#### Project

## **Residential Development, Cornelscourt, Dublin 18**

**Report Title** 

**Infrastructure Design Report** 

Client

**Cornel Living Ltd.** 





OCTOBER 2019

Infrastructure Design Report

## **Document Control**

Project Title:	Residential Development, Cornelscourt,
	Dublin 18.
Project Number:	180208
Report Ref:	180208-rep-001
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Date:	October 2019
Distribution:	An Bord Pleanala

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Revision	Issue Date	Description	Prepared	Reviewed	Approved
Draft	April 2019	Draft	SB	BK	
Draft	May 2019	Draft	SB	BK	
-	June 2019	ABP PRE APP	SB	BK	
A	Oct 2019	ABP APPLICATION	SB	BK	

Infrastructure Design Report

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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 located at Cornelscourt Village, Old Bray Road, Cornelscourt, Dublin 18.

The proposed development ("the site") comprises of 452 apartments, 10 houses, 6 bungalows, a café / restaurant, office space, concierge and central residential amenity space on a 2.14 Ha site (approx.).

## 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 which is currently greenfield (with the exception of a temporary carpark in its north-west corner) is located adjacent to Cornelscourt Village (refer to Figure 1.1).

The N11 road is located to the north-east of the site, existing residential development (Willow Grove) is located to the south-east of the site and the AIB (and associated carparking) is located to the north-west of the site. Old Bray Road is located to the south-west of the site.

## 1.4 Topography

The site generally falls from its western corner towards its eastern corner at a gradient of approximately 1/24.

Existing topographic survey information is shown in the background of the Proposed Roads Layout Plan (refer to DBFL Drawing Nos. 180208-XX-XX-DR-C-2001).

## 1.5 Ground Conditions

Ground Investigations Ireland carried out site investigations in January 2019 (trial pit logs are included in Appendix B).

The site is overlaid by a topsoil layer of up to 300mm deep with the exception of the temporary carpark area where made ground comprising of clayey gravels were observed at surface level.

Observed subsoil material comprises of sandy / gravelly clays.

Soakaway testing was carried out at three locations (in the vicinity of the proposed attenuation facility). Infiltration was not observed at any of the test locations.

## **1.6 Proposed Development**

The proposed development comprises of 452 apartments, 10 houses, 6 bungalows, a café / restaurant, office space, concierge, central residential amenity space and associated engineering infrastructure including access for vehicles and pedestrians from the Old Bray Road, surface water drainage, foul drainage and water supply connections (refer to DBFL Drawings 180208-XX-XX-DR-C-3001 and 180208-XX-XX-DR-C-3002).





## SITE ACCESS AND STREET LAYOUT

## 1.1 Site Access Layout

#### Vehicle Access – Old Bray Road

The primary access point for motorised vehicles is from Old Bray Road. This access route also serves the AIB carpark (north-west of the site). Refer to DBFL Drawings 180208-XX-XX-DR-C-2001 & 180208-XX-XX-DR-C-2002 for the proposed site access layout.

This serves as the vehicular access route to the basement carpark and to the podium area and provides a more formalised access when compared to the existing access arrangements for the AIB carpark.

The ten houses proposed along the eastern boundary and 6 bungalows proposed along the western boundary are also accessed from Old Bray Road via the basement carpark.

The Old Bray Road has a posted speed limit of 50 km/hour. The site entrance complies with minimum visibility splays as required by DMURS (Y Distance = 45m, X Distance = 2.4m).

Line marking is provided in accordance with the Department of Transport's Traffic Signs Manual.

#### Pedestrian and Cycle Access

The site layout also facilitates high levels of cycle and pedestrian connectivity as noted below.

- Pedestrians and cyclists can access the development via the proposed access from Old Bray Road (as described above).
- Pedestrian access is proposed on the southern side of the site access leading towards the podium area.
- A dedicated cycle / pedestrian access route is provided along the site's northwestern boundary which facilitates the following:
  - o Cycle access from Old Bray Road to basement bicycle parking areas.
  - Cycle access from the basement to the existing cycle track located along the N11.
  - Pedestrian access from the podium to the proposed footpath along the N11 (this proposed footpath along the N11 aligns with objectives in the Bus Connects Emerging Preferred Route for Bray to the City Centre). Also refer to Appendix G.

We note that the cycle / pedestrian route proposed along the site's north-western boundary is completely separate from the vehicle access ramp to the basement.

A cycle / pedestrian link is also proposed at the eastern corner of the site (linking the proposed development to the existing park at the northern end of Willow Grove).

The proposed pedestrian and cycle linkages noted above are shown on DBFL Drawing 180208-XX-XX-DR-C-2001.

## 1.2 Vehicle Tracking

The proposed site layout has been tracked (using AutoTrack software) to demonstrate that large vehicles such as fire tender can access the site, travel onto the podium slab and access the dwellings proposed along the eastern and western boundaries (refer to DBFL Drawings No. 180208-XX-XX-DR-C-2003).

## 1.3 Pavement Design Standards

The primary site access off Old Bray Road is designed in accordance with the Design Manual for Urban Roads and Streets (DMURS) and Local Authority requirements.

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

## **1.4 Traffic & Transportation**

A separate Traffic and Transportation Assessment has been prepared as part of this planning application (refer to DBFL Report No. 180208-DBFL-RP-D-0001).

## 2. SURFACE WATER DRAINAGE

## 2.1 Existing Surface Water Drainage

The site falls from its western corner towards its eastern corner forming a single surface water catchment. An existing 225mm diameter surface water drain is located adjacent to the site's eastern corner (at the northern end of Willow Grove, refer to Figure 3.1). This pipeline outfalls to the east via a crossing under the N11, South Park and Clonkeen College. DLRCC have confirmed that this infrastructure has been "taken in charge".

An existing 600mm concrete surface water line is located adjacent to the site's northeastern boundary. It is understood that this drain serves the N11 carriageway.



Figure 3.1 Extract from Irish Water Network Plan (Site Boundary Indicative Only)

## 2.2 Basis of Design

#### 2.2.1 General Description of Surface Water Design

As noted previously, an existing 225mm diameter surface water drain is located adjacent to the site's eastern corner (at the northern end of Willow Grove). This pipe is expected to provide a suitable surface water outfall for the proposed development.

Refer to DBFL Drawing No. 180208-XX-XX-DR-C-3001 for proposed surface water outfall location as noted above.

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

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

Surface water runoff from **apartment roofs will be captured by green roofs** (sedum blanket) prior to being routed to the piped surface water drainage network.

Surface water runoff from the **roofs of houses along the south-eastern boundary will be routed to the proposed surface water pipe network via bio-swale filter drains** (infiltration trenches) located in their rear gardens (providing an additional element of attenuation and treatment).

Surface water runoff from the roofs of bungalows along the south-westrn boundary will be routed to the proposed surface water pipe network via a bioretention area (again providing an additional element of attenuation and treatment).

A drainage reservoir (drainage board) is to be provided on the podium slab over **basement** (for green areas and paved areas).

Surface water runoff from the site's internal street network (adjacent to the houses and bungalows) will be directed to the proposed pipe network via tree pits with overflow to conventional road gullies.

Surface water runoff from paved areas adjacent to the site access from Old Bray Road will be directed to the proposed pipe network via conventional road gullies. Any incidental surface water runoff generated from the basement carpark would drain through a separate system beneath the basement slab (out falling to the proposed foul drainage network via a petrol interceptor). The detailed design of the basement drainage system has not been undertaken for planning stage but will be completed prior to construction.

#### 2.2.2 Stormwater Audit (Stage 1)

JBA Consulting have carried out a Stage 1 Stormwater Audit of the proposed surface water drainage design (refer to Appendix H). JBA conclude that "the surface water drainage design for the proposed development is acceptable and meets the requirement of the Stage 1 Stormwater Audit". The Stormwater Audit should be read in conjunction with Section 3.0 of this Infrastructure Design Report.

#### 2.2.3 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 site's proximity to fluvial flood plains (up to 1 in 100-year flood event).

Also refer to DBFL Report No. 180208-rep-002 (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.

### 2.2.4 Proposed Runoff Coefficients and Factored Impermeable Areas

#### Proposed Runoff Coefficients

Noted below are the proposed reduction factors for the proposed development.

The proposed reduction factors have been discussed with DLRCC Water Services and are understood to be acceptable in principle (subject to review of final submission).

• Green Roof – 5% Reduction Factor

The proposed build-up will be an extensive type with 100mm minimum construction depth and sedum planting. The soil build-up will partially absorb some of the initial run-off and once saturated will reduce flow rates through the green roof medium to the outlets and final attenuation storage location.

• Green Areas Over Podium – 15% Reduction Factor

Soft landscaped podium areas will have typical soil depths of up to 300mm to facilitate grassed areas, plants, shrubs and trees i.e. similar to a deep intensive green roof build up.

• Permeable Paving Over Podium – 10% Reduction Factor

On the podium will have a free draining material within the build-up and will reduce the flow rate from these areas. A reduction in velocity will also occur as the aggregate used will slow the run-off at source.

• Roof Areas Draining Via SuDS – 15% Reduction Factor

The houses located along the site's south-eastern boundary (adjacent to Willow Grove) and the bungalows located along the site's south-western boundary drain via filter drains and a bioretention area respectively. There will be a reduction of velocity as the aggregate/filter material used in SuDS features slow the run-off at source ultimately reduce the peak inflow for attenuation calculations.

• Permeable Paved Areas Draining via SUDS – 50% Reduction Factor

Reduction of velocity as the aggregate / filter material used in the SuDS feature (permeable paving and tree pits) slows the run-off at source ultimately reduce the peak inflow for attenuation calculations.

• Soft Landscaped / Grassed Areas – 60% Reduction Factor

Grassed / Landscaped areas slows the run-off at source ultimately reduce the peak inflow for attenuation calculations.

• Impermeable Roads (Site Access from Old Bray Road) – 5% Reduction Factor

A 5% reduction of the surface area is applied to take account of run-off not collected and stored within the micro and macro texture of the surfacing

#### Factored Impermeable Areas

Proposed Runoff Coefficients and Factored Impermeable Areas are noted below in Table 3.1.

		Catchme	ent A	Catchment B		Catchment B Catchment C		Total (m <sup>2</sup> )	
	Coefficients	Gross Area (m <sup>2</sup> )	Factored Area (m <sup>2</sup> )	Gross Area (m <sup>2</sup> )	Factored Area (m <sup>2</sup> )	Gross Area (m <sup>2</sup> )	Factored Area (m <sup>2</sup> )	Gross Total (m <sup>2</sup> )	Factored Total (m <sup>2</sup> )
Roofs (Houses + Bungalows) Draining Via SUDs	0.85	45	38	46	39	1,576	1,340	1,667	1,417
Green Roofs (Apartment Buildings) - Sedum Blanket	0.95	2,566	2,438	2,199	2,089	1,475	1,401	6,240	5,928
Green Areas on Podium (Over Drainage Board)	0.85	687	584	613	521	1,172	996	2,472	2,101
Permeable Paved Areas on Podium (Over Drainage Board)	0.9	778	700	298	268	609	548	1,685	1,516
Paved Areas Draining to Gullys (adjacent to Old Bray Road)	0.95	601	571	-	-	-	-	601	571
Permeable Paved Areas – Draining via Tree Pits with Overflow to Gullies	0.5	335	168	-	-	1,095	548	1,430	716
Soft Landscaping	0.4	1,039	416	767	307	5,000	2,000	6,806	2,723
		6,051	4,915	3,923	3,224	10,927	6,833	20,901	14,972

Table 3.1 Proposed Runoff Coefficients and Factored Impermeable Areas

## 2.2.5 Allowable Greenfield Runoff Rate

#### Ground Conditions

Observed subsoil material comprises of sandy / gravelly clays (refer trial pit logs included in Appendix B of this report). Three number infiltration tests were also carried out. Infiltration was not observed at any of the test locations.

Assessment of Soil Type

Drainage Group 1

Depth to Impermeable Layer 2 (40cm - 80cm)

Permeability Group 3 (Slow)

Slope 2 (gradient across site approx.) 1/24

Therefore, Soil Type 3

Drainage	Depth				S	ope classe	IS			
CHONO CHONO	to impermeable	Gerander Satism	0 - 2* 2 - 8*							
	tayer (cm)			Permea	bility rates	s above im	permeabl	e layers		1.2,6
		(1) Rapid	(2) Medium	(3) Slow	(1) Rapid	(2) Medíum	(3) Slow	(1) Rapid	(2) Medium	Slow <sup>(3)</sup>
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Figure 3.2, Assessment of Soil Type

Allowable Greenfield Runoff Rate

Qbar has been assessed based on GDSDS requirements

i.e. Qbar(m3/s) = 0.00108x(Area)0.89(SAAR)1.17(SOIL)2.17

Area – Approx.2.09 Ha (for purposes of total surface water catchment area)

SAAR – 945mm (based on local information from Met Eireann)

SOIL - Soil Type 3

Qbar = 8.36 l/sec (equivalent to 4.0 l/sec/Ha)

## 2.2.6 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	3
•	Allowable Outflow	4.0 l/sec/ha
•	Time of entry	4 minutes
•	M5 - 60	16.4 mm
•	Ratio "r"	0.273
•	Pipe Friction (Ks)	0.6 mm
•	Minimum Velocity (based on pipe flowing full)	1.0 m/s

Rainfall Depth Factored for Climate Change (as per GDSDS) 10%

(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 Calculations and Appendix E for Surface Water Network Design Calculations.

Surface Water Calculations have been carried out using Microdrainage WinDes analysis software.

## 2.2.7 SuDS

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

- Green Roof The proposed build-up will be an extensive type with 100mm minimum construction depth and sedum planting.
- Green Areas Over Podium –Soft landscaped podium areas will have typical soil depths of up to 300mm to facilitate grassed areas, plants, shrubs and trees i.e. similar to a deep intensive green roof build up.
- Permeable Paving Over Podium Free draining material within the build-up and will reduce the flow rate from these areas.
- Roof Areas Draining Via SuDS Houses located along the site's south-eastern boundary (adjacent to Willow Grove) and the bungalows located along the site's south-western boundary drain via filter drains and a bioretention area respectively.
- Permeable Paved Areas Draining via SUDS Aggregate / filter material used in the permeable paving and tree pits slow run-off at source.
- Soft Landscaped / Grassed Areas Slows run-off at source.
- Attenuation of the 30 and 100 year return period storms within Stormtech Attenuation Chambers.
- Installation of a vortex flow control devices (Hydrobrake or equivalent), limiting surface water discharge from the site to 8.36 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)

## 2.2.8 Attenuation Calculation

Attenuation volumes have been calculated based on an allowable outflow / greenfield runoff rate of 8.36 l/sec/ha (refer to Section 3.4.2 above).

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.

The location of proposed attenuation systems is shown on DBFL Drawing 180208-XX-XX-DR-C-3001.

Refer to Appendix C for Attenuation Design Calculations (attenuation volumes have been calculated using Microdrainage WinDes analysis software).

Catchment / Attenuation Area	Storage System Type	Catchment Area (Total)	Impermeable Catchment Area (Total)	Allowable Outflow (Max.)	Storage Volume Required (100 Yr.)	Storage Volume Provided (100 Yr.)
A	Stormtech Underground Chamber	0.61 Ha	0.49 Ha	2 l/s	260m <sup>3</sup>	285m <sup>3</sup>
В	Stormtech Underground Chamber	0.39 Ha	0.32 Ha	4.18 l/s	129m <sup>3</sup>	140m <sup>3</sup>
С	Stormtech Underground Chamber	1.09 Ha	0.68 Ha	4.18 l/s	298m <sup>3</sup>	308m <sup>3</sup>
Total		2.09 Ha	1.49 Ha		687m <sup>3</sup>	733m <sup>3</sup>

In total 733m<sup>3</sup> of stormwater storage is provided.

Note, Catchment B (4.18 l/s) & Catchment C (4.18 l/s) share a single discharge point. i.e. Qbar 8.36 l/s (i.e. allowable Greenfield Runoff Rate Calculated in Section 3.2.4)

#### Table 3.1 – Surface Water Attenuation Storage and Discharge Limits

### 2.2.9 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).

## 2.3 Flood Risk

A separate Site Specific Flood Risk Assessment has been prepared as part of this planning application (refer to DBFL Report No. 180208-rep-002).

This flood risk assessment has been undertaken by reviewing information from the Office of Public Works (OPW) National Flood Hazard Mapping (www.floods.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).

## 2.4 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. green roofs, drainage reservoir (drainage board) on the podium slab over basement, bio-swale filter drains, bioretention areas and tree pits with overflow to conventional road gullies
- 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.

## 3. FOUL DRAINAGE

## 3.1 Existing Foul Drainage

Existing foul drainage infrastructure (225 diameter) is located adjacent to the site's eastern corner (at the northern end of Willow Grove). Similar to comments above regarding surface water drainage, this pipeline outfalls to the east via a crossing under the N11 and Southpark (refer to Figure 4.1 and the Irish Water Network Plan included in Appendix A).

As the site generally falls from its western corner towards its eastern corner, a gravity foul drainage solution can be provided for the proposed development.



Figure 4.1 Extract from Irish Water Network Plan (Site Boundary Indicative Only)

## 3.2 Design Strategy

As per earlier comments regarding surface water drainage, the site falls from its South-West corner towards its North-Eastern corner forming a single foul drainage catchment.

In order to service the proposed development, it is proposed to connect the site to the existing 225mm diameter foul sewer discharging to the foul network in Willow Grove through the Eastern corner of the site. Existing on-site foul network will be replaced and routed through the proposed developments foul network.

The proposed foul drainage network will comprise of a series of 225mm diameter pipes. Each residential unit located along the site's south-eastern and south-western boundary is to be serviced by individual 100mm diameter connections.

Refer to DBFL Drawing 180208-XX-XX-DR-C-3001 for the proposed foul drainage infrastructure described above.

We note that Irish Water have issued a Statement of Design Acceptance in relation to the proposed foul drainage layout (refer to Appendix D).

## 3.3 Pre-Connection Feedback from Irish Water

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

- Subject to a valid connection agreement being put in place, the proposed connection to the Irish Water's foul drainage network can be facilitated.
- There is no known constraint downstream of the site, however, due to the size of the development it will be necessary to carry out further studies to confirm available capacity prior to agreeing to the proposed connection.
- The applicant has engaged with Irish Water in relation to the "further studies" noted above by way of requesting to enter into a Project Works Service Agreement (PWSA). Irish Water have confirmed that the scope of the PWSA is being reviewed. Their initial assessment indicates that the scope of the PWSA will include "flow monitoring / model update / capacity assessment" in the context of the Drainage Area Plan for the overall catchment. Also refer to e-mail correspondence between DBFL and Irish Water in Appendix D.

## 3.4 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 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

Design of the foul drainage network has been carried out using Microdrainage WinDes analysis software (refer to Appendix F for the foul drainage model).

#### **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

## 3.5 Foul Drainage – Environmental Impacts

#### **Residential**

#### Waste Water Discharge Calculation

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

No. of Dwellings	468
Post Development Average Discharge	2.4 l/sec
Post Development Peak Discharge	14.4 l/sec
Daily Foul Discharge Volume (446l per dwelling)	208,728 l/Day

#### Café / Restaurant / Office Space / Concierge and Residential Amenity Space

#### Waste Water Discharge Calculation

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

Assumed occupancy (persons)	75
Flow Rate / Person / Day (litres)	50
(Based on IW Flow Rate for Design	
non-residential school with canteen)	
Post Development Average Discharge	0.15 l/sec
(based on 8 hour occupancy)	
Post Development Peak Discharge	0.9 l/sec
(6 X DWF)	
Daily Foul Discharge Volume (50l per person)	3,750 l/Day

## 4. WATER SUPPLY AND DISTRIBUTION

## 4.1 Existing Public Watermains

Existing public water supply infrastructure is located along Old Bray Road (24" Cast Iron Watermain and 4" uPVC Watermain).

Refer to Figure 5.1 and the Irish Water Network Plan included in Appendix A which shows the location of these watermains.



Figure 5.1 Extract from Irish Water Network Plan

## 4.2 Pre-Connection Feedback from Irish Water

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

• Subject to a valid connection agreement being put in place, the proposed connection to the Irish Water's water supply network can be facilitated.

## 4.3 Proposed Watermain Layout

As noted previously, existing 24" Cast Iron and 4" uPVC watermains are located along Old Bray Road. This infrastructure is expected to provide a suitable connection for the proposed development.

The site's proposed water main layout is shown on DBFL Drawing 180208-XX-XX-DR-C-3002. We note that Irish Water have issued a Statement of Design Acceptance in relation to the proposed water main layout (refer to Appendix D).

It is proposed to take a 200mm diameter connection off the existing 24" Cast Iron public water supply line (located along the Old Bray Road). A looped water main will be provided within the proposed development.

The proposed water main layout and connections to existing public water mains have been designed in accordance with Irish Water Standard Detail STD-W-02.

Individual houses located along the site's eastern boundary will have their own connections (25mm O.D. PE pipe) to distribution water mains via service connections and meter / boundary boxes. Individual connections are to be installed in accordance with Irish Water Standard Detail STD-W-03.

### 4.4 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.

#### 4.5 Materials

Proposed water mains are to be HDPE 100 SDR17.

Service connections (to individual houses) are to be MDPE 80 SDR11.

