	1.14	126.3	106.1
S9.006	50.00	7.46	70.747	0.653	0.0	0.0	17.7	2.03	223.9	106.1
S12.000	50.00	4.34	72.300	0.070	0.0	0.0	1.9	1.31	52.0	11.4
S9.007	50.00	7.90	70.672	0.885	0.0	0.0	24.0	3.26	360.5	143.8
S9.008	50.00	8.03	67.821	0.905	0.0	0.0	24.5	1.99	219.8	147.1

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
S1.017	15.185	0.076	200.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
S13.000	28.708	0.574	50.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S14.000	25.203	0.504	50.0	0.020	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S13.001	41.512	0.286	145.1	0.055	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S13.002	58.093	0.224	259.0	0.145	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S15.000	54.325	1.811	30.0	0.020	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)
S1.017	50.00	9.97	67.415	2.197	0.0	0.0	59.5	1.43	228.1«	357.0
S13.000	50.00	4.26	68.100	0.000	0.0	0.0	0.0	1.85	73.7	0.0
S14.000	50.00	4.23	68.100	0.020	0.0	0.0	0.5	1.85	73.7	3.2
S13.001	50.00	4.90	67.527	0.075	0.0	0.0	2.0	1.08	43.1	12.2
S13.002	50.00	5.89	67.240	0.220	0.0	0.0	6.0	0.97	68.7	35.7
S15.000	50.00	4.38	72.150	0.020	0.0	0.0	0.5	2.40	95.3	3.2

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
S15.001	47.188	1.573	30.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S13.003	42.328	0.142	299.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S16.000	68.796	0.275	250.0	0.091	4.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S16.001	5.026	0.020	250.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S13.004	10.430	0.035	300.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	🔒
S1.018	47.347	0.316	150.0	0.076	0.00	0.0	0.600	o	600	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)
S15.001	50.00	4.71	70.325	0.020	0.0	0.0	0.5	2.40	95.3	3.2
S13.003	50.00	6.57	66.909	0.240	0.0	0.0	6.5	1.04	115.2	39.0
S16.000	50.00	5.00	66.900	0.091	0.0	0.0	2.5	1.14	126.1	14.8
S16.001	50.00	5.08	66.625	0.091	0.0	0.0	2.5	1.14	126.1	14.8
S13.004	50.00	6.69	66.542	0.331	0.0	0.0	9.0	1.40	396.0	53.8
S1.018	50.00	10.36	66.508	2.604	0.0	0.0	70.5	1.99	561.6	423.1

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
S1.019	10.534	0.070	150.0	0.016	0.00	0.0	0.600	o	600	Pipe/Conduit	🔒
S1.020	16.562	0.171	97.0	0.013	0.00	0.0	0.600	o	600	Pipe/Conduit	🔒
S17.000	59.498	0.744	80.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S18.000	35.787	0.358	100.0	0.023	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S17.001	41.273	0.138	299.0	0.089	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S19.000	22.597	0.753	30.0	0.016	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)
S1.019	50.00	10.45	66.192	2.620	0.0	0.0	71.0	1.99	561.6	425.7
S1.020	50.00	10.56	66.123	2.633	0.0	0.0	71.3	2.47	699.2	427.8
S17.000	50.00	4.68	67.400	0.000	0.0	0.0	0.0	1.46	58.2	0.0
S18.000	50.00	4.46	66.600	0.023	0.0	0.0	0.6	1.31	52.0	3.7
S17.001	50.00	5.59	66.167	0.112	0.0	0.0	3.0	0.75	29.9	18.2
S19.000	50.00	4.16	67.000	0.016	0.0	0.0	0.4	2.40	95.3	2.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S17.002	13.090	0.066	198.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S20.000	3.111	0.012	259.3	0.000	4.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S20.001	29.705	0.115	258.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S20.002	9.990	0.039	256.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S17.003	5.979	0.030	199.3	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	🔒
S1.021	34.328	0.169	203.1	0.044	0.00	0.0	0.600	o	600	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)
S17.002	50.00	5.83	66.029	0.128	0.0	0.0	3.5	0.93	36.8	20.8
S20.000	50.00	4.05	66.285	0.000	0.0	0.0	0.0	1.12	123.8	0.0
S20.001	50.00	4.49	66.273	0.000	0.0	0.0	0.0	1.12	124.0	0.0
S20.002	50.00	4.63	66.154	0.000	0.0	0.0	0.0	1.13	124.5	0.0
S17.003	50.00	5.89	65.963	0.128	0.0	0.0	3.5	1.72	486.7	20.8
S1.021	50.00	10.90	65.632	2.805	0.0	0.0	76.0	1.70	482.1	455.8

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
S21.000	27.242	0.257	106.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S1.022	17.446	0.087	200.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.023	88.797	0.370	240.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.024	94.201	0.942	100.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.025	22.762	0.228	100.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.026	72.045	0.360	200.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.027	62.237	0.311	200.1	0.000	0.00	0.0	0.600	o	600	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)
S21.000	50.00	4.36	66.300	0.000	0.0	0.0	0.0	1.27	50.5	0.0
S1.022	50.00	11.16	65.463	2.805	0.0	0.0	76.0	1.11	78.3«	455.8
S1.023	50.00	12.63	65.376	2.805	0.0	0.0	76.0	1.01	71.4«	455.8
S1.024	50.00	13.62	65.006	2.805	0.0	0.0	76.0	1.57	111.1«	455.8
S1.025	50.00	13.86	64.090	2.805	0.0	0.0	76.0	1.57	111.1«	455.8
S1.026	50.00	14.95	63.860	2.805	0.0	0.0	76.0	1.11	78.3«	455.8
S1.027	50.00	15.55	63.200	2.805	0.0	0.0	76.0	1.72	485.7	455.8

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out			Pipes In			Backdrop (mm)
					PN	Invert Level (m)	Diameter (mm)	PN	Invert Level (m)	Diameter (mm)	
SA28	75.100	1.000	Open Manhole	1200	S1.000	74.100	225				
SA27	75.400	1.658	Open Manhole	1200	S1.001	73.744	225	S1.000	73.742	225	
SA26	75.320	1.726	Open Manhole	1200	S1.002	73.595	225	S1.001	73.594	225	
SA25	75.150	1.720	Open Manhole	1200	S1.003	73.430	225	S1.002	73.431	225	1
SA24	75.100	1.899	Open Manhole	1200	S1.004	73.201	300	S1.003	73.275	225	
SA23	75.100	2.061	Open Manhole	1350	S1.005	73.039	375	S1.004	73.114	300	
SA22	74.850	1.963	Open Manhole	1350	S1.006	72.887	375	S1.005	72.887	375	
SA21	74.385	1.668	Open Manhole	1350	S1.007	72.717	375	S1.006	72.718	375	1
SA20-2	74.400	1.400	Open Manhole	1200	S2.000	73.000	225				
SA20-1	74.360	1.867	Open Manhole	1200	S2.001	72.498	225	S2.000	72.493	225	
SA20	74.292	2.293	Open Manhole	1350	S1.008	71.999	375	S1.007	72.656	375	657
								S2.001	72.150	225	1
SA19	74.320	2.393	Open Manhole	1350	S1.009	71.927	375	S1.008	71.927	375	
SA18	74.010	2.216	Open Manhole	1350	S1.010	71.794	375	S1.009	71.794	375	
SA17-3	75.500	1.200	Open Manhole	1200	S3.000	74.300	225				
SA17-2	74.554	1.131	Open Manhole	1200	S3.001	73.429	225	S3.000	73.423	225	
SA17-1	74.710	1.557	Open Manhole	1200	S3.002	73.160	225	S3.001	73.153	225	
SA17-1-1	73.750	1.250	Open Manhole	1200	S4.000	72.500	225				
SA17	73.480	2.120	Open Manhole	1350	S1.011	71.362	375	S1.010	71.360	375	

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)
								S3.002	72.788	225	1276
								S4.000	71.521	225	9
S13	73.420	2.162	Open Manhole	1350	S1.012	71.258	375	S1.011	71.258	375	
SA15-4	75.900	1.400	Open Manhole	1200	S5.000	74.500	225				
SA15-3	74.900	1.275	Open Manhole	1200	S5.001	73.625	225	S5.000	73.626	225	1
SA15-2	76.370	3.025	Open Manhole	1200	S5.002	73.345	225	S5.001	73.345	225	
SA15-1	73.650	1.566	Open Manhole	1200	S5.003	72.085	225	S5.002	72.084	225	
SA15	72.600	1.487	Open Manhole	1350	S1.013	71.113	375	S1.012	71.113	375	
								S5.003	71.541	225	278
SA14-5	71.970	1.195	Open Manhole	1200	S6.000	70.775	225				
SA14-4	71.830	1.591	Open Manhole	1200	S6.001	70.247	225	S6.000	70.239	225	
SA14-3-1	73.280	2.180	Open Manhole	1200	S7.000	71.100	225				
SA14-3	71.400	1.473	Open Manhole	1200	S6.002	69.932	225	S6.001	69.927	225	
								S7.000	70.168	225	236
SA14-2-1	73.500	2.220	Open Manhole	1200	S8.000	71.280	225				
SA14-2	71.210	1.412	Open Manhole	1200	S6.003	69.799	225	S6.002	69.800	225	1
								S8.000	69.798	225	
SA14-1	71.100	1.457	Open Manhole	1200	S6.004	69.643	225	S6.003	69.643	225	
SA14	70.960	1.946	Open Manhole	1350	S1.014	69.014	375	S1.013	69.349	375	335

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)**
								S6.004	69.164	225	
SA13	69.610	1.331	Open Manhole	1350	S1.015	68.279	450	S1.014	68.349	375	
SA12	69.010	1.180	Open Manhole	1350	S1.016	67.830	450	S1.015	67.830	450	
SA11-9	73.125	1.125	Open Manhole	1200	S9.000	72.000	225				
SA11-8	72.737	1.125	Open Manhole	1200	S9.001	71.612	225	S9.000	71.612	225	
SA11-7-1	74.000	1.200	Open Manhole	1200	S10.000	72.800	225				
SA11-7	73.390	2.018	Open Manhole	1200	S9.002	71.441	225	S9.001	71.372	225	
								S10.000	72.359	225	918
SA11-6	74.065	2.788	Open Manhole	1200	S9.003	71.277	225	S9.002	71.353	225	76
SA11-5	75.600	4.636	Open Manhole	1350	S9.004	70.964	375	S9.003	71.039	225	
SA11-4-3	76.600	1.600	Open Manhole	1200	S11.000	75.000	225				
SA11-4-2	75.820	1.449	Open Manhole	1200	S11.001	74.375	225	S11.000	74.371	225	
SA11-4-1	75.800	1.651	Open Manhole	1200	S11.002	74.149	225	S11.001	74.149	225	
SA11-4	75.280	4.413	Open Manhole	1350	S9.005	70.867	375	S9.004	70.867	375	
								S11.002	73.778	225	2761
SA11-3	74.210	3.463	Open Manhole	1350	S9.006	70.747	375	S9.005	70.747	375	
SA11-2-1	73.800	1.500	Open Manhole	1200	S12.000	72.300	225				
SA11-2	74.350	3.679	Open Manhole	1350	S9.007	70.672	375	S9.006	70.671	375	
								S12.000	72.034	225	1212

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)
SA11-1	69.521	1.700	Open Manhole	1350	S9.008	67.821	375	S9.007	67.867	375	46
SA11	69.040	1.625	Open Manhole	1350	S1.017	67.415	450	S1.016	67.563	450	148
								S9.008	67.641	375	151
SA10-5	69.300	1.200	Open Manhole	1200	S13.000	68.100	225				
SA10-4-1	69.300	1.200	Open Manhole	1200	S14.000	68.100	225				
SA10-4	69.000	1.474	Open Manhole	1200	S13.001	67.527	225	S13.000	67.526	225	
								S14.000	67.596	225	69
SA10-3	69.420	2.180	Open Manhole	1200	S13.002	67.240	300	S13.001	67.241	225	
SA10-1-2	75.200	3.050	Open Manhole	1200	S15.000	72.150	225				
SA10-1-1	71.900	1.575	Open Manhole	1200	S15.001	70.325	225	S15.000	70.339	225	14
SA10-2	69.520	2.611	Open Manhole	1350	S13.003	66.909	375	S13.002	67.016	300	32
								S15.001	68.752	225	1693
SA10-C	69.100	2.200	Open Manhole	1350	S16.000	66.900	375				
SA10-B	69.000	2.375	Open Manhole	1350	S16.001	66.625	375	S16.000	66.625	375	
SA10-1	68.960	2.418	Open Manhole	1500	S13.004	66.542	600	S13.003	66.767	375	
								S16.001	66.605	375	
SA10	68.800	2.293	Open Manhole	1500	S1.018	66.508	600	S1.017	67.339	450	681
								S13.004	66.507	600	
SA9	69.850	3.658	Open Manhole	1500	S1.019	66.192	600	S1.018	66.192	600	

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)
SA8	68.960	2.838	Open Manhole	1500	S1.020	66.123	600	S1.019	66.122	600	
SA7-4	69.210	1.810	Open Manhole	1200	S17.000	67.400	225				
SA7-3-1	67.760	1.160	Open Manhole	1200	S18.000	66.600	225				
SA7-3	67.950	1.783	Open Manhole	1200	S17.001	66.167	225	S17.000	66.656	225	489
								S18.000	66.242	225	75
SA7-2-1	68.600	1.600	Open Manhole	1200	S19.000	67.000	225				
SA7-2	68.690	2.661	Open Manhole	1200	S17.002	66.029	225	S17.001	66.029	225	
								S19.000	66.247	225	218
SA-7-1-3	69.120	2.835	Open Manhole	1350	S20.000	66.285	375				
SA-7-1-2	69.050	2.777	Open Manhole	1350	S20.001	66.273	375	S20.000	66.273	375	
SA-7-1-1	68.810	2.656	Open Manhole	1350	S20.002	66.154	375	S20.001	66.158	375	4
SA-7-1	68.800	2.837	Open Manhole	1500	S17.003	65.963	600	S17.002	65.963	225	
								S20.002	66.115	375	
SA7	68.810	3.178	Open Manhole	1500	S1.021	65.632	600	S1.020	65.952	600	320
								S17.003	65.933	600	301
SA6-1	68.100	1.800	Open Manhole	1200	S21.000	66.300	225				
SA6	68.455	2.992	Open Manhole	1500	S1.022	65.463	300	S1.021	65.463	600	
								S21.000	66.043	225	505
SA5	68.340	2.964	Open Manhole	1200	S1.023	65.376	300	S1.022	65.376	300	

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)
SA4	66.602	1.596	Open Manhole	1200	S1.024	65.006	300	S1.023	65.006	300	
SA3	66.020	1.956	Open Manhole	1200	S1.025	64.090	300	S1.024	64.064	300	
SA2	65.890	2.030	Open Manhole	1200	S1.026	63.860	300	S1.025	63.862	300	2
SA1	65.350	2.150	Open Manhole	1500	S1.027	63.200	600	S1.026	63.500	300	
SA0	65.300	2.411	Open Manhole	0		OUTFALL		S1.027	62.889	600	

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	225	SA28	75.100	74.100	0.775	Open Manhole	1200
S1.001	o	225	SA27	75.400	73.744	1.431	Open Manhole	1200
S1.002	o	225	SA26	75.320	73.595	1.500	Open Manhole	1200
S1.003	o	225	SA25	75.150	73.430	1.495	Open Manhole	1200
S1.004	o	300	SA24	75.100	73.201	1.599	Open Manhole	1200
S1.005	o	375	SA23	75.100	73.039	1.686	Open Manhole	1350
S1.006	o	375	SA22	74.850	72.887	1.588	Open Manhole	1350
S1.007	o	375	SA21	74.385	72.717	1.293	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	21.509	60.1	SA27	75.400	73.742	1.433	Open Manhole	1200
S1.001	8.998	60.0	SA26	75.320	73.594	1.501	Open Manhole	1200
S1.002	27.947	170.4	SA25	75.150	73.431	1.494	Open Manhole	1200
S1.003	33.228	214.4	SA24	75.100	73.275	1.600	Open Manhole	1200
S1.004	21.751	250.0	SA23	75.100	73.114	1.686	Open Manhole	1350
S1.005	37.793	248.6	SA22	74.850	72.887	1.588	Open Manhole	1350
S1.006	27.253	161.0	SA21	74.385	72.718	1.292	Open Manhole	1350
S1.007	9.743	159.0	SA20	74.292	72.656	1.261	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)
S2.000	o	225	SA20-2	74.400	73.000	1.175	Open Manhole	1200
S2.001	o	225	SA20-1	74.360	72.498	1.637	Open Manhole	1200
S1.008	o	375	SA20	74.292	71.999	1.918	Open Manhole	1350
S1.009	o	375	SA19	74.320	71.927	2.018	Open Manhole	1350
S1.010	o	375	SA18	74.010	71.794	1.841	Open Manhole	1350
S3.000	o	225	SA17-3	75.500	74.300	0.975	Open Manhole	1200
S3.001	o	225	SA17-2	74.554	73.429	0.900	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)
S2.000	22.804	45.0	SA20-1	74.360	72.493	1.642	Open Manhole	1200
S2.001	15.658	45.0	SA20	74.292	72.150	1.917	Open Manhole	1350
S1.008	17.777	247.0	SA19	74.320	71.927	2.018	Open Manhole	1350
S1.009	34.420	258.8	SA18	74.010	71.794	1.841	Open Manhole	1350
S1.010	39.029	90.0	SA17	73.480	71.360	1.745	Open Manhole	1350
S3.000	38.606	44.0	SA17-2	74.554	73.423	0.906	Open Manhole	1200
S3.001	12.398	45.0	SA17-1	74.710	73.153	1.332	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)
S3.002	o	225	SA17-1	74.710	73.160	1.325	Open Manhole	1200
S4.000	o	225	SA17-1-1	73.750	72.500	1.025	Open Manhole	1200
S1.011	o	375	SA17	73.480	71.362	1.743	Open Manhole	1350
S1.012	o	375	S13	73.420	71.258	1.787	Open Manhole	1350
S5.000	o	225	SA15-4	75.900	74.500	1.175	Open Manhole	1200
S5.001	o	225	SA15-3	74.900	73.625	1.050	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)
S3.002	56.968	153.1	SA17	73.480	72.788	0.467	Open Manhole	1350
S4.000	44.051	45.0	SA17	73.480	71.521	1.734	Open Manhole	1350
S1.011	20.040	192.7	S13	73.420	71.258	1.787	Open Manhole	1350
S1.012	29.123	200.8	SA15	72.600	71.113	1.112	Open Manhole	1350
S5.000	39.347	45.0	SA15-3	74.900	73.626	1.049	Open Manhole	1200
S5.001	12.331	44.0	SA15-2	76.370	73.345	2.800	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)
S5.002	o	225	SA15-2	76.370	73.345	2.800	Open Manhole	1200
S5.003	o	225	SA15-1	73.650	72.085	1.340	Open Manhole	1200
S1.013	o	375	SA15	72.600	71.113	1.112	Open Manhole	1350
S6.000	o	225	SA14-5	71.970	70.775	0.970	Open Manhole	1200
S6.001	o	225	SA14-4	71.830	70.247	1.358	Open Manhole	1200
S7.000	o	225	SA14-3-1	73.280	71.100	1.955	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)
S5.002	75.660	60.0	SA15-1	73.650	72.084	1.341	Open Manhole	1200
S5.003	32.627	60.0	SA15	72.600	71.541	0.834	Open Manhole	1350
S1.013	54.689	31.0	SA14	70.960	69.349	1.236	Open Manhole	1350
S6.000	24.115	45.0	SA14-4	71.830	70.239	1.366	Open Manhole	1200
S6.001	31.951	99.8	SA14-3	71.400	69.927	1.248	Open Manhole	1200
S7.000	37.286	40.0	SA14-3	71.400	70.168	1.007	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)
S6.002	o	225	SA14-3	71.400	69.932	1.243	Open Manhole	1200
S8.000	o	225	SA14-2-1	73.500	71.280	1.995	Open Manhole	1200
S6.003	o	225	SA14-2	71.210	69.799	1.186	Open Manhole	1200
S6.004	o	225	SA14-1	71.100	69.643	1.232	Open Manhole	1200
S1.014	o	375	SA14	70.960	69.014	1.571	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.002	19.820	150.2	SA14-2	71.210	69.800	1.185	Open Manhole	1200
S8.000	59.270	40.0	SA14-2	71.210	69.798	1.187	Open Manhole	1200
S6.003	23.251	149.0	SA14-1	71.100	69.643	1.232	Open Manhole	1200
S6.004	71.756	149.8	SA14	70.960	69.164	1.571	Open Manhole	1350
S1.014	53.192	80.0	SA13	69.610	68.349	0.886	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)
S1.015	o	450	SA13	69.610	68.279	0.881	Open Manhole	1350
S1.016	o	450	SA12	69.010	67.830	0.730	Open Manhole	1350
S9.000	o	225	SA11-9	73.125	72.000	0.900	Open Manhole	1200
S9.001	o	225	SA11-8	72.737	71.612	0.900	Open Manhole	1200
S10.000	o	225	SA11-7-1	74.000	72.800	0.975	Open Manhole	1200
S9.002	o	225	SA11-7	73.390	71.441	1.724	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)
S1.015	44.877	100.0	SA12	69.010	67.830	0.730	Open Manhole	1350
S1.016	26.668	100.0	SA11	69.040	67.563	1.027	Open Manhole	1350
S9.000	23.266	60.0	SA11-8	72.737	71.612	0.900	Open Manhole	1200
S9.001	24.031	100.1	SA11-7	73.390	71.372	1.793	Open Manhole	1200
S10.000	26.476	60.0	SA11-7	73.390	72.359	0.806	Open Manhole	1200
S9.002	15.476	175.0	SA11-6	74.065	71.353	2.487	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)
S9.003	o	225	SA11-6	74.065	71.277	2.563	Open Manhole	1200
S9.004	o	375	SA11-5	75.600	70.964	4.261	Open Manhole	1350
S11.000	o	225	SA11-4-3	76.600	75.000	1.375	Open Manhole	1200
S11.001	o	225	SA11-4-2	75.820	74.375	1.220	Open Manhole	1200
S11.002	o	225	SA11-4-1	75.800	74.149	1.426	Open Manhole	1200
S9.005	o	375	SA11-4	75.280	70.867	4.038	Open Manhole	1350
S9.006	o	375	SA11-3	74.210	70.747	3.088	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S9.003	71.408	300.0	SA11-5	75.600	71.039	4.336	Open Manhole	1350
S9.004	33.908	349.6	SA11-4	75.280	70.867	4.038	Open Manhole	1350
S11.000	25.162	40.0	SA11-4-2	75.820	74.371	1.224	Open Manhole	1200
S11.001	22.635	100.0	SA11-4-1	75.800	74.149	1.426	Open Manhole	1200
S11.002	55.631	150.0	SA11-4	75.280	73.778	1.277	Open Manhole	1350
S9.005	29.819	249.0	SA11-3	74.210	70.747	3.088	Open Manhole	1350
S9.006	6.086	80.0	SA11-2	74.350	70.671	3.304	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)
S12.000	o	225	SA11-2-1	73.800	72.300	1.275	Open Manhole	1200
S9.007	o	375	SA11-2	74.350	70.672	3.303	Open Manhole	1350
S9.008	o	375	SA11-1	69.521	67.821	1.325	Open Manhole	1350
S1.017	o	450	SA11	69.040	67.415	1.175	Open Manhole	1350
S13.000	o	225	SA10-5	69.300	68.100	0.975	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)
S12.000	26.566	100.0	SA11-2	74.350	72.034	2.091	Open Manhole	1350
S9.007	86.965	31.0	SA11-1	69.521	67.867	1.279	Open Manhole	1350
S9.008	14.975	83.0	SA11	69.040	67.641	1.024	Open Manhole	1350
S1.017	15.185	200.0	SA10	68.800	67.339	1.011	Open Manhole	1500
S13.000	28.708	50.0	SA10-4	69.000	67.526	1.249	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)
S14.000	o	225	SA10-4-1	69.300	68.100	0.975	Open Manhole	1200
S13.001	o	225	SA10-4	69.000	67.527	1.248	Open Manhole	1200
S13.002	o	300	SA10-3	69.420	67.240	1.880	Open Manhole	1200
S15.000	o	225	SA10-1-2	75.200	72.150	2.825	Open Manhole	1200
S15.001	o	225	SA10-1-1	71.900	70.325	1.350	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)
S14.000	25.203	50.0	SA10-4	69.000	67.596	1.179	Open Manhole	1200
S13.001	41.512	145.1	SA10-3	69.420	67.241	1.954	Open Manhole	1200
S13.002	58.093	259.0	SA10-2	69.520	67.016	2.204	Open Manhole	1350
S15.000	54.325	30.0	SA10-1-1	71.900	70.339	1.336	Open Manhole	1200
S15.001	47.188	30.0	SA10-2	69.520	68.752	0.543	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)
S13.003	o	375	SA10-2	69.520	66.909	2.236	Open Manhole	1350
S16.000	o	375	SA10-C	69.100	66.900	1.825	Open Manhole	1350
S16.001	o	375	SA10-B	69.000	66.625	2.000	Open Manhole	1350
S13.004	o	600	SA10-1	68.960	66.542	1.818	Open Manhole	1500
S1.018	o	600	SA10	68.800	66.508	1.692	Open Manhole	1500
S1.019	o	600	SA9	69.850	66.192	3.058	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S13.003	42.328	299.0	SA10-1	68.960	66.767	1.818	Open Manhole	1500
S16.000	68.796	250.0	SA10-B	69.000	66.625	2.000	Open Manhole	1350
S16.001	5.026	250.0	SA10-1	68.960	66.605	1.980	Open Manhole	1500
S13.004	10.430	300.0	SA10	68.800	66.507	1.693	Open Manhole	1500
S1.018	47.347	150.0	SA9	69.850	66.192	3.058	Open Manhole	1500
S1.019	10.534	150.0	SA8	68.960	66.122	2.238	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.020	o	600	SA8	68.960	66.123	2.237	Open Manhole	1500
S17.000	o	225	SA7-4	69.210	67.400	1.585	Open Manhole	1200
S18.000	o	225	SA7-3-1	67.760	66.600	0.935	Open Manhole	1200
S17.001	o	225	SA7-3	67.950	66.167	1.558	Open Manhole	1200
S19.000	o	225	SA7-2-1	68.600	67.000	1.375	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)
S1.020	16.562	97.0	SA7	68.810	65.952	2.258	Open Manhole	1500
S17.000	59.498	80.0	SA7-3	67.950	66.656	1.069	Open Manhole	1200
S18.000	35.787	100.0	SA7-3	67.950	66.242	1.483	Open Manhole	1200
S17.001	41.273	299.0	SA7-2	68.690	66.029	2.436	Open Manhole	1200
S19.000	22.597	30.0	SA7-2	68.690	66.247	2.218	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)**
S17.002	o	225	SA7-2	68.690	66.029	2.436	Open Manhole	1200
S20.000	o	375	SA-7-1-3	69.120	66.285	2.460	Open Manhole	1350
S20.001	o	375	SA-7-1-2	69.050	66.273	2.402	Open Manhole	1350
S20.002	o	375	SA-7-1-1	68.810	66.154	2.281	Open Manhole	1350
S17.003	o	600	SA-7-1	68.800	65.963	2.237	Open Manhole	1500

Downstream Manhole

PN	**Length (m)**	**Slope (1:X)**	**MH Name**	**C.Level (m)**	**I.Level (m)**	**D.Depth (m)**	**MH Connection**	**MH DIAM., L*W (mm)**
S17.002	13.090	198.0	SA-7-1	68.800	65.963	2.612	Open Manhole	1500
S20.000	3.111	259.3	SA-7-1-2	69.050	66.273	2.402	Open Manhole	1350
S20.001	29.705	258.3	SA-7-1-1	68.810	66.158	2.277	Open Manhole	1350
S20.002	9.990	256.2	SA-7-1	68.800	66.115	2.310	Open Manhole	1500
S17.003	5.979	199.3	SA7	68.810	65.933	2.277	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.021	o	600	SA7	68.810	65.632	2.578	Open Manhole	1500
S21.000	o	225	SA6-1	68.100	66.300	1.575	Open Manhole	1200
S1.022	o	300	SA6	68.455	65.463	2.692	Open Manhole	1500
S1.023	o	300	SA5	68.340	65.376	2.664	Open Manhole	1200
S1.024	o	300	SA4	66.602	65.006	1.296	Open Manhole	1200
S1.025	o	300	SA3	66.020	64.090	1.630	Open Manhole	1200
S1.026	o	300	SA2	65.890	63.860	1.730	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)
S1.021	34.328	203.1	SA6	68.455	65.463	2.392	Open Manhole	1500
S21.000	27.242	106.0	SA6	68.455	66.043	2.187	Open Manhole	1500
S1.022	17.446	200.0	SA5	68.340	65.376	2.664	Open Manhole	1200
S1.023	88.797	240.0	SA4	66.602	65.006	1.296	Open Manhole	1200
S1.024	94.201	100.0	SA3	66.020	64.064	1.656	Open Manhole	1200
S1.025	22.762	100.0	SA2	65.890	63.862	1.728	Open Manhole	1200
S1.026	72.045	200.0	SA1	65.350	63.500	1.550	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.027	o	600	SA1	65.350	63.200	1.550	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.027	62.237	200.1	SA0	65.300	62.889	1.811	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.027	SA0	65.300	62.889	0.000	0	0

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                          Simulation Criteria for Storm

  Volumetric Runoff Coeff 0.750   Manhole Headloss Coeff (Global)   0.500                 Inlet Coeffiecient 0.800
   Areal Reduction Factor 1.000      Foul Sewage per hectare (l/s)   0.000 Flow per Person per Day (l/per/day) 0.000
         Hot Start (mins)     0 Additional Flow - % of Total Flow 20.000                      Run Time (mins)  2880
     Hot Start Level (mm)     0      MADD Factor * 10m³/ha Storage   2.000               Output Interval (mins)    24

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

                          Synthetic Rainfall Details

                  Rainfall Model                  FSR   M5-60 (mm) 16.100          Cv (Summer) 0.750
             Return Period (years)                  5        Ratio R  0.250          Cv (Winter) 0.840
                            Region Scotland and Ireland Profile Type Summer Storm Duration (mins)  1440
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SA10, DS/PN: S1.018, Volume (m³): 8.8

Unit Reference	MD-SHE-0167-1520-1600-1520	Sump Available	Yes
Design Head (m)	1.600	Diameter (mm)	167
Design Flow (l/s)	15.2	Invert Level (m)	66.508
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1500
Application	Surface		

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.600	15.1	Kick-Flo®	1.013	12.2
Flush-Flo™	0.473	15.1	Mean Flow over Head Range	-	13.2

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)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	5.9	0.600	15.0	1.600	15.1	2.600	19.1	5.000	26.1	7.500	31.7
0.200	13.4	0.800	14.3	1.800	16.0	3.000	20.4	5.500	27.3	8.000	32.7
0.300	14.6	1.000	12.4	2.000	16.8	3.500	22.0	6.000	28.5	8.500	33.7
0.400	15.1	1.200	13.2	2.200	17.6	4.000	23.4	6.500	29.6	9.000	34.6
0.500	15.1	1.400	14.2	2.400	18.3	4.500	24.8	7.000	30.7	9.500	35.5

Hydro-Brake® Optimum Manhole: SA6, DS/PN: S1.022, Volume (m³): 15.6

Unit Reference	MD-SHE-0190-1830-1060-1830	Sump Available	Yes
Design Head (m)	1.060	Diameter (mm)	190
Design Flow (l/s)	18.3	Invert Level (m)	65.463
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1500
Application	Surface		

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.060	18.3	Kick-Flo®	0.746	15.5
Flush-Flo™	0.344	18.2	Mean Flow over Head Range	-	15.5

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)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	6.6	0.600	17.4	1.600	22.2	2.600	28.1	5.000	38.5	7.500	46.8
0.200	17.4	0.800	16.0	1.800	23.5	3.000	30.1	5.500	40.3	8.000	48.3
0.300	18.2	1.000	17.8	2.000	24.7	3.500	32.4	6.000	42.0	8.500	49.7
0.400	18.2	1.200	19.4	2.200	25.9	4.000	34.5	6.500	43.7	9.000	51.1
0.500	17.9	1.400	20.9	2.400	27.0	4.500	36.5	7.000	45.3	9.500	52.5

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

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                        Pipe Sizes STANDARD Manhole Sizes STANDARD

                        FSR Rainfall Model - Scotland and Ireland
            Return Period (years)    100          Foul Sewage (l/s/ha) 0.000           Maximum Backdrop Height (m) 1.500
                       M5-60 (mm)  16.100      Volumetric Runoff Coeff. 0.750 Min Design Depth for Optimisation (m) 1.200
                          Ratio R   0.250                     PIMP (%)   100     Min Vel for Auto Design only (m/s)  1.00
           Maximum Rainfall (mm/hr)    50 Add Flow / Climate Change (%)    20       Min Slope for Optimisation (1:X)   500
Maximum Time of Concentration (mins)    30   Minimum Backdrop Height (m) 0.200