## 4.6 Water Demand

#### **Residential**

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

•	No. of Dwellings	468
•	Average Occupancy Ration (Persons Per Dwelling)	2.7
•	Per-Capita Consumption (I/person/day)	150
•	Average Domestic Daily Demand (I/sec)	2.2
•	Post Development Average Hour Water Demand (I/sec)	2.8
	(1.25 x Average Domestic Daily Demand)	
•	Post Development Peak Hour Water Demand (I/sec)	14.0

(5.0 x Post Development Average Hour Water Demand)

### Café / Restaurant / Office Space / Concierge and Residential Amenity Space

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

•	Assumed occupancy (persons)	75
•	Per-Capita Consumption (I/person/day)	50
	(Based on IW Flow Rate for Design	
	non-residential school with canteen)	
•	Average Domestic Daily Demand (I/sec)	0.15
	(based on 8 hour occupancy)	
•	Post Development Average Hour Water Demand (I/sec)	0.2
	(1.25 x Average Domestic Daily Demand)	
•	Post Development Peak Hour Water Demand (I/sec)	1.0
	(5.0 x Post Development Average Hour Water Demand)	

## APPENDIX A – IRISH WATER NETWORK PLANS



### 10/10/2018 12:18:24 PM

### Legend

Stormwater Gravity Mains (Irish Water Owned)

Surface

Stormwater Gravity Mains (Non-Irish Water Owned)

- Surface

#### Storm Manholes

- Cascade
- 왐 Catchpit
- -¥-Hatchbox

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

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# Site at Cornelscourt



© Ordnance Survey Ireland | osi |

#### Legend

Stormwater Gravity Mains (Irish Water Owned)

- Surface
- Stormwater Gravity Mains (Non-Irish Water Owned)
- --- Surface

#### Storm Manholes

- Cascade
- Catchpit
- : 1 : Hatchbox
- Lamphole
- 4 Standard
- - 1 Other; Unknown

#### Storm Inlets

- Gully
- Standard
- Other; Unknown

- Storm Fittings
  - Vent/Col
- $r_{\rm c}=1$ Other; Unknown
- Storm Discharge Points
  - ÷ Outfall
  - Overflow
  - Soakaway
- Other; Unknown
- Storm Culverts
- Storm Clean Outs

- Combined
- Foul
- Overflow
- Unknown

- Sewer Gravity Mains (Non-Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown
- Sewer Pressurized Mains (Irish Water owned)
- Combined
- ---- Foul
- Overflow
- Unknown

#### Sewer Gravity Mains (Irish Water owned) Sewer Pressurized Mains (Non-Irish Water owned)

---- Foul

Overflow

- Combined
  - - - Unknown

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

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## **APPENDIX B – GII TRIAL PIT LOGS**

	Gro	und In	vestigatio www.gii	Site Cornelscourt	Trial Pit Number IT01	Trial Pit Number IT01				
Machine : J Method :	СВ	Dimens	ions	G	Found	Level (mOD)	Client DBFL		Job Number 8354-01-1	<b>r</b> 19
		Locatio	Location			/01/2019	Engineer		<b>Sheet</b> 1/1	
Depth (m)	Sample / Test	s Water Depth (m)	Field Re	cords (	Level mOD)	Depth (m) (Thickness)	Description		Legend	Water
						- 0.20 - (0.30) - 0.50 	MADE GROUND: Brown s CLAY. Firm brown slightly sandy	slightly sandy slightly gravel	y	
							Complete at 1.90m			
Plan .						.   F	Remarks No Groundwater encountere Trial pit stable.	ed.		
							Infiltration test completed in Trial pit backfilled on completed on complete Trial pit backfilled on complete Trial pit backfilled Trial pit backf	trial pit. etion of infiltration test.		
· ·						•				
· ·	• •	•	· ·	· ·		•				
						. s	scale (approx) 1:25	Logged By Tmcl	<b>Figure No.</b> 8354-01-19.IT0 <sup>7</sup>	

	Gro	und In	vestigat www.g	ions Ire jii.ie	Site Cornelscourt	Trial Pit Number IT02			
Machine : J Method :	СВ	Dimens	sions		Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19
		Locatio	'n		Dates 21	/01/2019	Engineer		Sheet 1/1
Depth (m)	Sample / Test	Water Depth (m)	Field F	lecords	Level (mOD)	Depth (ṁ) (Thickness)	D	escription	Legend Safe
Plan .						(Thičkňess)	Brown slightly sandy sligh Firm to stiff light brown slig Stiff grey mottled brown sl rare sub-angular cobbles. Complete at 1.90m Complete at 1.90m Remarks No Groundwater encounterent Infiltration test completed in	tly gravelly TOPSOIL. ghtly sandy slightly gravelly C ightly sandy gravelly CLAY w defined by the second	Ecgent S
							mai pit packtilled on comple	euon of inflitration test.	
					-	-			
						s	Scale (approx) 1:25	Logged By Tmcl	Figure No. 8354-01-19.IT02

Ground Investigations Ireland Ltd							Site Cornelscourt Trial Pi IT03		
Machine : J Method :	СВ	Dimens	ions		Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19
		Locatio	Location			/01/2019	Engineer		Sheet 1/1
Depth (m)	Sample / Test	Water Depth (m)	Field Red	cords	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend S
						(0.25)	Brown slightly sandy sligh	lly gravelly TOPSOIL.	
						(0.25)	Firm to stiff light brown slig with rare sub-angular cob	htly sandy slightly gravelly ( bles.	
						0.50	Firm to stiff brown slightly	sandy gravelly CLAY with ra	re 0 0 0
						 - 	sub-angular cobbles.		
						- (0.80)			
						(0.80)			0 <u>.0</u> 0 6.00
									0 <u>.0</u> 0
						1.30	Firm to stiff grey mottled b	rown slightly sandy gravelly	CLAY
							with rare sub-angular cobi	Jies.	10 10 0 10 10 0 10 10 0
						(0.60)			
						- 1.00			
						- 1.90	Complete at 1.90m		
						-			
						-			
						-			
						-			
Plan					• •		Remarks		
							No Groundwater encountere Trial pit stable. Infiltration test completed in	ea. trial pit.	
		-					Trial pit backfilled on comple	tion of infiltration test.	
					•				
		-	•	-		•			
		•							
			· ·		- '		Scale (approx)	Logged By	Figure No.
							1:25	Tmcl	8354-01-19.IT03

	Grou	nd Inv	vestigations www.gii.ie	Site Cornelscourt				
Machine : J	CB 3CX rial Pit	Dimensi	ons	Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19
		Locatior	n (Handheld GPS)	Dates 2	1/01/2019	Engineer		<b>Sheet</b> 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend Safe
					(0.20) 0.20 (0.15) 0.35 (1.35) (1.35)	Brown slightly sandy sligh fragments of conrete and MADE GROUND: Blueish angular to subangular, fine Firm, brown, slightly sandy subangular to subrounded	tly gravelly TOPSOIL with plastic. grey slightly sandy CLAY w to coarse gravel. / slightly gravelly CLAY with cobbles of granite.	ith
					- 1.70 - 1.70 - (1.10)	Firm, brown, slightly sandy occasional subangular to granite and limestone. Rai	r, slightly gravelly CLAY with subrounded weathered cobt e boulders of granite.	
					2.80 (0.20) 3.00 	Firm, brown, very sandy, a coarse gravel with rare co weathered rock. Trial pit terminated due t Complete at 3.00m	ingular to subangular, fine to bbles of granite and possible o sidewall collapse.	
Plan .					ľ	Remarks	t 1 40m (Slight seenage) 2	10m (medium
		·				seepage) and 2.80m (mediu Trial pit sidewall collapsed b Trial pit terminated at 3.0m I	etween 0.70m and 2.80m B BGL due to sidewall collapse	GL.
· ·	· ·		· · ·	•	· ·			
					s	Scale (approx)	Logged By	Figure No.
1						1:25	Tmcl	8354-01-19.TP01

GROUND IRELAND	Ground Investigations Ireland Ltd						Site T Cornelscourt		
Machine:J Method:	СВ	Dimensi	ons	Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19	
		Locatior	1	Dates 21	/01/2019	Engineer		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend S	
Plan . 		- (m)			(Thičkňess) (0.25) (0.25) (0.25) (0.25) (0.25) (0.80) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (0.60) (	Brown slightly sandy slight     Firm to stiff light brown slightly sub-angular cobbles.     Firm to stiff grey mottled b     with rare sub-angular cobbles.     Complete at 1.90m     Complete at 1.90m     Remarks     No Groundwater encounterer Trial pit stable.     Infiltration test completed in Trial pit backfilled on Completed in	tly gravelly TOPSOIL. ghtly sandy slightly gravelly Obles. sandy gravelly CLAY with ra rown slightly sandy gravelly ples. ed. trial pit. stion of infiltration test.	CLAY (0, 10, 0) (0, 10, 0) (	
	· ·	•		•	· ·				
	· ·	·	· · ·	-	s	Scale (approx)	Logged By	Figure No. 8354-01-19 IT03	
						1.20		500.0110.000	

	Gro	und In	vestigati www.gi	Site Trial Cornelscourt TP					
Machine:J Method:	СВ	Dimens	ions		Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19
		Locatio	Location			2/01/2019	Engineer		<b>Sheet</b> 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Re	cords	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend S
						(0.30)	Brown slightly sandy sligh fragments of plastic and g	tly gravelly TOPSOIL with rass rootetls.	
						0.30	Firm light brown slightly sa	andy slightly gravelly CLAY.	
						(0.60)			
						- 0.90	Firm to stiff greyish brown occaisonal sub-angular cc	slightly sandy gravelly CLAY bbles.	with
						(2.10)			0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
						3.00	Terminated due to sidew Complete at 3.00m	alls collapsing.	10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10
Plan .							Remarks	t 2.80m BGL (Medium Seep	age).
			· ·		•		Trial pit sidewall collapsed b Trial pit backfilled on comple	etween 0.90m and 2.30m. tion.	
		•		·	•				
· ·	· ·	•	· ·			· · ·			
							Scale (annrox)	Logged By	Figure No.
							1:25	Tmcl	8354-01-19.TP03

Ground	nd Inv	estigation www.gii.ie	Site Trial Pit Cornelscourt TP04				
Machine : JCB Method :	Dimensio	ns	Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19
	Location		Dates 2	2/01/2019	Engineer		<b>Sheet</b> 1/1
Depth (m) Sample / Tests	Water Depth (m)	Field Record	s (mOD)	Depth (m) (Thickness)	D	escription	Legend Star
				(0.30)	Brown slightly sandy sligh rootetls.	tly gravelly TOPSOIL with grade the set of t	ass
				- 0.30 - (0.30)	Firm light brown slightly sa	andy slightly gravelly CLAY.	
				0.60	Firm to stiff grey mottled b with rare sub-angular cobl	rown slightly sandy gravelly bles and rare boulders.	
Plan				(1.50) 2.10 (1.40) 3.50	Stiff light orange/brown sli rare sub-rounded cobbles	ghtly sandy gravelly CLAY w	
	·			'	No Groundwater encountere Trial pit stable.	ed.	
				•••	Trial pit backfilled on comple	etion.	
				•••			
	·			s	Scale (approx) 1:25	Logged By Tmcl	Figure No. 8354-01-19.TP04

	Grou	nd Inv	vestigatio www.gii.	Site Cornelscourt			Trial Pit Number <b>TP-06</b>			
Machine : J Method :	СВ	Dimensions			Ground	Level (mOD)	Client DBFL			Job Number 8354-01-19
		Location (Handheld GPS)			Dates 21/01/2019		Engineer			<b>Sheet</b> 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Rec	ords	Level (mOD)	Depth (m) (Thickness)	D	escription		Legend S
Plan .						(0.20) (0.10) (0.30) (0.80) (0.80) (1.40) (1.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40) (0.40)	Topsoil      MADE GROUND: Blueish angular to subangular fine     Firm brown slightly sandy piece of concrete slab.     Soft brown slightly sandy s subangular cobbles of lime     Stiff dark brown/grey slightly subangular cobbles.     Trial pit terminated.     Complete at 2.90m     Remarks     Groundwater encountered at fine	grey slightly sandy CLAY w to coarse gravel. slightly gravelly CLAY with a slightly gravelly CLAY with r estone and granite.	rith a are th rare	
		•					Trial pit collapsed from 1.20 Trial pit terminated due to si	m to 2.40m BGL. dewall collapse.		
	· ·	•	· ·							
						S	Scale (approx) 1:25	Logged By TMcI	Figure 8354-0	<b>No.</b> )1-19.TP-06
	Gro	und In	vestigatio	ons Ire i.ie	eland	Ltd	Site Cornelscourt		Trial Pit Number TP07A	
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Machine : J Method :	CB	Dimensi	ons		Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19	
		Location	n		Dates 21	/01/2019	Engineer		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Re	cords	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend Steel	
						(0.60) 0.60 (0.65)	MADE GROUND: Brown s Clay with rare fragments of Firm light brown slightly sa rare sub-angular cobbles.	ilightly sandy slightly gravelly f plastic and metal. Indy slightly gravelly CLAY w	ith 6 10 0 6 10 0 6 10 0 10	
						(0.25) (0.25) (0.25) (0.70) (0.70)	Soft to firm greyish brown CLAY with rare sub-angula Firm to stiff grey mottled b with rare sub-rounded cob	slightly sandy slightly gravel ar to sub-rounded cobbles. rown slightly sandy gravelly bles.	io         io           y         io         io           y         io         io           io         io         io	
						2.20 (0.60) 2.80	Stiff grey mottled brown sl occasional boulders.	ightly sandy gravelly CLAY w		
							Complete at 3.30m			
Plan		·		·	-	I	Remarks Trial pit stable.	od		
			· ·		•		Trial pit backfilled on comple	ition.		
			· ·	·						
· ·	· ·		· ·			· ·				
						s	Scale (approx) 1:25	Logged By Tmcl	Figure No. 8354-01-19.TP-14	

	Grou	nd In	vestigations I www.gii.ie	reland	Ltd	Site Cornelscourt		Trial Pit Number <b>TP08</b>
Machine : J	СВ	Dimens	ions	Ground	Level (mOD)	Client		Job Number
Methou .								8354-01-19
		Locatio	n	Dates 22	2/01/2019	Engineer		<b>Sheet</b> 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend Safe
					(0.40) 0.40	Brown slightly sandy sligh rootlets.	tly gravelly TOPSOIL with gr	rass
					(0.40)	i inn ignt brown siignuy se		
					2.90	Firm to stiff greyish brown CLAY with rare sub-angula lenses.	slightly sandy slightly grave ar cobbles and sandy grave	
Plan					<u> </u>	Remarks		
					· · ·   '	Groundwater encountered a seepage).	at 2.00m (slight seepage) an	d 2.30m BGL(fast
		·		•	•••	Trial pit sidewalls collapsed. Trial pit backfilled on comple	etion.	
		•		·	•••			
		•						
					-			<b>P</b> <sup>1</sup>
					S	cale (approx) 1:25	<b>Loggea Ву</b> Tmcl	<b>Figure No.</b> 8354-01-19.TP08

	Grou	nd In	vestigations www.gii.ie	Ireland	Ltd	Site Cornelscourt		Trial Pit Number <b>TP09</b>
Machine : J Method :	СВ	Dimens	ions	Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19
		Locatio	n	Dates		Engineer		Sheet
				2	2/01/2019			1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	D	escription	Kater Kater
					(0.40)	MADE GROUND: Brown s CLAY with occasional frag	slightly sandy slightly gravel ments of concrete and plas	ly lic.
					0.40	Soft to firm light brown slig	htly sandy slightly gravelly (	CLAY.
					0.80	Firm greyish brown slightly sub-angular cobbles.	/ sandy gravelly CLAY with	rare 6.02.0
					- (0.70) 			
					1.50	Firm to stiff greyish brown rare sub-rounded boulders	slightly sandy gravelly CLA s of limestone.	Y with
					(0.50)  2.00	Stiff grevish brown slightly	sandy gravelly CLAY with r	
						sub-angular cobbles.		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
								0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
					- (1.50) 			0.00 0.00 0.00 0.00 0.00 0.00
					3.50	Obstruction: Presumed I	Rock.	6 • 2 • 0 •
					-	Complete at 3.50m		
					-			
Plan .	· ·	•				Remarks		
						Trial pit sidewalls collapsed Trial pit backfilled on comple	ու Հ.օստ ԵՅL. between 1.0m and 1.80m B ttion.	GL.
		•				Scale (approx)	Logged By	Figure No.
						1:25	Tmcl	8354-01-19.TP09

GROUND IRELAND	Gro	und In	vestigatio	ons Irel .ie	land	Ltd	Site Cornelscourt		Trial Pit Number <b>TP11</b>
Machine : J	СВ	Dimensi	ions		Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19
		Location	n		Dates 21	/01/2019	Engineer		<b>Sheet</b> 1/1
Depth (m)	Sample / Test	Water Depth (m)	Field Rec	cords	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend S
						(0.80)	MADE GROUND: Brown s Clay with frequent fragmen cloth and plastic.	lightly sandy slightly gravel Its of concrete, glass, red b	ly rick,
						- 0.80 - (0.20) - 1.00 	Soft light brown slightly sa rare sub-angular to sub-ro Firm grey slightly sandy sli sub-angular cobbles and a	ndy slightly gravelly CLAY v unded cobbles. ghtly gravelly CLAY with rai a strong hydrocarbon odour.	vith 6 10 0 6 10 0 10
						(1.00) (1.00)			0 0 0 0 0 0 0 0 0 0 0 0 0 0
						2.00	Firm to stiff grey slightly sa rare sub-angular cobbles a	andy slightly gravelly CLAY and a hydrocarbon odour.	with <u>6 - 5 4</u> <u>6 - 5 4</u>
						(1.00)			0 0 0 0 0 0 0 0 0 0 0 0 0 0
						3.00 	Obstruction: Boulders or Complete at 3.00m	rock.	
						- - - - - - - - - - - - - - - - - - -			
Plan		-	· ·	•	· ·	. F	Remarks		I
							No Groundwater encountere Trial pit sidewall collapsed b Trial pit backfilled on comple	ed. etween 0.80m and 2.25m E tion.	GL.
					· ·				
					• •				
						. s	Scale (approx) 1:25	Logged By Tmcl	Figure No. 8354-01-19.TP11

		Grou	nd In	vestig ww	jation v.gii.ie	s Ire	land	Ltd	Site Cornelscourt		Trial Pit Number TP12
Machine : . Method :	JCB		Dimensi	ions			Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19
			Location	n			Dates 22	/01/2019	Engineer		<b>Sheet</b> 1/1
Depth (m)	Sampl	e / Tests	Water Depth (m)	Fie	eld Record	ls	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend Safe
								(0.20) 0.20	Brown slightly sandy sligh rootlets. Firm light brown slightly sa	ly gravelly TOPSOIL with gr	ass
								(0.30) 0.50	Firm greu mottled brown s	lightly sandy gravelly CLAY	with <u>6 5 4</u>
								0.70	Firm to stiff gey mottled br with rare sub-angular cobl	own slightly sandy gravelly ( oles.	
								- - - - -			6 0 0 0
								- - - - -			
								 (2.20)			<u>6</u> 
								- - - -			
								- - - -			
											0.0.0 0.0 0.0 0.0 0.0 0.0
								2.90	Obstruction: Granite Bou	lder.	
Plan .								· ·	Remarks	t 2 50m (Medium seepage)	
									Trial pit sidewalls collapsed Trial pit backfilled on comple	from 0.90m to 2.60m	
· ·											
· ·		•	•	•							
	·	-		-	-				Scale (approx) 1:25	Logged By Tmcl	Figure No. 8354-01-19.TP12

GROUND IRELAND	Ground Investigations www.gii.ie			ons Ire <sup>i.ie</sup>	land	Ltd	Site Cornelscourt	Trial Pit Number TP13	
Machine : J	СВ	Dimensi	ions		Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19
		Location	n		Dates 22	2/01/2019	Engineer		<b>Sheet</b> 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Re	ecords	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend X
						(0.40) 0.40 (0.50)	MADE GROUND: Brown s CLAY with rare fragments grass rootlets.	slightly sandy slightly gravell of metal, plastic, concrete a ghtly sandy slightly gravelly (	y nd CLAY. (*) (*********************************
						0.90	Firm to stiff greyish brown rare sub-angular to sub-ro	slightly sandy gravelly CLA unded cobbles.	Y with <u>a way</u> <u>a way</u>
						(1.10)			4 
						2.00	Stiff grey mottled brown sl rare sub-angular cobbles.	ightly sandy gravelly CLAY v	•         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •
						3.20	Complete at 3.20m		<u>,,,,,,,</u> ,,,
Plan .					-	!	Remarks	ed.	
· ·		•		·	-		Trial pit stable. Trial pit backfilled on comple	tion.	
					-				
· ·	· ·		· ·			· ·			
							Scale (approx) 1:25	Logged By Tmcl	Figure No. 8354-01-19.TP13

Ground Investigations www.gii.ie				ns Ire	land	Ltd		Site Cornelscourt				
Machine : J Method :	ICB		Dimensi	ions			Ground	Level (mO	D)	Client DBFL		Job Number 8354-01-1
			Location	n			Dates 21	1/01/2019		Engineer		Sheet 1/1
Depth (m)	Sample /	Tests	Water Depth (m)	Fi	eld Recor	ds	Level (mOD)	Depth (m) (Thicknes	ss)	D	escription	Legend
								- (0.8 - (0.8	0)	MADE GROUND: Brown s Clay with frequent fragment cloth and plastic.	slightly sandy slightly gravel	yrick,
								- (0.2 - 1.0 	0)	Firm grey slightly sandy slightly sligh	ady signity gravely CLAY v unded cobbles. ightly gravelly CLAY with ran a strong hydrocarbon odour.	re <u>6 0 0</u>
								- - - - - - - - -	0)			2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 200 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2
								2.0	0)	Firm to stiff grey slightly sa rare sub-angular cobbles a	andy slightly gravelly CLAY and a hydrocarbon odour.	with 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
								- 3.3 - 3.3 	60	Obstruction: Boulders or Complete at 3.30m	rock.	
Plan .									F	Remarks Trial pit stable.		
										No Groundwater encountere Trial pit backfilled on comple	ed. etion.	
		•										
· ·		•	•	·	•	•	•					
		•	·		•		•		S	<b>scale (approx)</b> 1:25	Logged By Tmcl	Figure No. 8354-01-19.TP-14