                              Designed with Level Soffits
```

Time Area Diagram for Storm

Time (mins)	**Area (ha)**	**Time (mins)**	**Area (ha)**	**Time (mins)**	**Area (ha)**	**Time (mins)**	**Area (ha)**
0-4	0.000	4-8	0.444	8-12	1.918	12-16	0.443

Total Area Contributing (ha) = 2.805

Total Pipe Volume (m³) = 221.037

Network Design Table for Storm

« - Indicates pipe capacity < flow

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	21.509	0.358	60.1	0.031	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S1.001	8.998	0.150	60.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.002	27.947	0.164	170.4	0.087	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.003	33.228	0.155	214.4	0.085	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.004	21.751	0.087	250.0	0.148	0.00	0.0	0.600	o	300	Pipe/Conduit	🔓
S1.005	37.793	0.152	248.6	0.088	0.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S1.006	27.253	0.169	161.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S1.007	9.743	0.061	159.0	0.000	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)
S1.000	50.00	4.21	74.100	0.031	0.0	0.0	0.8	1.69	67.2	5.0
S1.001	50.00	4.30	73.744	0.031	0.0	0.0	0.8	1.69	67.3	5.0
S1.002	50.00	4.77	73.595	0.118	0.0	0.0	3.2	1.00	39.7	19.2
S1.003	50.00	5.39	73.430	0.203	0.0	0.0	5.5	0.89	35.3	33.0
S1.004	50.00	5.76	73.201	0.351	0.0	0.0	9.5	0.99	70.0	57.0
S1.005	50.00	6.31	73.039	0.439	0.0	0.0	11.9	1.14	126.4	71.3
S1.006	50.00	6.63	72.887	0.439	0.0	0.0	11.9	1.43	157.4	71.3
S1.007	50.00	6.74	72.717	0.439	0.0	0.0	11.9	1.43	158.4	71.3

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**
S2.000	22.804	0.507	45.0	0.020	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S2.001	15.658	0.348	45.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.008	17.777	0.072	247.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S1.009	34.420	0.133	258.8	0.046	0.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S1.010	39.029	0.434	90.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S3.000	38.606	0.877	44.0	0.022	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S3.001	12.398	0.276	45.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S3.002	56.968	0.372	153.1	0.084	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)**
S2.000	50.00	4.19	73.000	0.020	0.0	0.0	0.5	1.96	77.8	3.2
S2.001	50.00	4.33	72.498	0.020	0.0	0.0	0.5	1.96	77.7	3.2
S1.008	50.00	7.00	71.999	0.459	0.0	0.0	12.4	1.15	126.8	74.6
S1.009	50.00	7.51	71.927	0.505	0.0	0.0	13.7	1.12	123.9	82.1
S1.010	50.00	7.85	71.794	0.505	0.0	0.0	13.7	1.91	211.0	82.1
S3.000	50.00	4.33	74.300	0.022	0.0	0.0	0.6	1.98	78.6	3.6
S3.001	50.00	4.43	73.429	0.022	0.0	0.0	0.6	1.96	77.7	3.6
S3.002	50.00	5.33	73.160	0.106	0.0	0.0	2.9	1.05	41.9	17.2

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.000	44.051	0.979	45.0	0.021	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.011	20.040	0.104	192.7	0.014	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S1.012	29.123	0.145	200.8	0.019	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S5.000	39.347	0.874	45.0	0.022	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S5.001	12.331	0.280	44.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S5.002	75.660	1.261	60.0	0.104	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S5.003	32.627	0.544	60.0	0.028	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.000	50.00	4.38	72.500	0.021	0.0	0.0	0.6	1.96	77.7	3.4
S1.011	50.00	8.11	71.362	0.646	0.0	0.0	17.5	1.30	143.8	105.0
S1.012	50.00	8.49	71.258	0.665	0.0	0.0	18.0	1.27	140.8	108.1
S5.000	50.00	4.34	74.500	0.022	0.0	0.0	0.6	1.95	77.7	3.6
S5.001	50.00	4.44	73.625	0.022	0.0	0.0	0.6	1.98	78.6	3.6
S5.002	50.00	5.18	73.345	0.126	0.0	0.0	3.4	1.69	67.3	20.5
S5.003	50.00	5.51	72.085	0.154	0.0	0.0	4.2	1.69	67.3	25.0

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
S1.013	54.689	1.764	31.0	0.129	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S6.000	24.115	0.536	45.0	0.016	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S6.001	31.951	0.320	99.8	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S7.000	37.286	0.932	40.0	0.036	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S6.002	19.820	0.132	150.2	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.013	50.00	8.77	71.113	0.948	0.0	0.0	25.7	3.26	360.5	154.0
S6.000	50.00	4.21	70.775	0.016	0.0	0.0	0.4	1.96	77.7	2.6
S6.001	50.00	4.61	70.247	0.041	0.0	0.0	1.1	1.31	52.0	6.7
S7.000	50.00	4.30	71.100	0.036	0.0	0.0	1.0	2.07	82.5	5.8
S6.002	50.00	4.92	69.932	0.102	0.0	0.0	2.8	1.06	42.3	16.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S8.000	59.270	1.482	40.0	0.028	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S6.003	23.251	0.156	149.0	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S6.004	71.756	0.479	149.8	0.028	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S1.014	53.192	0.665	80.0	0.151	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S1.015	44.877	0.449	100.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
S1.016	26.668	0.267	100.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
S9.000	23.266	0.388	60.0	0.035	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)
S8.000	50.00	4.48	71.280	0.028	0.0	0.0	0.8	2.07	82.5	4.5
S6.003	50.00	5.29	69.799	0.165	0.0	0.0	4.5	1.07	42.5	26.8
S6.004	50.00	6.41	69.643	0.193	0.0	0.0	5.2	1.07	42.4	31.4
S1.014	50.00	9.20	69.014	1.292	0.0	0.0	35.0	2.03	223.9	209.9
S1.015	50.00	9.57	68.279	1.292	0.0	0.0	35.0	2.03	323.4	209.9
S1.016	50.00	9.79	67.830	1.292	0.0	0.0	35.0	2.03	323.4	209.9
S9.000	50.00	4.23	72.000	0.035	0.0	0.0	0.9	1.69	67.3	5.7

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
S9.001	24.031	0.240	100.1	0.059	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S10.000	26.476	0.441	60.0	0.035	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S9.002	15.476	0.088	175.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S9.003	71.408	0.238	300.0	0.178	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S9.004	33.908	0.097	349.6	0.092	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S11.000	25.162	0.629	40.0	0.020	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S11.001	22.635	0.226	100.0	0.045	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)
S9.001	50.00	4.54	71.612	0.094	0.0	0.0	2.5	1.31	52.0	15.3
S10.000	50.00	4.26	72.800	0.035	0.0	0.0	0.9	1.69	67.2	5.7
S9.002	50.00	4.80	71.441	0.129	0.0	0.0	3.5	0.99	39.2	21.0
S9.003	50.00	6.39	71.277	0.307	0.0	0.0	8.3	0.75	29.8«	49.9
S9.004	50.00	6.97	70.964	0.399	0.0	0.0	10.8	0.96	106.4	64.8
S11.000	50.00	4.20	75.000	0.020	0.0	0.0	0.5	2.07	82.5	3.2
S11.001	50.00	4.49	74.375	0.065	0.0	0.0	1.8	1.31	52.0	10.6

Network Design Table for Storm

PN	**Length (m)**	**Fall (m)**	**Slope (1:X)**	**I.Area (ha)**	**T.E. (mins)**	**Base Flow (l/s)**	**k (mm)**	**HYD SECT**	**DIA (mm)**	**Section Type**	**Auto Design**
S11.002	55.631	0.371	150.0	0.110	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S9.005	29.819	0.120	249.0	0.079	0.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S9.006	6.086	0.076	80.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S12.000	26.566	0.266	100.0	0.070	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S9.007	86.965	2.805	31.0	0.162	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S9.008	14.975	0.180	83.0	0.020	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)**
S11.002	50.00	5.36	74.149	0.175	0.0	0.0	4.7	1.07	42.4	28.4
S9.005	50.00	7.41	70.867	0.653	0.0	0.0	17.7	1.14	126.3	106.1
S9.006	50.00	7.46	70.747	0.653	0.0	0.0	17.7	2.03	223.9	106.1
S12.000	50.00	4.34	72.300	0.070	0.0	0.0	1.9	1.31	52.0	11.4
S9.007	50.00	7.90	70.672	0.885	0.0	0.0	24.0	3.26	360.5	143.8
S9.008	50.00	8.03	67.821	0.905	0.0	0.0	24.5	1.99	219.8	147.1

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
S1.017	15.185	0.076	200.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
S13.000	28.708	0.574	50.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S14.000	25.203	0.504	50.0	0.020	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S13.001	41.512	0.286	145.1	0.055	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S13.002	58.093	0.224	259.0	0.145	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S15.000	54.325	1.811	30.0	0.020	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)
S1.017	50.00	9.97	67.415	2.197	0.0	0.0	59.5	1.43	228.1«	357.0
S13.000	50.00	4.26	68.100	0.000	0.0	0.0	0.0	1.85	73.7	0.0
S14.000	50.00	4.23	68.100	0.020	0.0	0.0	0.5	1.85	73.7	3.2
S13.001	50.00	4.90	67.527	0.075	0.0	0.0	2.0	1.08	43.1	12.2
S13.002	50.00	5.89	67.240	0.220	0.0	0.0	6.0	0.97	68.7	35.7
S15.000	50.00	4.38	72.150	0.020	0.0	0.0	0.5	2.40	95.3	3.2

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
S15.001	47.188	1.573	30.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S13.003	42.328	0.142	299.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S16.000	68.796	0.275	250.0	0.091	4.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S16.001	5.026	0.020	250.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S13.004	10.430	0.035	300.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	🔒
S1.018	47.347	0.316	150.0	0.076	0.00	0.0	0.600	o	600	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)
S15.001	50.00	4.71	70.325	0.020	0.0	0.0	0.5	2.40	95.3	3.2
S13.003	50.00	6.57	66.909	0.240	0.0	0.0	6.5	1.04	115.2	39.0
S16.000	50.00	5.00	66.900	0.091	0.0	0.0	2.5	1.14	126.1	14.8
S16.001	50.00	5.08	66.625	0.091	0.0	0.0	2.5	1.14	126.1	14.8
S13.004	50.00	6.69	66.542	0.331	0.0	0.0	9.0	1.40	396.0	53.8
S1.018	50.00	10.36	66.508	2.604	0.0	0.0	70.5	1.99	561.6	423.1

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
S1.019	10.534	0.070	150.0	0.016	0.00	0.0	0.600	o	600	Pipe/Conduit	🔒
S1.020	16.562	0.171	97.0	0.013	0.00	0.0	0.600	o	600	Pipe/Conduit	🔒
S17.000	59.498	0.744	80.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S18.000	35.787	0.358	100.0	0.023	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S17.001	41.273	0.138	299.0	0.089	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S19.000	22.597	0.753	30.0	0.016	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)
S1.019	50.00	10.45	66.192	2.620	0.0	0.0	71.0	1.99	561.6	425.7
S1.020	50.00	10.56	66.123	2.633	0.0	0.0	71.3	2.47	699.2	427.8
S17.000	50.00	4.68	67.400	0.000	0.0	0.0	0.0	1.46	58.2	0.0
S18.000	50.00	4.46	66.600	0.023	0.0	0.0	0.6	1.31	52.0	3.7
S17.001	50.00	5.59	66.167	0.112	0.0	0.0	3.0	0.75	29.9	18.2
S19.000	50.00	4.16	67.000	0.016	0.0	0.0	0.4	2.40	95.3	2.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S17.002	13.090	0.066	198.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S20.000	3.111	0.012	259.3	0.000	4.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S20.001	29.705	0.115	258.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S20.002	9.990	0.039	256.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S17.003	5.979	0.030	199.3	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	🔒
S1.021	34.328	0.169	203.1	0.044	0.00	0.0	0.600	o	600	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)
S17.002	50.00	5.83	66.029	0.128	0.0	0.0	3.5	0.93	36.8	20.8
S20.000	50.00	4.05	66.285	0.000	0.0	0.0	0.0	1.12	123.8	0.0
S20.001	50.00	4.49	66.273	0.000	0.0	0.0	0.0	1.12	124.0	0.0
S20.002	50.00	4.63	66.154	0.000	0.0	0.0	0.0	1.13	124.5	0.0
S17.003	50.00	5.89	65.963	0.128	0.0	0.0	3.5	1.72	486.7	20.8
S1.021	50.00	10.90	65.632	2.805	0.0	0.0	76.0	1.70	482.1	455.8

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
S21.000	27.242	0.257	106.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.022	17.446	0.087	200.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.023	88.797	0.370	240.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.024	94.201	0.942	100.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.025	22.762	0.228	100.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.026	72.045	0.360	200.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.027	62.237	0.311	200.1	0.000	0.00	0.0	0.600	o	600	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)
S21.000	50.00	4.36	66.300	0.000	0.0	0.0	0.0	1.27	50.5	0.0
S1.022	50.00	11.16	65.463	2.805	0.0	0.0	76.0	1.11	78.3«	455.8
S1.023	50.00	12.63	65.376	2.805	0.0	0.0	76.0	1.01	71.4«	455.8
S1.024	50.00	13.62	65.006	2.805	0.0	0.0	76.0	1.57	111.1«	455.8
S1.025	50.00	13.86	64.090	2.805	0.0	0.0	76.0	1.57	111.1«	455.8
S1.026	50.00	14.95	63.860	2.805	0.0	0.0	76.0	1.11	78.3«	455.8
S1.027	50.00	15.55	63.200	2.805	0.0	0.0	76.0	1.72	485.7	455.8

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)		Pipe Out			Pipes In		
					PN	Invert Level (m)	Diameter (mm)	PN	Invert Level (m)	Diameter (mm)	Backdrop (mm)
SA28	75.100	1.000	Open Manhole	1200	S1.000	74.100	225				
SA27	75.400	1.658	Open Manhole	1200	S1.001	73.744	225	S1.000	73.742	225	
SA26	75.320	1.726	Open Manhole	1200	S1.002	73.595	225	S1.001	73.594	225	
SA25	75.150	1.720	Open Manhole	1200	S1.003	73.430	225	S1.002	73.431	225	1
SA24	75.100	1.899	Open Manhole	1200	S1.004	73.201	300	S1.003	73.275	225	
SA23	75.100	2.061	Open Manhole	1350	S1.005	73.039	375	S1.004	73.114	300	
SA22	74.850	1.963	Open Manhole	1350	S1.006	72.887	375	S1.005	72.887	375	
SA21	74.385	1.668	Open Manhole	1350	S1.007	72.717	375	S1.006	72.718	375	1
SA20-2	74.400	1.400	Open Manhole	1200	S2.000	73.000	225				
SA20-1	74.360	1.867	Open Manhole	1200	S2.001	72.498	225	S2.000	72.493	225	
SA20	74.292	2.293	Open Manhole	1350	S1.008	71.999	375	S1.007	72.656	375	657
								S2.001	72.150	225	1
SA19	74.320	2.393	Open Manhole	1350	S1.009	71.927	375	S1.008	71.927	375	
SA18	74.010	2.216	Open Manhole	1350	S1.010	71.794	375	S1.009	71.794	375	
SA17-3	75.500	1.200	Open Manhole	1200	S3.000	74.300	225				
SA17-2	74.554	1.131	Open Manhole	1200	S3.001	73.429	225	S3.000	73.423	225	
SA17-1	74.710	1.557	Open Manhole	1200	S3.002	73.160	225	S3.001	73.153	225	
SA17-1-1	73.750	1.250	Open Manhole	1200	S4.000	72.500	225				
SA17	73.480	2.120	Open Manhole	1350	S1.011	71.362	375	S1.010	71.360	375	

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)
								S3.002	72.788	225	1276
								S4.000	71.521	225	9
S13	73.420	2.162	Open Manhole	1350	S1.012	71.258	375	S1.011	71.258	375	
SA15-4	75.900	1.400	Open Manhole	1200	S5.000	74.500	225				
SA15-3	74.900	1.275	Open Manhole	1200	S5.001	73.625	225	S5.000	73.626	225	1
SA15-2	76.370	3.025	Open Manhole	1200	S5.002	73.345	225	S5.001	73.345	225	
SA15-1	73.650	1.566	Open Manhole	1200	S5.003	72.085	225	S5.002	72.084	225	
SA15	72.600	1.487	Open Manhole	1350	S1.013	71.113	375	S1.012	71.113	375	
								S5.003	71.541	225	278
SA14-5	71.970	1.195	Open Manhole	1200	S6.000	70.775	225				
SA14-4	71.830	1.591	Open Manhole	1200	S6.001	70.247	225	S6.000	70.239	225	
SA14-3-1	73.280	2.180	Open Manhole	1200	S7.000	71.100	225				
SA14-3	71.400	1.473	Open Manhole	1200	S6.002	69.932	225	S6.001	69.927	225	
								S7.000	70.168	225	236
SA14-2-1	73.500	2.220	Open Manhole	1200	S8.000	71.280	225				
SA14-2	71.210	1.412	Open Manhole	1200	S6.003	69.799	225	S6.002	69.800	225	1
								S8.000	69.798	225	
SA14-1	71.100	1.457	Open Manhole	1200	S6.004	69.643	225	S6.003	69.643	225	
SA14	70.960	1.946	Open Manhole	1350	S1.014	69.014	375	S1.013	69.349	375	335

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
								S6.004	69.164	225	
SA13	69.610	1.331	Open Manhole	1350	S1.015	68.279	450	S1.014	68.349	375	
SA12	69.010	1.180	Open Manhole	1350	S1.016	67.830	450	S1.015	67.830	450	
SA11-9	73.125	1.125	Open Manhole	1200	S9.000	72.000	225				
SA11-8	72.737	1.125	Open Manhole	1200	S9.001	71.612	225	S9.000	71.612	225	
SA11-7-1	74.000	1.200	Open Manhole	1200	S10.000	72.800	225				
SA11-7	73.390	2.018	Open Manhole	1200	S9.002	71.441	225	S9.001	71.372	225	
								S10.000	72.359	225	918
SA11-6	74.065	2.788	Open Manhole	1200	S9.003	71.277	225	S9.002	71.353	225	76
SA11-5	75.600	4.636	Open Manhole	1350	S9.004	70.964	375	S9.003	71.039	225	
SA11-4-3	76.600	1.600	Open Manhole	1200	S11.000	75.000	225				
SA11-4-2	75.820	1.449	Open Manhole	1200	S11.001	74.375	225	S11.000	74.371	225	
SA11-4-1	75.800	1.651	Open Manhole	1200	S11.002	74.149	225	S11.001	74.149	225	
SA11-4	75.280	4.413	Open Manhole	1350	S9.005	70.867	375	S9.004	70.867	375	
								S11.002	73.778	225	2761
SA11-3	74.210	3.463	Open Manhole	1350	S9.006	70.747	375	S9.005	70.747	375	
SA11-2-1	73.800	1.500	Open Manhole	1200	S12.000	72.300	225				
SA11-2	74.350	3.679	Open Manhole	1350	S9.007	70.672	375	S9.006	70.671	375	
								S12.000	72.034	225	1212

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)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SA11-1	69.521	1.700	Open Manhole	1350	S9.008	67.821	375	S9.007	67.867	375	46
SA11	69.040	1.625	Open Manhole	1350	S1.017	67.415	450	S1.016	67.563	450	148
								S9.008	67.641	375	151
SA10-5	69.300	1.200	Open Manhole	1200	S13.000	68.100	225				
SA10-4-1	69.300	1.200	Open Manhole	1200	S14.000	68.100	225				
SA10-4	69.000	1.474	Open Manhole	1200	S13.001	67.527	225	S13.000	67.526	225	
								S14.000	67.596	225	69
SA10-3	69.420	2.180	Open Manhole	1200	S13.002	67.240	300	S13.001	67.241	225	
SA10-1-2	75.200	3.050	Open Manhole	1200	S15.000	72.150	225				
SA10-1-1	71.900	1.575	Open Manhole	1200	S15.001	70.325	225	S15.000	70.339	225	14
SA10-2	69.520	2.611	Open Manhole	1350	S13.003	66.909	375	S13.002	67.016	300	32
								S15.001	68.752	225	1693
SA10-C	69.100	2.200	Open Manhole	1350	S16.000	66.900	375				
SA10-B	69.000	2.375	Open Manhole	1350	S16.001	66.625	375	S16.000	66.625	375	
SA10-1	68.960	2.418	Open Manhole	1500	S13.004	66.542	600	S13.003	66.767	375	
								S16.001	66.605	375	
SA10	68.800	2.293	Open Manhole	1500	S1.018	66.508	600	S1.017	67.339	450	681
								S13.004	66.507	600	
SA9	69.850	3.658	Open Manhole	1500	S1.019	66.192	600	S1.018	66.192	600	

Manhole Schedules for Storm

MH	MH	MH	MH	MH		Pipe Out			Pipes In		
Name	**CL (m)**	**Depth (m)**	**Connection**	**Diam.,L*W (mm)**	**PN**	**Invert Level (m)**	**Diameter (mm)**	**PN**	**Invert Level (m)**	**Diameter (mm)**	**Backdrop (mm)**
SA8	68.960	2.838	Open Manhole	1500	S1.020	66.123	600	S1.019	66.122	600	
SA7-4	69.210	1.810	Open Manhole	1200	S17.000	67.400	225				
SA7-3-1	67.760	1.160	Open Manhole	1200	S18.000	66.600	225				
SA7-3	67.950	1.783	Open Manhole	1200	S17.001	66.167	225	S17.000	66.656	225	489
								S18.000	66.242	225	75
SA7-2-1	68.600	1.600	Open Manhole	1200	S19.000	67.000	225				
SA7-2	68.690	2.661	Open Manhole	1200	S17.002	66.029	225	S17.001	66.029	225	
								S19.000	66.247	225	218
SA-7-1-3	69.120	2.835	Open Manhole	1350	S20.000	66.285	375				
SA-7-1-2	69.050	2.777	Open Manhole	1350	S20.001	66.273	375	S20.000	66.273	375	
SA-7-1-1	68.810	2.656	Open Manhole	1350	S20.002	66.154	375	S20.001	66.158	375	4
SA-7-1	68.800	2.837	Open Manhole	1500	S17.003	65.963	600	S17.002	65.963	225	
								S20.002	66.115	375	
SA7	68.810	3.178	Open Manhole	1500	S1.021	65.632	600	S1.020	65.952	600	320
								S17.003	65.933	600	301
SA6-1	68.100	1.800	Open Manhole	1200	S21.000	66.300	225				
SA6	68.455	2.992	Open Manhole	1500	S1.022	65.463	300	S1.021	65.463	600	
								S21.000	66.043	225	505
SA5	68.340	2.964	Open Manhole	1200	S1.023	65.376	300	S1.022	65.376	300	

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)
SA4	66.602	1.596	Open Manhole	1200	S1.024	65.006	300	S1.023	65.006	300	
SA3	66.020	1.956	Open Manhole	1200	S1.025	64.090	300	S1.024	64.064	300	
SA2	65.890	2.030	Open Manhole	1200	S1.026	63.860	300	S1.025	63.862	300	2
SA1	65.350	2.150	Open Manhole	1500	S1.027	63.200	600	S1.026	63.500	300	
SA0	65.300	2.411	Open Manhole	0		OUTFALL		S1.027	62.889	600	

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	225	SA28	75.100	74.100	0.775	Open Manhole	1200
S1.001	o	225	SA27	75.400	73.744	1.431	Open Manhole	1200
S1.002	o	225	SA26	75.320	73.595	1.500	Open Manhole	1200
S1.003	o	225	SA25	75.150	73.430	1.495	Open Manhole	1200
S1.004	o	300	SA24	75.100	73.201	1.599	Open Manhole	1200
S1.005	o	375	SA23	75.100	73.039	1.686	Open Manhole	1350
S1.006	o	375	SA22	74.850	72.887	1.588	Open Manhole	1350
S1.007	o	375	SA21	74.385	72.717	1.293	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	21.509	60.1	SA27	75.400	73.742	1.433	Open Manhole	1200
S1.001	8.998	60.0	SA26	75.320	73.594	1.501	Open Manhole	1200
S1.002	27.947	170.4	SA25	75.150	73.431	1.494	Open Manhole	1200
S1.003	33.228	214.4	SA24	75.100	73.275	1.600	Open Manhole	1200
S1.004	21.751	250.0	SA23	75.100	73.114	1.686	Open Manhole	1350
S1.005	37.793	248.6	SA22	74.850	72.887	1.588	Open Manhole	1350
S1.006	27.253	161.0	SA21	74.385	72.718	1.292	Open Manhole	1350
S1.007	9.743	159.0	SA20	74.292	72.656	1.261	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)
S2.000	o	225	SA20-2	74.400	73.000	1.175	Open Manhole	1200
S2.001	o	225	SA20-1	74.360	72.498	1.637	Open Manhole	1200
S1.008	o	375	SA20	74.292	71.999	1.918	Open Manhole	1350
S1.009	o	375	SA19	74.320	71.927	2.018	Open Manhole	1350
S1.010	o	375	SA18	74.010	71.794	1.841	Open Manhole	1350
S3.000	o	225	SA17-3	75.500	74.300	0.975	Open Manhole	1200
S3.001	o	225	SA17-2	74.554	73.429	0.900	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)
S2.000	22.804	45.0	SA20-1	74.360	72.493	1.642	Open Manhole	1200
S2.001	15.658	45.0	SA20	74.292	72.150	1.917	Open Manhole	1350
S1.008	17.777	247.0	SA19	74.320	71.927	2.018	Open Manhole	1350
S1.009	34.420	258.8	SA18	74.010	71.794	1.841	Open Manhole	1350
S1.010	39.029	90.0	SA17	73.480	71.360	1.745	Open Manhole	1350
S3.000	38.606	44.0	SA17-2	74.554	73.423	0.906	Open Manhole	1200
S3.001	12.398	45.0	SA17-1	74.710	73.153	1.332	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)
S3.002	o	225	SA17-1	74.710	73.160	1.325	Open Manhole	1200
S4.000	o	225	SA17-1-1	73.750	72.500	1.025	Open Manhole	1200
S1.011	o	375	SA17	73.480	71.362	1.743	Open Manhole	1350
S1.012	o	375	S13	73.420	71.258	1.787	Open Manhole	1350
S5.000	o	225	SA15-4	75.900	74.500	1.175	Open Manhole	1200
S5.001	o	225	SA15-3	74.900	73.625	1.050	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)
S3.002	56.968	153.1	SA17	73.480	72.788	0.467	Open Manhole	1350
S4.000	44.051	45.0	SA17	73.480	71.521	1.734	Open Manhole	1350
S1.011	20.040	192.7	S13	73.420	71.258	1.787	Open Manhole	1350
S1.012	29.123	200.8	SA15	72.600	71.113	1.112	Open Manhole	1350
S5.000	39.347	45.0	SA15-3	74.900	73.626	1.049	Open Manhole	1200
S5.001	12.331	44.0	SA15-2	76.370	73.345	2.800	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)
S5.002	o	225	SA15-2	76.370	73.345	2.800	Open Manhole	1200
S5.003	o	225	SA15-1	73.650	72.085	1.340	Open Manhole	1200
S1.013	o	375	SA15	72.600	71.113	1.112	Open Manhole	1350
S6.000	o	225	SA14-5	71.970	70.775	0.970	Open Manhole	1200
S6.001	o	225	SA14-4	71.830	70.247	1.358	Open Manhole	1200
S7.000	o	225	SA14-3-1	73.280	71.100	1.955	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)
S5.002	75.660	60.0	SA15-1	73.650	72.084	1.341	Open Manhole	1200
S5.003	32.627	60.0	SA15	72.600	71.541	0.834	Open Manhole	1350
S1.013	54.689	31.0	SA14	70.960	69.349	1.236	Open Manhole	1350
S6.000	24.115	45.0	SA14-4	71.830	70.239	1.366	Open Manhole	1200
S6.001	31.951	99.8	SA14-3	71.400	69.927	1.248	Open Manhole	1200
S7.000	37.286	40.0	SA14-3	71.400	70.168	1.007	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)
S6.002	o	225	SA14-3	71.400	69.932	1.243	Open Manhole	1200
S8.000	o	225	SA14-2-1	73.500	71.280	1.995	Open Manhole	1200
S6.003	o	225	SA14-2	71.210	69.799	1.186	Open Manhole	1200
S6.004	o	225	SA14-1	71.100	69.643	1.232	Open Manhole	1200
S1.014	o	375	SA14	70.960	69.014	1.571	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.002	19.820	150.2	SA14-2	71.210	69.800	1.185	Open Manhole	1200
S8.000	59.270	40.0	SA14-2	71.210	69.798	1.187	Open Manhole	1200
S6.003	23.251	149.0	SA14-1	71.100	69.643	1.232	Open Manhole	1200
S6.004	71.756	149.8	SA14	70.960	69.164	1.571	Open Manhole	1350
S1.014	53.192	80.0	SA13	69.610	68.349	0.886	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)
S1.015	o	450	SA13	69.610	68.279	0.881	Open Manhole	1350
S1.016	o	450	SA12	69.010	67.830	0.730	Open Manhole	1350
S9.000	o	225	SA11-9	73.125	72.000	0.900	Open Manhole	1200
S9.001	o	225	SA11-8	72.737	71.612	0.900	Open Manhole	1200
S10.000	o	225	SA11-7-1	74.000	72.800	0.975	Open Manhole	1200
S9.002	o	225	SA11-7	73.390	71.441	1.724	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)
S1.015	44.877	100.0	SA12	69.010	67.830	0.730	Open Manhole	1350
S1.016	26.668	100.0	SA11	69.040	67.563	1.027	Open Manhole	1350
S9.000	23.266	60.0	SA11-8	72.737	71.612	0.900	Open Manhole	1200
S9.001	24.031	100.1	SA11-7	73.390	71.372	1.793	Open Manhole	1200
S10.000	26.476	60.0	SA11-7	73.390	72.359	0.806	Open Manhole	1200
S9.002	15.476	175.0	SA11-6	74.065	71.353	2.487	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)**
S9.003	o	225	SA11-6	74.065	71.277	2.563	Open Manhole	1200
S9.004	o	375	SA11-5	75.600	70.964	4.261	Open Manhole	1350
S11.000	o	225	SA11-4-3	76.600	75.000	1.375	Open Manhole	1200
S11.001	o	225	SA11-4-2	75.820	74.375	1.220	Open Manhole	1200
S11.002	o	225	SA11-4-1	75.800	74.149	1.426	Open Manhole	1200
S9.005	o	375	SA11-4	75.280	70.867	4.038	Open Manhole	1350
S9.006	o	375	SA11-3	74.210	70.747	3.088	Open Manhole	1350

Downstream Manhole

PN	**Length (m)**	**Slope (1:X)**	**MH Name**	**C.Level (m)**	**I.Level (m)**	**D.Depth (m)**	**MH Connection**	**MH DIAM., L*W (mm)**
S9.003	71.408	300.0	SA11-5	75.600	71.039	4.336	Open Manhole	1350
S9.004	33.908	349.6	SA11-4	75.280	70.867	4.038	Open Manhole	1350
S11.000	25.162	40.0	SA11-4-2	75.820	74.371	1.224	Open Manhole	1200
S11.001	22.635	100.0	SA11-4-1	75.800	74.149	1.426	Open Manhole	1200
S11.002	55.631	150.0	SA11-4	75.280	73.778	1.277	Open Manhole	1350
S9.005	29.819	249.0	SA11-3	74.210	70.747	3.088	Open Manhole	1350
S9.006	6.086	80.0	SA11-2	74.350	70.671	3.304	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)
S12.000	o	225	SA11-2-1	73.800	72.300	1.275	Open Manhole	1200
S9.007	o	375	SA11-2	74.350	70.672	3.303	Open Manhole	1350
S9.008	o	375	SA11-1	69.521	67.821	1.325	Open Manhole	1350
S1.017	o	450	SA11	69.040	67.415	1.175	Open Manhole	1350
S13.000	o	225	SA10-5	69.300	68.100	0.975	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)
S12.000	26.566	100.0	SA11-2	74.350	72.034	2.091	Open Manhole	1350
S9.007	86.965	31.0	SA11-1	69.521	67.867	1.279	Open Manhole	1350
S9.008	14.975	83.0	SA11	69.040	67.641	1.024	Open Manhole	1350
S1.017	15.185	200.0	SA10	68.800	67.339	1.011	Open Manhole	1500
S13.000	28.708	50.0	SA10-4	69.000	67.526	1.249	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)**
S14.000	o	225	SA10-4-1	69.300	68.100	0.975	Open Manhole	1200
S13.001	o	225	SA10-4	69.000	67.527	1.248	Open Manhole	1200
S13.002	o	300	SA10-3	69.420	67.240	1.880	Open Manhole	1200
S15.000	o	225	SA10-1-2	75.200	72.150	2.825	Open Manhole	1200
S15.001	o	225	SA10-1-1	71.900	70.325	1.350	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)**
S14.000	25.203	50.0	SA10-4	69.000	67.596	1.179	Open Manhole	1200
S13.001	41.512	145.1	SA10-3	69.420	67.241	1.954	Open Manhole	1200
S13.002	58.093	259.0	SA10-2	69.520	67.016	2.204	Open Manhole	1350
S15.000	54.325	30.0	SA10-1-1	71.900	70.339	1.336	Open Manhole	1200
S15.001	47.188	30.0	SA10-2	69.520	68.752	0.543	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)
S13.003	o	375	SA10-2	69.520	66.909	2.236	Open Manhole	1350
S16.000	o	375	SA10-C	69.100	66.900	1.825	Open Manhole	1350
S16.001	o	375	SA10-B	69.000	66.625	2.000	Open Manhole	1350
S13.004	o	600	SA10-1	68.960	66.542	1.818	Open Manhole	1500
S1.018	o	600	SA10	68.800	66.508	1.692	Open Manhole	1500
S1.019	o	600	SA9	69.850	66.192	3.058	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S13.003	42.328	299.0	SA10-1	68.960	66.767	1.818	Open Manhole	1500
S16.000	68.796	250.0	SA10-B	69.000	66.625	2.000	Open Manhole	1350
S16.001	5.026	250.0	SA10-1	68.960	66.605	1.980	Open Manhole	1500
S13.004	10.430	300.0	SA10	68.800	66.507	1.693	Open Manhole	1500
S1.018	47.347	150.0	SA9	69.850	66.192	3.058	Open Manhole	1500
S1.019	10.534	150.0	SA8	68.960	66.122	2.238	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.020	o	600	SA8	68.960	66.123	2.237	Open Manhole	1500
S17.000	o	225	SA7-4	69.210	67.400	1.585	Open Manhole	1200
S18.000	o	225	SA7-3-1	67.760	66.600	0.935	Open Manhole	1200
S17.001	o	225	SA7-3	67.950	66.167	1.558	Open Manhole	1200
S19.000	o	225	SA7-2-1	68.600	67.000	1.375	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)
S1.020	16.562	97.0	SA7	68.810	65.952	2.258	Open Manhole	1500
S17.000	59.498	80.0	SA7-3	67.950	66.656	1.069	Open Manhole	1200
S18.000	35.787	100.0	SA7-3	67.950	66.242	1.483	Open Manhole	1200
S17.001	41.273	299.0	SA7-2	68.690	66.029	2.436	Open Manhole	1200
S19.000	22.597	30.0	SA7-2	68.690	66.247	2.218	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)
S17.002	o	225	SA7-2	68.690	66.029	2.436	Open Manhole	1200
S20.000	o	375	SA-7-1-3	69.120	66.285	2.460	Open Manhole	1350
S20.001	o	375	SA-7-1-2	69.050	66.273	2.402	Open Manhole	1350
S20.002	o	375	SA-7-1-1	68.810	66.154	2.281	Open Manhole	1350
S17.003	o	600	SA-7-1	68.800	65.963	2.237	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S17.002	13.090	198.0	SA-7-1	68.800	65.963	2.612	Open Manhole	1500
S20.000	3.111	259.3	SA-7-1-2	69.050	66.273	2.402	Open Manhole	1350
S20.001	29.705	258.3	SA-7-1-1	68.810	66.158	2.277	Open Manhole	1350
S20.002	9.990	256.2	SA-7-1	68.800	66.115	2.310	Open Manhole	1500
S17.003	5.979	199.3	SA7	68.810	65.933	2.277	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.021	o	600	SA7	68.810	65.632	2.578	Open Manhole	1500
S21.000	o	225	SA6-1	68.100	66.300	1.575	Open Manhole	1200
S1.022	o	300	SA6	68.455	65.463	2.692	Open Manhole	1500
S1.023	o	300	SA5	68.340	65.376	2.664	Open Manhole	1200
S1.024	o	300	SA4	66.602	65.006	1.296	Open Manhole	1200
S1.025	o	300	SA3	66.020	64.090	1.630	Open Manhole	1200
S1.026	o	300	SA2	65.890	63.860	1.730	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)
S1.021	34.328	203.1	SA6	68.455	65.463	2.392	Open Manhole	1500
S21.000	27.242	106.0	SA6	68.455	66.043	2.187	Open Manhole	1500
S1.022	17.446	200.0	SA5	68.340	65.376	2.664	Open Manhole	1200
S1.023	88.797	240.0	SA4	66.602	65.006	1.296	Open Manhole	1200
S1.024	94.201	100.0	SA3	66.020	64.064	1.656	Open Manhole	1200
S1.025	22.762	100.0	SA2	65.890	63.862	1.728	Open Manhole	1200
S1.026	72.045	200.0	SA1	65.350	63.500	1.550	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.027	o	600	SA1	65.350	63.200	1.550	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.027	62.237	200.1	SA0	65.300	62.889	1.811	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.027	SA0	65.300	62.889	0.000	0	0

Simulation Criteria for Storm