GROUND INVENIGATIONS IRELAND	Gro	und In	vestigat www.g	ions Ire <sup>ii.ie</sup>	land	Ltd	Site Cornelscourt		Trial Pit Number TP16
Machine : Method :	JCB	Dimens	ions		Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19
		Locatio	n		Dates 22	2/01/2019	Engineer		<b>Sheet</b> 1/1
Depth (m)	Sample / Test	Water Depth (m)	Field R	ecords	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend E
					-	(Intextiess) (0.25) (0.55) (0.55) (0.50) (0.50) (1.30) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (1.40) (	Brown slightly sandy slight rootlets.         Soft to firm light brown slightly sub-angular cobbles.         Firm to stiff greyish brown rare sub-angular cobbles and the s	ly gravelly TOPSOIL with gravelly for sandy slightly gravelly CLAY with r sandy gravelly CLAY with r slightly sandy gravel lenses.	ass LAY. with 6 0 0 0 6 0 0
· ·	· ·	•	· ·	•		· ·			
						s	Scale (approx) 1:25	Logged By Tmcl	Figure No. 8354-01-19.TP16

GROUND IRELAND	Grou	nd In	vestigations www.gii.ie	Ireland	Ltd	Site Cornelscourt		Trial Pit Number TP17
Machine : J	СВ	Dimensi	ions	Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19
		Locatio	n	Dates 22	2/01/2019	Engineer		<b>Sheet</b> 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend S
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (Thickness) (0.25) 0.25 0.25 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.9	D         Brown slightly sandy slight rootlets.         Firm light brown slightly sa         Firm to stiff greyish brown rare sub-rounded cobbles         Light yellowish grey very s to sub-rounded fine to coa granite(Weathered Rock).         Obstruction: Rock (Grant Complete at 3.20m	escription Ity gravelly TOPSOIL with gr indy slightly gravelly CLAY. slightly sandy gravelly CLAN limestone. andy slightly clayey sub-angrise GRAVEL of ite).	Legend       ass       (with       ass       (with       (a)       (b)       (a)       (b)       (a)       (b)       (a)       (b)       (b)       (a)       (b)       (a)       (b)       (a)       (b)       (a)       (a)       (b)       (a)       (b)       (a)       (b)       (a)       (a)       (a)       (b)       (a)       (b)       (a)       (a) <t< th=""></t<>
				•	· · ·   ·	Groundwater encountered a Trial pit sidewalls spalling. Trial pit backfilled on comple	t 3.10m BGL (Medium seep tion.	age).
							-	
					<u> </u>	Scale (approx) 1:25	Logged By Tmcl	<b>Figure No.</b> 8354-01-19.TP16

	C	Grou	nd In	vestig ww	jations w.gii.ie	s Ire	and	Ltd	Site Cornelscourt		Trial Pit Number TP20
Machine : . Method :	JCB		Dimens	ions	-		Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19
			Location	n			Dates 21	/01/2019	Engineer		Sheet 1/1
Depth (m)	Sample /	Tests	Water Depth (m)	Fie	eld Records	5	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend S
								 (0.50)	MADE GROUND: Brown s Clay with rare fragments c	slightly sandy slightly gravell f plastic, wire, cloth and glas	y ss.
								0.50 (0.20)	Firm light brown slightly sa	ndy slightly gravelly CLAY.	· · · · · · · · · · · · · · · · · · ·
								0.70	Stiff grey mottled brown sl rare sub-angular cobbles.	ghtly sandy gravelly CLAY v	vith 0.00
								(0.80) 			0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
								1.50	Firm greyish brown slightly sub-angular cobbles.	v sandy gravelly CLAY with r	are 6.000
								(1.00)			0 0 0 0 0 0 0 0 0 0 0 0 0 0
								2.50 (0.50)	Stiff to very stiff black sligh cobbles and boulders.	tly sandy gravelly CLAY witl	n rare
								3.00	Obstruction: Boulder or i	ock.	<u> <u> </u></u>
									Complete at 3.00m		
Plan .				•		1		<u> </u>	Remarks		
									Groundwater encountered a Trial pit sidewalls spalling. Trial pit backfilled on comple	t 2.0m BGL(Medium seepaç tion.	ge).
									Scale (approx)	Logged By	Figure No.
									1:25	Tmcl	8354-01-19.TP20

	Gr	ound In	vestigati www.g	ions Ire <sup>ii.ie</sup>	land	Ltd	Site Cornelscourt		Trial Pit Number TP21
Machine : J Method :	СВ	Dimens	sions		Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19
		Locatio	on		Dates 22	2/01/2019	Engineer		Sheet 1/1
Depth (m)	Sample / Te	sts Water Depth (m)	Field R	ecords	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend S
						(0.25)	Brown slightly sandy slight rootlets.	tly gravelly TOPSOIL with gravelly the structure of the second second second second second second second second	ass
						(0.35)	Firm light brown slightly sa	andy slightly gravelly CLAY.	
						0.60	Firm greyish brown slightly sub-angular cobbles and l	/ sandy gravelly CLAY with r enses of granite.	are 6 0 0
						0.95 (0.25)	Grey very sand slightly cla to coarse GRAVEL with ra	yey subrounded to rounded re sub-rounded cobbles.	fine
						1.20	Firm to stiff grey mottled b with rare sub-angular cobb	rown slightly sandy gravelly oles.	
						 - - - -			6 <u>.0</u> 0
						 - - -			6 · 0 · 0 · 0 · 0 · 0 · 0 · 0 · 0 · 0 ·
						(1.80)			
						-  - - -			
						- - - -			
						3.00	Obstruction: Rock (Gran	ite).	
						 - - - - -	Complete at 3.00m		
						 - - -			
						- - - - -			
Plan					•	<u> </u>	Remarks		
					•		No Groundwater encountere Trial pit stable. Trial pit backfilled on comple Strong hydrocarbon odour u	ed. etion. pon reaching rock.	
					•				
					•				
					•				
	·				•		Scale (approx) 1:25	Logged By Tmcl	Figure No. 8354-01-19.TP21

# APPENDIX C – ATTENUATION CALCULATION

DBFL Consulting Engi	neers						Page 1
Ormond House		Catc	hment A				
Upper Ormond Quay							
Dublin 7							Micco
Date 30/10/2019 12:3	4	Des	igned h	v Byrnes	e		
File casl casy		Che	aked by	, , , , , , , , , , , , , , , , , , , ,	C		Drainage
File Casi.Casx		Cile	ckeu by				
Innovyze		Sou	rce Con	itrol 201	8.1		
			6 5	<b>.</b>			
<u> </u>	Lascade Sui	imary c	or Resu	its for A	A.Srcx		
	Unstre	am 011+	flow To	Overflow T	<b>'</b> 0		
	Structu	res	110# 10	0001110# 1	.0		
	(Noi	ne)	B.srcx	(None	e)		
	Half D	rain Ti	me : 128	4 minutes.			
Storm	Max Max	M	lax	Max	Max	Max	Status
Event	Level Deptl	h Infil	tration	Control E	Outflow	Volume	beacab
	(m) (m)	(1	/s)	(1/s)	(1/s)	(m <sup>3</sup> )	
		_					
15 min Summer	46.477 0.37	/ 0	0.0	1.5	1.5	70.9	OK
50 min Summer	46.620 0.520	0 7	0.0	1.5	1.5	125 6	OK
120 min Summer	46 923 0 82	3	0.0	1.5	1.5	154 8	O K O K
180 min Summer	47 015 0 91	5	0.0	1.0	1.0	172 1	0 K
240 min Summer	47 079 0 979	с С	0.0	1 7	1.0	184 1	O K
360 min Summer	47 162 1 06	2 2	0.0	1 7	1 7	109.1	O K
480 min Summer	47 213 1 11	2	0.0	1.8	1 8	209 3	0 K
600 min Summer	47.244 1.144	4	0.0	1.8	1.8	215.2	0 K
720 min Summer	47 263 1 16	- 3	0 0	1 8	1 8	218 8	0 K
960 min Summer	47.277 1.17	7	0.0	1.8	1.8	221.3	0 K
1440 min Summer	47.273 1.17	3	0.0	1.8	1.8	220.7	O K
2160 min Summer	47.256 1.150	6	0.0	1.8	1.8	217.4	O K
2880 min Summer	47.234 1.134	4	0.0	1.8	1.8	213.4	O K
4320 min Summer	47.181 1.08	1	0.0	1.7	1.7	203.4	ОК
5760 min Summer	47.120 1.020	0	0.0	1.7	1.7	191.9	ΟK
7200 min Summer	47.057 0.95	7	0.0	1.7	1.7	180.0	O K
		·					
	Storm	Rain	Flooded	l Discharge	e Time-Pe	eak	
	Event	(mm/hr)	Volume	Volume	(mins	)	
			(m³)	(m³)			
15	min Summer	78.546	0.0	72.4	Ł	23	
30	min Summer	54.456	0.0	100.3	3	38	
60	min Summer	35.457	0.0	130.7	7	68	
120	min Summer	22.431	0.0	165.4	l 1	L28	
180	min Summer	17.011	0.0	188.3	3 1	L86	
240	min Summer	13.956	0.0	205.8	3 2	246	
360	min Summer	10.526	0.0	232.9	) 3	366	
480	min Summer	8.606	0.0	254.0	) 4	186	
600	min Summer	7.356	0.0	258.1	. 6	506	
720	min Summer	6.469	0.0	259.5	5 5	724	
960	min Cummor	E 201	0 0	261 2		20	

960 min Summer

1440 min Summer 2160 min Summer

2880 min Summer

4320 min Summer

5760 min Summer

7200 min Summer

5.281

3.965 2.976

2.425

1.815

1.476

1.257

0.0

0.0

0.0

0.0

0.0

0.0

0.0

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259.5 261.3

265.4 395.2

429.6

465.7

522.5

556.7

2816

3640

4472

DBFL Consulting Engi	neers							Page	2
Ormond House Catchment A									
Upper Ormond Quay									
Dublin 7								Mico	
Date 30/10/2019 12:3	34		Desi	gned b	y Byrnes	е			U
File cas1.casx			Chec	ked by				DIdli	lage
Innovyze			Sour	ce Cont	trol 201	8.1			
	Cascade	Summa	ary o	f Resul	lts for 2	A.srcx			
Storm	Max	Max	M	ax	Max	Max	Max	Status	
Event	Level	Depth	Infilt	ration	Control S	Outflow	Volume		
	(m)	(m)	(1	/s)	(1/s)	(1/s)	(m³)		
8640 min Summer	46.994	0.894		0.0	1.6	1.6	168.2	ОК	
10080 min Summer	46.932	0.832		0.0	1.6	1.6	156.6	ОК	
15 min Winter	46.523	0.423		0.0	1.5	1.5	79.6	ОК	
30 min Winter	46.684	0.584		0.0	1.5	1.5	109.8	ОК	
60 min Winter	46.851	0.751		0.0	1.5	1.5	141.2	ΟK	
120 min Winter	47.029	0.929		0.0	1.6	1.6	174.7	ОК	
180 min Winter	47.135	1.035		0.0	1.7	1.7	194.7	ОК	
240 min Winter	47.210	1.110		0.0	1.8	1.8	208.9	ΟK	
360 min Winter	47.311	1.211		0.0	1.8	1.8	227.8	ΟK	
480 min Winter	47.375	1.275		0.0	1.9	1.9	239.8	ОК	
600 min Winter	47.418	1.318		0.0	1.9	1.9	247.9	ОК	
720 min Winter	47.447	1.347		0.0	1.9	1.9	253.3	ОК	
960 min Winter	47.478	1.378		0.0	1.9	1.9	259.1	ОК	
1440 min Winter		1.382		0.0	1.9	1.9	260.0	OK	
2160 min Winter	4/.45/	1 216		0.0	1.9	1.9	255.2	OK	
4220 min Winter	4/.410	1 225		0.0	1.9	1.9	24/.5	0 K	
5760 min Winter	47 224	1.225		0.0	1.8	1.0	230.5	0 K	
7200 min Winter	47 122	1 022		0.0	1.0	1 7	192 2	0 K	
8640 min Winter	47.023	0.923		0.0	1.6	1.6	173.7	ОК	
10080 min Winter	46.930	0.830		0.0	1.6	1.0	156.0	ОК	
	Storm	F	Rain	Flooded	Discharg	e Time-Pe	eak		
	Event	( m	m/hr)	Volume	Volume	(mins	)		
				(m³)	(m³)				
8640	) min Sun	mer	1.103	0.0	586.	1 52	280		
10080	) min Sun	mer	0.987	0.0	611.	8 60	)56		
1!	5 min Wir	nter 7	8.546	0.0	81.	0	23		
30	) min Wir	nter 5	4.456	0.0	112.	4	37		
60	) min Wir	nter 3	5.457	0.0	146.	5	66		
120	) min Wir	nter 2	2.431	0.0	185.	4 1	26		
180	) min Wir	nter 1	7.011	0.0	210.	8 1	84		
240	) min Wir	nter 1	3.956	0.0	230.	7 2	242		
360	) min Wir	nter 1	0.526	0.0	258.	4 3	360		
480	) min Wir	nter	8.606	0.0	262.	3 4	176		
600	) min Wir	nter	7.356	0.0	264.	8 5	588		
720	) min Wir	nter	6.469	0.0	267.	1 7	704		
960	) min Wir	nter	5.281	0.0	271.	8 9	926		

1440 min Winter

2160 min Winter

2880 min Winter

4320 min Winter

5760 min Winter

7200 min Winter

8640 min Winter

10080 min Winter

3.965

2.976

1.815

1.476

1.257

1.103

0.987

2.425

0.0

0.0

0.0

0.0

0.0

0.0

0.0

0.0

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279.9

442.9 481.0

491.2

585.9

623.7

655.8

685.1

1330

1668

2136

3068

3928

4824

5696

6552

DBFL Consulting Engineers		Page 3
Ormond House	Catchment A	
Upper Ormond Quay		
Dublin 7		Mirco
Date 30/10/2019 12:34	Designed by Byrnese	
File cas1.casx	Checked by	Diamage
Innovyze	Source Control 2018.1	
Cascade Rai	nfall Details for A.srcx	
Rainfall Model	FSR Winter Storms	Yes
Return Period (years)	100 Cv (Summer) 0	.750
Region Scotl	and and Ireland Cv (Winter) 0	.840
M5-60 (mm)	16.400 Shortest Storm (mins)	15
Summer Storms	Yes Climate Change %	+10
<u></u>	me Area Diagram	
То	tal Area (ha) 0.492	
Time (mins	s) Area Time (mins) Area	
FION: IO:		
0	4 0.000 4 8 0.492	
©19	982-2018 Innovyze	

Ormond House         Catchment A           Upper Ormond Quay         Designed by Byrnese           Date 30/10/2019 12:34         Designed by Byrnese           File casl.casx         Checked by           Innovyze         Source Control 2018.1           Cascade Model Details for A.srcx           Storage is Online Cover Level (m) 52.660           Cascade Model Details for A.srcx           Storage is Online Cover Level (m) 52.660           Cate 10:10 Safety Pactor 2.0           Infiltration Coefficient Base (m/hr) 0.00000           Depth (m) Area (m) Inf. Area (m)           0.00           0.00           Depth (m) Area (m) Inf. Area (m)           0.00           Depth (m) Area (m) Inf. Area (m)           0.00           Depth (m) Area (m) Inf. Area (m)           One Infiltration Coefficient Side (m/hr) 0.0000           Depth (m) Area (m) Inf. Area (m)           One Infiltration Coefficient Side (m/hr) 0.0000           Depth (m) Area (m) Inf. Area (m)           One Infiltration Coefficient Side (m/hr) 0.0000           Depth (m) Area (m) Inf. Area (m)           One Inf	DBFL Consulting Engineers		Page 4							
Upper Ormond Quay         Designed by Byrnese         Division           Data 30/10/2019 12:34         Designed by Byrnese         Division           File casl.casx         Checked by         Division           Innovyze         Source Control 2018.1         Division           Cascade Model Details for A.srcx           Detain for A.srcx	Ormond House									
Dublin 7         Designed by Byrnese Checked by         Discrete Control 2018.1           Checked by           Innovyze         Source Control 2018.1           Cascade Model Details for A.srcx           Storage is Online Cover Level (m) 52.660           Cellular Storage Structure           Innovyze           Source (m/r) 0.0000           Period (m/r) 0.0000           Design 6(m/r) 0.0000           Design 6(m/r) 0.0000           Design 7(m/r) 0.000           Design 7(m/r) 0.000 <t< td=""><td>Upper Ormond Quay</td><td></td><td></td></t<>	Upper Ormond Quay									
Date 30/10/2019 12:34         Designed by Byrnese Checked by         Diverse Checked by           File cas1.casx         Source Control 2018.1           Cascade Model Details for A.srcx           Storage is Online Cover Level (n) 52.660           Cellular Storage Structure           Towert Level (n) 46.100 Safety Factor 2.0           Infiltration Coefficient Sate (m/hr) 0.0000           Depth (n) Area (n*) Inf. Area (n*)           0.000 198.0           0.000           Bright Coefficient Side (m/hr) 0.0000           Depth (n) Area (n*) Inf. Area (n*)           0.000 198.0           0.000           Depth (n) Area (n*) Inf. Area (n*)           Depth (n) Area (n*) Inf. Area (n*)           Diater (n*)           1.601           Diater (n*)           Dinfilteration <td c<="" td=""><td>Dublin 7</td><td></td><td></td><td></td><td></td><td>Micco</td></td>	<td>Dublin 7</td> <td></td> <td></td> <td></td> <td></td> <td>Micco</td>	Dublin 7					Micco			
Pile cal.casz         Checked by           Innovyze         Source Control 2018.1           Cacade Model Details for A.srcx           Storage is Online Cover Level (n) 52.660           Calluar Storage Structure           Infileration Coefficient Base (m/hr) 0.00000           Derosity 0.05           Derosity 0.05           Derosity 0.05           Derosity 0.00           Derosity 0.00           Derosity 0.00           Derosity 0.00           Derosity 0.00           Derosity 0.00           0.00           180.0           0.00           190.0           0.00           190.0           0.00           190.0           0.00           190.0           190.0           190.0           1000           Derign Plow (1/k)           Calculated           1000           Derign Plow (1/k)           Calculated           1000           Derign Plow (1/k)           Calculated           1000           Derign Plow (1/k)           Derosity 0.253           Sungeested Manhole Dlameter (nm)	Date 30/10/2019 12:34	Designed	l by Byr	nese						
Intervent         Intervent           Innovyze         Source Cortrol 2018.1           Garcade Model Details for A.srcx           Garcade Model Details for A.srcx           Cellular Storage Structure           Invert Level (m) 46.100 Safety Factor 2.0           Infiltration Coefficient Sale (m/hr) 0.00000           Depth (m) Area (m²) Inf. Area (m²)           0.000 198.0         0.0           1.601 0.0         0.0           Mydro-Brake@ Optimum Outflow Control           Mydro-Brake@ Optimum Outflow Control           Mydro-Brake@ Optimum Outflow Control           Details for A.srcx           Mydro-Brake@ Optimum Outflow Control           Details for A.srcx           Mydro-Brake@ Optimum Outflow Control           Design Pior (1/s)           Calculated           Objective Minaise upstream storage           Supparenter (mn)           Supparenter (mn)           Diameter (mn)           Diameter (mn)           Diameter (mn)           Diameter (mn)           Diameter (mn)      <	File casl casy		Urainage							
Multiple         Concert control formation           Cascade Model Details for A.srcx           Storage is Online Cover Level (m) 52.660           Cellular Storage Structure           Invert Level (m) 46.100 Safety Factor 2.0           Infiltration Coefficient Sale (m/hr) 0.00000           Depth (m) Area (m²) Inf. Area (m²)           0.000 198.0           0.000 198.0           1.601 0.0           Depth (m) Area (m²) Inf. Area (m²)           Depth (m) Area (m²) Inf. Area (m²)           0.000 198.0           0.000 198.0           Depth (m) Area (m²) Inf. Area (m²)           Depth (m) Flow Control           Depth (m) Flow Control           Depth (m) Flow Control           Depth (m) Flow (1/a)	Innowze									
Decode Model Details for A.srcs           Acras is Online Cover Level (i) 52.66           Callar Storage Structure           Mark Level (i) 46.10 Safety Factor 2.6           Differention Coefficient Side (m/hr) 0.00000 percessity 0.55           Differention Coefficient Side (m/hr) 0.00000 percessity 0.55           Differention Coefficient Side (m/hr) 0.00000 percessity 0.55           Differentia Coefficient Side (m/hr) 0.0000 percessity 0.55           Differentia Coefficient Side (m/hr) 0.000 percessity 0.55           Differentia Coefficient Side (m/hr) 0.5000 percessity 0.55           Differentia Coefficient Side		Source Concroit 2010.1								
Determine the end of the end end end end end end end end end en	Cascade Mo	odel Deta	ils for	A.srcx						
Object of the set of th	Storage is Online Cover Level (m) 52.660									
Invert Level (m) 46.100 Safety Factor 2.0         Infiltration Coefficient Base (m/hr) 0.00000         Dept (m) Area (m²) Inf. Area (m²)   Depth (m) Area (m²) Inf. Area (m²)         0.00       198.0       0.0         1.600       198.0       0.0         1.600       198.0       0.0         1.600       198.0       0.0         1.600       198.0       0.0         1.600       198.0       0.0         Dept (m) Area (m²) Inf. Area (m²)       0.0       0.0         1.600       198.0       0.0       0.0         Dept (m) Area (m²)       1.601       0.0       0.0         1.600       198.0       0.0       1.601       0.0         Design Flow (1/s)       2.0       2.0       Surface         Sump Available       Yes       1000       1200         Diameter (m)       1200       1200       1200         Cottrol Point       Head (m) Flow (1/s)       1200         Design Point (Calculated)       1.600       2.0         Sugested Manhole Diameter (mm)       1.00       1.0         Sugested Manhole Diameter (mm)       1.00       1.0         Sugested Softimm as specified.       Should another type of control device other than a spd	Cellula	ar Storage	e Struct	ure						
Depth (m) Area (m²) Inf. Area (m²)         Depth (m) Area (m²) Inf. Area (m²)           0.00         198.0         0.0         1.601         0.0         0.0           Inf. Area (m²)         1.601         0.0         0.0           Hodro-Brake@ Optimum Outflow Control           Unit Reference MD-SHE-0060-2000-1600-2000           Design Head (m)         1.600           Design Head (m)         1.600           Design Head (m)         1.600           Design Head (m)         1.600           Sump Available         Yes           Application           Suggested Manhole Diameter (mm)         1200           Control Points< Head (m) Flow (1/s)	Inve Infiltration Coefficient Infiltration Coefficient	rt Level (n Base (m/hr Side (m/hr	46.100         c)       0.00000         c)       0.00000	) Safety F ) Por )	actor 2.0 osity 0.95					
0.000       198.0       0.0       1.601       0.0       0.0         Hydro-Brake@ Optimum Outflow Control         Linit Reference MD-SHE-0060-2000 1600-2000         Design Head (m)       1.600         Design Head (m)       1.600         Design Head (m)       2.0         Plush-Flo <sup>m</sup> Calculated         Objective       Minimise upstream storage         Application       Surface         Sump Available       Yes         Diameter (mm)       200         Minimum Outlet Pipe Diameter (mm)       200         Suggested Manhole Diameter (mm)       1200         Control Points         Head (m) Flow (1/s)         Design Point (Calculated)       1.600       2.0         Flush-Flo <sup>m</sup> 0.263       1.5         Man Flow over Head Range       - 1.5         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 as specified. Should another type of 2.9       7.500       4.0         0.100       1.3       1.200       1.8       3.000       2.7       7.000       4.0         0.200       1.5       1.600       2.0	Depth (m) Area (m²) Inf. Ar	ea (m²) Dej	oth (m) A	rea (m²) I	nf. Area (	m²)				
1.60       198.0       0.0         Hydro-Brake@ Optimum OutFlow Control         Linit Reference MD-SHE-0060-2000-1600-2000         Design Flead (m)       1.600         Design Flead (m)       1.600         Design Flead (m)       1.600         Design Flead (m)       1.600         Diameter (mm)       Surgested Manhole Diameter (mm)         Design Point (Calculated)       1.600       2.00         Twert Level (m)       46.000         Diameter (mm)       1200         Design Point (Calculated)       1.600       2.00         Flow (Dr 2033       1.5         Distor vorer Head Range       -       1.51         The hydrological calculations have been based on the Head/Discharge relationship for the systor-Brake@ Optimum as specified. Should another type of control device other than a systor-Brake@ Optimum as the systor of the system of the system of the system of the system of the systor of the systor of the systor of the system of the sy	0.000 198.0	0.0	1.601	0.0		0.0				
Enderse Optimum Outflow Control           Dirk Reference         MO-SHE-0060-2000-1600-2000           Design Flow (1/s)         0.0           Period         0.00           Period         0.00           Period         Calculated           Optication         Surface           Supplication         Surface           Supplication         Surface           Surgested Manhole Diameter (mm)         00           Dising Point (Calculated)         1.600         2.0           Period         0.263         1.5           Man Flow over Head Range         -         1.5           The hydrological calculations have been based on the Head/Discharge relationship for the sydro-Brakee Optimum as specified. Should another type of control device other than a sydro-Brakee Optimum be utilised then these storage routing calculations will be invalidated           Pepth (n) Flow (1/s)         Pepth (n) Flow (1/s)         Pepth (n) Flow (1/s)           0.100         1.3         1.200         1.8           0.500         1.3         2.000         2.1           0.100         1.5         1.600         2.0           0.200         1.5         1.600         2.0           0.200         1.5         1.600         2.0           0.200	1.600 198.0	0.0								
Inject Difference Optimize Control         Unit Reference MD-SHE-0060-2000-1600-2000 Design Flow (1/s)         1.600 Design Flow (1/s)         Calculated Objective Minimise upstream storage Application         Surface         Sump Available         Yes Diameter (mm)         60         Nump Available         Yes         Diameter (mm)         Other Pipe Diameter (mm)         1000         Control Points         Head (n) Flow (1/s)         Design Point (Calculated)       1.600       2.0         Flush-Flo®       0.263       1.5         Kick-Flo@       0.263       1.5         Kick-Flo@       0.263       1.5         Kick-Flo@       0.263       1.5         Kick-Flo@       0.263       1.5         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       1.600       2.7       7.000       4.0         Other M	Hydro-Brake	Ontimum	Outflow	Control						
Unit Reference MD-SHE-0060-2000-1600-2000         Design Head (m)       1.600         Design Head (m)       2.0         Flush-Flow       Calculated         Objective       Minimise upstream storage         Application       Surface         Sump Available       Yes         Diameter (mn)       60         Invert Level (n)       46.000         Minimum Outlet Pipe Diameter (mn)       1200         Control Points       Head (n) Flow (1/s)         Design Point (Calculated)       1.600       2.0         Flush-Flow       0.263       1.5         Kick-Flow       0.536       1.2         Mean Flow over Head Range       -       1.5         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       1.1         0.100       1.3       1.200       1.8       3.000       2.7       7.000       4.0         0.200       1.5       1.600       2.0       4.000       3.00       4.2         0.100       1.3       1.200       1.8       3.000 <t< td=""><td>ingui o Brance</td><td>opermum</td><td>OUCTION</td><td>0000000</td><td></td><td></td></t<>	ingui o Brance	opermum	OUCTION	0000000						
Design Head (m)       1.600         Design Flow (1/s)       2.0         Flush-Flo <sup>m</sup> Calculated         Objective       Minimise upstream storage         Application       Surface         Sump Available       Yes         Diameter (mm)       60         Invert Level (m)       46.000         Minimum Outlet Pipe Diameter (mm)       75         Suggested Manhole Diameter (mm)       1200         Centrol Points         Head (m) Flow (1/s)         Design Point (Calculated)       1.600       2.0         Flush-Flo <sup>m</sup> 0.263       1.2         Mean Flow over Head Range       -       1.5         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 (1/s)         Depth (m) Flow (1/s)       Depth (m) Flow (1/s)         O.100       1.3       1.200       1.8         0.200       1.5       1.600       2.0         0.300       1.5       1.600       2.0         0.400       1.5       1.600       2.0	Unit	t Reference	MD-SHE-0	060-2000-1	600-2000					
Design Flow (1/s)       2.0         Flush-Flow       Calculated         Objective       Minimise upstream storage         Application       Surface         Sump Available       Yes         Diameter (mm)       60         Invert Level (m)       46.000         Minimum Outlet Pipe Diameter (mm)       1200         Control Points         Head (m) Flow (1/s)         Design Point (Calculated)         Design Point (Calculated)         I.600         Flush-Flow         0.263         Kick-Flo@         Design Point (Calculated)       1.600       2.0         Flush-Flow       0.263       1.5         Kick-Flo@       0.536       1.2         Mean Flow over Head Range       -       1.5         The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake@ Optimum@ be utilised then these storage routing calculations will be invalidated         Depth (m) Flow (1/s)         Depth (m) Flow (1/s)       Depth (m) Flow (1/s)       Depth (m) Flow (1/s)         0.100       1.5       1.600       2.0       4.00	Desig	gn Head (m)			1.600					
Control Points         Minimise upstream storage Application         Surface Surface           Sump Available         Yes           Diameter (mm)         60           Invert Level (m)         46.000           Minimum Outlet Pipe Diameter (mm)         1200           Control Points         Head (m) Flow (1/s)           Design Point (Calculated)         1.600         2.0           Flush-Flo <sup>∞</sup> 0.263         1.5           Kick-Flo <sup>®</sup> 0.536         1.2           Mean Flow over Head Range         -         1.5           The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated           Depth (m) Flow (1/s)           Depth (m) Flow (1/s)         Pepth (m) Flow (1/s)           O.100         1.3         1.200         1.8         3.000         2.7         7.000         4.0           0.200         1.5         1.400         1.9         3.500         2.9         7.500         4.1           0.300         1.5         1.600         2.0         4.000         3.6         8.000         4.2           0.400         1.3         2.000         2.2         5.000	Design	Flow (1/s)		0-	2.0					
Application       Surface         Sump Available       Yes         Diameter (mm)       60         Invert Level (m)       46.000         Minimum Outlet Pipe Diameter (mm)       75         Suggested Manhole Diameter (mm)       1200         Control Points Head (m) Flow (1/s)         Design Point (Calculated)       1.600       2.0         Flush-Flo*       0.263       1.5         Kick-Flo@       0.536       1.2         Mean Flow over Head Range       -       1.5         The hydrological calculations have been based on the Head/Discharge relationship for the         Hydro-Brake@ Optimum@ be utilised then these storage routing calculations will be         invalidated         Depth (m) Flow (1/s)         Depth (m) Flow (1/s)       Depth (m) Flow (1/s)         0.100       1.3       1.200       1.8         0.300       1.5       1.600       2.0       7.000       4.0         0.300       1.5       1.600       2.1       4.500       3.2       8.500       4.3         0.500       1.3       2.000       2.2       5.000       3.4       9.000       4.6         0.600       1.5       2.600       2.5       6.		Plusn-Flom	Minimia	Ca upatroa	atorado					
Sump Available       Sump Available       Fes         Diameter (mm)       60         Invert Level (m)       46.000         Minimum Outlet Pipe Diameter (mm)       75         Suggested Manhole Diameter (mm)       1200         Control Points Head (m) Flow (1/s)         Design Point (Calculated)       1.600       2.0         Flush-Flow       0.263       1.5         Kick-Filo@       0.536       1.2         Mean Flow over Head Range       -       1.5         The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake@ Optimum@ be utilised then these storage routing calculations will be invalidated         Depth (m) Flow (1/s)       Pepth (m) Flow (1/s)       Pepth (m) Flow (1/s)         0.100       1.3       1.200       1.8       3.000       2.7       7.000       4.0         0.300       1.5       1.600       2.0       4.000       3.0       8.000       4.2         0.400       1.5       1.800       2.1       4.500       3.2       8.500       4.3         0.500       1.3       2.000       2.3       5.500       3.6       9.500       4.6         0.600       1.5       2.400       2.4		Application	MIIIIIIII	e upscream	Surface					
Diameter (mm)       60         Invert Level (m)       46.000         Minimum Outlet Pipe Diameter (mm)       75         Suggested Manhole Diameter (mm)       1200         Control Points Head (m) Flow (1/s)         Design Point (Calculated)       1.600       2.0         Flush-Flo®       0.263       1.5         Kick-Flo@       0.536       1.2         Mean Flow over Head Range       -       1.5         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 (1/s)       Depth (m) Flow (1/s)       Depth (m) Flow (1/s)         0.100       1.3       1.200       1.8       3.000       2.7       7.000       4.0         0.200       1.5       1.400       1.9       3.500       2.9       7.500       4.1         0.100       1.3       1.200       1.8       3.000       2.7       7.000       4.0         0.200       1.5       1.400       1.9       3.500       2.9       7.500       4.1         0.400       1.5       1.800       2.1       4.500       3.2	Sum	Available			Veg					
Invert Level (m)       46.000         Minimum Outlet Pipe Diameter (mm)       75         Suggested Manhole Diameter (mm)       1200         Control Points Head (n) Flow (1/s)         Design Point (Calculated)       1.600       2.0         Flush-Flow       0.263       1.5         Kick-Filo®       0.536       1.2         Mean Flow over Head Range       -       1.5         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 (n) Flow (1/s)       Pepth (m) Flow (1/s)       Pepth (m) Flow (1/s)       Pepth (m) Flow (1/s)         0.100       1.3       1.200       1.8       3.000       2.7       7.000       4.0         0.300       1.5       1.600       2.0       4.000       3.0       8.000       4.2         0.400       1.5       1.800       2.1       4.500       3.2       8.500       4.3         0.500       1.3       2.200       2.3       5.500       3.5       9.500       4.6         0.600       1.3       2.200       2.3       5.500       3.8       9.500       4		ameter (mm)			60					
Minimum Outlet Pipe Diameter (mm)       75         Suggested Manhole Diameter (mm)       1200         Control Points Head (m) Flow (1/s)         Design Point (Calculated)       1.600       2.0         Flush-Flo <sup>m</sup> 0.263       1.5         Kick-Flo@       0.536       1.2         Mean Flow over Head Range       -       1.5         The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake@ Optimum@ be utilised then these storage routing calculations will be invalidated         Depth (m) Flow (1/s)       Depth (m) Flow (1/s)       Depth (m) Flow (1/s)       Depth (m) Flow (1/s)         0.100       1.3       1.200       1.8       3.000       2.7       7.000       4.0         0.300       1.5       1.600       2.0       4.000       3.0       8.000       4.2         0.400       1.5       1.800       2.1       4.500       3.2       8.500       4.3         0.500       1.3       2.000       2.3       5.500       3.5       9.500       4.6         0.800       1.5       2.400       2.4       6.000       3.7       1.000       4.6       2.600       2.5       6.500       3.8       9.500       4.6	Inveri	t Level (m)			46.000					
Suggested Manhole Diameter (mm)         1200           Control Points         Head (m) Flow (l/s)           Design Point (Calculated)         1.600         2.0           Flush-Flow         0.263         1.5           Kick-Flow         0.536         1.2           Mean Flow over Head Range         -         1.5           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)           0.100         1.3         1.200         1.8         3.000         2.7         7.000         4.0           0.300         1.5         1.600         2.0         4.000         3.0         8.000         4.2           0.400         1.5         1.600         2.0         4.000         3.0         8.000         4.2           0.600         1.3         2.200         2.3         5.500         3.5         9.500         4.6           0.600         1.5         2.400         2.4         6.000         3.7         1.000         4.6           0.800 </td <td>Minimum Outlet Pipe Dia</td> <td>ameter (mm)</td> <td></td> <td></td> <td>75</td> <td></td>	Minimum Outlet Pipe Dia	ameter (mm)			75					
Control Point         Head (m) Flow (l/s)           Design Point (Calculated)         1.600         2.0           Flush-Flo*         0.263         1.5           Kick-Flo®         0.536         1.2           Mean Flow over Head Rang         -         1.5   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 as specified. Should another type of control device other than a Hydro-Brake Optimum as 1.200           Depth (m) Flow (l/s)         Depth (m) Flow (l/s)         Depth (m) Flow (l/s)         Depth (m) Flow (l/s)           0.100         1.3         1.200         1.8         3.000         2.7         7.000         4.0           0.200         1.5         1.400         1.9         3.500         2.9         7.500         4.1           0.300         1.5         1.600         2.0         4.000         3.0         8.500         4.3           0.500         1.3         2.000         2.2         5.000         3.4         9.000         4.6           0.600         1.3         2.000         2.5         6.500         3.8         9.500         4.6           0.600         1.5         2.400         2.6         6	Suggested Manhole Dia	ameter (mm)			1200					
Design Point (Calculated)       1.600       2.0         Flush-Flo <sup>m</sup> 0.263       1.5         Kick-Flo®       0.536       1.2         Mean Flow over Head Range       -       1.5         The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake@ Optimum@ be utilised then these storage routing calculations will be invalidated         Depth (m) Flow (1/s)       Depth (m) Flow (1/s)       Depth (m) Flow (1/s)       Depth (m) Flow (1/s)         0.100       1.3       1.200       1.8       3.000       2.7       7.000       4.0         0.200       1.5       1.400       1.9       3.500       2.9       7.500       4.1         0.300       1.5       1.600       2.0       4.000       3.2       8.500       4.3         0.500       1.3       2.000       2.2       5.000       3.4       9.000       4.4         0.600       1.3       2.200       2.3       5.500       3.5       9.500       4.6         0.8000       1.6       2.600       2.5       6.500       3.8       4.6	Control Po	oints	Head (m)	Flow (l/s	)					
Design Folme (calculation)       1.000       1.5         Flush-Flo®       0.536       1.2         Mean Flow over Head Range       -       1.5         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 (1/s)       Depth (m) Flow (1/s)       Depth (m) Flow (1/s)       Depth (m) Flow (1/s)         0.100       1.3       1.200       1.8       3.000       2.7       7.000       4.0         0.300       1.5       1.400       1.9       3.500       2.9       7.500       4.1         0.300       1.5       1.800       2.1       4.500       3.2       8.500       4.3         0.500       1.3       2.000       2.2       5.000       3.4       9.000       4.4         0.600       1.3       2.200       2.3       5.500       3.5       9.500       4.6         0.800       1.6       2.600       2.5       6.500       3.8       9.500       4.6	Design Point (C	algulated)	1 600	2	0					
Kick-Flo@       0.536       1.2         Mean Flow over Head Range       -       1.5         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 (1/s)         0.100       1.3       1.200       1.8       3.000       2.7       7.000       4.0         0.200       1.5       1.400       1.9       3.500       2.9       7.500       4.1         0.300       1.5       1.600       2.0       4.000       3.0       8.000       4.2         0.400       1.5       1.800       2.1       4.500       3.2       8.500       4.3         0.500       1.3       2.200       2.3       5.500       3.5       9.500       4.6         0.800       1.5       2.400       2.4       6.000       3.7       1.000       1.6       2.600       2.5       6.500       3.8	Design Forne (C	Flush-Flo™	0 263	2. 1	5					
Mean Flow over Head Range       -       1.5         The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake@ Optimum@ be utilised then these storage routing calculations will be invalidated       Depth (m) Flow (1/s)		Kick-Flo®	0.536	1.	2					
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake@Optimum@be utilised then these storage routing calculations will be invalidated         Depth (m) Flow (1/s)       Depth (m) Fl	Mean Flow over	Head Range	-	1.	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 (1/s)         0.100       1.3       1.200       1.8       3.000       2.7       7.000       4.0         0.200       1.5       1.400       1.9       3.500       2.9       7.500       4.1         0.300       1.5       1.600       2.0       4.000       3.0       8.000       4.2         0.400       1.5       1.800       2.1       4.500       3.2       8.500       4.3         0.500       1.3       2.000       2.2       5.000       3.4       9.000       4.4         0.600       1.3       2.200       2.3       5.500       3.5       9.500       4.6         0.800       1.5       2.400       2.4       6.000       3.7       1.000       1.6       2.600       2.5       6.500       3.8       9.500       4.6										
Depth (m)         Flow (1/s)         Depth (m)         Flow (1/s)         Depth (m)         Flow (1/s)         Depth (m)         Flow (1/s)           0.100         1.3         1.200         1.8         3.000         2.7         7.000         4.0           0.200         1.5         1.400         1.9         3.500         2.9         7.500         4.1           0.300         1.5         1.600         2.0         4.000         3.0         8.000         4.2           0.400         1.5         1.800         2.1         4.500         3.2         8.500         4.3           0.500         1.3         2.000         2.2         5.000         3.4         9.000         4.4           0.600         1.3         2.200         2.3         5.500         3.5         9.500         4.6           0.800         1.5         2.400         2.4         6.000         3.7         7.500         4.6           0.800         1.6         2.600         2.5         6.500         3.8         7.5         7.5	The hydrological calculations have in Hydro-Brake® Optimum as specified. Hydro-Brake Optimum® be utilised the invalidated	been based Should ano en these st	on the He ther type orage rou	ad/Dischar of contro ting calcu	ge relatic ol device c lations wi	onship for the other than a .ll be				
0.100       1.3       1.200       1.8       3.000       2.7       7.000       4.0         0.200       1.5       1.400       1.9       3.500       2.9       7.500       4.1         0.300       1.5       1.600       2.0       4.000       3.0       8.000       4.2         0.400       1.5       1.800       2.1       4.500       3.2       8.500       4.3         0.500       1.3       2.000       2.2       5.000       3.4       9.000       4.6         0.600       1.3       2.200       2.3       5.500       3.5       9.500       4.6         0.800       1.5       2.400       2.4       6.000       3.7       1.000       1.6       2.600       2.5       6.500       3.8       9.500       4.6	Depth (m) Flow (1/s) Depth (m) Flo	w (l/s) De	pth (m) F	low (l/s)	Depth (m)	Flow (l/s)				
0.200       1.5       1.400       1.9       3.500       2.9       7.500       4.1         0.300       1.5       1.600       2.0       4.000       3.0       8.000       4.2         0.400       1.5       1.800       2.1       4.500       3.2       8.500       4.3         0.500       1.3       2.000       2.2       5.000       3.4       9.000       4.4         0.600       1.3       2.200       2.3       5.500       3.5       9.500       4.6         0.800       1.5       2.400       2.4       6.000       3.7       1.000       1.6       2.600       2.5       6.500       3.8       9.500       4.6	0.100 1.3 1.200	1.8	3.000	2.7	7.000	4.0				
0.300       1.5       1.600       2.0       4.000       3.0       8.000       4.2         0.400       1.5       1.800       2.1       4.500       3.2       8.500       4.3         0.500       1.3       2.000       2.2       5.000       3.4       9.000       4.4         0.600       1.3       2.200       2.3       5.500       3.5       9.500       4.6         0.800       1.5       2.400       2.4       6.000       3.7       1.000       1.6       2.600       2.5       6.500       3.8       9.500       4.6	0.200 1.5 1.400	1.9	3.500	2.9	7.500	4.1				
0.400 1.5 1.800 2.1 4.500 3.2 8.500 4.3 0.500 1.3 2.000 2.2 5.000 3.4 9.000 4.4 0.600 1.3 2.200 2.3 5.500 3.5 9.500 4.6 0.800 1.5 2.400 2.4 6.000 3.7 1.000 1.6 2.600 2.5 6.500 3.8	0.300 1.5 1.600	2.0	4.000	3.0	8.000	4.2				
0.500 1.3 2.000 2.2 5.000 3.4 9.000 4.4 0.600 1.3 2.200 2.3 5.500 3.5 9.500 4.6 0.800 1.5 2.400 2.4 6.000 3.7 1.000 1.6 2.600 2.5 6.500 3.8	0.400 1.5 1.800	2.1	4.500	3.2	8.500	4.3				
0.600 1.3 2.200 2.3 5.500 3.5 9.500 4.6 0.800 1.5 2.400 2.4 6.000 3.7 1.000 1.6 2.600 2.5 6.500 3.8	0.500 1.3 2.000	2.2	5.000	3.4	9.000	4.4				
0.800 1.5 2.400 2.4 6.000 3.7 1.000 1.6 2.600 2.5 6.500 3.8 ©1982-2018 Innovyze	0.600 1.3 2.200	2.3	5.500	3.5	9.500	4.6				
1.000 1.6  2.600 2.5  6.500 3.8  ©1982-2018 Innovyze	0.800 1.5 2.400	2.4	6.000	3.7						
©1982-2018 Innovyze	1.000 1.6 2.600	2.5	6.500	3.8						
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Ormond House							
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Innovyze	Source Co	ntrol 201	8.1				
Cacaada Su	mmary of Doc	ulta for	Paraz				
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Upstr	eam Outflow To	Overflow 1	Го				
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_							
A.srcx (None) (None)							
А.	srcx (None)	(None	e)				
A. Half	Srcx (None)	(None	⊇)				
A. Half	srcx (None) Drain Time : 2	(None 82 minutes.	e)				
A. Half Storm Max Ma	srcx (None) Drain Time : 2 <b>x Max</b>	(None 82 minutes. <b>Max</b>	e) Max	Max	Status		
A. Half Storm Max Ma Event Level Dep	srcx (None) Drain Time : 2 x Max th Infiltration	(None 82 minutes. Max Control E	Max Outflow	Max Volume	Status		
A. Half Storm Max Ma Event Level Dep (m) (m	srcx (None) Drain Time : 2 x Max th Infiltration ) (1/s)	(None 82 minutes. Max Control E (1/s)	Max Outflow (1/s)	Max Volume (m³)	Status		
A. Half Storm Max Ma Event Level Dep (m) (m	srcx (None) Drain Time : 2 x Max th Infiltration ) (1/s)	(None 82 minutes. Max Control E (1/s)	Max Outflow (1/s)	Max Volume (m <sup>3</sup> )	Status		
A. Half Storm Max Ma Event Level Dep (m) (m 15 min Summer 45.794 0.3	srcx (None) Drain Time : 2 x Max th Infiltration ) (1/s) 94 0.0	(None 82 minutes. Max Control E (1/s) 4.0	Max Outflow (1/s) 4.0	Max Volume (m <sup>3</sup> ) 44.9	Status O K		
A. Half Storm Max Ma Event Level Dep (m) (m 15 min Summer 45.794 0.3 30 min Summer 45.937 0.5	srcx       (None)         Drain Time : 2         x       Max         th Infiltration         )       (1/s)         94       0.0         37       0.0         0       0.0	(None 82 minutes. Max Control E (1/s) 4.0 4.0	Max Outflow (1/s) 4.0 4.0	Max Volume (m <sup>3</sup> ) 44.9 61.2	<b>Status</b> 0 K 0 K		
A. Half Storm Max Ma Event Level Dep (m) (m 15 min Summer 45.794 0.3 30 min Summer 45.937 0.5 60 min Summer 46.079 0.6	srcx (None) Drain Time : 2 x Max th Infiltration ) (1/s) 94 0.0 37 0.0 79 0.0	(None 82 minutes. Max Control E (1/s) 4.0 4.0 4.0	Max Outflow (1/s) 4.0 4.0 4.0 4.0	Max Volume (m <sup>3</sup> ) 44.9 61.2 77.4	<b>Status</b> 0 K 0 K 0 K		
A. Half Storm Max Max Event Level Dep (m) (m 15 min Summer 45.794 0.3 30 min Summer 45.937 0.5 60 min Summer 46.079 0.6 120 min Summer 46.220 0.8	srcx       (None)         Drain Time : 2         x       Max         th Infiltration         )       (1/s)         94       0.0         37       0.0         79       0.0         20       0.0	(None 82 minutes. Max Control E (1/s) 4.0 4.0 4.0 4.0 4.0	Max Outflow (1/s) 4.0 4.0 4.0 4.0 4.0	Max Volume (m <sup>3</sup> ) 44.9 61.2 77.4 93.5	<b>Status</b> 0 K 0 K 0 K 0 K		
A. Half Storm Max Max Event Level Dep (m) (m 15 min Summer 45.794 0.3 30 min Summer 45.937 0.5 60 min Summer 46.079 0.6 120 min Summer 46.220 0.8 180 min Summer 46.288 0.8	srcx       (None)         Drain Time : 2         x       Max         th Infiltration         )       (1/s)         94       0.0         37       0.0         79       0.0         20       0.0         88       0.0	(None 82 minutes. Max Control E (1/s) 4.0 4.0 4.0 4.0 4.0 4.0 4.0	Max Outflow (1/s) 4.0 4.0 4.0 4.0 4.0 4.0 4.0	Max Volume (m <sup>3</sup> ) 44.9 61.2 77.4 93.5 101.3	<b>Status</b> 0 K 0 K 0 K 0 K 0 K		
A. Half Storm Max Max Event Level Dep (m) (m 15 min Summer 45.794 0.3 30 min Summer 45.937 0.5 60 min Summer 46.079 0.6 120 min Summer 46.220 0.8 180 min Summer 46.288 0.8 240 min Summer 46.328 0.9	srcx       (None)         Drain Time : 2         x       Max         th Infiltration         )       (1/s)         94       0.0         37       0.0         79       0.0         20       0.0         88       0.0         28       0.0	(None 82 minutes. Max Control E (1/s) 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0	Max Outflow (1/s) 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0	Max Volume (m <sup>3</sup> ) 44.9 61.2 77.4 93.5 101.3 105.7	<b>Status</b> 0 K 0 K 0 K 0 K 0 K 0 K		