```
Volumetric Runoff Coeff 0.750   Manhole Headloss Coeff (Global)   0.500                  Inlet Coeffiecient 0.800
 Areal Reduction Factor 1.000      Foul Sewage per hectare (l/s)   0.000 Flow per Person per Day (l/per/day) 0.000
       Hot Start (mins)      0 Additional Flow - % of Total Flow 20.000                       Run Time (mins)  2880
    Hot Start Level (mm)     0      MADD Factor * 10m³/ha Storage  2.000                Output Interval (mins)    24

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

Synthetic Rainfall Details

```
               Rainfall Model                   FSR    M5-60 (mm) 16.100          Cv (Summer) 0.750
        Return Period (years)                   100       Ratio R  0.250          Cv (Winter) 0.840
                    Region Scotland and Ireland Profile Type Summer Storm Duration (mins)  1440
```

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SA10, DS/PN: S1.018, Volume (m³): 8.8

Unit Reference	MD-SHE-0167-1520-1600-1520	Sump Available	Yes
Design Head (m)	1.600	Diameter (mm)	167
Design Flow (l/s)	15.2	Invert Level (m)	66.508
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1500
Application	Surface		

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.600	15.1	Kick-Flo®	1.013	12.2
Flush-Flo™	0.473	15.1	Mean Flow over Head Range	-	13.2

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)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	5.9	0.600	15.0	1.600	15.1	2.600	19.1	5.000	26.1	7.500	31.7
0.200	13.4	0.800	14.3	1.800	16.0	3.000	20.4	5.500	27.3	8.000	32.7
0.300	14.6	1.000	12.4	2.000	16.8	3.500	22.0	6.000	28.5	8.500	33.7
0.400	15.1	1.200	13.2	2.200	17.6	4.000	23.4	6.500	29.6	9.000	34.6
0.500	15.1	1.400	14.2	2.400	18.3	4.500	24.8	7.000	30.7	9.500	35.5

Hydro-Brake® Optimum Manhole: SA6, DS/PN: S1.022, Volume (m³): 15.6

Unit Reference	MD-SHE-0190-1830-1060-1830	Sump Available	Yes
Design Head (m)	1.060	Diameter (mm)	190
Design Flow (l/s)	18.3	Invert Level (m)	65.463
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1500
Application	Surface		

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.060	18.3	Kick-Flo®	0.746	15.5
Flush-Flo™	0.344	18.2	Mean Flow over Head Range	-	15.5

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)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	6.6	0.600	17.4	1.600	22.2	2.600	28.1	5.000	38.5	7.500	46.8
0.200	17.4	0.800	16.0	1.800	23.5	3.000	30.1	5.500	40.3	8.000	48.3
0.300	18.2	1.000	17.8	2.000	24.7	3.500	32.4	6.000	42.0	8.500	49.7
0.400	18.2	1.200	19.4	2.200	25.9	4.000	34.5	6.500	43.7	9.000	51.1
0.500	17.9	1.400	20.9	2.400	27.0	4.500	36.5	7.000	45.3	9.500	52.5

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SB 230419.sws

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	100	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	16.100	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.251	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	20	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

Time Area Diagram for SB 230419.sws

Time (mins)	**Area (ha)**	**Time (mins)**	**Area (ha)**	**Time (mins)**	**Area (ha)**
0-4	0.050	4-8	0.476	8-12	0.072

Total Area Contributing (ha) = 0.599

Total Pipe Volume (m³) = 25.226

Network Design Table for SB 230419.sws

Network Design Table for SB 230419.sws

- Indicates pipe length does not match coordinates
« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	38.556	0.482	80.0	0.075	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.001	37.126	0.464	80.0	0.075	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S1.002	77.923	0.917	85.0	0.075	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S1.003	44.874	0.309	145.0	0.075	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.004	45.331	0.453	100.0	0.075	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S2.000	2.693#	0.011	250.0	0.000	4.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S2.001	16.251#	0.065	250.0	0.000	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)
S1.000	50.00	4.44	74.400	0.075	0.0	0.0	2.0	1.46	58.2	12.2
S1.001	50.00	4.86	73.918	0.150	0.0	0.0	4.1	1.46	58.2	24.4
S1.002	50.00	5.78	73.454	0.225	0.0	0.0	6.1	1.42	56.4	36.6
S1.003	50.00	6.47	72.535	0.300	0.0	0.0	8.1	1.08	43.1«	48.7
S1.004	50.00	7.05	72.151	0.375	0.0	0.0	10.2	1.31	52.0«	60.9
S2.000	50.00	4.04	71.300	0.000	0.0	0.0	0.0	1.14	126.1	0.0
S2.001	50.00	4.28	71.289	0.000	0.0	0.0	0.0	1.14	126.1	0.0

Network Design Table for SB 230419.sws

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
S3.000	23.365	0.292	80.0	0.056	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S3.001	29.991	0.300	100.0	0.056	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S3.002	42.807	0.428	100.0	0.056	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S3.003	1.769	0.018	100.0	0.056	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S1.005	36.149	0.377	96.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.006	34.960	0.372	94.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.007	26.147	0.261	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.008	44.402	0.444	100.0	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)
S3.000	50.00	4.27	72.200	0.056	0.0	0.0	1.5	1.46	58.2	9.1
S3.001	50.00	4.65	71.908	0.112	0.0	0.0	3.0	1.31	52.0	18.2
S3.002	50.00	5.19	71.608	0.168	0.0	0.0	4.5	1.31	52.0	27.3
S3.003	50.00	5.22	71.180	0.224	0.0	0.0	6.1	1.31	52.0	36.4
S1.005	50.00	7.50	71.162	0.599	0.0	0.0	16.2	1.33	53.1«	97.3
S1.006	50.00	7.93	71.638	0.599	0.0	0.0	16.2	1.35	53.6«	97.3
S1.007	50.00	8.26	70.268	0.599	0.0	0.0	16.2	1.31	52.0«	97.3
S1.008	50.00	8.83	69.932	0.599	0.0	0.0	16.2	1.31	52.0«	97.3

Network Design Table for SB 230419.sws

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**
S1.009	85.942	2.096	41.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.010	12.486	0.083	150.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒

Network Results Table

PN	**Rain (mm/hr)**	**T.C. (mins)**	**US/IL (m)**	**Σ I.Area (ha)**	**Σ Base Flow (l/s)**	**Foul (l/s)**	**Add Flow (l/s)**	**Vel (m/s)**	**Cap (l/s)**	**Flow (l/s)**
S1.009	50.00	9.53	69.413	0.599	0.0	0.0	16.2	2.05	81.5«	97.3
S1.010	50.00	9.72	67.310	0.599	0.0	0.0	16.2	1.06	42.3«	97.3

Manhole Schedules for SB 230419.sws

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SB11	79.789	5.389	Open Manhole	1200	S1.000	74.400	225				
SB10	78.845	4.927	Open Manhole	1200	S1.001	73.918	225	S1.000	73.918	225	
SB9	78.694	5.240	Open Manhole	1200	S1.002	73.454	225	S1.001	73.454	225	
SB8	74.793	2.258	Open Manhole	1200	S1.003	72.535	225	S1.002	72.537	225	2
SB7	74.358	2.207	Open Manhole	1200	S1.004	72.151	225	S1.003	72.226	225	75
SB6-A	73.895	2.595	Open Manhole	1350	S2.000	71.300	375				
SB6	73.916	2.627	Open Manhole	1350	S2.001	71.289	375	S2.000	71.289	375	
SB6-4	73.610	1.410	Open Manhole	1200	S3.000	72.200	225				
SB6-3	74.536	2.628	Open Manhole	1200	S3.001	71.908	225	S3.000	71.908	225	
SB6-2	74.916	3.308	Open Manhole	1200	S3.002	71.608	225	S3.001	71.608	225	
SB6-1	73.930	2.750	Open Manhole	1200	S3.003	71.180	225	S3.002	71.180	225	
SSB6	73.916	2.754	Open Manhole	1350	S1.005	71.162	225	S1.004	71.698	225	536
								S2.001	71.224	375	212
								S3.003	71.162	225	
SB5	74.707	3.922	Open Manhole	1200	S1.006	71.638	225	S1.005	70.785	225	
SB4	74.443	4.175	Open Manhole	1200	S1.007	70.268	225	S1.006	71.266	225	998
SB3	73.480	3.548	Open Manhole	1200	S1.008	69.932	225	S1.007	70.007	225	75
SB2	71.847	2.434	Open Manhole	1200	S1.009	69.413	225	S1.008	69.488	225	75
SB1	68.530	1.220	Open Manhole	1200	S1.010	67.310	225	S1.009	67.317	225	7

Manhole Schedules for SB 230419.sws

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)
SB0	68.330	1.103	Open Manhole	1200		OUTFALL		S1.010	67.227	225	

PIPELINE SCHEDULES for SB 230419.sws

Upstream Manhole

- Indicates pipe length does not match coordinates

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	225	SB11	79.789	74.400	5.164	Open Manhole	1200
S1.001	o	225	SB10	78.845	73.918	4.702	Open Manhole	1200
S1.002	o	225	SB9	78.694	73.454	5.015	Open Manhole	1200
S1.003	o	225	SB8	74.793	72.535	2.033	Open Manhole	1200
S1.004	o	225	SB7	74.358	72.151	1.982	Open Manhole	1200
S2.000	o	375	SB6-A	73.895	71.300	2.220	Open Manhole	1350

Downstream Manhole

PN	**Length (m)**	**Slope (1:X)**	**MH Name**	**C.Level (m)**	**I.Level (m)**	**D.Depth (m)**	**MH Connection**	**MH DIAM., L*W (mm)**
S1.000	38.556	80.0	SB10	78.845	73.918	4.702	Open Manhole	1200
S1.001	37.126	80.0	SB9	78.694	73.454	5.015	Open Manhole	1200
S1.002	77.923	85.0	SB8	74.793	72.537	2.031	Open Manhole	1200
S1.003	44.874	145.0	SB7	74.358	72.226	1.907	Open Manhole	1200
S1.004	45.331	100.0	SSB6	73.916	71.698	1.993	Open Manhole	1350
S2.000	2.693#	250.0	SB6	73.916	71.289	2.252	Open Manhole	1350

PIPELINE SCHEDULES for SB 230419.sws

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)
S2.001	o	375	SB6	73.916	71.289	2.252	Open Manhole	1350
S3.000	o	225	SB6-4	73.610	72.200	1.185	Open Manhole	1200
S3.001	o	225	SB6-3	74.536	71.908	2.403	Open Manhole	1200
S3.002	o	225	SB6-2	74.916	71.608	3.083	Open Manhole	1200
S3.003	o	225	SB6-1	73.930	71.180	2.525	Open Manhole	1200
S1.005	o	225	SSB6	73.916	71.162	2.529	Open Manhole	1350
S1.006	o	225	SB5	74.707	71.638	2.844	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)
S2.001	16.251#	250.0	SSB6	73.916	71.224	2.317	Open Manhole	1350
S3.000	23.365	80.0	SB6-3	74.536	71.908	2.403	Open Manhole	1200
S3.001	29.991	100.0	SB6-2	74.916	71.608	3.083	Open Manhole	1200
S3.002	42.807	100.0	SB6-1	73.930	71.180	2.525	Open Manhole	1200
S3.003	1.769	100.0	SSB6	73.916	71.162	2.529	Open Manhole	1350
S1.005	36.149	96.0	SB5	74.707	70.785	3.697	Open Manhole	1200
S1.006	34.960	94.0	SB4	74.443	71.266	2.952	Open Manhole	1200

PIPELINE SCHEDULES for SB 230419.sws

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)
S1.007	o	225	SB4	74.443	70.268	3.950	Open Manhole	1200
S1.008	o	225	SB3	73.480	69.932	3.323	Open Manhole	1200
S1.009	o	225	SB2	71.847	69.413	2.209	Open Manhole	1200
S1.010	o	225	SB1	68.530	67.310	0.995	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)
S1.007	26.147	100.0	SB3	73.480	70.007	3.248	Open Manhole	1200
S1.008	44.402	100.0	SB2	71.847	69.488	2.134	Open Manhole	1200
S1.009	85.942	41.0	SB1	68.530	67.317	0.988	Open Manhole	1200
S1.010	12.486	150.4	SB0	68.330	67.227	0.878	Open Manhole	1200

Free Flowing Outfall Details for SB 230419.sws

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.010	SB0	68.330	67.227	0.000	1200	0

Simulation Criteria for SB 230419.sws

```
Volumetric Runoff Coeff 0.750   Manhole Headloss Coeff (Global)   0.500                 Inlet Coeffiecient 0.800
 Areal Reduction Factor 1.000     Foul Sewage per hectare (l/s)   0.000 Flow per Person per Day (l/per/day) 0.000
       Hot Start (mins)     0 Additional Flow - % of Total Flow 20.000                      Run Time (mins)  4320
   Hot Start Level (mm)     0     MADD Factor * 10m³/ha Storage  2.000               Output Interval (mins)    24

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

Synthetic Rainfall Details

```
          Rainfall Model                   FSR   M5-60 (mm) 16.100            Cv (Summer) 0.750
   Return Period (years)                     5      Ratio R  0.250            Cv (Winter) 0.840
                Region Scotland and Ireland Profile Type Summer Storm Duration (mins)   2160
```

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SB 230419.sws

```
                         Pipe Sizes STANDARD Manhole Sizes STANDARD

                          FSR Rainfall Model - Scotland and Ireland
           Return Period (years)    100          Foul Sewage (l/s/ha) 0.000          Maximum Backdrop Height (m) 1.500
                     M5-60 (mm) 16.100      Volumetric Runoff Coeff. 0.750 Min Design Depth for Optimisation (m) 1.200
                        Ratio R  0.251                      PIMP (%)   100     Min Vel for Auto Design only (m/s)  1.00
         Maximum Rainfall (mm/hr)    50 Add Flow / Climate Change (%)    20       Min Slope for Optimisation (1:X)   500
Maximum Time of Concentration (mins)  30   Minimum Backdrop Height (m) 0.200

                                  Designed with Level Soffits
```

Time Area Diagram for SB 230419.sws

Time (mins)	**Area (ha)**	**Time (mins)**	**Area (ha)**	**Time (mins)**	**Area (ha)**
0-4	0.050	4-8	0.476	8-12	0.072

Total Area Contributing (ha) = 0.599

Total Pipe Volume (m³) = 25.226

Network Design Table for SB 230419.sws

Network Design Table for SB 230419.sws

- Indicates pipe length does not match coordinates
« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	38.556	0.482	80.0	0.075	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.001	37.126	0.464	80.0	0.075	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S1.002	77.923	0.917	85.0	0.075	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S1.003	44.874	0.309	145.0	0.075	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.004	45.331	0.453	100.0	0.075	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S2.000	2.693#	0.011	250.0	0.000	4.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S2.001	16.251#	0.065	250.0	0.000	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)
S1.000	50.00	4.44	74.400	0.075	0.0	0.0	2.0	1.46	58.2	12.2
S1.001	50.00	4.86	73.918	0.150	0.0	0.0	4.1	1.46	58.2	24.4
S1.002	50.00	5.78	73.454	0.225	0.0	0.0	6.1	1.42	56.4	36.6
S1.003	50.00	6.47	72.535	0.300	0.0	0.0	8.1	1.08	43.1«	48.7
S1.004	50.00	7.05	72.151	0.375	0.0	0.0	10.2	1.31	52.0«	60.9
S2.000	50.00	4.04	71.300	0.000	0.0	0.0	0.0	1.14	126.1	0.0
S2.001	50.00	4.28	71.289	0.000	0.0	0.0	0.0	1.14	126.1	0.0

Network Design Table for SB 230419.sws

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
S3.000	23.365	0.292	80.0	0.056	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S3.001	29.991	0.300	100.0	0.056	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S3.002	42.807	0.428	100.0	0.056	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S3.003	1.769	0.018	100.0	0.056	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S1.005	36.149	0.377	96.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.006	34.960	0.372	94.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.007	26.147	0.261	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.008	44.402	0.444	100.0	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)
S3.000	50.00	4.27	72.200	0.056	0.0	0.0	1.5	1.46	58.2	9.1
S3.001	50.00	4.65	71.908	0.112	0.0	0.0	3.0	1.31	52.0	18.2
S3.002	50.00	5.19	71.608	0.168	0.0	0.0	4.5	1.31	52.0	27.3
S3.003	50.00	5.22	71.180	0.224	0.0	0.0	6.1	1.31	52.0	36.4
S1.005	50.00	7.50	71.162	0.599	0.0	0.0	16.2	1.33	53.1«	97.3
S1.006	50.00	7.93	71.638	0.599	0.0	0.0	16.2	1.35	53.6«	97.3
S1.007	50.00	8.26	70.268	0.599	0.0	0.0	16.2	1.31	52.0«	97.3
S1.008	50.00	8.83	69.932	0.599	0.0	0.0	16.2	1.31	52.0«	97.3

Network Design Table for SB 230419.sws

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
S1.009	85.942	2.096	41.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.010	12.486	0.083	150.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.009	50.00	9.53	69.413	0.599	0.0	0.0	16.2	2.05	81.5«	97.3
S1.010	50.00	9.72	67.310	0.599	0.0	0.0	16.2	1.06	42.3«	97.3

Manhole Schedules for SB 230419.sws

MH	MH	MH	MH	MH		Pipe Out			Pipes In		
Name	CL (m)	Depth (m)	Connection	Diam.,L*W (mm)	PN	Invert Level (m)	Diameter (mm)	PN	Invert Level (m)	Diameter (mm)	Backdrop (mm)
SB11	79.789	5.389	Open Manhole	1200	S1.000	74.400	225				
SB10	78.845	4.927	Open Manhole	1200	S1.001	73.918	225	S1.000	73.918	225	
SB9	78.694	5.240	Open Manhole	1200	S1.002	73.454	225	S1.001	73.454	225	
SB8	74.793	2.258	Open Manhole	1200	S1.003	72.535	225	S1.002	72.537	225	2
SB7	74.358	2.207	Open Manhole	1200	S1.004	72.151	225	S1.003	72.226	225	75
SB6-A	73.895	2.595	Open Manhole	1350	S2.000	71.300	375				
SB6	73.916	2.627	Open Manhole	1350	S2.001	71.289	375	S2.000	71.289	375	
SB6-4	73.610	1.410	Open Manhole	1200	S3.000	72.200	225				
SB6-3	74.536	2.628	Open Manhole	1200	S3.001	71.908	225	S3.000	71.908	225	
SB6-2	74.916	3.308	Open Manhole	1200	S3.002	71.608	225	S3.001	71.608	225	
SB6-1	73.930	2.750	Open Manhole	1200	S3.003	71.180	225	S3.002	71.180	225	
SSB6	73.916	2.754	Open Manhole	1350	S1.005	71.162	225	S1.004	71.698	225	536
								S2.001	71.224	375	212
								S3.003	71.162	225	
SB5	74.707	3.922	Open Manhole	1200	S1.006	71.638	225	S1.005	70.785	225	
SB4	74.443	4.175	Open Manhole	1200	S1.007	70.268	225	S1.006	71.266	225	998
SB3	73.480	3.548	Open Manhole	1200	S1.008	69.932	225	S1.007	70.007	225	75
SB2	71.847	2.434	Open Manhole	1200	S1.009	69.413	225	S1.008	69.488	225	75
SB1	68.530	1.220	Open Manhole	1200	S1.010	67.310	225	S1.009	67.317	225	7

Manhole Schedules for SB 230419.sws

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SB0	68.330	1.103	Open Manhole	1200		OUTFALL		S1.010	67.227	225	

PIPELINE SCHEDULES for SB 230419.sws

Upstream Manhole

- Indicates pipe length does not match coordinates

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	225	SB11	79.789	74.400	5.164	Open Manhole	1200
S1.001	o	225	SB10	78.845	73.918	4.702	Open Manhole	1200
S1.002	o	225	SB9	78.694	73.454	5.015	Open Manhole	1200
S1.003	o	225	SB8	74.793	72.535	2.033	Open Manhole	1200
S1.004	o	225	SB7	74.358	72.151	1.982	Open Manhole	1200
S2.000	o	375	SB6-A	73.895	71.300	2.220	Open Manhole	1350

Downstream Manhole

PN	**Length (m)**	**Slope (1:X)**	**MH Name**	**C.Level (m)**	**I.Level (m)**	**D.Depth (m)**	**MH Connection**	**MH DIAM., L*W (mm)**
S1.000	38.556	80.0	SB10	78.845	73.918	4.702	Open Manhole	1200
S1.001	37.126	80.0	SB9	78.694	73.454	5.015	Open Manhole	1200
S1.002	77.923	85.0	SB8	74.793	72.537	2.031	Open Manhole	1200
S1.003	44.874	145.0	SB7	74.358	72.226	1.907	Open Manhole	1200
S1.004	45.331	100.0	SSB6	73.916	71.698	1.993	Open Manhole	1350
S2.000	2.693#	250.0	SB6	73.916	71.289	2.252	Open Manhole	1350

PIPELINE SCHEDULES for SB 230419.sws

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)
S2.001	o	375	SB6	73.916	71.289	2.252	Open Manhole	1350
S3.000	o	225	SB6-4	73.610	72.200	1.185	Open Manhole	1200
S3.001	o	225	SB6-3	74.536	71.908	2.403	Open Manhole	1200
S3.002	o	225	SB6-2	74.916	71.608	3.083	Open Manhole	1200
S3.003	o	225	SB6-1	73.930	71.180	2.525	Open Manhole	1200
S1.005	o	225	SSB6	73.916	71.162	2.529	Open Manhole	1350
S1.006	o	225	SB5	74.707	71.638	2.844	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)
S2.001	16.251#	250.0	SSB6	73.916	71.224	2.317	Open Manhole	1350
S3.000	23.365	80.0	SB6-3	74.536	71.908	2.403	Open Manhole	1200
S3.001	29.991	100.0	SB6-2	74.916	71.608	3.083	Open Manhole	1200
S3.002	42.807	100.0	SB6-1	73.930	71.180	2.525	Open Manhole	1200
S3.003	1.769	100.0	SSB6	73.916	71.162	2.529	Open Manhole	1350
S1.005	36.149	96.0	SB5	74.707	70.785	3.697	Open Manhole	1200
S1.006	34.960	94.0	SB4	74.443	71.266	2.952	Open Manhole	1200

PIPELINE SCHEDULES for SB 230419.sws

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)
S1.007	o	225	SB4	74.443	70.268	3.950	Open Manhole	1200
S1.008	o	225	SB3	73.480	69.932	3.323	Open Manhole	1200
S1.009	o	225	SB2	71.847	69.413	2.209	Open Manhole	1200
S1.010	o	225	SB1	68.530	67.310	0.995	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)
S1.007	26.147	100.0	SB3	73.480	70.007	3.248	Open Manhole	1200
S1.008	44.402	100.0	SB2	71.847	69.488	2.134	Open Manhole	1200
S1.009	85.942	41.0	SB1	68.530	67.317	0.988	Open Manhole	1200
S1.010	12.486	150.4	SB0	68.330	67.227	0.878	Open Manhole	1200

Free Flowing Outfall Details for SB 230419.sws

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.010	SB0	68.330	67.227	0.000	1200	0

Simulation Criteria for SB 230419.sws

```
Volumetric Runoff Coeff 0.750   Manhole Headloss Coeff (Global)  0.500                 Inlet Coeffiecient 0.800
   Areal Reduction Factor 1.000     Foul Sewage per hectare (l/s)  0.000 Flow per Person per Day (l/per/day) 0.000
          Hot Start (mins)     0 Additional Flow - % of Total Flow 20.000                      Run Time (mins)  4320
     Hot Start Level (mm)     0     MADD Factor * 10m³/ha Storage  2.000               Output Interval (mins)    24

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

Synthetic Rainfall Details

```
      Rainfall Model                  FSR   M5-60 (mm) 16.100            Cv (Summer) 0.750
Return Period (years)                 100      Ratio R  0.250            Cv (Winter) 0.840
             Region Scotland and Ireland Profile Type Summer Storm Duration (mins)   2160
```

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SC.sws

```
                        Pipe Sizes STANDARD Manhole Sizes STANDARD

                          FSR Rainfall Model - England and Wales
           Return Period (years)     100         Foul Sewage (l/s/ha) 0.000          Maximum Backdrop Height (m) 1.500
                      M5-60 (mm)  16.100    Volumetric Runoff Coeff. 0.750 Min Design Depth for Optimisation (m) 1.200
                         Ratio R   0.251                    PIMP (%)   100     Min Vel for Auto Design only (m/s)  1.00
          Maximum Rainfall (mm/hr)    50 Add Flow / Climate Change (%)    20       Min Slope for Optimisation (1:X)   500
Maximum Time of Concentration (mins)  30   Minimum Backdrop Height (m) 0.200

                                Designed with Level Soffits
```

Time Area Diagram for SC.sws

Time (mins)	**Area (ha)**	**Time (mins)**	**Area (ha)**
0-4	0.490	4-8	0.308

Total Area Contributing (ha) = 0.798

Total Pipe Volume (m³) = 23.042

Network Design Table for SC.sws

Network Design Table for SC.sws

\# - Indicates pipe length does not match coordinates
« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	25.356	0.471	53.8	0.150	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S1.001	29.542	0.492	60.0	0.150	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S1.002	17.064	0.280	61.0	0.150	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S2.000	37.263	1.096	34.0	0.020	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S2.001	50.050	0.501	100.0	0.020	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S1.003	8.546	0.372	23.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.24	73.500	0.150	0.0	0.0	4.1	1.79	71.0	24.4
S1.001	50.00	4.53	73.029	0.300	0.0	0.0	8.1	1.69	67.2	48.7
S1.002	50.00	4.70	72.537	0.450	0.0	0.0	12.2	1.68	66.7«	73.1
S2.000	50.00	4.28	73.375	0.020	0.0	0.0	0.5	2.25	89.5	3.2
S2.001	50.00	4.91	72.275	0.040	0.0	0.0	1.1	1.31	52.0	6.5
S1.003	50.00	4.97	71.739	0.490	0.0	0.0	13.3	2.74	109.0	79.6

Network Design Table for SC.sws

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
S3.000	2.811	0.005	562.2	0.000	4.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S3.001	35.854#	0.065	550.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S3.002	8.577	0.034	250.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S1.004	7.700	0.060	128.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.005	19.195	0.087	220.0	0.018	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.006	10.468	0.048	220.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.007	23.437	0.107	220.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.008	11.826	0.054	220.0	0.000	0.00	0.0	0.600	o	300	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)
S3.000	50.00	4.06	71.435	0.000	0.0	0.0	0.0	0.76	83.6	0.0
S3.001	50.00	4.84	71.430	0.000	0.0	0.0	0.0	0.77	84.6	0.0
S3.002	50.00	4.97	71.365	0.000	0.0	0.0	0.0	1.14	126.1	0.0
S1.004	50.00	5.06	71.360	0.490	0.0	0.0	13.3	1.39	98.1	79.6
S1.005	50.00	5.36	71.300	0.508	0.0	0.0	13.8	1.06	74.6«	82.5
S1.006	50.00	5.53	71.213	0.508	0.0	0.0	13.8	1.06	74.6«	82.5
S1.007	50.00	5.90	71.007	0.508	0.0	0.0	13.8	1.06	74.6«	82.5
S1.008	50.00	6.08	70.900	0.508	0.0	0.0	13.8	1.06	74.6«	82.5

Network Design Table for SC.sws

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.000	40.001	1.212	33.0	0.238	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S4.001	48.769	0.975	50.0	0.052	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S4.002	3.094	0.012	250.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔓
S4.003	17.900	0.072	250.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔓
S4.004	2.679	0.011	250.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔓
S1.009	11.525	0.115	100.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.000	50.00	4.29	73.940	0.238	0.0	0.0	6.4	2.29	90.9	38.7
S4.001	50.00	4.73	72.724	0.290	0.0	0.0	7.9	1.85	73.7	47.1
S4.002	50.00	4.78	71.674	0.290	0.0	0.0	7.9	0.99	70.0	47.1
S4.003	50.00	5.08	71.661	0.290	0.0	0.0	7.9	0.99	70.0	47.1
S4.004	50.00	5.13	71.590	0.290	0.0	0.0	7.9	0.99	70.0	47.1
S1.009	50.00	6.21	70.846	0.798	0.0	0.0	21.6	1.57	111.1«	129.7

Manhole Schedules for SC.sws

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)**
SC10	74.900	1.400	Open Manhole	1200	S1.000	73.500	225				
SC9	74.700	1.671	Open Manhole	1200	S1.001	73.029	225	S1.000	73.029	225	
SC8	74.000	1.463	Open Manhole	1200	S1.002	72.537	225	S1.001	72.537	225	
SC7-2	74.910	1.535	Open Manhole	1200	S2.000	73.375	225				
SC7-1	73.700	1.425	Open Manhole	1200	S2.001	72.275	225	S2.000	72.279	225	4
SC7	72.920	1.181	Open Manhole	1200	S1.003	71.739	225	S1.002	72.257	225	518
								S2.001	71.775	225	35
SC6-3	72.880	1.445	Open Manhole	1350	S3.000	71.435	375				
SC6-2	72.800	1.370	Open Manhole	1350	S3.001	71.430	375	S3.000	71.430	375	
SC6-1	72.660	1.295	Open Manhole	1350	S3.002	71.365	375	S3.001	71.365	375	
SC6	72.630	1.299	Open Manhole	1350	S1.004	71.360	300	S1.003	71.367	225	
								S3.002	71.331	375	
SC5	72.500	1.200	Open Manhole	1200	S1.005	71.300	300	S1.004	71.300	300	
SC4	72.400	1.187	Open Manhole	1200	S1.006	71.213	300	S1.005	71.213	300	
SC3	72.800	1.793	Open Manhole	1200	S1.007	71.007	300	S1.006	71.165	300	158
SC2	72.700	1.800	Open Manhole	1200	S1.008	70.900	300	S1.007	70.900	300	
SC1-5	75.420	1.480	Open Manhole	1200	S4.000	73.940	225				
SC1-4	74.149	1.425	Open Manhole	1200	S4.001	72.724	225	S4.000	72.728	225	4
SC1-3	73.500	1.826	Open Manhole	1200	S4.002	71.674	300	S4.001	71.749	225	

Manhole Schedules for SC.sws

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)
SC1-2	72.400	0.739	Open Manhole	1200	S4.003	71.661	300	S4.002	71.661	300	
SC1-1	72.300	0.710	Open Manhole	1200	S4.004	71.590	300	S4.003	71.590	300	
SC1	72.200	1.354	Open Manhole	1200	S1.009	70.846	300	S1.008	70.846	300	
								S4.004	71.579	300	733
SC0	72.320	1.589	Open Manhole	1200		OUTFALL		S1.009	70.731	300	

PIPELINE SCHEDULES for SC.sws

Upstream Manhole

- Indicates pipe length does not match coordinates

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	225	SC10	74.900	73.500	1.175	Open Manhole	1200
S1.001	o	225	SC9	74.700	73.029	1.446	Open Manhole	1200
S1.002	o	225	SC8	74.000	72.537	1.238	Open Manhole	1200
S2.000	o	225	SC7-2	74.910	73.375	1.310	Open Manhole	1200
S2.001	o	225	SC7-1	73.700	72.275	1.200	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	25.356	53.8	SC9	74.700	73.029	1.446	Open Manhole	1200
S1.001	29.542	60.0	SC8	74.000	72.537	1.238	Open Manhole	1200
S1.002	17.064	61.0	SC7	72.920	72.257	0.438	Open Manhole	1200
S2.000	37.263	34.0	SC7-1	73.700	72.279	1.196	Open Manhole	1200
S2.001	50.050	100.0	SC7	72.920	71.775	0.920	Open Manhole	1200