480 min Summer 46.366 0.966

600 min Summer 46.361 0.961

720 min Summer 46.355 0.955

960 min Summer 46.339 0.939

1440 min Summer 46.299 0.899

2160 min Summer 46.224 0.824

2880 min Summer 46.125 0.725

4320 min Summer 45.872 0.472

5760 min Summer 45.711 0.311

7200 min Summer 45.606 0.206

4.0 110.1

4.0 109.6

4.0 107.0

4.0 102.5

108.8

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	Stor	cm	Rain	Flooded	Discharge	Time-Peak	
	Ever	nt	(mm/hr)	Volume	Volume	(mins)	
				(m³)	(m <sup>3</sup> )		
15	min	Summer	78.546	0.0	119.8	22	
30	min	Summer	54.456	0.0	166.0	37	
60	min	Summer	35.457	0.0	216.2	68	
120	min	Summer	22.431	0.0	273.5	126	
180	min	Summer	17.011	0.0	311.5	186	
240	min	Summer	13.956	0.0	340.6	246	
360	min	Summer	10.526	0.0	385.3	364	
480	min	Summer	8.606	0.0	420.2	480	
600	min	Summer	7.356	0.0	435.7	538	
720	min	Summer	6.469	0.0	446.9	602	
960	min	Summer	5.281	0.0	465.3	736	
1440	min	Summer	3.965	0.0	495.2	1014	
2160	min	Summer	2.976	0.0	654.0	1452	
2880	min	Summer	2.425	0.0	710.7	1904	
4320	min	Summer	1.815	0.0	781.1	2556	
5760	min	Summer	1.476	0.0	864.8	3232	
7200	min	Summer	1.257	0.0	921.0	3888	
		C	1982-20	18 Inno	ovyze		

DBFL Consulting Engineers		Page 2
Ormond House		
Upper Ormond Quay		
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#### Cascade Summary of Results for B.srcx

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
8640	min S	Summer	45.538	0.138	0.0	3.8	3.8	15.7	ОК
10080	min S	Summer	45.495	0.095	0.0	3.7	3.7	10.8	ОК
15	min V	Winter	45.844	0.444	0.0	4.0	4.0	50.6	ОК
30	min V	Winter	46.007	0.607	0.0	4.0	4.0	69.2	ΟK
60	min W	Winter	46.174	0.774	0.0	4.0	4.0	88.2	ОК
120	min V	Winter	46.334	0.934	0.0	4.0	4.0	106.5	ОК
180	min V	Winter	46.417	1.017	0.0	4.0	4.0	115.9	ΟK
240	min V	Winter	46.467	1.067	0.0	4.0	4.0	121.7	ΟK
360	min Þ	Winter	46.518	1.118	0.0	4.0	4.0	127.4	ОК
480	min V	Winter	46.534	1.134	0.0	4.0	4.0	129.3	ОК
600	min Þ	Winter	46.533	1.133	0.0	4.0	4.0	129.1	ОК
720	min Þ	Winter	46.522	1.122	0.0	4.0	4.0	127.9	ОК
960	min Þ	Winter	46.494	1.094	0.0	4.0	4.0	124.8	ОК
1440	min M	Winter	46.435	1.035	0.0	4.0	4.0	118.0	ОК
2160	min M	Winter	46.319	0.919	0.0	4.0	4.0	104.8	ОК
2880	min M	Winter	46.169	0.769	0.0	4.0	4.0	87.6	ОК
4320	min M	Winter	45.771	0.371	0.0	4.0	4.0	42.3	ОК
5760	min M	Winter	45.583	0.183	0.0	3.9	3.9	20.8	ОК
7200	min V	Winter	45.491	0.091	0.0	3.7	3.7	10.4	ОК
8640	min Þ	Winter	45.442	0.042	0.0	3.4	3.4	4.8	ОК
10080	min Þ	Winter	45.422	0.022	0.0	3.2	3.2	2.5	ОК

	Stor	m	Rain	Flooded	Discharge	Time-Peak	
	Even	t	(mm/hr)	Volume	Volume	(mins)	
				(m <sup>3</sup> )	(m³)		
8640	min	Summer	1.103	0.0	969.6	4576	
10080	min	Summer	0.987	0.0	1012.2	5240	
15	min	Winter	78.546	0.0	134.1	22	
30	min	Winter	54.456	0.0	186.0	37	
60	min	Winter	35.457	0.0	242.4	66	
120	min	Winter	22.431	0.0	306.6	124	
180	min	Winter	17.011	0.0	348.8	182	
240	min	Winter	13.956	0.0	381.6	240	
360	min	Winter	10.526	0.0	429.1	354	
480	min	Winter	8.606	0.0	448.5	464	
600	min	Winter	7.356	0.0	463.8	572	
720	min	Winter	6.469	0.0	477.0	674	
960	min	Winter	5.281	0.0	500.3	768	
1440	min	Winter	3.965	0.0	537.4	1086	
2160	min	Winter	2.976	0.0	732.5	1580	
2880	min	Winter	2.425	0.0	795.8	2080	
4320	min	Winter	1.815	0.0	844.6	2684	
5760	min	Winter	1.476	0.0	969.1	3344	
7200	min	Winter	1.257	0.0	1031.7	3968	
8640	min	Winter	1.103	0.0	1085.3	4672	
10080	min	Winter	0.987	0.0	1133.4	4920	
		©	L982-20	18 Inno	vyze		

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Ormond House		
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# Cascade Rainfall Details for B.srcx

Rainfall Model	FS	SR Winter Storms	Yes
Return Period (years)	10	00 Cv (Summer) 0	.750
Region	Scotland and Irelar	nd Cv (Winter) 0	.840
M5-60 (mm)	16.40	00 Shortest Storm (mins)	15
Ratio R	0.27	73 Longest Storm (mins) 1	0800
Summer Storms	Ye	es Climate Change %	+10

# Time Area Diagram

Total Area (ha) 0.322

Time	(mins)	Area	Time	(mins)	Area	
From:	To:	(ha)	From:	To:	(ha)	
0	4	0.000	4	8	0.322	

DBFL Consulting Engl	neers					Page 4		
Ormond House								
Upper Ormond Quay								
Dublin 7	Dublin 7							
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Innovvze		Source C	ontrol	2018.1				
	Cascade Model Details for B.srcx							
	Storage is On	line Cover	Level (m	n) 49.000				
	Cellula	r Storage	e Struct	ure				
Infiltrati Infiltrati	Inver on Coefficient on Coefficient	t Level (m Base (m/hr Side (m/hr	<ul> <li>45.400</li> <li>0.00000</li> <li>0.00000</li> </ul>	0 Safety Fa 0 Poro 0	ctor 2.0 sity 0.95			
Depth (m) Are	a (m²) Inf. Are	ea (m²) Der	oth (m) A	rea (m²) Ir	nf. Area (	(m²)		
0.000	120.0	0.0	1.445	0.0		0.0		
1.440	120.0	0.0						
	Hydro-Brake®	Optimum	Outilow	Control				
	IInit	Reference	MD-SHE-0	0090-4200-14	145-4200			
	Desig	n Head (m)	MD-SHE-0	1090-4200-14	1.445			
	Design	Flow (l/s)			4.2			
	_	Flush-Flo™		Cal	lculated			
		Objective	Minimis	se upstream	storage			
	A	pplication			Surface			
	Sump	Available			Yes			
	Dia	meter (mm)			90			
	Invert	Level (m)			45.300			
Minimum	Outlet Pipe Dia	meter (mm)			150			
Sugges	ted Mannole Dia	meter (mm)			1200			
	Control Po	ints	Head (m)	Flow (l/s)				
I	esign Point (Ca	(lculated)	1.445	4.2				
_	I I I I I I I I I I I I I I I I I I I	flush-Flo™	0.398	4.0				
		Kick-Flo®	0.808	3.2				
ŀ	lean Flow over H	Iead Range	-	3.6				
The hydrological calc	ulations have b	een based	on the He	ad/Discharg	ge relatio	onship for the		
Hydro-Brake® Optimum	as specified.	Should ano	ther type	e of control	l device d	other than a		
Hydro-Brake Optimum®	be utilised the	n these st	orage rou	ting calcul	lations wi	ill be		
invalidated								
Depth (m) Flow (l/s)	Depth (m) Flow	v (l/s) Der	oth (m) F	low (l/s) I	Oepth (m)	Flow (l/s)		
0 100 0 0	1 200	2 0	2 000	E O	7 000	0 0		
	1 400	3.8	3.000	5.9	7 500	δ.δ 0 1		
	1 600	±.⊥ / /	4 000	0.3	0.000	9.1 0 /		
	1 800	±.4 4 6	4 500	0.0 7 1	0.000 8 ENN	9.4 0 6		
	2 000	4.0			0.500	0.E		
	2.000	±.2 5 1	5.000	/.>	9.000 0 E00	۲.۶ ۱0 ۵		
	2.200	5.1	5.500	/.0 0 0	9.000	10.2		
	2.400	5.5	6.500	0.2 8 5				
1.000 3.5	2.000		0.000	0.5				
	~1.07	0 0010 -						
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Dublin 7										<u></u>
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Innouvre Control 2019 1										
тшоуудс				DOUL						
		-			_					
	Summary of	of Resu	ilts f	or 10	0 year	Return 1	Period	(+10%)	-	
Half Drain Time : 646 minutes.										
	Storm	Max	Max	м	ax	Max	Max	Max	Status	
	Event	Level	Depth	Infilt	ration	Control $\Sigma$	Outflow	Volume		
		(m)	(m)	(1	/s)	(l/s)	(l/s)	(m³)		
15	min Summer	45.895	0.445		0.0	4.0	4.0	97.0	ОК	
30	min Summer	46.060	0.610		0.0	4.0	4.0	132.9	ОК	
60	min Summer	46.227	0.777		0.0	4.0	4.0	169.5	ОК	
120	min Summer	46.394	0.944		0.0	4.0	4.0	205.9	O K	
180	min Summer	46.483	1.033		0.0	4.0	4.0	225.1	ОК	
240	min Summer	46.538	1.088		0.0	4.0	4.0	237.2	ОК	
360	min Summer	46.595	1.145		0.0	4.0	4.0	249.7	ОК	
480	min Summer	46.616	1.166		0.0	4.0	4.0	254.2	ΟK	
600	min Summer	46.620	1.170		0.0	4.0	4.0	255.1	ОК	
720	min Summer	46.620	1.170		0.0	4.0	4.0	255.2	ΟK	
960	min Summer	46.613	1.163		0.0	4.0	4.0	253.5	ΟK	
1440	min Summer	46.585	1.135		0.0	4.0	4.0	247.4	ΟK	
2160	min Summer	46.528	1.078		0.0	4.0	4.0	235.0	ΟK	
2880	min Summer	46.462	1.012		0.0	4.0	4.0	220.7	ΟK	
4320	min Summer	46.317	0.867		0.0	4.0	4.0	189.0	ΟK	
5760	min Summer	46.132	0.682		0.0	4.0	4.0	148.6	ΟK	
7200	min Summer	45.973	0.523		0.0	4.0	4.0	114.0	O K	
8640	min Summer	45.853	0.403		0.0	4.0	4.0	88.0	O K	
10080	min Summer	45.763	0.313		0.0	4.0	4.0	68.3	O K	
15	min Winter	45.950	0.500		0.0	4.0	4.0	109.1	ΟK	
		Storm	1	Rain	Flooded	Discharge	a Time-Pe	ak		
		Event	(π	m/hr)	Volume	Volume	(mins	)		
		пленс	(1	,,	(m <sup>3</sup> )	(m <sup>3</sup> )	(1111)	,		
					( )	(				
	15	min Sur	mer 7	78.546	0.0	100.5	5	23		
	30	min Sur	mer 5	54.456	0.0	139.4	ł	37		
	60	min Sur	mer 3	35.457	0.0	181.5	5	68		
	120	min Sur	mer 2	22.431	0.0	229.7	, 1	L26		
	180	min Sur	mer 1	.7.011	0.0	261.3	3 1	L86		
	240	min Sur	mer 1	3.956	0.0	285.9	) 2	246		
	360	min Sur	mer 1	0.526	0.0	323.4	1 5	364		
	480	min Sur	mer	8.606	0.0	352.4		184		
	600	min Sur	mer	7.356	0.0	376.6	5	542		
	720	min Sur	mer	6.469	0.0	397.6	5 6	506		
	960	min Sur	mer	5.281	0.0	432.7	, -	736		
	1440	min Sur	mer	3.965	0.0	487.5	5 10	)12		
	2160	min Sur	nmer	2.976	0.0	548.7	1 14	132		
	2880	min Sur	nmer	2.425	0.0	596.0	) 18	348		
	4320	min Sur	nmer	1.815	0.0	669.2	2 26	584		
	5760	min Sur	mer	1.476	0.0	725.7	7 34	156		
	7200	min Sur	mer	1.257	0.0	772.7	41	L12		
	8640	min Sur	mer	1.103	0.0	813.3	3 47	760		
	10080	min Sur	mer	0.987	0.0	849.2	2 54	148		
	15	min Wir	nter 7	78.546	0.0	112.5	5	22		

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File C.SRCX	Chec	ked bv	-			Digin	aye					
Innovyze	Sour	Source Control 2018 1										
Summary	of Resu	lts f	or 10	0 vear	Return 1	Period	(+10%)					
				- 1								
Storm	Max	м	Max Max Max Max				Status					
Event	Level 1	Depth	Infilt	ration (	Control $\Sigma$	Outflow	Volume					
	(m)	(m)	(1	/s)	(l/s)	(l/s)	(m³)					
30 min Winter	46 137 (	0 687		0 0	4 0	4 0	149 8	ΟK				
60 min Winter	46.328	0.878		0.0	4.0	4.0	191.4	ОК				
120 min Winter	46.519	1.069		0.0	4.0	4.0	233.1	ОК				
180 min Winter	46.624	1.174		0.0	4.0	4.0	256.0	ОК				
240 min Winter	46.692	1.242		0.0	4.0	4.0	270.9	ОК				
360 min Winter	46.770	1.320		0.0	4.1	4.1	287.7	ОК				
480 min Winter	46.805	1.355		0.0	4.1	4.1	295.4	ОК				
600 min Winter	46.817	1.367		0.0	4.2	4.2	298.1	ОК				
720 min Winter	46.816	1.366		0.0	4.2	4.2	297.9	ОК				
960 min Winter	46.802	1.352		0.0	4.1	4.1	294.7	ОК				
1440 min Winter	46.758	1.308		0.0	4.1	4.1	285.1	ОК				
2160 min Winter	46.661	1.211		0.0	4.0	4.0	264.0	O K				
2880 min Winter	46.551	1.101		0.0	4.0	4.0	240.0	ОК				
4320 min Winter	46.312 (	0.862		0.0	4.0	4.0	187.9	ОК				
5760 min Winter	46.003 (	0.553		0.0	4.0	4.0	120.6	ΟK				
7200 min Winter	45.802 (	0.352		0.0	4.0	4.0	76.8	ΟK				
8640 min Winter	45.677 (	0.227		0.0	3.9	3.9	49.5	ОК				
10080 min Winter	45.602 (	0.152		0.0	3.7	3.7	33.1	ОК				
	Storm	1	Rain	Flooded	Discharge	Time-Pe	ak					
	Event	(п	m/hr)	Volume	Volume	(mins	)					
				(m³)	(m³)							
30	min Wint	ter 5	54 456	0 0	156 1		37					
60	min Wint	ter 3	35.457	0.0	203.4		66					
120	min Wint	ter 2	22.431	0.0	257.2	: 1	.24					
180	min Wint	ter 1	.7.011	0.0	292.8	1	.82					
240	min Wint	ter 1	3.956	0.0	320.2	2	240					
360	min Wint	ter 1	0.526	0.0	362.4	. 3	54					
480	min Wint	ter	8.606	0.0	394.9	4	66					
600	min Wint	ter	7.356	0.0	422.1	. 5	574					
720	min Wint	ter	6.469	0.0	445.4	. 6	576					
960	min Wint	ter	5.281	0.0	484.7	7	66					
1440	min Wint	ter	3.965	0.0	546.0	10	84					
2160	min Wint	ter	2.976	0.0	614.5	15	40					
2880	min Wint	ter	2.425	0.0	667.7	19	96					
4320	min Wint	ter	1.815	0.0	749.4	29	00					
5760	min Wint	ter	1.476	0.0	813.0	35	0/6					
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Ormond House	Catchment C							
Upper Ormond Quay								
Dublin 7		Micco						
Date 29/10/2019 17:35	Designed by Byrnese							
File C.SRCX	Checked by	Digiligh						
Innovyze	Source Control 2018.1							
- · <b>Z</b> -								
Rainfall Details								
Rainfall Model	FSR Winter Storms	Yes						
Return Period (years)	100 Cv (Summer) 0	.750						
Region	Scotland and Ireland Cv (Winter) 0	.840						
Ratio R	0.273 Longest Storm (mins) 1	080						
Summer Storms	Yes Climate Change %	+10						
	Time Area Diagram							
	Total Area (ha) 0.683							
m	(ming) Area Time (ming) Area							
Time From:	To: (ha) From: To: (ha)							
0	4 0.000 4 8 0.683							
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DBFL Consulting Engineers	Page	4									
Ormond House											
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Innovyze	Source	Control	2018.1								
Model Details											
MODEL DELAIIS											
Storage is Online Cover Level (m) 50.000											
Cellula	r Storag	ge Struct	ure								
Inver	t Level (	m) 45.450	) Safety Fa	ctor 2.0							
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000											
Depth (m) Area (m²) Inf. Area (m²) Depth (m) Area (m²) Inf. Area (m²)											
0.000 229.5	0.0	1.445	0.0	0.0							
1.440 229.5	0.0										
Undro-Proko@	Optimum	Outflow	Control								
nyuro-brakes	Opermun	. OUCLIOW	CONCLOT								
Unit	Referenc	e MD-SHE-0	090-4200-14	445-4200							
Desig	n Head (m	.)		1.445							
Design	Flow (1/s	) TM	Ca	4.2							
	Objectiv	e Minimis	ca. Linstream	storage							
A	pplicatio	n	apper cum	Surface							
Sump	Availabl	e		Yes							
Dia	meter (mm	.)		90							
Invert	Level (m	.)		45.400							
Minimum Outlet Pipe Dia	meter (mm	)		150							
Suggested Manhole Dia	meter (mm	.)		1200							
Control Po	ints	Head (m)	Flow (l/s)								
Design Point (Ca	alculated)	1.445	4.2								
I	Flush-Flom	∞ 0.398	4.0								
_	Kick-Flo®	0.808	3.2								
Mean Flow over H	lead Range	5 -	3.6								
The hydrological calculations have b	een based	on the He	ad/Dischar	ge relationship	for the						
Hydro-Brake® Optimum as specified.	Should an	other type	of contro	l device other t	han a						
Hydro-Brake Optimum® be utilised the	n these s	torage rou	ting calcu	lations will be							
invalidated											
Depth (m) Flow (1/s) Depth (m) Flow	v (l/s) De	epth (m) F	low (l/s)	Depth (m) Flow (	(l/s)						
0.100 2.8 1.200	3.8	3.000	5.9	7.000	8.8						
0.200 3.7 1.400	4.1	3.500	6.3	7.500	9.1						
0.300 3.9 1.600	4.4	4.000	6.8	8.000	9.4						
0.400 4.0 1.800	4.6	4.500	7.1	8.500	9.6						
0.500 4.0 2.000	4.9	5.000	7.5	9.000	9.9						
0.600 3.9 2.200	5.1	5.500	7.8	9.500	10.2						
0.800 3.3 2.400	5.3	6.000	8.2								
1.000 3.5 2.600	5.5	6.500	8.5								
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# APPENDIX D – CORRESPONDANCE WITH IRISH WATER

Ardstone Residential Partners c/o Sean Byrne DBFL Consulting Eng, Ormond House, Upper Ormond Quay, Dublin D07W704



**Uisce Éireann** Bosca OP 6000 Baile Átha Cliath 1 Éire

**Irish Water** PO Box 6000 Dublin 1 Ireland

T: +353 1 89 25000 F: +353 1 89 25001 www.water.ie

21 February 2019

Dear Sir/Madam,

# Re: Customer Reference No 7745992294 pre-connection enquiry - Subject to contract | Contract denied 500 unit housing development at Old Bray Road, Cornelscourt, Dublin

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

In the case of wastewater connections this assessment does not confirm that a gravity connection is achievable. Therefore a suitably sized pumping station may be required to be installed on your site. All infrastructure should be designed and installed in accordance with the Irish Water Code of Practice.

With regard to the proposed wastewater connection, while there is no known constraint downstream of this site, due to the size of the development it will be necessary to carry out further detailed studies to confirm the available capacity and to determine the full extent of any upgrades which may be required, prior to agreeing to the proposed connection.

Should you wish to have such studies progressed by Irish Water, you will be required to enter into a Project Works Services Agreement. Irish Water will also require that you contribute a relevant portion of the cost of works to achieve such upgrades. Please contact Irish Water for further information.

Please see attached drawing for location of existing watermains and sewers. Wayleaves and appropriate separation distances shall be maintained for any infrastructure within the development site.

#### **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.

C. In advance of submitting this development to An Bord Pleanala for full assessment, the Developer is required to have entered into a Project Works Services Agreement to deliver studies to confirm the available capacity and to determine the full extent of any upgrades which may be required to be completed to Irish Water infrastructure.

All infrastructure should be designed and installed in accordance with the Irish Water Codes of Practice and Standard Details.

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 Regulation of Utilities.

If you have any further questions, please contact Brian O'Mahony from the design team on 022 52205 or email <u>bomahony@water.ie</u>. For further information, visit **www.water.ie/connections** 

Yours sincerely,

#### Maria O'Dwyer Connections and Developer Services

Stúrthóirí / Directors: Mike Quinn (Chairman), Eamon Gallen, Cathal Marley, Brendan Murphy, Michael G. O'Sullivan 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. Ulimhir Chláraithe in Éirinn / Registered in Ireland No.: 530363



Ardstone Residential Partners c/o Sean Byrne DBFL Consulting Eng, Ormond House, Upper Ormond Quay, Dublin D07W704

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

20 September 2019

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

www.water.ie

#### Re: Design Submission for 500 unit housing development at Old Bray Road, Cornelscourt, Dublin (the "Development") (the "Design Submission") / Connection Reference No: 7745992294

Dear Sean Byrne,

Many thanks for your recent Design Submission.

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

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

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

If you have any further questions, please contact your Irish Water representative: Name: Brian O'Mahony Phone: 022 52205 Email: bomahony@water.ie

Yours sincerely,

M Buyes

Maria O'Dwyer

Stiúrthóirí / Directors: Cathal Marley (Chairman), Niall Gleeson, Eamon Gallen, Brendan Murphy, Michael G. O'Sullivan 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

REV009

## **Connections and Developer Services**

# Appendix A

# **Document Title & Revision**

- [Site Services Layout] 180208-DBFL-XX-XX-DR-C-3001-P1
- [Watermain Layout] 180208-DBFL-XX-XX-DR-C-3002-P1
- [Longitudinal Sections Through Foul Sewer] 180208-DBFL-XX-XX-DR-C-3010-P1

For further information, visit <u>www.water.ie/connections</u>

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

# Brendan Keogh - DBFL Consulting Engineers

From:Fionan Ginty <fginty@water.ie>Sent:Friday 16 August 2019 11:53To:Brendan Keogh - DBFL Consulting EngineersSubject:RE: 180208 - Cornelscourt - Irish Water PCE - Customer Reference No -<br/>7745992294

Brendan,

The scope of the PWSA is still being reviewed.

There is currently a Drainage Area Plan (DAP) underway in this overall catchment. The initial assessment for this site outlined some additional flow monitoring/model update/capacity assessment, in addition to what is underway as part of the DAP.

**Best Regards** 

Fionán Ginty Senior Design Engineer Connections and Developer Services - Greater Dublin Region

Uisce Éireann Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath, Éire Irish Water Colvill House, 24-26 Talbot Street, Dublin 1, Ireland T: 01 8925734 | E: fginty@water.ie P Please consider the environment before printing this e-mail

From: Brendan Keogh - DBFL Consulting Engineers [mailto:Brendan.Keogh@dbfl.ie] Sent: 14 August 2019 17:04 To: Fionan Ginty Subject: FW: 180208 - Cornelscourt - Irish Water PCE - Customer Reference No - 7745992294

Fionan,

I'm following up on the e-mails below regarding Ardstone's site in Cornelscourt (PCE Ref. 7745992294).

Can you provide an update on progress of preparation of a PWSA?

Can you advise the likely scope of a PWSA?

Regards

From: Brendan Keogh - DBFL Consulting Engineers Sent: Wednesday 17 July 2019 17:45 To: Fionan Ginty <fginty@water.ie> Cc: Dan Reilly-DBFL Consulting Engineers <Dan.Reilly@dbfl.ie> Subject: RE: 180208 - Cornelscourt - Irish Water PCE - Customer Reference No - 7745992294

Thanks, much appreciated.

From: Fionan Ginty <<u>fginty@water.ie</u>> Sent: Wednesday 17 July 2019 17:35 To: Brendan Keogh - DBFL Consulting Engineers <<u>Brendan.Keogh@dbfl.ie</u>> Cc: Dan Reilly-DBFL Consulting Engineers <<u>Dan.Reilly@dbfl.ie</u>> Subject: RE: 180208 - Cornelscourt - Irish Water PCE - Customer Reference No - 7745992294

## Brendan,

I have forwarded for scoping, noting the request to prioritise.

Regards

Fionán

From: Brendan Keogh - DBFL Consulting Engineers [<u>mailto:Brendan.Keogh@dbfl.ie</u>] Sent: 17 July 2019 17:15 To: Fionan Ginty Cc: Dan Reilly-DBFL Consulting Engineers Subject: RE: 180208 - Cornelscourt - Irish Water PCE - Customer Reference No - 7745992294

Fionan,

Thanks for responding to our queries.

Please proceed with preparation of a PWSA for Ardstone's site in Cornelscourt (PCE Ref. 7745992294).

The pre-app meeting at ABP is on this Friday, we'll note that Ardstone have engaged with Irish Water following receipt of PCE feedback and have requested Irish Water to issue a PWSA.

It would be greatly appreciated if you could prioritise issue of this PWSA as we'd like to include this information in the subsequent SHD application.

Feel free to contact me if you have any queries regarding the site at Cornelscourt.

Regards

From: Fionan Ginty <<u>fginty@water.ie</u>> Sent: Wednesday 17 July 2019 09:48 To: Brendan Keogh - DBFL Consulting Engineers <<u>Brendan.Keogh@dbfl.ie</u>> Subject: RE: 180208 - Cornelscourt - Irish Water PCE - Customer Reference No - 7745992294

Brendan,

Responses to your questions in red below:

**Best Regards** 

Fionán Ginty Senior Design Engineer Connections and Developer Services - Greater Dublin Region

Uisce Éireann Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath, Éire From: Brendan Keogh - DBFL Consulting Engineers [<u>mailto:Brendan.Keogh@dbfl.ie</u>] Sent: 16 July 2019 14:02 To: Brian O'Mahony Subject: 180208 - Cornelscourt - Irish Water PCE

Brian,

I'm following up on a PCE that was issued for Ardstone's site in Cornelscourt in February 2019, reference 7745992294 (see attached). You were listed as a contact in Irish Water.

The PCE notes that there are no known constraints downstream of this site but also notes that a PWSA is required.

Ardstone have been working through the planning process and will soon attend the pre-application meeting with ABP.

Can you advise the following:

- What would be the likely scope of a PWSA include given that the PCE notes "no known constraints" ? Flow monitoring and model update in addition to the current scope of the ongoing Drainage Area Plan in this area.
- Can you advise the process by which Ardstone could engage with Irish Water on a PWSA ? Advise via email if Ardstone wish to proceed with the PWSA.
- What would be the likely timeframe for confirming the scope and cost of such a PWSA ? Timeframe for same not currently available. This generally takes a number of weeks.
- What would be the likely timeframe for carrying out any investigations required by such a PWSA ? This
  would depend on the scope of the required investigations.
- Have Irish Water any planned foul network upgrades in the vicinity of the site / downstream of the site ? The ongoing Drainage Area Plan in this area will outline upgrades, if any, within this catchment.

# Regards

Brendan Keogh BA BAI PGradDip CEng MIEI Associate Director DBFL Consulting Engineers

DUBLIN OFFICE: Ormond House, Upper Ormond Quay, Dublin 7. Tel: +353 1 400 4000 Email: <u>brendan.keogh@dbfl.ie</u> Web: <u>www.dbfl.ie</u>

CORK OFFICE: Phoenix House, Monahan Road, Cork. Tel: +353 (0) 21 2024538

WATERFORD OFFICE: Unit 2, The Chandlery, 1-2 O'Connell Street, Waterford. Tel: +353 (0) 51 309500 Fax: +353 (0) 51 844913



www.dbfl.ie

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Thank you for your attention.

Tá an fhaisnéis á seachadadh dírithe ar an duine nó ar an eintiteas chuig a bhfuil sí seolta amháin agus féadfar ábhar faoi rún, faoi phribhléid nó ábhar atá íogair ó thaobh tráchtála de a bheith mar chuid de. Tá aon athsheachadadh nó scaipeadh den fhaisnéis, aon athbhreithniú ar nó aon úsáid eile a bhaint as, nó aon ghníomh a dhéantar ag brath ar an bhfaisnéis seo ag daoine nó ag eintitis nach dóibh siúd an fhaisnéis seo, toirimiscthe agus féadfar é a bheith neamhdhleathach. Níl Uisce Éireann faoi dhliteanas maidir le seachadadh iomlán agus ceart na faisnéise sa chumarsáid seo nó maidir le haon mhoill a bhaineann léi. Ní ghlacann Uisce Éireann le haon dliteanas faoi ghnímh nó faoi iarmhairtí bunaithe ar úsáid thoirmiscthe na faisnéise seo. Níl Uisce Éireann faoi dhliteanas maidir le seachadadh ceart agus iomlán na faisnéise sa chumarsáid seo nó maidir le haon mhoill a bhaineann léi. Má fuair tú an teachtaireacht seo in earráid, más é do thoil é, déan teagmháil leis an seoltóir agus scrios an t-ábhar ó gach aon ríomhaire. Féadfar ríomhphost a bheith soghabhálach i leith truaillithe, idircheaptha agus i leith leasaithe neamhúdaraithe. Ní ghlacann Uisce Éireann le haon fhreagracht as athruithe nó as idircheapadh a rinneadh ar an ríomhphost seo i ndiaidh é a sheoladh nó as aon dochar do chórais na bhfaighteoirí déanta ag an teachtaireacht seo nó ag a ceangaltáin. Más é do thoil é, tabhair faoi deara chomh maith go bhféadfar monatóireacht a dhéanamh ar theachtaireachtaí chuig nó ó Uisce Éireann chun comhlíonadh le polasaithe agus le caighdeáin Uisce Éireann a chinntiú agus chun ár ngnó a chosaint. Fochuideachta gníomhaíochta de chuid Ervia is ea Uisce Éireann atá faoi theorainn scaireanna, de bhun fhorálacha an tAcht um Sheirbhísí Uisce 2013, a bhfuil a bpríomh ionad gnó ag 24-26 Teach Colvill, Sráid na Talbóide, BÁC 1.

Go raibh maith agat as d'aird a thabhairt.

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an bhfaisnéis seo ag daoine nó ag eintitis nach dóibh siúd an fhaisnéis seo, toirimiscthe agus féadfar é a bheith neamhdhleathach. Níl Uisce Éireann faoi dhliteanas maidir le seachadadh iomlán agus ceart na faisnéise sa chumarsáid seo nó maidir le haon mhoill a bhaineann léi. Ní ghlacann Uisce Éireann le haon dliteanas faoi ghnímh nó faoi iarmhairtí bunaithe ar úsáid thoirmiscthe na faisnéise seo. Níl Uisce Éireann faoi dhliteanas maidir le seachadadh ceart agus iomlán na faisnéise sa chumarsáid seo nó maidir le haon mhoill a bhaineann léi. Má fuair tú an teachtaireacht seo in earráid, más é do thoil é, déan teagmháil leis an seoltóir agus scrios an t-ábhar ó gach aon ríomhaire. Féadfar ríomhphost a bheith soghabhálach i leith truaillithe, idircheaptha agus i leith leasaithe neamhúdaraithe. Ní ghlacann Uisce Éireann le haon fhreagracht as athruithe nó as idircheapadh a rinneadh ar an ríomhphost seo i ndiaidh é a sheoladh nó as aon dochar do chórais na bhfaighteoirí déanta ag an teachtaireacht seo nó ag a ceangaltáin. Más é do thoil é, tabhair faoi deara chomh maith go bhféadfar monatóireacht a dhéanamh ar theachtaireachtaí chuig nó ó Uisce Éireann chun comhlíonadh le polasaithe agus le caighdeáin Uisce Éireann a chinntiú agus chun ár ngnó a chosaint. Fochuideachta gníomhaíochta de chuid Ervia is ea Uisce Éireann atá faoi theorainn scaireanna, de bhun fhorálacha an tAcht um Sheirbhísí Uisce 2013, a bhfuil a bpríomh ionad gnó ag 24-26 Teach Colvill, Sráid na Talbóide, BÁC 1.