PIPELINE SCHEDULES for SC.sws

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)
S1.003	o	225	SC7	72.920	71.739	0.956	Open Manhole	1200
S3.000	o	375	SC6-3	72.880	71.435	1.070	Open Manhole	1350
S3.001	o	375	SC6-2	72.800	71.430	0.995	Open Manhole	1350
S3.002	o	375	SC6-1	72.660	71.365	0.920	Open Manhole	1350
S1.004	o	300	SC6	72.630	71.360	0.970	Open Manhole	1350
S1.005	o	300	SC5	72.500	71.300	0.900	Open Manhole	1200
S1.006	o	300	SC4	72.400	71.213	0.887	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)
S1.003	8.546	23.0	SC6	72.630	71.367	1.038	Open Manhole	1350
S3.000	2.811	562.2	SC6-2	72.800	71.430	0.995	Open Manhole	1350
S3.001	35.854#	550.0	SC6-1	72.660	71.365	0.920	Open Manhole	1350
S3.002	8.577	250.0	SC6	72.630	71.331	0.924	Open Manhole	1350
S1.004	7.700	128.0	SC5	72.500	71.300	0.900	Open Manhole	1200
S1.005	19.195	220.0	SC4	72.400	71.213	0.887	Open Manhole	1200
S1.006	10.468	220.0	SC3	72.800	71.165	1.335	Open Manhole	1200

PIPELINE SCHEDULES for SC.sws

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)
S1.007	o	300	SC3	72.800	71.007	1.493	Open Manhole	1200
S1.008	o	300	SC2	72.700	70.900	1.500	Open Manhole	1200
S4.000	o	225	SC1-5	75.420	73.940	1.255	Open Manhole	1200
S4.001	o	225	SC1-4	74.149	72.724	1.200	Open Manhole	1200
S4.002	o	300	SC1-3	73.500	71.674	1.526	Open Manhole	1200
S4.003	o	300	SC1-2	72.400	71.661	0.439	Open Manhole	1200
S4.004	o	300	SC1-1	72.300	71.590	0.410	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)
S1.007	23.437	220.0	SC2	72.700	70.900	1.500	Open Manhole	1200
S1.008	11.826	220.0	SC1	72.200	70.846	1.054	Open Manhole	1200
S4.000	40.001	33.0	SC1-4	74.149	72.728	1.196	Open Manhole	1200
S4.001	48.769	50.0	SC1-3	73.500	71.749	1.526	Open Manhole	1200
S4.002	3.094	250.0	SC1-2	72.400	71.661	0.439	Open Manhole	1200
S4.003	17.900	250.0	SC1-1	72.300	71.590	0.410	Open Manhole	1200
S4.004	2.679	250.0	SC1	72.200	71.579	0.321	Open Manhole	1200

PIPELINE SCHEDULES for SC.sws

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)
S1.009	o	300	SC1	72.200	70.846	1.054	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)
S1.009	11.525	100.0	SC0	72.320	70.731	1.289	Open Manhole	1200

Free Flowing Outfall Details for SC.sws

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.009	SC0	72.320	70.731	70.740	1200	0

Simulation Criteria for SC.sws

```
Volumetric Runoff Coeff 0.750   Manhole Headloss Coeff (Global)   0.500                  Inlet Coeffiecient 0.800
 Areal Reduction Factor 1.000      Foul Sewage per hectare (l/s)   0.000 Flow per Person per Day (l/per/day) 0.000
         Hot Start (mins)     0 Additional Flow - % of Total Flow 20.000                      Run Time (mins)     60
     Hot Start Level (mm)     0      MADD Factor * 10m³/ha Storage  2.000                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   M5-60 (mm) 16.100           Cv (Summer) 0.750
         Return Period (years)                      5      Ratio R  0.250           Cv (Winter) 0.840
                       Region Scotland and Ireland Profile Type Summer Storm Duration (mins)    30
```

Online Controls for SC.sws

Hydro-Brake® Optimum Manhole: SC6, DS/PN: S1.004, Volume (m^3): 2.9

Unit Reference	MD-SHE-0066-2000-1060-2000	Sump Available	Yes
Design Head (m)	1.060	Diameter (mm)	66
Design Flow (l/s)	2.0	Invert Level (m)	71.360
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.060	2.0	Kick-Flo®	0.589	1.5
Flush-Flo™	0.291	1.9	Mean Flow over Head Range	-	1.7

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)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	1.6	0.600	1.5	1.600	2.4	2.600	3.0	5.000	4.1	7.500	4.9
0.200	1.8	0.800	1.8	1.800	2.5	3.000	3.2	5.500	4.3	8.000	5.1
0.300	1.9	1.000	1.9	2.000	2.7	3.500	3.5	6.000	4.4	8.500	5.2
0.400	1.9	1.200	2.1	2.200	2.8	4.000	3.7	6.500	4.6	9.000	5.4
0.500	1.8	1.400	2.3	2.400	2.9	4.500	3.9	7.000	4.8	9.500	5.5

Hydro-Brake® Optimum Manhole: SC1-1, DS/PN: S4.004, Volume (m³): 2.0

Unit Reference	MD-SHE-0066-2000-1060-2000	Sump Available	Yes
Design Head (m)	1.060	Diameter (mm)	66
Design Flow (l/s)	2.0	Invert Level (m)	71.590
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.060	2.0	Kick-Flo®	0.589	1.5
Flush-Flo™	0.291	1.9	Mean Flow over Head Range	-	1.7

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)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	1.6	0.600	1.5	1.600	2.4	2.600	3.0	5.000	4.1	7.500	4.9
0.200	1.8	0.800	1.8	1.800	2.5	3.000	3.2	5.500	4.3	8.000	5.1
0.300	1.9	1.000	1.9	2.000	2.7	3.500	3.5	6.000	4.4	8.500	5.2
0.400	1.9	1.200	2.1	2.200	2.8	4.000	3.7	6.500	4.6	9.000	5.4
0.500	1.8	1.400	2.3	2.400	2.9	4.500	3.9	7.000	4.8	9.500	5.5

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SC.sws

```
                    Pipe Sizes STANDARD Manhole Sizes STANDARD

                      FSR Rainfall Model - England and Wales
           Return Period (years)    100         Foul Sewage (l/s/ha) 0.000          Maximum Backdrop Height (m) 1.500
                     M5-60 (mm) 16.100     Volumetric Runoff Coeff. 0.750 Min Design Depth for Optimisation (m) 1.200
                        Ratio R  0.251                     PIMP (%)   100     Min Vel for Auto Design only (m/s)  1.00
         Maximum Rainfall (mm/hr)    50 Add Flow / Climate Change (%)    20      Min Slope for Optimisation (1:X)   500
Maximum Time of Concentration (mins)  30   Minimum Backdrop Height (m) 0.200

                           Designed with Level Soffits
```

Time Area Diagram for SC.sws

Time (mins)	**Area (ha)**	**Time (mins)**	**Area (ha)**
0-4	0.490	4-8	0.308

Total Area Contributing (ha) = 0.798

Total Pipe Volume (m³) = 23.042

Network Design Table for SC.sws

Network Design Table for SC.sws

- Indicates pipe length does not match coordinates
« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	25.356	0.471	53.8	0.150	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S1.001	29.542	0.492	60.0	0.150	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S1.002	17.064	0.280	61.0	0.150	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S2.000	37.263	1.096	34.0	0.020	4.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S2.001	50.050	0.501	100.0	0.020	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S1.003	8.546	0.372	23.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.24	73.500	0.150	0.0	0.0	4.1	1.79	71.0	24.4
S1.001	50.00	4.53	73.029	0.300	0.0	0.0	8.1	1.69	67.2	48.7
S1.002	50.00	4.70	72.537	0.450	0.0	0.0	12.2	1.68	66.7«	73.1
S2.000	50.00	4.28	73.375	0.020	0.0	0.0	0.5	2.25	89.5	3.2
S2.001	50.00	4.91	72.275	0.040	0.0	0.0	1.1	1.31	52.0	6.5
S1.003	50.00	4.97	71.739	0.490	0.0	0.0	13.3	2.74	109.0	79.6

Network Design Table for SC.sws

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
S3.000	2.811	0.005	562.2	0.000	4.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S3.001	35.854#	0.065	550.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S3.002	8.577	0.034	250.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔓
S1.004	7.700	0.060	128.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.005	19.195	0.087	220.0	0.018	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.006	10.468	0.048	220.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.007	23.437	0.107	220.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.008	11.826	0.054	220.0	0.000	0.00	0.0	0.600	o	300	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)
S3.000	50.00	4.06	71.435	0.000	0.0	0.0	0.0	0.76	83.6	0.0
S3.001	50.00	4.84	71.430	0.000	0.0	0.0	0.0	0.77	84.6	0.0
S3.002	50.00	4.97	71.365	0.000	0.0	0.0	0.0	1.14	126.1	0.0
S1.004	50.00	5.06	71.360	0.490	0.0	0.0	13.3	1.39	98.1	79.6
S1.005	50.00	5.36	71.300	0.508	0.0	0.0	13.8	1.06	74.6«	82.5
S1.006	50.00	5.53	71.213	0.508	0.0	0.0	13.8	1.06	74.6«	82.5
S1.007	50.00	5.90	71.007	0.508	0.0	0.0	13.8	1.06	74.6«	82.5
S1.008	50.00	6.08	70.900	0.508	0.0	0.0	13.8	1.06	74.6«	82.5

Network Design Table for SC.sws

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.000	40.001	1.212	33.0	0.238	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S4.001	48.769	0.975	50.0	0.052	0.00	0.0	0.600	o	225	Pipe/Conduit	🔓
S4.002	3.094	0.012	250.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔓
S4.003	17.900	0.072	250.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔓
S4.004	2.679	0.011	250.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔓
S1.009	11.525	0.115	100.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.000	50.00	4.29	73.940	0.238	0.0	0.0	6.4	2.29	90.9	38.7
S4.001	50.00	4.73	72.724	0.290	0.0	0.0	7.9	1.85	73.7	47.1
S4.002	50.00	4.78	71.674	0.290	0.0	0.0	7.9	0.99	70.0	47.1
S4.003	50.00	5.08	71.661	0.290	0.0	0.0	7.9	0.99	70.0	47.1
S4.004	50.00	5.13	71.590	0.290	0.0	0.0	7.9	0.99	70.0	47.1
S1.009	50.00	6.21	70.846	0.798	0.0	0.0	21.6	1.57	111.1«	129.7

Manhole Schedules for SC.sws

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out			Pipes In			Backdrop (mm)
					PN	Invert Level (m)	Diameter (mm)	PN	Invert Level (m)	Diameter (mm)	
SC10	74.900	1.400	Open Manhole	1200	S1.000	73.500	225				
SC9	74.700	1.671	Open Manhole	1200	S1.001	73.029	225	S1.000	73.029	225	
SC8	74.000	1.463	Open Manhole	1200	S1.002	72.537	225	S1.001	72.537	225	
SC7-2	74.910	1.535	Open Manhole	1200	S2.000	73.375	225				
SC7-1	73.700	1.425	Open Manhole	1200	S2.001	72.275	225	S2.000	72.279	225	4
SC7	72.920	1.181	Open Manhole	1200	S1.003	71.739	225	S1.002	72.257	225	518
								S2.001	71.775	225	35
SC6-3	72.880	1.445	Open Manhole	1350	S3.000	71.435	375				
SC6-2	72.800	1.370	Open Manhole	1350	S3.001	71.430	375	S3.000	71.430	375	
SC6-1	72.660	1.295	Open Manhole	1350	S3.002	71.365	375	S3.001	71.365	375	
SC6	72.630	1.299	Open Manhole	1350	S1.004	71.360	300	S1.003	71.367	225	
								S3.002	71.331	375	
SC5	72.500	1.200	Open Manhole	1200	S1.005	71.300	300	S1.004	71.300	300	
SC4	72.400	1.187	Open Manhole	1200	S1.006	71.213	300	S1.005	71.213	300	
SC3	72.800	1.793	Open Manhole	1200	S1.007	71.007	300	S1.006	71.165	300	158
SC2	72.700	1.800	Open Manhole	1200	S1.008	70.900	300	S1.007	70.900	300	
SC1-5	75.420	1.480	Open Manhole	1200	S4.000	73.940	225				
SC1-4	74.149	1.425	Open Manhole	1200	S4.001	72.724	225	S4.000	72.728	225	4
SC1-3	73.500	1.826	Open Manhole	1200	S4.002	71.674	300	S4.001	71.749	225	

Manhole Schedules for SC.sws

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)**
SC1-2	72.400	0.739	Open Manhole	1200	S4.003	71.661	300	S4.002	71.661	300	
SC1-1	72.300	0.710	Open Manhole	1200	S4.004	71.590	300	S4.003	71.590	300	
SC1	72.200	1.354	Open Manhole	1200	S1.009	70.846	300	S1.008	70.846	300	
								S4.004	71.579	300	733
SC0	72.320	1.589	Open Manhole	1200		OUTFALL		S1.009	70.731	300	

PIPELINE SCHEDULES for SC.sws

Upstream Manhole

- Indicates pipe length does not match coordinates

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	225	SC10	74.900	73.500	1.175	Open Manhole	1200
S1.001	o	225	SC9	74.700	73.029	1.446	Open Manhole	1200
S1.002	o	225	SC8	74.000	72.537	1.238	Open Manhole	1200
S2.000	o	225	SC7-2	74.910	73.375	1.310	Open Manhole	1200
S2.001	o	225	SC7-1	73.700	72.275	1.200	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	25.356	53.8	SC9	74.700	73.029	1.446	Open Manhole	1200
S1.001	29.542	60.0	SC8	74.000	72.537	1.238	Open Manhole	1200
S1.002	17.064	61.0	SC7	72.920	72.257	0.438	Open Manhole	1200
S2.000	37.263	34.0	SC7-1	73.700	72.279	1.196	Open Manhole	1200
S2.001	50.050	100.0	SC7	72.920	71.775	0.920	Open Manhole	1200

PIPELINE SCHEDULES for SC.sws

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)
S1.003	o	225	SC7	72.920	71.739	0.956	Open Manhole	1200
S3.000	o	375	SC6-3	72.880	71.435	1.070	Open Manhole	1350
S3.001	o	375	SC6-2	72.800	71.430	0.995	Open Manhole	1350
S3.002	o	375	SC6-1	72.660	71.365	0.920	Open Manhole	1350
S1.004	o	300	SC6	72.630	71.360	0.970	Open Manhole	1350
S1.005	o	300	SC5	72.500	71.300	0.900	Open Manhole	1200
S1.006	o	300	SC4	72.400	71.213	0.887	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)
S1.003	8.546	23.0	SC6	72.630	71.367	1.038	Open Manhole	1350
S3.000	2.811	562.2	SC6-2	72.800	71.430	0.995	Open Manhole	1350
S3.001	35.854#	550.0	SC6-1	72.660	71.365	0.920	Open Manhole	1350
S3.002	8.577	250.0	SC6	72.630	71.331	0.924	Open Manhole	1350
S1.004	7.700	128.0	SC5	72.500	71.300	0.900	Open Manhole	1200
S1.005	19.195	220.0	SC4	72.400	71.213	0.887	Open Manhole	1200
S1.006	10.468	220.0	SC3	72.800	71.165	1.335	Open Manhole	1200

PIPELINE SCHEDULES for SC.sws

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)
S1.007	o	300	SC3	72.800	71.007	1.493	Open Manhole	1200
S1.008	o	300	SC2	72.700	70.900	1.500	Open Manhole	1200
S4.000	o	225	SC1-5	75.420	73.940	1.255	Open Manhole	1200
S4.001	o	225	SC1-4	74.149	72.724	1.200	Open Manhole	1200
S4.002	o	300	SC1-3	73.500	71.674	1.526	Open Manhole	1200
S4.003	o	300	SC1-2	72.400	71.661	0.439	Open Manhole	1200
S4.004	o	300	SC1-1	72.300	71.590	0.410	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)
S1.007	23.437	220.0	SC2	72.700	70.900	1.500	Open Manhole	1200
S1.008	11.826	220.0	SC1	72.200	70.846	1.054	Open Manhole	1200
S4.000	40.001	33.0	SC1-4	74.149	72.728	1.196	Open Manhole	1200
S4.001	48.769	50.0	SC1-3	73.500	71.749	1.526	Open Manhole	1200
S4.002	3.094	250.0	SC1-2	72.400	71.661	0.439	Open Manhole	1200
S4.003	17.900	250.0	SC1-1	72.300	71.590	0.410	Open Manhole	1200
S4.004	2.679	250.0	SC1	72.200	71.579	0.321	Open Manhole	1200

PIPELINE SCHEDULES for SC.sws

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)
S1.009	o	300	SC1	72.200	70.846	1.054	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)
S1.009	11.525	100.0	SC0	72.320	70.731	1.289	Open Manhole	1200

Free Flowing Outfall Details for SC.sws

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.009	SC0	72.320	70.731	70.740	1200	0

Simulation Criteria for SC.sws

```
Volumetric Runoff Coeff 0.750   Manhole Headloss Coeff (Global)   0.500                   Inlet Coeffiecient 0.800
 Areal Reduction Factor 1.000      Foul Sewage per hectare (l/s)   0.000 Flow per Person per Day (l/per/day) 0.000
       Hot Start (mins)      0 Additional Flow - % of Total Flow 20.000                       Run Time (mins)     60
   Hot Start Level (mm)      0      MADD Factor * 10m³/ha Storage   2.000                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    M5-60 (mm) 16.100            Cv (Summer) 0.750
  Return Period (years)                   100       Ratio R  0.250            Cv (Winter) 0.840
                Region Scotland and Ireland Profile Type Summer Storm Duration (mins)    30
```

Online Controls for SC.sws

Hydro-Brake® Optimum Manhole: SC6, DS/PN: S1.004, Volume (m³): 2.9

Unit Reference	MD-SHE-0066-2000-1060-2000	Sump Available	Yes
Design Head (m)	1.060	Diameter (mm)	66
Design Flow (l/s)	2.0	Invert Level (m)	71.360
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.060	2.0	Kick-Flo®	0.589	1.5
Flush-Flo™	0.291	1.9	Mean Flow over Head Range	-	1.7

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)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	1.6	0.600	1.5	1.600	2.4	2.600	3.0	5.000	4.1	7.500	4.9
0.200	1.8	0.800	1.8	1.800	2.5	3.000	3.2	5.500	4.3	8.000	5.1
0.300	1.9	1.000	1.9	2.000	2.7	3.500	3.5	6.000	4.4	8.500	5.2
0.400	1.9	1.200	2.1	2.200	2.8	4.000	3.7	6.500	4.6	9.000	5.4
0.500	1.8	1.400	2.3	2.400	2.9	4.500	3.9	7.000	4.8	9.500	5.5

Hydro-Brake® Optimum Manhole: SC1-1, DS/PN: S4.004, Volume (m³): 2.0

Unit Reference	MD-SHE-0066-2000-1060-2000	Sump Available	Yes
Design Head (m)	1.060	Diameter (mm)	66
Design Flow (l/s)	2.0	Invert Level (m)	71.590
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.060	2.0	Kick-Flo®	0.589	1.5
Flush-Flo™	0.291	1.9	Mean Flow over Head Range	-	1.7

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)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	1.6	0.600	1.5	1.600	2.4	2.600	3.0	5.000	4.1	7.500	4.9
0.200	1.8	0.800	1.8	1.800	2.5	3.000	3.2	5.500	4.3	8.000	5.1
0.300	1.9	1.000	1.9	2.000	2.7	3.500	3.5	6.000	4.4	8.500	5.2
0.400	1.9	1.200	2.1	2.200	2.8	4.000	3.7	6.500	4.6	9.000	5.4
0.500	1.8	1.400	2.3	2.400	2.9	4.500	3.9	7.000	4.8	9.500	5.5

APPENDIX H – FOUL DRAINAGE NETWORK CALCULATION

FOUL SEWERAGE DESIGN

Design Criteria for FA.fws

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00
Industrial Peak Flow Factor	0.00
Calculation Method	BS 8301
Frequency Factor	0.50
Domestic (l/s/ha)	0.00
Domestic Peak Flow Factor	6.00
Add Flow / Climate Change (%)	20
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	0.75
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for FA.fws

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	26.492	0.265	100.0	0.000	28.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.001	26.769	0.268	100.0	0.000	14.0	0.0	0.600	o	225	Pipe/Conduit	🔓
2.000	25.339	0.253	100.0	0.000	28.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.002	14.172	0.142	100.0	0.000	28.0	0.0	0.600	o	225	Pipe/Conduit	🔒
1.003	42.239	0.422	100.0	0.000	140.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.004	30.159	0.251	120.0	0.000	42.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.005	30.207	0.252	120.0	0.000	84.0	0.0	0.600	o	225	Pipe/Conduit	🔒
3.000	23.109	0.462	50.0	0.000	28.0	0.0	0.600	o	225	Pipe/Conduit	🔓

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	72.100	0.000	0.0	28.0	0.6	40	0.75	1.31	52.0	3.6
1.001	71.835	0.000	0.0	42.0	0.7	42	0.77	1.31	52.0	3.9
2.000	72.500	0.000	0.0	28.0	0.6	40	0.75	1.31	52.0	3.6
1.002	71.567	0.000	0.0	98.0	0.8	45	0.82	1.31	52.0	4.7
1.003	71.425	0.000	0.0	238.0	1.0	51	0.87	1.31	52.0	5.9
1.004	71.003	0.000	0.0	280.0	1.0	54	0.83	1.19	47.4	6.1
1.005	70.752	0.000	0.0	364.0	1.1	57	0.84	1.19	47.4	6.6
3.000	74.800	0.000	0.0	28.0	0.6	34	0.97	1.85	73.7	3.6