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### **APPENDIX E – SURFACE WATER NETWORK DESIGN CALCULATIONS**

Ormond House         S Year 30 Minute Event           Upper Ormond Quay         Designed by Byrnese           Date 30/10/2019 14:56         Designed by Byrnese           File NETWORK 29102019.MOX         Checked by           Innovyze           STORM SEWER DESIGN by the Modified Rational Method           Designed by Byrnese           File NETWORK 29102019.MOX           Designe Criteria for SW_1           Network 2018.1           Network Design Table for SM_1           Retwork Design Table for SM_1           Retwork Design Table for SM_1           « Indicates pipe capacity < flow           Prov (ran)           Network Design Table for SM_1           « Indicates pipe capacity < flow           Prov (ran)           Network Design Table for SM_1           « Indicates pipe capacity < flow           Network Design T	0	nsulti	ng Ei	ngine	ers							Pag	ge 1		
Upper Ormond Quay Dublin 7 Date 30/10/2019 14:56 File NETWORK 29102019.NDX Checked by Innovyze STORM SEWER DESIGN by the Modified Rational Method Design Criteria for SW 1 Fipe Sizes STANDARD Mamhole Sizes STANDARD FSR Rainfall Model - Scotland and Ireland Return Period (yeary) 5 M5-60 (nm) 16.400 Maximum Backforp Height (n) 0.200 Maximum Rainfall (nm/hr) 100 Maximum Backforp Height (n) 0.200 No Unmetric Runof Coeff, 0.750 Min Design Orthor Optimisation (n) 1.500 FN - 60 (nm) 16.400 Maximum Backforp Height (n) 0.200 Maximum Rainfall (nm/hr) 100 Maximum Backforp Height (n) 1.500 Faximum Time of Concentration (nin; 30 Min Design Depth For Optimisation (n) 1.500 FN - 60 (nm) 16.400 Maximum Backforp Height (n) 1.500 Maximum Time of Concentration (nin; 30 Nin Design Depth For Optimisation (n) 1.500 FN Length Fall Slope LArea T.E. Base k HYD DIA Section Type Auto Designed with Level Soffits Network Design Table for SW 1 <a href="http://conduit">concentration (nin; 1.500 Poil Sevage (1/a/ha) 0.000 0.00 0.000 0.225 Fipe/Conduit 1.001 27.363 1.300 21.0 0.195 4.00 1.001 4.27.483 0.100 274.8 0.016 0.00 0.0 0.600 0 225 Fipe/Conduit 1.001 427.483 0.100 274.8 0.016 0.00 0.0 0.600 0 225 Fipe/Conduit 1.001 427.483 0.100 274.8 0.016 0.00 0.0 0.600 0 225 Fipe/Conduit 1.001 427.483 0.100 274.8 0.016 0.00 0.0 0.600 0 225 Fipe/Conduit 1.001 427.483 0.100 274.8 0.016 0.00 0.0 0.600 0 225 Fipe/Conduit 1.004 27.483 0.100 274.8 0.016 0.00 0.0 0.600 0 225 Fipe/Conduit 1.004 14.990 0.230 65.2 0.011 4.00 0.0 0.600 0 225 Fipe/Conduit 2.001 14.990 0.230 65.2 0.011 4.00 0.0 0.600 0 225 Fipe/Conduit 1.004 647.3 43.7 0.100 3.035 0.00 0.0 0.600 0 225 Fipe/Conduit 2.001 14.990 0.230 65.2 0.011 4.00 0.0 0.0 0.0 3.4 2.66 113.9 37.9 1.001 65.12 4.15 51.500 0.01 0.0 0.0 3.4 2.66 113</a>	Urmond	House				5 Y	ear 30 Mi	nute Ev	/ent						
Dublin 7         Designed by Byrnese Checked by         Micro- Dialoge           Innovyze         Network 2018.1         Micro- Dialoge         Micro- Checked by           Innovyze         Network 2018.1         Micro- Dialoge         Micro- Dialoge         Dialoge           Innovyze         Network 2018.1         Storm SEWER DESIGN by the Modified Rational Method         Design Criteria for SW_1           Innovyze         Network 2018.1         Network 2018.1         Dialoge         Dialoge           Maximum Rainfall (model - Scotland and Ireland Return Period (years)         S         PIMP (%) 100         Maximum Backdrop Height (m) 0.200           Maximum Rainfall (model - Scotland and Ireland Return Period (years)         S         PIMP (%) 100         Maximum Backdrop Height (m) 1.200           Maximum Time of Concentration (mine)         30 Min Design Depth for Optimisation (1:X)         S00           Volumetric Runoff Coeff.         0.750         Min Slope for Optimisation (1:X)         S00           Designed with Level Soffits         Network Design Table for SW 1         Sector (m)         Sector (m)           1.000 27.365 1.300 21.0         0.195 4.00         0.00 0.00         225 Pipe/Conduit         Sector           1.001 4.921 0.190 25.9         0.000 0.00         0.00 0.00         0.25 Pipe/Conduit         Sector (m)         Sector (m)	Upper C	Ormond	Quay												
Date 30/10/2019 14:56         Designed by Byrnese         Difference           File NETWORK 29102019.MDX         Checked by         Difference         Difference           Innovyze         Network 2018.1         Difference         Difference         Difference           Innovyze         Network 2018.1         File Sizes STANDAED Manhole Sizes STANDAED         FIMP (%) 100           Return Period (vears)         S         FIMP (%) 100         Mad Flow / Climate Change (%) 100           Mariams Reinfall (mn/h)         100         Mad Flow / Climate Change (%) 100         Network 2018.1           Mariams Reinfall (mn/h)         100         Maximum Time of Concentration (mina)         30 Min Design Peth for Optimisation (1) 1.200           Paul Swage (1/s/h)         0.000         Min W1 for Auto Design only (ms/s)         500           Volumetric Runoff Coeff.         0.750         Min Slope for Optimisation (1:X)         500           Designed with Level Soffits          Design         1.000 27.363 1.300 21.0         0.100 0.00 0.0         225 Pipe/Conduit         1.002 27.363 1.300 21.0         0.000 0.0         0.000 0.00 0.0         225 Pipe/Conduit         1.002 27.363 1.300 27.48 0.016 0.000 0.0         0.000 0.00 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.0000 0.000 0.000 0.000 0.000 0.000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.0	Dublin	7										M	irro		
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Thnovyze Network 2018.1 STORM SEWER DESIGN by the Modified Rational Method Design Criteria for SW 1 Pipe Sizes STANDARD Manhole Sizes STANDARD FSR Rainfall Model - Soctland and Ireland Return Period (years) 5 Ms-60 (m) 16.400 Maximum Sine of Concentration (mins) 30 Min Design Depth for Optimisation (m) 1.500 Maximum Time of Concentration (mins) 30 Min Design Depth for Optimisation (m) 1.500 Maximum Time of Concentration (mins) 30 Min Design Depth for Optimisation (m) 1.500 Maximum Sine of Concentration (mins) 30 Min Design Depth for Optimisation (m) 1.500 Maximum Time of Concentration (mins) 30 Min Design Depth for Optimisation (m) 1.200 Poul Sewage (1/s/ha) 0.000 Min Vel for Auto Design only (m/s) 1.00 Designed with Level Soffits Metwork Design Table for SW_1 - Indicates pipe capacity < flow FN Length Fall Slope I.Area T.E. Base k HYD DIA Section Type Auto (m) (m) (1:X) (ha) (mins) Flow (1/s) (mm) SECT (mm) Design 1.000 27.363 1.300 21.0 0.195 4.000 .000 0.0 0.0 0.000 0.225 Pipe/Conduit 1.002 13.874 0.730 19.0 0.020 0.000 .000 0.000 0.000 0.225 Pipe/Conduit 1.002 42.7483 0.100 274.8 0.016 0.000 .000 0.000 0.000 0.000 0.225 Pipe/Conduit 1.004 27.483 0.100 274.8 0.016 0.000 .000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	File NE	TWORK	2910	2019.	MDX	Ch	Checked by							ייר	
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Design Criteria for SW 1         Figs Sizes STANDARD Manhole Sizes STANDARD         Stainfall Model - Scotland and Ireland         Return Period (years)       5       Add Flow / Climate Change (8)       100         National Return Period (years)       5       Minimum Backdrop Height (10,020)         Maximum Rainfall (mm/hr)       100         Maximum Backdrop Height (10,020)         Maximum Rainfall (mm/hr)       100         Maximum Backdrop Height (10,020)         Maximum Rainfall (mm/hr)       100         Maximum Rainfall (mm/hr)       1000         Maximum Rainfall       Maximum Rainfall       1000         Maximum Rainfall </td <td></td> <td></td> <td>STORM</td> <td>4 SEW</td> <td>ER DES</td> <td>IGN by</td> <td>the Mod</td> <td>fied</td> <td>Ratio</td> <td>nal M</td> <td>Metho</td> <td>d</td> <td></td> <td></td>			STORM	4 SEW	ER DES	IGN by	the Mod	fied	Ratio	nal M	Metho	d			
Pipe Sizes STANDARD Manhole Sizes STANDARD         FSR Rainfall Model - Scotland and Ireland         Return Period (years)       5       FMP (%) 100         Matio R 0.273       Minimum Backdrop Height (m) 0.200         Maximum Raindrop Height (m) 1.200         Maxim Raindrop Height (m) 1.200					De	sign Cr	iteria	for SV	<u>√_1</u>						
FRR Rainfall Model - Scoland and Ireland         Return Period (years) 5       PIMP (%) 100         MS-60 (mm) 16.400       Add Plow / Climate Change (%) 100         Maximum Rainfall (mm/hr)       100         Maximum Backdrop Height (m) 0.200         Maximum Time of Concentration (mins)       30 Min Design Depth for Optimisation (m) 1.200         Volumetric Runoff Coeff. 0.750       Min Slope for Optimisation (1:X) 500         Volumetric Runoff Coeff. 0.750       Min Slope for Optimisation (1:X) 500         Designed with Level Soffits         Network Design Table for SW 1         « - Indicates pipe capacity < flow         Pipe/Conduit         1.000 27.353 1.300 21.0 0.195 4.00       0.0 0.600 o       225 Pipe/Conduit         1.001 4.921 0.190 25.9 0.000       0.0 0.600 o       225 Pipe/Conduit         1.002 27.353 1.303 21.0 0.220 0.00       0.0 0.600 o       300 Pipe/Conduit         1.002 47.48 0.101 0.248 0.016 0.00       0.0 0.600 o       225 Pipe/Conduit         1.003 24.541 1.169 21.0 0.250 0.00       0.0 0.600 o       450 Pipe/Conduit         1.005 74.071 0.350 211.6 0.120 0.00       0.0 0.600 o       450 Pipe/Conduit         1.005 74.071 0.350				Pi	pe Sizes	STANDA	RD Manhol	e Size	s STANI	DARD					
Return Period (years)       5       DIMP (%)       100         NS-500 (mm) 16.400       Add Flow / Climate Change (%)       100         Naximum Rainfall (mm/hr)       100       Maximum Backdrop Height (m)       0.200         Maximum Time of Concentration (mins)       30       Min Design Depth for Optimisation (m)       1.200         Foul Sewage (1/s/ha)       0.000       Min Vel for Auto Design only (m/s)       1.00         Volumetric Runoff Coeff.       0.750       Min Slope for Optimisation (1:X)       500         Designed with Level Soffits         Network Design Table for SW_1         (m) (m) (1:X) (ha) (mins) Flow (1/s) (mm) SECT (mm)         1000 27.363 1.300 21.0 0.195 4.00       0.0 0.600       o 225 Pipe/Conduit         1.002 13.874 0.730 19.0 0.202 0.00       0.00 0.600       o 225 Pipe/Conduit       0.002 13.074.88 0.016 0.00       0.00 0.600       o 225 Pipe/Conduit         1.004 27.483 0.100 27.48 0.016 0.00       0.00 0.600       o 225 Pipe/Conduit       0.004 0.00 0.600       o 225 Pipe/Conduit         1.005 74.01 0.50 0.80 0.00 0.00 0.00 0.600       o 225 Pipe/Conduit       0.004 0.00 0.600       o 225 Pipe/Conduit       0.004 0.00 0.600       o 225 Pipe/Conduit       0.005 0.00       0.00 0.600       o 225 Pipe/Conduit       0.005 0.00 <t< td=""><td></td><td></td><td></td><td>F</td><td>SR Rainf</td><td>all Mode</td><td>el - Scotl</td><td>and an</td><td>d Irela</td><td>and</td><td></td><td></td><td></td><td></td></t<>				F	SR Rainf	all Mode	el - Scotl	and an	d Irela	and					
Ratio R 0.273       Minimum Backdrop Height (m) 0.200         Maximum Rainfall (mm/hr)       100       Maximum Backdrop Height (m) 1.500         Maximum Time of Concentration (mins)       30 Min Design Depth for Optimisation (1:X)       500         Volumetric Runoff Coeff.       0.750       Min Slope for Optimisation (1:X)       500         Designed with Level Soffits         Network Design Table for SW_1         (m) (n) (1:X) (ha) (mins) Flow (1/s) (mm) SECT (mm)       Design         Network Design Table for SW_1         (m) (n) (1:X) (ha) (mins) Flow (1/s) (mm) SECT (mm)       Design         1.000 27.363 1.300 21.0 0.195 4.00       0.0 0.600       o 225 Pipe/Conduit         1.001 4.921 0.190 25.9 0.000       0.00       0.00 0.600       o 225 Pipe/Conduit         1.002 27.363 1.300 21.0 0.250 0.00       0.00 0.600       o 225 Pipe/Conduit         1.002 4.480 0.102 0.480 0.00 0.00 0.600       o 225 Pipe/Conduit         1.002 27.363 1.300 21.0 0.195 4.00       0.0 0.00 0.600       o 225 Pipe/Conduit         1.002 1.374 8.0.101 6.0.00       0.0 0.600       o 225 Pipe/Conduit         1.002 27.483 0.102 0.74.8 0.016 0.00       0.0 0.600       o 450 Pipe/Conduit       0.00         1.001 6.5.2 0.011 4.00<			Retu	rn Pei	riod (ye	ars) (mm) 16	5	مام		/ al in	ata di	PIMP (	%) 1 %)	00	
Maximum Rainfall (mm/hr)       100       Maximum Design Depth for Optimisation (m) 1.200         Maximum Time of Concentration (mins)       30 Min Design Depth for Optimisation (m) 1.200         Volumetric Runoff Coeff.       0.750       Min Slope for Optimisation (1:X)       500         Designed with Level Soffits         Network Design Table for SW_1         * - Indicates pipe capacity < flow					M5-60 Rat	(mm) 16. io R 0.	400 273	Aac M	i Flow . Iinimum	Backd	nate Cl drop He	nange ( eight (	*) m) 0.2	10	
Maximum Time of Concentration (mins)       30 Min Design Depth for Optimisation (m) 1.200         Foul Sewage (1/s/ha)       0.000       Min Vel for Auto Design only (m/s)       1.00         Min Slope for Optimisation (1:X)       500         Designed with Level Soffits         Network Design Table for SW_1         « - Indicates pipe capacity < flow		Ma	aximum	Rain	Eall (mm	/hr)	100	Μ	laximum	Backo	drop He	eight (	m) 1.5	00	
Foul Sewage (1/g/ng) 0.000       Min Slope for Optimisation (1:X)       500         Min Slope for Optimisation (1:X)       500         Designed with Level Soffits         Network Design Table for SW_1         « - Indicates pipe capacity < flow	Maximum	n Time d	of Con	centra	ation (m	ins)	30 Min I	esign	Depth :	for Op	otimisa	ation (	m) 1.2	00	
Designed with Level Soffits         Network Design Table for SW_1         (- Indicates pipe capacity < flow         PN Length Fall Slope I.Area T.E. Base k HYD DIA Section Type Auto (m) (m) (1:X) (ha) (mins) Flow (1/s) (mm) SECT (mm) Design         1.000 27.363 1.300 21.0 0.195 4.00       0.0 0.600 o 225 Pipe/Conduit         1.001 24.921 0.190 25.9 0.000 0.00       0.0 0.600 o 225 Pipe/Conduit         1.002 13.874 0.730 19.0 0.220 0.00       0.0 0.600 o 300 Pipe/Conduit         1.004 27.483 0.100 274.8 0.016 0.00       0.0 0.600 o 300 Pipe/Conduit         1.005 47.071 0.350 211.6 0.120 0.000       0.0 0.600 o 450 Pipe/Conduit         1.006 47.333 0.200 236.7 0.101 0.00       0.0 0.600 o 450 Pipe/Conduit         1.007 1.434 0.050 28.7 0.000 0.00       0.0 0.600 o 225 Pipe/Conduit         2.000 14.990 0.230 65.2 0.011 4.00       0.0 0.600 o 225 Pipe/Conduit         2.000 14.990 0.230 65.2 0.011 4.00       0.0 0.600 o 225 Pipe/Conduit         Network Results Table		Ve	F'ou lumet	I Sewa ric Ru	age (l/s moff Co	/ha) 0. eff 0	000 M: 750	n Vel Min Sl	for Aut	to Des r Opti	misat	nly (m/ ion (1:	s) 1. x) 5	00	
Designed with Level Soffits           Network Design Table for SW_1           « - Indicates pipe capacity < flow           PN Length Fall Slope I.Area T.E. Base k HYD DIA Section Type Auto Design           1.000 27.363 1.300 21.0 0.195 4.00 0.0 0.600 o 225 Pipe/Conduit           1.001 2.7.363 1.300 21.0 0.195 4.00 0.0 0.600 o 225 Pipe/Conduit           1.000 27.363 1.300 21.0 0.220 0.00 0.00 0.00 0.600 o 225 Pipe/Conduit           1.000 27.363 1.300 21.0 0.250 0.00 0.00 0.00 0.600 o 225 Pipe/Conduit           1.000 27.48 0.100 0.730 19.0 0.020 0.00 0.00 0.00 0.600 o 300 Pipe/Conduit           1.000 27.48 0.100 27.48 0.016 0.00 0.00 0.00 0.600 o 450 Pipe/Conduit           1.000 27.48 0.100 27.4 0.016 0.00 0.00 0.00 0.600 o 450 Pipe/Conduit           1.000 27.4 0.016 0.120 0.00 0.00 0.00 0.00 0.00 0.600 o 225 Pipe/Conduit           1.000 236 65.2 0.011 4.00 0.0 0.600 o 225 Pipe/Conduit           1.000 0.00 0.00 0.00 0.00 0.00 0.00 0.0		v	JI UNIC C				150		.opc 10.	L OPCI	Init Sac.	1011 (1)	11) 5	00	
Network Design Table for SW_1         « - Indicates pipe capacity < flow         PN Length Fall Slope I.Area T.E. Base k HYD DIA Section Type Auto (m) (1:X) (ha) (mins) Flow (1/s) (m) SECT (mm)         1.000 27.363 1.300 21.0 0.195 4.00       0.0 0.600 0 225 Pipe/Conduit         1.001 4.921 0.190 25.9 0.000 0.00       0.0 0.600 0 225 Pipe/Conduit         1.002 13.874 0.730 19.0 0.0220 0.00       0.00 0.600 0 225 Pipe/Conduit         1.003 24.541 1.169 21.0 0.250 0.000 0.00 0.00 0.600 0 300 Pipe/Conduit         1.004 27.483 0.100 274.8 0.016 0.00       0.00 0.600 0 450 Pipe/Conduit         1.005 74.071 0.350 211.6 0.120 0.00       0.00 0.600 0 450 Pipe/Conduit         1.006 47.33 0.20 236.7 0.1011 0.00       0.0600 0 450 Pipe/Conduit         2.000 14.990 0.230 65.2 0.011 4.00       0.0 0.600 0 225 Pipe/Conduit         2.001 17.058 0.170 100.3 0.035 0.00       0.0 0.00 0.00       0.225 Pipe/Conduit         1.000 65.29 4.16 52.800 0.195 0.0 0.0       3.4 2.86 113.9 37.9         1.001 65.12 4.19 51.500 0.195 0.0 0.0       3.4 2.86 113.9 37.9         1.002 64.73 4.27 51.310 0.215 0.0 0.0       0.0 8.1 3.45 243.6 88.8         1.001 65.12 4.19 51.500 0.195 0.0 0.0       0.45 Pipe/Conduit         1.002 64.73 4.27 51.310 0.215 0.0 0.0       0.4 1.39 221.6 103.9         1.003 64.12 4.39 50.505 0.465 0.0 0.0       8.1 3.45 243.6 88.8         1.005 58.05 5.76 45.850		Designed with Level Soffits													
<pre></pre>		Network Design Table for SW_1													
PN       Length (m)       Fall (1:X)       Slope (1:X)       I.Area (m)       T.E. (m)       Base (mm)       k (mm)       HYD SECT (mm)       DIA SECT (mm)       Section Type Design       Auto Design         1.000       27.363       1.300       21.0       0.195       4.00       0.0       0.600       o       225       Pipe/Conduit       Image: Conduit       Image: Condui		« - Indicates pipe capacity < flow													
FN         Length         Fall         Slope         I.Area         T.E.         Base         k         HYD         DIA         Section Type         Auto           1.000         27.363         1.300         21.0         0.195         4.00         0.0         0.600         0         225         Pipe/Conduit         1           1.001         4.921         0.190         25.9         0.000         0.00         0.600         0         225         Pipe/Conduit         1           1.002         13.874         0.730         19.0         0.250         0.00         0.00         0.600         0         225         Pipe/Conduit         1         1.003         24.541         1.169         21.0         0.250         0.00         0.00         0.600         0         300         Pipe/Conduit         1         1.005         74.71         0.350         21.6         0.120         0.00         0.00         0.600         0         450         Pipe/Conduit         1         1.007         1.434         0.050         28.7         0.000         0.00         0.600         0         225         Pipe/Conduit         1         2.001         17.058         0.170         100.3         0.035         0.															