Network Design Table for FA.fws

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
3.001	21.203	0.353	60.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔒
3.002	58.494	0.975	60.0	0.000	126.0	0.0	0.600	o	225	Pipe/Conduit	🔒
1.006	32.391	0.270	120.0	0.000	84.0	0.0	0.600	o	225	Pipe/Conduit	🔒
4.000	29.548	0.492	60.1	0.000	70.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.007	50.432	1.009	50.0	0.000	70.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.008	38.220	1.274	30.0	0.000	84.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.009	13.152	0.598	22.0	0.000	14.0	0.0	0.600	o	225	Pipe/Conduit	🔒
5.000	38.999	0.650	60.0	0.000	56.0	0.0	0.600	o	225	Pipe/Conduit	🔓
5.001	9.197	0.153	60.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
5.002	76.463	1.699	45.0	0.000	84.0	0.0	0.600	o	225	Pipe/Conduit	🔓
5.003	33.770	1.023	33.0	0.000	28.0	0.0	0.600	o	225	Pipe/Conduit	🔓
5.004	50.518	2.526	20.0	0.000	154.0	0.0	0.600	o	225	Pipe/Conduit	🔓
5.005	51.009	0.567	90.0	0.000	168.0	0.0	0.600	o	225	Pipe/Conduit	🔓
5.006	42.639	0.426	100.1	0.000	28.0	0.0	0.600	o	225	Pipe/Conduit	🔓
5.007	29.337	0.341	86.0	0.000	14.0	0.0	0.600	o	225	Pipe/Conduit	🔒
1.010	14.081	0.143	98.5	0.000	14.0	0.0	0.600	o	225	Pipe/Conduit	🔓

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.001	74.340	0.000	0.0	28.0	0.6	35	0.90	1.69	67.3	3.6
3.002	73.987	0.000	0.0	154.0	0.9	42	1.01	1.69	67.3	5.2
1.006	70.500	0.000	0.0	602.0	1.3	62	0.89	1.19	47.4	7.9
4.000	70.727	0.000	0.0	70.0	0.7	39	0.96	1.69	67.2	4.4
1.007	70.230	0.000	0.0	742.0	1.4	52	1.25	1.85	73.7	8.5
1.008	69.221	0.000	0.0	826.0	1.5	46	1.52	2.40	95.3	8.9
1.009	67.947	0.000	0.0	840.0	1.5	43	1.70	2.80	111.4	9.0
5.000	74.800	0.000	0.0	56.0	0.7	38	0.95	1.69	67.3	4.2
5.001	74.075	0.000	0.0	56.0	0.7	38	0.95	1.69	67.3	4.2
5.002	73.922	0.000	0.0	140.0	0.9	39	1.11	1.96	77.7	5.1
5.003	72.223	0.000	0.0	168.0	0.9	37	1.26	2.28	90.9	5.3
5.004	71.200	0.000	0.0	322.0	1.1	36	1.59	2.94	116.9	6.4
5.005	68.674	0.000	0.0	490.0	1.2	55	0.97	1.38	54.8	7.3
5.006	68.107	0.000	0.0	518.0	1.2	57	0.93	1.31	52.0	7.5
5.007	67.681	0.000	0.0	532.0	1.3	56	0.99	1.41	56.1	7.5
1.010	67.340	0.000	0.0	1386.0	1.9	70	1.05	1.32	52.4	11.2

Network Design Table for FA.fws

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
6.000	25.253	0.421	60.0	0.000	28.0	0.0	0.600	o	225	Pipe/Conduit	🔓
7.000	27.158	0.339	80.1	0.000	28.0	0.0	0.600	o	150	Pipe/Conduit	🔓
6.001	49.828	0.415	120.1	0.000	98.0	0.0	0.600	o	225	Pipe/Conduit	🔒
6.002	50.397	0.420	120.0	0.000	42.0	0.0	0.600	o	225	Pipe/Conduit	🔓
8.000	55.984	1.866	30.0	0.000	98.0	0.0	0.600	o	225	Pipe/Conduit	🔓
8.001	44.741	1.492	30.0	0.000	70.0	0.0	0.600	o	225	Pipe/Conduit	🔓
6.003	49.133	0.617	79.7	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.011	50.036	0.365	137.1	0.000	70.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.012	10.465	0.104	100.6	0.000	14.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.013	12.130	0.152	79.8	0.000	28.0	0.0	0.600	o	225	Pipe/Conduit	🔒
9.000	37.496	0.469	79.9	0.000	70.0	0.0	0.600	o	225	Pipe/Conduit	🔓
10.000	56.833	0.948	60.0	0.000	224.0	0.0	0.600	o	225	Pipe/Conduit	🔓
9.001	40.388	0.449	90.0	0.000	42.0	0.0	0.600	o	225	Pipe/Conduit	🔓

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
6.000	68.100	0.000	0.0	28.0	0.6	35	0.90	1.69	67.3	3.6
7.000	68.100	0.000	0.0	28.0	0.6	43	0.85	1.12	19.9	3.6
6.001	67.647	0.000	0.0	154.0	0.9	50	0.79	1.19	47.4	5.2
6.002	67.232	0.000	0.0	196.0	0.9	52	0.80	1.19	47.4	5.6
8.000	71.579	0.000	0.0	98.0	0.8	34	1.25	2.40	95.3	4.7
8.001	69.713	0.000	0.0	168.0	0.9	36	1.30	2.40	95.3	5.3
6.003	66.812	0.000	0.0	364.0	1.1	51	0.98	1.47	58.3	6.6
1.011	66.195	0.000	0.0	1820.0	2.2	83	0.97	1.11	44.3	12.9
1.012	65.830	0.000	0.0	1834.0	2.2	76	1.09	1.30	51.8	13.0
1.013	65.726	0.000	0.0	1862.0	2.2	72	1.19	1.47	58.3	13.1
9.000	66.650	0.000	0.0	70.0	0.7	41	0.87	1.46	58.2	4.4
10.000	67.760	0.000	0.0	224.0	1.0	44	1.04	1.69	67.3	5.8
9.001	66.181	0.000	0.0	336.0	1.1	52	0.93	1.38	54.8	6.5

Network Design Table for FA.fws

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
11.000	27.255	0.454	60.0	0.000	28.0	0.0	0.600	o	225	Pipe/Conduit	🔒
9.002	15.413	0.159	96.9	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.014	41.793	0.418	100.0	0.000	28.0	0.0	0.600	o	225	Pipe/Conduit	🔓
12.000	28.106	0.468	60.1	0.000	28.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.015	10.893	0.134	81.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
11.000	66.800	0.000	0.0	28.0	0.6	35	0.90	1.69	67.2	3.6
9.002	65.732	0.000	0.0	364.0	1.1	54	0.91	1.33	52.8	6.6
1.014	65.573	0.000	0.0	2254.0	2.4	81	1.12	1.31	52.0	14.5
12.000	66.800	0.000	0.0	28.0	0.6	35	0.90	1.69	67.2	3.6
1.015	65.155	0.000	0.0	2282.0	2.4	77	1.22	1.45	57.8	14.6

Manhole Schedules for FA.fws

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)
FA16	72.950	0.850	Open Manhole	1200	1.000	72.100	225				
FA15	72.960	1.125	Open Manhole	1200	1.001	71.835	225	1.000	71.835	225	
FA14-1	74.145	1.645	Open Manhole	1200	2.000	72.500	225				
FA14	73.500	1.933	Open Manhole	1200	1.002	71.567	225	1.001	71.567	225	
								2.000	72.247	225	680
FA13	74.083	2.658	Open Manhole	1200	1.003	71.425	225	1.002	71.425	225	
FA12	75.027	4.024	Open Manhole	1200	1.004	71.003	225	1.003	71.003	225	
FA11	75.547	4.796	Open Manhole	1200	1.005	70.752	225	1.004	70.751	225	
FA10-3	76.953	2.153	Open Manhole	1200	3.000	74.800	225				
FA10-2	75.844	1.506	Open Manhole	1200	3.001	74.340	225	3.000	74.338	225	
FA10-1	75.776	1.789	Open Manhole	1200	3.002	73.987	225	3.001	73.987	225	
FA10	75.260	4.760	Open Manhole	1200	1.006	70.500	225	1.005	70.500	225	
								3.002	73.012	225	2512
FA9-1	73.737	3.010	Open Manhole	1200	4.000	70.727	225				
FA9	74.165	3.935	Open Manhole	1200	1.007	70.230	225	1.006	70.230	225	
								4.000	70.235	225	5
FA8	71.319	2.098	Open Manhole	1200	1.008	69.221	225	1.007	69.221	225	
FA7	69.260	1.313	Open Manhole	1200	1.009	67.947	225	1.008	67.947	225	
FA6-8	75.807	1.007	Open Manhole	1200	5.000	74.800	225				
FA6-7	76.250	2.175	Open Manhole	1200	5.001	74.075	225	5.000	74.150	225	75
FA6-6	76.209	2.287	Open Manhole	1200	5.002	73.922	225	5.001	73.922	225	
FA6-5	73.680	1.457	Open Manhole	1200	5.003	72.223	225	5.002	72.223	225	
FA6-4	72.769	1.569	Open Manhole	1200	5.004	71.200	225	5.003	71.200	225	
FA6-3	70.850	2.176	Open Manhole	1200	5.005	68.674	225	5.004	68.674	225	
FA6-2	69.679	1.572	Open Manhole	1200	5.006	68.107	225	5.005	68.107	225	
FA6-1	69.371	1.690	Open Manhole	1200	5.007	67.681	225	5.006	67.681	225	
FA6	69.128	1.788	Open Manhole	1200	1.010	67.340	225	1.009	67.349	225	9
								5.007	67.340	225	
FA5-1-3	69.143	1.043	Open Manhole	1200	6.000	68.100	225				
FA5-1-2-	69.143	1.043	Open Manhole	1200	7.000	68.100	150				
FA5-1-2	69.081	1.434	Open Manhole	1200	6.001	67.647	225	6.000	67.679	225	32
								7.000	67.761	150	39
FA5-1-1	69.430	2.198	Open Manhole	1200	6.002	67.232	225	6.001	67.232	225	
FA5-3	75.252	3.673	Open Manhole	1200	8.000	71.579	225				
FA5-2	71.912	2.199	Open Manhole	1200	8.001	69.713	225	8.000	69.713	225	
FA5-1	69.487	2.675	Open Manhole	1200	6.003	66.812	225	6.002	66.812	225	
								8.001	68.221	225	1409
FA5	68.952	2.757	Open Manhole	1200	1.011	66.195	225	1.010	67.197	225	1002

Manhole Schedules for FA.fws

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)
								6.003	66.195	225	
FA4	68.788	2.958	Open Manhole	1200	1.012	65.830	225	1.011	65.830	225	
FA3	68.895	3.169	Open Manhole	1200	1.013	65.726	225	1.012	65.726	225	
FA2-2-1	67.739	1.089	Open Manhole	1200	9.000	66.650	225				
FA2-3	69.186	1.426	Open Manhole	1200	10.000	67.760	225				
FA2-2	67.937	1.756	Open Manhole	1200	9.001	66.181	225	9.000	66.181	225	
								10.000	66.812	225	631
FA2-1-1	68.550	1.750	Open Manhole	1200	11.000	66.800	225				
FA2-1	68.749	3.017	Open Manhole	1200	9.002	65.732	225	9.001	65.732	225	
								11.000	66.346	225	614
FA2	68.873	3.300	Open Manhole	1200	1.014	65.573	225	1.013	65.574	225	1
								9.002	65.573	225	
FA1-1	68.252	1.452	Open Manhole	1200	12.000	66.800	225				
FA1	68.740	3.585	Open Manhole	1200	1.015	65.155	225	1.014	65.155	225	
								12.000	66.332	225	1177
FA0	0.000		Open Manhole	1200		OUTFALL		1.015	65.021	225	

PIPELINE SCHEDULES for FA.fws

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	FA16	72.950	72.100	0.625	Open Manhole	1200
1.001	o	225	FA15	72.960	71.835	0.900	Open Manhole	1200
2.000	o	225	FA14-1	74.145	72.500	1.420	Open Manhole	1200
1.002	o	225	FA14	73.500	71.567	1.708	Open Manhole	1200
1.003	o	225	FA13	74.083	71.425	2.433	Open Manhole	1200
1.004	o	225	FA12	75.027	71.003	3.799	Open Manhole	1200
1.005	o	225	FA11	75.547	70.752	4.570	Open Manhole	1200
3.000	o	225	FA10-3	76.953	74.800	1.928	Open Manhole	1200
3.001	o	225	FA10-2	75.844	74.340	1.279	Open Manhole	1200
3.002	o	225	FA10-1	75.776	73.987	1.564	Open Manhole	1200
1.006	o	225	FA10	75.260	70.500	4.535	Open Manhole	1200
4.000	o	225	FA9-1	73.737	70.727	2.785	Open Manhole	1200
1.007	o	225	FA9	74.165	70.230	3.710	Open Manhole	1200
1.008	o	225	FA8	71.319	69.221	1.873	Open Manhole	1200
1.009	o	225	FA7	69.260	67.947	1.088	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)
1.000	26.492	100.0	FA15	72.960	71.835	0.900	Open Manhole	1200
1.001	26.769	100.0	FA14	73.500	71.567	1.708	Open Manhole	1200
2.000	25.339	100.0	FA14	73.500	72.247	1.028	Open Manhole	1200
1.002	14.172	100.0	FA13	74.083	71.425	2.433	Open Manhole	1200
1.003	42.239	100.0	FA12	75.027	71.003	3.799	Open Manhole	1200
1.004	30.159	120.0	FA11	75.547	70.751	4.571	Open Manhole	1200
1.005	30.207	120.0	FA10	75.260	70.500	4.535	Open Manhole	1200
3.000	23.109	50.0	FA10-2	75.844	74.338	1.281	Open Manhole	1200
3.001	21.203	60.0	FA10-1	75.776	73.987	1.564	Open Manhole	1200
3.002	58.494	60.0	FA10	75.260	73.012	2.023	Open Manhole	1200
1.006	32.391	120.0	FA9	74.165	70.230	3.710	Open Manhole	1200
4.000	29.548	60.1	FA9	74.165	70.235	3.705	Open Manhole	1200
1.007	50.432	50.0	FA8	71.319	69.221	1.873	Open Manhole	1200
1.008	38.220	30.0	FA7	69.260	67.947	1.088	Open Manhole	1200
1.009	13.152	22.0	FA6	69.128	67.349	1.554	Open Manhole	1200

PIPELINE SCHEDULES for FA.fws

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)
5.000	o	225	FA6-8	75.807	74.800	0.782	Open Manhole	1200
5.001	o	225	FA6-7	76.250	74.075	1.950	Open Manhole	1200
5.002	o	225	FA6-6	76.209	73.922	2.062	Open Manhole	1200
5.003	o	225	FA6-5	73.680	72.223	1.232	Open Manhole	1200
5.004	o	225	FA6-4	72.769	71.200	1.344	Open Manhole	1200
5.005	o	225	FA6-3	70.850	68.674	1.951	Open Manhole	1200
5.006	o	225	FA6-2	69.679	68.107	1.347	Open Manhole	1200
5.007	o	225	FA6-1	69.371	67.681	1.465	Open Manhole	1200
1.010	o	225	FA6	69.128	67.340	1.563	Open Manhole	1200
6.000	o	225	FA5-1-3	69.143	68.100	0.818	Open Manhole	1200
7.000	o	150	FA5-1-2-	69.143	68.100	0.893	Open Manhole	1200
6.001	o	225	FA5-1-2	69.081	67.647	1.209	Open Manhole	1200
6.002	o	225	FA5-1-1	69.430	67.232	1.973	Open Manhole	1200
8.000	o	225	FA5-3	75.252	71.579	3.448	Open Manhole	1200
8.001	o	225	FA5-2	71.912	69.713	1.974	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)
5.000	38.999	60.0	FA6-7	76.250	74.150	1.875	Open Manhole	1200
5.001	9.197	60.0	FA6-6	76.209	73.922	2.062	Open Manhole	1200
5.002	76.463	45.0	FA6-5	73.680	72.223	1.232	Open Manhole	1200
5.003	33.770	33.0	FA6-4	72.769	71.200	1.344	Open Manhole	1200
5.004	50.518	20.0	FA6-3	70.850	68.674	1.951	Open Manhole	1200
5.005	51.009	90.0	FA6-2	69.679	68.107	1.347	Open Manhole	1200
5.006	42.639	100.1	FA6-1	69.371	67.681	1.465	Open Manhole	1200
5.007	29.337	86.0	FA6	69.128	67.340	1.563	Open Manhole	1200
1.010	14.081	98.5	FA5	68.952	67.197	1.530	Open Manhole	1200
6.000	25.253	60.0	FA5-1-2	69.081	67.679	1.177	Open Manhole	1200
7.000	27.158	80.1	FA5-1-2	69.081	67.761	1.170	Open Manhole	1200
6.001	49.828	120.1	FA5-1-1	69.430	67.232	1.973	Open Manhole	1200
6.002	50.397	120.0	FA5-1	69.487	66.812	2.450	Open Manhole	1200
8.000	55.984	30.0	FA5-2	71.912	69.713	1.974	Open Manhole	1200
8.001	44.741	30.0	FA5-1	69.487	68.221	1.041	Open Manhole	1200

PIPELINE SCHEDULES for FA.fws

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
6.003	o	225	FA5-1	69.487	66.812	2.450	Open Manhole	1200
1.011	o	225	FA5	68.952	66.195	2.532	Open Manhole	1200
1.012	o	225	FA4	68.788	65.830	2.733	Open Manhole	1200
1.013	o	225	FA3	68.895	65.726	2.944	Open Manhole	1200
9.000	o	225	FA2-2-1	67.739	66.650	0.864	Open Manhole	1200
10.000	o	225	FA2-3	69.186	67.760	1.201	Open Manhole	1200
9.001	o	225	FA2-2	67.937	66.181	1.531	Open Manhole	1200
11.000	o	225	FA2-1-1	68.550	66.800	1.525	Open Manhole	1200
9.002	o	225	FA2-1	68.749	65.732	2.792	Open Manhole	1200
1.014	o	225	FA2	68.873	65.573	3.075	Open Manhole	1200
12.000	o	225	FA1-1	68.252	66.800	1.227	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)
6.003	49.133	79.7	FA5	68.952	66.195	2.532	Open Manhole	1200
1.011	50.036	137.1	FA4	68.788	65.830	2.733	Open Manhole	1200
1.012	10.465	100.6	FA3	68.895	65.726	2.944	Open Manhole	1200
1.013	12.130	79.8	FA2	68.873	65.574	3.074	Open Manhole	1200
9.000	37.496	79.9	FA2-2	67.937	66.181	1.531	Open Manhole	1200
10.000	56.833	60.0	FA2-2	67.937	66.812	0.900	Open Manhole	1200
9.001	40.388	90.0	FA2-1	68.749	65.732	2.792	Open Manhole	1200
11.000	27.255	60.0	FA2-1	68.749	66.346	2.178	Open Manhole	1200
9.002	15.413	96.9	FA2	68.873	65.573	3.075	Open Manhole	1200
1.014	41.793	100.0	FA1	68.740	65.155	3.360	Open Manhole	1200
12.000	28.106	60.1	FA1	68.740	66.332	2.183	Open Manhole	1200

PIPELINE SCHEDULES for FA.fws

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.015	o	225	FA1	68.740	65.155	3.360	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)
1.015	10.893	81.0	FA0	0.000	65.021		Open Manhole	1200

Free Flowing Outfall Details for FA.fws

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.015	FA0	0.000	65.021	0.000	1200	0

FOUL SEWERAGE DESIGN

Design Criteria for FB.fws

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00
Industrial Peak Flow Factor	0.00
Calculation Method	BS 8301
Frequency Factor	0.50
Domestic (l/s/ha)	0.00
Domestic Peak Flow Factor	6.00
Add Flow / Climate Change (%)	20
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	0.75
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for FB.fws

PN	**Length (m)**	**Fall (m)**	**Slope (1:X)**	**Area (ha)**	**Units**	**Base Flow (l/s)**	**k (mm)**	**HYD SECT**	**DIA (mm)**	**Section Type**	**Auto Design**
1.000	21.634	0.361	60.0	0.000	112.0	0.0	0.600	o	150	Pipe/Conduit	🔓
1.001	10.876	0.181	60.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔒
1.002	28.235	0.353	80.0	0.000	112.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.003	33.471	0.418	80.0	0.000	196.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.004	24.091	0.301	80.0	0.000	140.0	0.0	0.600	o	225	Pipe/Conduit	🔒
1.005	40.404	0.505	80.0	0.000	14.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.006	35.785	0.447	80.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.007	32.356	0.404	80.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.008	24.547	0.307	80.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.009	38.548	0.482	80.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔒

Network Results Table

PN	**US/IL (m)**	**Σ Area (ha)**	**Σ Base Flow (l/s)**	**Σ Units**	**Add Flow (l/s)**	**P.Dep (mm)**	**P.Vel (m/s)**	**Vel (m/s)**	**Cap (l/s)**	**Flow (l/s)**
1.000	74.100	0.000	0.0	112.0	0.8	47	1.03	1.30	23.0	4.8
1.001	73.739	0.000	0.0	112.0	0.8	41	0.99	1.69	67.3	4.8
1.002	73.558	0.000	0.0	224.0	1.0	48	0.94	1.46	58.2	5.8
1.003	73.205	0.000	0.0	420.0	1.2	52	0.99	1.46	58.2	7.0
1.004	72.787	0.000	0.0	560.0	1.3	55	1.02	1.46	58.2	7.7
1.005	72.486	0.000	0.0	574.0	1.3	55	1.02	1.46	58.2	7.8
1.006	71.981	0.000	0.0	574.0	1.3	55	1.02	1.46	58.2	7.8
1.007	71.534	0.000	0.0	574.0	1.3	55	1.02	1.46	58.2	7.8
1.008	71.129	0.000	0.0	574.0	1.3	55	1.02	1.46	58.2	7.8
1.009	70.822	0.000	0.0	574.0	1.3	55	1.02	1.46	58.2	7.8

Network Design Table for FB.fws

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.000	36.584	0.915	40.0	0.000	56.0	0.0	0.600	o	225	Pipe/Conduit	🔓
2.001	10.828	0.204	53.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
2.002	58.167	0.786	74.0	0.000	28.0	0.0	0.600	o	225	Pipe/Conduit	🔓
3.000	41.237	0.598	69.0	0.000	56.0	0.0	0.600	o	225	Pipe/Conduit	🔓
2.003	38.613	0.568	68.0	0.000	56.0	0.0	0.600	o	225	Pipe/Conduit	🔒
4.000	30.979	0.585	53.0	0.000	42.0	0.0	0.600	o	225	Pipe/Conduit	🔓
4.001	16.331	0.340	48.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
4.002	37.104	0.714	52.0	0.000	28.0	0.0	0.600	o	225	Pipe/Conduit	🔒
2.004	5.488	0.055	100.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
2.005	32.730	0.327	100.0	0.000	14.0	0.0	0.600	o	225	Pipe/Conduit	🔓
2.006	21.858	0.219	100.0	0.000	196.0	0.0	0.600	o	225	Pipe/Conduit	🔓
2.007	13.350	0.134	100.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
2.008	43.531	0.435	100.0	0.000	406.0	0.0	0.600	o	225	Pipe/Conduit	🔓
5.000	43.777	0.547	80.0	0.000	112.0	0.0	0.600	o	225	Pipe/Conduit	🔓
6.000	39.673	0.478	83.0	0.000	42.0	0.0	0.600	o	225	Pipe/Conduit	🔓

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.000	74.200	0.000	0.0	56.0	0.7	34	1.09	2.08	82.5	4.2
2.001	73.285	0.000	0.0	56.0	0.7	37	0.99	1.80	71.6	4.2
2.002	73.081	0.000	0.0	84.0	0.8	41	0.90	1.52	60.5	4.5
3.000	72.500	0.000	0.0	56.0	0.7	39	0.90	1.58	62.7	4.2
2.003	71.902	0.000	0.0	196.0	0.9	45	0.99	1.59	63.1	5.6
4.000	73.000	0.000	0.0	42.0	0.7	36	0.97	1.80	71.6	3.9
4.001	72.415	0.000	0.0	42.0	0.7	35	1.01	1.89	75.3	3.9
4.002	72.075	0.000	0.0	70.0	0.7	37	1.01	1.82	72.3	4.4
2.004	71.333	0.000	0.0	266.0	1.0	52	0.88	1.31	52.0	6.0
2.005	71.278	0.000	0.0	280.0	1.0	52	0.88	1.31	52.0	6.1
2.006	70.951	0.000	0.0	476.0	1.2	57	0.93	1.31	52.0	7.3
2.007	70.732	0.000	0.0	476.0	1.2	57	0.93	1.31	52.0	7.3
2.008	70.599	0.000	0.0	882.0	1.5	64	0.99	1.31	52.0	9.2
5.000	69.800	0.000	0.0	112.0	0.8	44	0.89	1.46	58.2	4.8
6.000	70.000	0.000	0.0	42.0	0.7	40	0.83	1.44	57.1	3.9

Network Design Table for FB.fws

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
5.001	27.615	0.184	150.0	0.000	70.0	0.0	0.600	o	225	Pipe/Conduit	🔓
5.002	13.811	0.092	150.0	0.000	28.0	0.0	0.600	o	225	Pipe/Conduit	🔓
2.009	36.298	0.242	150.0	0.000	42.0	0.0	0.600	o	225	Pipe/Conduit	🔓
7.000	27.171	0.453	60.0	0.000	28.0	0.0	0.600	o	225	Pipe/Conduit	🔓
2.010	16.212	0.108	150.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.010	44.456	0.296	150.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.011	43.952	0.733	60.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.012	12.746	0.209	61.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔒
1.013	26.930	0.673	40.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔒

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
5.001	69.253	0.000	0.0	224.0	1.0	56	0.75	1.07	42.4	5.8
5.002	69.069	0.000	0.0	252.0	1.0	57	0.76	1.07	42.4	6.0
2.009	68.977	0.000	0.0	1176.0	1.7	76	0.88	1.07	42.4	10.4
7.000	69.600	0.000	0.0	28.0	0.6	35	0.90	1.69	67.3	3.6
2.010	68.735	0.000	0.0	1204.0	1.8	76	0.89	1.07	42.4	10.5
1.010	68.627	0.000	0.0	1778.0	2.1	84	0.93	1.07	42.4	12.7
1.011	68.330	0.000	0.0	1778.0	2.1	66	1.31	1.69	67.3	12.7
1.012	67.600	0.000	0.0	1778.0	2.1	66	1.30	1.68	66.7	12.7
1.013	67.390	0.000	0.0	1778.0	2.1	60	1.52	2.07	82.5	12.7

Manhole Schedules for FB.fws

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)
FB14	74.929	0.829	Open Manhole	1200	1.000	74.100	150				
FB13	74.911	1.172	Open Manhole	1200	1.001	73.739	225	1.000	73.739	150	
FB12	75.289	1.731	Open Manhole	1200	1.002	73.558	225	1.001	73.558	225	
FB11	75.129	1.924	Open Manhole	1200	1.003	73.205	225	1.002	73.205	225	
FB10	75.076	2.290	Open Manhole	1200	1.004	72.787	225	1.003	72.786	225	
FB9	75.105	2.619	Open Manhole	1200	1.005	72.486	225	1.004	72.486	225	
FB8	74.900	2.919	Open Manhole	1200	1.006	71.981	225	1.005	71.981	225	
FB7	74.901	3.367	Open Manhole	1200	1.007	71.534	225	1.006	71.534	225	
FB6	74.257	3.128	Open Manhole	1200	1.008	71.129	225	1.007	71.129	225	
FB5	73.441	2.619	Open Manhole	1200	1.009	70.822	225	1.008	70.822	225	
FB4-11	75.872	1.672	Open Manhole	1200	2.000	74.200	225				
FB4-10	74.824	1.539	Open Manhole	1200	2.001	73.285	225	2.000	73.285	225	
FB4-9	74.647	1.566	Open Manhole	1200	2.002	73.081	225	2.001	73.081	225	
FB4-8-1	73.466	0.966	Open Manhole	1200	3.000	72.500	225				
FB4-8	73.481	1.579	Open Manhole	1200	2.003	71.902	225	2.002	72.295	225	393
								3.000	71.902	225	
FB4-7-3	74.779	1.779	Open Manhole	1200	4.000	73.000	225				
FB4-7-2	74.350	1.935	Open Manhole	1200	4.001	72.415	225	4.000	72.415	225	
FB4-7-1	74.363	2.288	Open Manhole	1200	4.002	72.075	225	4.001	72.075	225	
FB4-7	73.919	2.586	Open Manhole	1200	2.004	71.333	225	2.003	71.334	225	1
								4.002	71.361	225	28
FB4-6	73.770	2.492	Open Manhole	1200	2.005	71.278	225	2.004	71.278	225	
FB4-5	73.831	2.880	Open Manhole	1200	2.006	70.951	225	2.005	70.951	225	
FB4-4	72.943	2.211	Open Manhole	1200	2.007	70.732	225	2.006	70.732	225	
FB4-3	73.264	2.665	Open Manhole	1200	2.008	70.599	225	2.007	70.599	225	
FB4-2-3	71.035	1.235	Open Manhole	1200	5.000	69.800	225				
FB4-2-2-	72.291	2.291	Open Manhole	1200	6.000	70.000	225				
FB4-2-2	71.085	1.832	Open Manhole	1200	5.001	69.253	225	5.000	69.253	225	
								6.000	69.522	225	269
FB4-2-1	71.219	2.150	Open Manhole	1200	5.002	69.069	225	5.001	69.069	225	
FB4-2	71.427	2.450	Open Manhole	1200	2.009	68.977	225	2.008	70.163	225	1187
								5.002	68.977	225	
FB4-1-1	71.845	2.245	Open Manhole	1200	7.000	69.600	225				
FB4-1	71.850	3.115	Open Manhole	1200	2.010	68.735	225	2.009	68.735	225	
								7.000	69.147	225	412
FB4	72.056	3.429	Open Manhole	1200	1.010	68.627	225	1.009	70.340	225	1713
								2.010	68.627	225	
FB3	70.360	2.030	Open Manhole	1200	1.011	68.330	225	1.010	68.330	225	

Manhole Schedules for FB.fws

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
FB2	68.820	1.222	Open Manhole	1200	1.012	67.600	225	1.011	67.598	225	
FB1	68.720	1.330	Open Manhole	1200	1.013	67.390	225	1.012	67.391	225	1
FB0	0.000		Open Manhole	1200		OUTFALL		1.013	66.717	225	

PIPELINE SCHEDULES for FB.fws

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	FB14	74.929	74.100	0.679	Open Manhole	1200
1.001	o	225	FB13	74.911	73.739	0.947	Open Manhole	1200
1.002	o	225	FB12	75.289	73.558	1.506	Open Manhole	1200
1.003	o	225	FB11	75.129	73.205	1.699	Open Manhole	1200
1.004	o	225	FB10	75.076	72.787	2.064	Open Manhole	1200
1.005	o	225	FB9	75.105	72.486	2.394	Open Manhole	1200
1.006	o	225	FB8	74.900	71.981	2.694	Open Manhole	1200
1.007	o	225	FB7	74.901	71.534	3.142	Open Manhole	1200
1.008	o	225	FB6	74.257	71.129	2.903	Open Manhole	1200
1.009	o	225	FB5	73.441	70.822	2.394	Open Manhole	1200
2.000	o	225	FB4-11	75.872	74.200	1.447	Open Manhole	1200
2.001	o	225	FB4-10	74.824	73.285	1.314	Open Manhole	1200
2.002	o	225	FB4-9	74.647	73.081	1.341	Open Manhole	1200
3.000	o	225	FB4-8-1	73.466	72.500	0.741	Open Manhole	1200
2.003	o	225	FB4-8	73.481	71.902	1.354	Open Manhole	1200
4.000	o	225	FB4-7-3	74.779	73.000	1.554	Open Manhole	1200
4.001	o	225	FB4-7-2	74.350	72.415	1.710	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)
1.000	21.634	60.0	FB13	74.911	73.739	1.022	Open Manhole	1200
1.001	10.876	60.0	FB12	75.289	73.558	1.506	Open Manhole	1200
1.002	28.235	80.0	FB11	75.129	73.205	1.699	Open Manhole	1200
1.003	33.471	80.0	FB10	75.076	72.786	2.065	Open Manhole	1200
1.004	24.091	80.0	FB9	75.105	72.486	2.394	Open Manhole	1200
1.005	40.404	80.0	FB8	74.900	71.981	2.694	Open Manhole	1200
1.006	35.785	80.0	FB7	74.901	71.534	3.142	Open Manhole	1200
1.007	32.356	80.0	FB6	74.257	71.129	2.903	Open Manhole	1200
1.008	24.547	80.0	FB5	73.441	70.822	2.394	Open Manhole	1200
1.009	38.548	80.0	FB4	72.056	70.340	1.491	Open Manhole	1200
2.000	36.584	40.0	FB4-10	74.824	73.285	1.314	Open Manhole	1200
2.001	10.828	53.0	FB4-9	74.647	73.081	1.341	Open Manhole	1200
2.002	58.167	74.0	FB4-8	73.481	72.295	0.961	Open Manhole	1200
3.000	41.237	69.0	FB4-8	73.481	71.902	1.354	Open Manhole	1200
2.003	38.613	68.0	FB4-7	73.919	71.334	2.360	Open Manhole	1200
4.000	30.979	53.0	FB4-7-2	74.350	72.415	1.710	Open Manhole	1200
4.001	16.331	48.0	FB4-7-1	74.363	72.075	2.063	Open Manhole	1200

PIPELINE SCHEDULES for FB.fws

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)
4.002	o	225	FB4-7-1	74.363	72.075	2.063	Open Manhole	1200
2.004	o	225	FB4-7	73.919	71.333	2.361	Open Manhole	1200
2.005	o	225	FB4-6	73.770	71.278	2.267	Open Manhole	1200
2.006	o	225	FB4-5	73.831	70.951	2.655	Open Manhole	1200
2.007	o	225	FB4-4	72.943	70.732	1.986	Open Manhole	1200
2.008	o	225	FB4-3	73.264	70.599	2.440	Open Manhole	1200
5.000	o	225	FB4-2-3	71.035	69.800	1.010	Open Manhole	1200
6.000	o	225	FB4-2-2-	72.291	70.000	2.066	Open Manhole	1200
5.001	o	225	FB4-2-2	71.085	69.253	1.607	Open Manhole	1200
5.002	o	225	FB4-2-1	71.219	69.069	1.925	Open Manhole	1200
2.009	o	225	FB4-2	71.427	68.977	2.225	Open Manhole	1200
7.000	o	225	FB4-1-1	71.845	69.600	2.020	Open Manhole	1200
2.010	o	225	FB4-1	71.850	68.735	2.890	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)
4.002	37.104	52.0	FB4-7	73.919	71.361	2.333	Open Manhole	1200
2.004	5.488	100.0	FB4-6	73.770	71.278	2.267	Open Manhole	1200
2.005	32.730	100.0	FB4-5	73.831	70.951	2.655	Open Manhole	1200
2.006	21.858	100.0	FB4-4	72.943	70.732	1.986	Open Manhole	1200
2.007	13.350	100.0	FB4-3	73.264	70.599	2.440	Open Manhole	1200
2.008	43.531	100.0	FB4-2	71.427	70.163	1.039	Open Manhole	1200
5.000	43.777	80.0	FB4-2-2	71.085	69.253	1.607	Open Manhole	1200
6.000	39.673	83.0	FB4-2-2	71.085	69.522	1.338	Open Manhole	1200
5.001	27.615	150.0	FB4-2-1	71.219	69.069	1.925	Open Manhole	1200
5.002	13.811	150.0	FB4-2	71.427	68.977	2.225	Open Manhole	1200
2.009	36.298	150.0	FB4-1	71.850	68.735	2.890	Open Manhole	1200
7.000	27.171	60.0	FB4-1	71.850	69.147	2.478	Open Manhole	1200
2.010	16.212	150.0	FB4	72.056	68.627	3.204	Open Manhole	1200

PIPELINE SCHEDULES for FB.fws

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.010	o	225	FB4	72.056	68.627	3.204	Open Manhole	1200
1.011	o	225	FB3	70.360	68.330	1.805	Open Manhole	1200
1.012	o	225	FB2	68.820	67.600	0.995	Open Manhole	1200
1.013	o	225	FB1	68.720	67.390	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)
1.010	44.456	150.0	FB3	70.360	68.330	1.805	Open Manhole	1200
1.011	43.952	60.0	FB2	68.820	67.598	0.997	Open Manhole	1200
1.012	12.746	61.0	FB1	68.720	67.391	1.104	Open Manhole	1200
1.013	26.930	40.0	FB0	0.000	66.717		Open Manhole	1200

Free Flowing Outfall Details for FB.fws

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.013	FB0	0.000	66.717	0.000	1200	0

FOUL SEWERAGE DESIGN

Design Criteria for FC.fws

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00
Industrial Peak Flow Factor	0.00
Calculation Method	BS 8301
Frequency Factor	0.50
Domestic (l/s/ha)	0.00
Domestic Peak Flow Factor	6.00
Add Flow / Climate Change (%)	20
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	0.75
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for FC.fws

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	25.368	0.507	50.0	0.000	252.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.001	27.969	0.699	40.0	0.000	252.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.002	18.475	0.430	43.0	0.000	252.0	0.0	0.600	o	225	Pipe/Conduit	🔒
1.003	14.706	0.545	27.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔒
1.004	17.597	0.129	136.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.005	9.573	0.060	160.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.006	26.600	0.147	181.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓
1.007	36.537	0.183	200.0	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	🔓

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	73.488	0.000	0.0	252.0	1.0	43	1.12	1.85	73.7	6.0
1.001	72.981	0.000	0.0	504.0	1.2	45	1.30	2.07	82.5	7.4
1.002	72.286	0.000	0.0	756.0	1.4	50	1.32	2.00	79.5	8.6
1.003	71.854	0.000	0.0	756.0	1.4	44	1.56	2.53	100.5	8.6
1.004	71.300	0.000	0.0	756.0	1.4	67	0.87	1.12	44.5	8.6
1.005	71.171	0.000	0.0	756.0	1.4	70	0.82	1.03	41.0	8.6
1.006	71.111	0.000	0.0	756.0	1.4	72	0.78	0.97	38.5	8.6
1.007	70.964	0.000	0.0	756.0	1.4	74	0.76	0.92	36.6	8.6

Manhole Schedules for FC.fws

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)
FC8	75.058	1.570	Open Manhole	1200	1.000	73.488	225				
FC7	75.051	2.070	Open Manhole	1200	1.001	72.981	225	1.000	72.981	225	
FC6	73.904	1.622	Open Manhole	1200	1.002	72.286	225	1.001	72.282	225	
FC5	73.195	1.341	Open Manhole	1200	1.003	71.854	225	1.002	71.856	225	2
FC4	72.642	1.342	Open Manhole	1200	1.004	71.300	225	1.003	71.309	225	9
FC3	73.296	2.125	Open Manhole	1200	1.005	71.171	225	1.004	71.171	225	
FC2	73.372	2.261	Open Manhole	1200	1.006	71.111	225	1.005	71.111	225	
FC1	72.899	1.935	Open Manhole	1200	1.007	70.964	225	1.006	70.964	225	
FC0	72.234	1.453	Open Manhole	1200		OUTFALL		1.007	70.781	225	

PIPELINE SCHEDULES for FC.fws

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	FC8	75.058	73.488	1.345	Open Manhole	1200
1.001	o	225	FC7	75.051	72.981	1.845	Open Manhole	1200
1.002	o	225	FC6	73.904	72.286	1.393	Open Manhole	1200
1.003	o	225	FC5	73.195	71.854	1.116	Open Manhole	1200
1.004	o	225	FC4	72.642	71.300	1.117	Open Manhole	1200
1.005	o	225	FC3	73.296	71.171	1.900	Open Manhole	1200
1.006	o	225	FC2	73.372	71.111	2.036	Open Manhole	1200
1.007	o	225	FC1	72.899	70.964	1.710	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)
1.000	25.368	50.0	FC7	75.051	72.981	1.845	Open Manhole	1200
1.001	27.969	40.0	FC6	73.904	72.282	1.397	Open Manhole	1200
1.002	18.475	43.0	FC5	73.195	71.856	1.114	Open Manhole	1200
1.003	14.706	27.0	FC4	72.642	71.309	1.108	Open Manhole	1200
1.004	17.597	136.0	FC3	73.296	71.171	1.900	Open Manhole	1200
1.005	9.573	160.0	FC2	73.372	71.111	2.036	Open Manhole	1200
1.006	26.600	181.0	FC1	72.899	70.964	1.710	Open Manhole	1200
1.007	36.537	200.0	FC0	72.234	70.781	1.228	Open Manhole	1200

Free Flowing Outfall Details for FC.fws

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	FC0	72.234	70.781	0.000	1200	0