(m)       (m)       (1:x)       (m)       (m)       SECT       (m)       SECT       (m)       Design         1.000       27.363       1.300       21.0       0.195       4.00       0.0       0.600       o       225       Pipe/Conduit       1         1.001       4.921       0.190       0.25.9       0.000       0.00       0.00       0.600       o       225       Pipe/Conduit       1         1.003       24.541       1.169       21.0       0.250       0.00       0.00       0.600       o       300       Pipe/Conduit       1       1       1.004       27.483       0.100       274.8       0.016       0.00       0.00       0.600       o       300       Pipe/Conduit       1       1.005       74.071       0.350       211.6       0.120       0.00       0.00       0.600       o       450       Pipe/Conduit       1       1.006       74.071       0.350       28.7       0.000       0.00       0.00       0.600       o       450       Pipe/Conduit       1       1.007       1.434       0.050       28.7       0.000       0.00       0.00       0.00       0.00       225       Pipe/Conduit       1       1.001	PN	Length	Fall	Slope	e I.Area	T.E.	Base	k	HYD	DIA	Secti	lon Typ	e Auto	D	
1.000 27.363 1.300 21.0 0.195 4.00 0.0 0.600 o 225 Pipe/Conduit 1.001 4.921 0.190 25.9 0.000 0.00 0.00 0.00 0.600 o 225 Pipe/Conduit 1.003 24.541 1.169 21.0 0.250 0.00 0.0 0.600 o 300 Pipe/Conduit 1.004 27.483 0.100 274.8 0.016 0.00 0.0 0.600 o 300 Pipe/Conduit 1.004 77.433 0.200 236.7 0.101 0.00 0.0 0.600 o 450 Pipe/Conduit 1.007 1.434 0.050 28.7 0.000 0.00 0.0 0.600 o 450 Pipe/Conduit 2.000 14.990 0.230 65.2 0.011 4.00 0.0 0.600 o 450 Pipe/Conduit 2.001 17.058 0.170 100.3 0.035 0.00 0.0 0.600 o 225 Pipe/Conduit 2.001 17.058 0.170 100.3 0.035 0.00 0.0 0.600 o 225 Pipe/Conduit 1.004 65.29 4.16 52.800 0.195 0.0 0.0 3.4 2.86 113.9 37.9 1.001 65.12 4.19 51.500 0.195 0.0 0.0 3.4 2.58 102.6 37.9 1.002 64.73 4.27 51.310 0.215 0.0 0.0 3.4 2.58 102.6 37.9 1.003 64.12 4.39 50.505 0.465 0.0 0.0 3.4 2.58 102.6 37.9 1.003 64.12 4.39 50.505 0.465 0.0 0.0 3.4 2.58 102.6 37.9 1.004 61.80 4.87 46.100 0.481 0.0 0.0 0.8 1.1 3.45 243.6 88.8 1.004 61.80 4.87 46.100 0.481 0.0 0.0 8.1 [0.94 66.74 88.8 1.004 65.22 6.36 45.500 0.702 0.0 0.0 10.6 1.32 209.5 116.7 1.007 55.80 6.36 45.500 0.702 0.0 0.0 10.6 1.32 209.5 116.7 1.007 55.80 6.36 45.500 0.702 0.0 0.0 10.6 1.32 209.5 116.7 1.007 55.80 6.36 45.300 0.702 0.0 0.0 10.6 1.32 209.5 116.7 1.007 55.80 6.36 45.300 0.702 0.0 0.0 10.6 1.32 209.5 116.7 1.007 55.80 6.36 45.300 0.702 0.0 0.0 10.6 1.32 209.5 116.7 1.007 55.80 6.36 45.300 0.702 0.0 0.0 10.6 1.32 209.5 116.7 1.007 55.80 6.36 45.300 0.702 0.0 0.0 10.6 1.32 1.5 1.9 8.8 1.005 58.20 4.15 51.500 0.011 0.0 0.0 0.2 1.62 64.5 2.1 2.000 65.32 4.15 51.500 0.011 0.0 0.0 10.6 1.31 51.9 8.8		(m)	(m)	(1:X)	) (na)	(mins)	FIOW (1/8	;) (mm	) SECT	(mm)			Desig	JU	
1.001 4.921 0.190 25.9 0.000 0.00 0.00 0.00 0.225 Pipe/Conduit 1.002 13.874 0.730 19.0 0.020 0.00 0.00 0.0 0.600 o 225 Pipe/Conduit 1.004 27.483 0.100 274.8 0.016 0.00 0.0 0.600 o 300 Pipe/Conduit 1.005 74.071 0.350 211.6 0.120 0.00 0.0 0.600 o 450 Pipe/Conduit 1.006 47.333 0.200 236.7 0.101 0.00 0.0 0.600 o 450 Pipe/Conduit 1.007 1.434 0.050 28.7 0.000 0.00 0.0 0.600 o 450 Pipe/Conduit 2.000 14.990 0.230 65.2 0.011 4.00 0.0 0.600 o 225 Pipe/Conduit 2.001 17.058 0.170 100.3 0.035 0.00 0.0 0.600 o 225 Pipe/Conduit 1.006 65.29 4.16 52.800 0.195 0.0 0.0 3.4 2.86 113.9 37.9 1.001 65.12 4.19 51.500 0.195 0.0 0.0 3.4 2.86 113.9 37.9 1.002 64.73 4.27 51.310 0.215 0.0 0.0 3.4 2.86 113.9 37.9 1.003 64.12 4.39 50.505 0.465 0.0 0.0 3.8 3.02 119.9 41.5 1.003 64.12 4.39 50.505 0.465 0.0 0.0 3.81 3.45 243.6 88.8 1.004 61.80 4.87 46.100 0.481 0.0 0.0 8.1 3.45 243.6 88.8 1.004 61.80 4.87 46.100 0.481 0.0 0.0 8.1 1.345 243.6 88.8 1.005 55.05 5.76 45.850 0.601 0.0 0.0 8.1 1.345 243.6 88.8 1.005 55.05 6.76 45.850 0.702 0.0 0.0 10.6 1.32 209.5 116.7 2.000 65.32 4.15 51.500 0.702 0.0 0.0 0.0 8.1 3.45 243.6 13.9 7.9 1.005 58.05 6.76 45.850 0.601 0.0 0.0 8.1 1.345 243.6 13.9 1.005 58.05 6.76 45.850 0.702 0.0 0.0 10.6 1.32 209.5 116.7 2.000 65.32 4.15 51.500 0.702 0.0 0.0 8.1 3.45 243.6 88.8 1.005 58.05 6.76 45.850 0.702 0.0 0.0 0.8 1.3 4.54 6.52 11.5 1.500 1.007 55.80 6.36 45.500 0.702 0.0 0.0 0.8 1.3 1.51.9 8.8 1.006 55.32 4.15 51.500 0.011 0.0 0.0 0.8 1.31 51.9 8.8 1.007 55.80 6.36 45.500 0.702 0.0 0.0 0.8 1.31 51.9 8.8	1.000	27.363	1.300	21.0	0.195	4.00	0	0 0.60	)0 o	225	Pipe/	Condui	t 🤒		
1.003       24.541       1.169       21.0       0.250       0.00       0.00       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0       0.000       0.000       0       0.000       0       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.0000       0.0000       0.0000       0.0	1.001	4.921	0.190	25.9		0.00	0	0 0.60		225	Pipe/	Condui	t <mark></mark> ∰ ⊦ ≜		
1.004 27.483 0.100 274.8 0.016 0.00 0.0 0.600 0 300 Pipe/Conduit 1.005 74.071 0.350 211.6 0.120 0.00 0.0 0.600 0 450 Pipe/Conduit 1.006 47.333 0.200 236.7 0.101 0.00 0.0 0.600 0 450 Pipe/Conduit 1.007 1.434 0.050 28.7 0.000 0.00 0.0 0.600 0 450 Pipe/Conduit 2.000 14.990 0.230 65.2 0.011 4.00 0.0 0.600 0 225 Pipe/Conduit 2.001 17.058 0.170 100.3 0.035 0.00 0.0 0.600 0 225 Pipe/Conduit <b>Network Results Table</b> <b>PN Rain T.C. US/IL E I.Area E Base Foul Add Flow Vel Cap Flow (mm/hr) (mins) (m) (ha) Flow (1/s) (1/s) (1/s) (m/s) (1/s) (1/s) 1.000 65.29 4.16 52.800 0.195 0.0 0.0 3.4 2.86 113.9 37.9 1.001 65.12 4.19 51.500 0.195 0.0 0.0 3.4 2.58 102.6 37.9 1.002 64.73 4.27 51.310 0.215 0.0 0.0 3.8 3.02 119.9 41.5 1.003 64.12 4.39 50.505 0.465 0.0 0.0 8.1 3.45 243.6 88.8 1.004 61.80 4.87 46.100 0.481 0.0 0.0 8.1 10.94 66.7* 88.8 1.004 61.80 4.87 45.500 0.702 0.0 0.0 10.6 1.32 209.5 116.7 1.005 58.05 5.76 45.850 0.601 0.0 0.0 10.6 3.81 605.6 116.7 2.000 65.32 4.15 51.500 0.702 0.0 0.0 10.6 3.81 605.6 116.7 2.000 65.32 4.15 51.270 0.046 0.0 0.0 0.8 1.31 51.9 8.8 <b>Example 1.001 65.12 4.19 51.500 0.011 0.0 0.0 0.2 1.62 64.5 2.1</b> 2.001 64.20 4.37 51.270 0.046 0.0 0.0 0.8 1.31 51.9 8.8</b>	1.002	24.541	1.169	21.0	0.250	0.00	0	0 0.60	)0 0	300	Pipe/	Condui	t 🔒		
1.005 74.071 0.350 211.6 0.120 0.00 0.0 0.600 o 450 Pipe/Conduit 1.006 47.333 0.200 236.7 0.101 0.00 0.0 0.600 o 450 Pipe/Conduit 1.007 1.434 0.050 28.7 0.000 0.00 0.0 0.600 o 450 Pipe/Conduit 2.000 14.990 0.230 65.2 0.011 4.00 0.0 0.600 o 225 Pipe/Conduit 2.001 17.058 0.170 100.3 0.035 0.00 0.0 0.600 o 225 Pipe/Conduit <b>Network Results Table</b> <b>PN Rain T.C. US/IL E I.Area E Base Foul Add Flow Vel Cap Flow (mm/hr) (mins) (m) (ha) Flow (1/s) (1/s) (1/s) (m/s) (1/s) (1/s) 1.000 65.29 4.16 52.800 0.195 0.0 0.0 3.4 2.86 113.9 37.9 1.001 65.12 4.19 51.500 0.195 0.0 0.0 3.4 2.58 102.6 37.9 1.002 64.73 4.27 51.310 0.215 0.0 0.0 3.4 2.58 102.6 37.9 1.003 64.12 4.39 50.505 0.465 0.0 0.0 8.1 3.45 243.6 88.8 1.004 61.80 4.87 46.100 0.481 0.0 0.0 8.1 <u>0.94 66.7* 88.8</u> 1.005 58.05 5.76 45.850 0.601 0.0 0.0 10.6 1.32 209.5 116.7 1.007 55.80 6.36 45.300 0.702 0.0 0.0 10.6 1.32 209.5 116.7 1.007 55.80 6.36 45.300 0.702 0.0 0.0 10.6 3.81 605.6 116.7 2.000 65.32 4.15 51.500 0.011 0.0 0.0 0.2 1.62 64.5 2.1 2.001 64.20 4.37 51.270 0.046 0.0 0.0 0.8 1.31 51.9 8.8 ©1982-2018 Innovyze</b>	1.004	27.483	0.100	274.8	0.016	0.00	0	0 0.60	)0 0	300	Pipe/	Condui	t 🔒		
1.006       47.333       0.200       236.7       0.101       0.00       0.0       0.600       o       450       Pipe/Conduit         1.007       1.434       0.050       28.7       0.000       0.00       0.0       0.600       o       450       Pipe/Conduit         2.000       14.990       0.230       65.2       0.011       4.00       0.0       0.600       o       225       Pipe/Conduit         2.001       17.058       0.170       100.3       0.035       0.00       0.0       0.600       o       225       Pipe/Conduit         Network Results Table         PN Rain T.C. US/IL E I.Area E Base Foul Add Flow Vel Cap Flow (1/s) (1/s) (1/s) (1/s) (1/s)         1.000       65.29       4.16       52.800       0.195       0.0       0.0       3.4       2.86       11.9       37.9         1.001       65.12       4.19       51.500       0.195       0.0       0.0       3.4       2.86       11.9       37.9         1.002       64.73       4.27       51.310       0.215       0.0       0.0       3.4       2.86       13.45       243.6       88.8         1.004       61.80       4.87       66.100 </td <td>1.005</td> <td>74.071</td> <td>0.350</td> <td>211.6</td> <td>5 0.120</td> <td>0.00</td> <td>0</td> <td>0 0.60</td> <td>)0 0</td> <td>450</td> <td>Pipe/</td> <td>Condui</td> <td>t 🦷</td> <td></td>	1.005	74.071	0.350	211.6	5 0.120	0.00	0	0 0.60	)0 0	450	Pipe/	Condui	t 🦷		
1.007 1.434 0.050 28.7 0.000 0.00 0.0 0.0 0.600 o 450 Pipe/Conduit 2.000 14.990 0.230 65.2 0.011 4.00 0.0 0.600 o 225 Pipe/Conduit 2.001 17.058 0.170 100.3 0.035 0.00 0.0 0.600 o 225 Pipe/Conduit Network Results Table PN Rain T.C. US/IL 2 I.Area 2 Base Foul Add Flow Vel Cap Flow (mm/hr) (mins) (m) (ha) Flow (1/s) (1/s) (1/s) (1/s) (1/s) 1.000 65.29 4.16 52.800 0.195 0.0 0.0 3.4 2.86 113.9 37.9 1.001 65.12 4.19 51.500 0.195 0.0 0.0 3.4 2.58 102.6 37.9 1.002 64.73 4.27 51.310 0.215 0.0 0.0 3.8 3.02 119.9 41.5 1.003 64.12 4.39 50.505 0.465 0.0 0.0 8.1 3.45 243.6 88.8 1.004 61.80 4.87 46.100 0.481 0.0 0.0 8.1 0.94 66.7« 88.8 1.005 58.05 5.76 45.850 0.601 0.0 0.0 10.6 1.32 209.5 116.7 1.007 55.80 6.36 45.500 0.702 0.0 0.0 10.6 1.32 209.5 116.7 1.007 55.80 6.36 45.300 0.702 0.0 0.0 0.2 1.62 64.5 2.1 2.000 65.32 4.15 51.500 0.011 0.0 0.0 0.2 1.62 64.5 2.1 2.001 64.20 4.37 51.270 0.046 0.0 0.0 0.8 1.31 51.9 8.8 E01982-2018 Innovyze	1.006	47.333	0.200	236.7	7 0.101	0.00	0	0 0.60	0 0	450	Pipe/	'Condui	t 🧴		
2.000 14.990 0.230 65.2 0.011 4.00 0.0 0.600 o 225 Pipe/Conduit 2.001 17.058 0.170 100.3 0.035 0.00 0.0 0.600 o 225 Pipe/Conduit Network Results Table PN Rain T.C. US/IL 2 I.Area 2 Base Foul Add Flow Vel Cap Flow (mm/hr) (mins) (m) (ha) Flow (1/s) (1/s) (1/s) (1/s) (1/s) (1/s) 1.000 65.29 4.16 52.800 0.195 0.0 0.0 3.4 2.86 113.9 37.9 1.001 65.12 4.19 51.500 0.195 0.0 0.0 3.4 2.58 102.6 37.9 1.002 64.73 4.27 51.310 0.215 0.0 0.0 3.8 3.02 119.9 41.5 1.003 64.12 4.39 50.505 0.465 0.0 0.0 8.1 3.45 243.6 88.8 1.004 61.80 4.87 46.100 0.481 0.0 0.0 8.1 0.94 66.7« 88.8 1.005 58.05 5.76 45.850 0.601 0.0 0.0 9.4 1.39 221.6 103.9 (1.007 55.80 6.36 45.300 0.702 0.0 0.0 10.6 1.32 209.5 116.7 1.007 55.80 6.36 45.300 0.702 0.0 0.0 10.6 3.81 605.6 116.7 2.000 65.32 4.15 51.500 0.011 0.0 0.0 0.2 1.62 64.5 2.1 2.001 64.20 4.37 51.270 0.046 0.0 0.0 0.8 1.31 51.9 8.8 (E1982-2018 Innovyze	1.007	1.434	0.050	28.7	7 0.000	0.00	0	0 0.60	00 0	450	Pipe/	'Condui	t ễ		
2.001 17.058 0.170 100.3 0.035 0.00 0.0 0.600 o 225 Pipe/Conduit Network Results Table PN Rain T.C. US/IL E I.Area E Base Foul Add Flow Vel Cap Flow (mm/hr) (mins) (m) (ha) Flow (1/s) (1/s) (1/s) (1/s) (1/s) (1/s) 1.000 65.29 4.16 52.800 0.195 0.0 0.0 3.4 2.86 113.9 37.9 1.001 65.12 4.19 51.500 0.195 0.0 0.0 3.4 2.58 102.6 37.9 1.002 64.73 4.27 51.310 0.215 0.0 0.0 3.8 3.02 119.9 41.5 1.003 64.12 4.39 50.505 0.465 0.0 0.0 8.1 3.45 243.6 88.8 1.004 61.80 4.87 46.100 0.481 0.0 0.0 8.1 [0.94 66.7« 88.8 1.005 58.05 5.76 45.850 0.601 0.0 0.0 10.6 1.32 209.5 116.7 1.007 55.80 6.36 45.500 0.702 0.0 0.0 10.6 1.32 209.5 116.7 1.007 55.80 6.36 45.300 0.702 0.0 0.0 10.6 3.81 605.6 116.7 2.000 65.32 4.15 51.500 0.011 0.0 0.0 0.2 1.62 64.5 2.1 2.001 64.20 4.37 51.270 0.046 0.0 0.0 0.8 1.31 51.9 8.8	2.000	14.990	0.230	65.2	2 0.011	4.00	0	0 0.60	)0 0	225	Pipe/	Condui	t 🤒		
Network Results Table           FN         Rain (mm/hr)         T.C. (mins)         US/IL (n)         E I.Area (ha)         E Base Flow (1/s)         Foul (1/s)         Add Flow (1/s)         Vel (1/s)         Cap (1/s)         Flow (1/s)           1.000         65.29         4.16         52.800         0.195         0.0         0.0         3.4         2.86         113.9         37.9           1.001         65.12         4.19         51.500         0.195         0.0         0.0         3.4         2.86         113.9         37.9           1.002         64.73         4.27         51.310         0.215         0.0         0.0         3.8         3.02         119.9         41.5           1.003         64.12         4.39         50.505         0.465         0.0         0.0         8.1         3.45         243.6         88.8           1.004         61.80         4.87         46.100         0.481         0.0         0.0         8.1         0.94         66.7< <td>88.8           1.005         58.05         5.76         45.850         0.601         0.0         0.0         1.39         221.6         103.9           1.006         55.82         6.36         45.300</td> <td>2.001</td> <td>17.058</td> <td>0.170</td> <td>100.3</td> <td>3 0.035</td> <td>0.00</td> <td>0</td> <td>0 0.60</td> <td>0 0</td> <td>225</td> <td>Pipe/</td> <td>Condui</td> <td>t 🦰</td> <td></td>	88.8           1.005         58.05         5.76         45.850         0.601         0.0         0.0         1.39         221.6         103.9           1.006         55.82         6.36         45.300	2.001	17.058	0.170	100.3	3 0.035	0.00	0	0 0.60	0 0	225	Pipe/	Condui	t 🦰	
PN         Rain (mm/hr)         T.C. (mins)         US/IL (m)         Σ I.Area (ha)         Σ Base Flow (1/s)         Foul (1/s)         Add Flow (1/s)         Vel (m/s)         Cap (1/s)         Flow (1/s)           1.000         65.29         4.16         52.800         0.195         0.0         0.0         3.4         2.86         113.9         37.9           1.001         65.12         4.19         51.500         0.195         0.0         0.0         3.4         2.86         113.9         37.9           1.002         64.73         4.27         51.310         0.215         0.0         0.0         3.8         3.02         119.9         41.5           1.003         64.12         4.39         50.505         0.465         0.0         0.0         8.1         3.45         243.6         88.8           1.004         61.80         4.87         46.100         0.481         0.0         0.0         8.1         0.94         66.7< <tt>88.8           1.005         58.05         5.76         45.850         0.601         0.0         0.0         10.6         1.32         209.5         116.7           1.007         55.80         6.36         45.300         0.702         0.</tt>		Network Results Table													
(mm/hr)       (mins)       (m)       (ha)       Flow       (l/s)       (l/s)       (m/s)       (l/s)       (l/s)         1.000       65.29       4.16       52.800       0.195       0.0       0.0       3.4       2.86       113.9       37.9         1.001       65.12       4.19       51.500       0.195       0.0       0.0       3.4       2.86       113.9       37.9         1.002       64.73       4.27       51.310       0.215       0.0       0.0       3.8       3.02       119.9       41.5         1.003       64.12       4.39       50.505       0.465       0.0       0.0       8.1       3.45       243.6       88.8         1.004       61.80       4.87       46.100       0.481       0.0       0.0       8.1       0.94       66.7%       88.8         1.005       58.05       5.76       45.850       0.601       0.0       0.0       9.4       1.39       221.6       103.9       1         1.006       55.82       6.36       45.500       0.702       0.0       0.0       10.6       3.81       605.6       116.7         2.000       65.32       4.15       51.500		DN Pain TC US/II. 7 I Area 7 Base Foul Add Flow Vel Can Flow													
1.000       65.29       4.16       52.800       0.195       0.0       0.0       3.4       2.86       113.9       37.9         1.001       65.12       4.19       51.500       0.195       0.0       0.0       3.4       2.86       113.9       37.9         1.002       64.73       4.27       51.310       0.215       0.0       0.0       3.8       3.02       119.9       41.5         1.003       64.12       4.39       50.505       0.465       0.0       0.0       8.1       3.45       243.6       88.8         1.004       61.80       4.87       46.100       0.481       0.0       0.0       8.1       0.94       66.7       88.8         1.005       58.05       5.76       45.850       0.601       0.0       0.0       9.4       1.39       221.6       103.9       1         1.006       55.82       6.36       45.500       0.702       0.0       0.0       10.6       1.32       209.5       116.7         1.007       55.80       6.36       45.300       0.702       0.0       0.0       10.6       3.81       605.6       116.7         2.000       65.32       4.15	PN	Rai	n T	.c.	US/IL Σ	I.Area	Σ Base	Fou	ıl Add	Flow	Vel	Cap	Flow		
1.001       65.12       4.19       51.500       0.195       0.0       0.0       3.4       2.58       102.6       37.9         1.002       64.73       4.27       51.310       0.215       0.0       0.0       3.8       3.02       119.9       41.5         1.003       64.12       4.39       50.505       0.465       0.0       0.0       8.1       3.45       243.6       88.8         1.004       61.80       4.87       46.100       0.481       0.0       0.0       8.1       0.94       66.7       88.8         1.005       58.05       5.76       45.850       0.601       0.0       0.0       9.4       1.39       221.6       103.9       \text{A}         1.006       55.82       6.36       45.500       0.702       0.0       0.0       10.6       1.32       209.5       116.7         1.007       55.80       6.36       45.300       0.702       0.0       0.0       10.6       3.81       605.6       116.7         2.000       65.32       4.15       51.500       0.011       0.0       0.0       0.2       1.62       64.5       2.1         2.001       64.20       4.37	PN	Rai (mm/l	n T hr) (m	.C. ins)	US/IL Σ (m)	I.Area (ha)	Σ Base Flow (1/	Fou 3) (1/	ıl Add s) (l	Flow /s)	Vel (m/s)	Cap (1/s)	Flow (l/s)		
1.002       64.73       4.27       51.310       0.215       0.0       0.0       3.8       3.02       119.9       41.5         1.003       64.12       4.39       50.505       0.465       0.0       0.0       8.1       3.45       243.6       88.8         1.004       61.80       4.87       46.100       0.481       0.0       0.0       8.1       0.94       66.7       88.8         1.005       58.05       5.76       45.850       0.601       0.0       0.0       9.4       1.39       221.6       103.9       1006         1.006       55.82       6.36       45.500       0.702       0.0       0.0       10.6       1.32       209.5       116.7         1.007       55.80       6.36       45.300       0.702       0.0       0.0       10.6       3.81       605.6       116.7         2.000       65.32       4.15       51.500       0.011       0.0       0.0       0.8       1.31       51.9       8.8         .001       64.20       4.37       51.270       0.046       0.0       0.0       0.8       1.31       51.9       8.8	PN	<b>Rai</b> (mm/]	n T nr) (m .29	<b>.C.</b> <b>ins)</b> 4.16	US/IL Σ (m) 52.800	<b>I.Area</b> (ha) 0.195	Σ Base Flow (1/ 0	<b>Fou</b> <b>s) (1/</b> .0 0	<b>1 Add s) (1</b> .0	<b>Flow</b> /s) 3.4	<b>vel</b> (m/s) 2.86	<b>Cap</b> (1/s) 113.9	<b>Flow</b> (1/s) 37.9		
1.003       64.12       4.39       50.505       0.465       0.0       0.0       8.1       3.45       243.6       88.8         1.004       61.80       4.87       46.100       0.481       0.0       0.0       8.1       0.94       66.7       88.8         1.005       58.05       5.76       45.850       0.601       0.0       0.0       9.4       1.39       221.6       103.9       100.0         1.006       55.82       6.36       45.500       0.702       0.0       0.0       10.6       1.32       209.5       116.7         1.007       55.80       6.36       45.300       0.702       0.0       0.0       10.6       3.81       605.6       116.7         2.000       65.32       4.15       51.500       0.011       0.0       0.0       0.2       1.62       64.5       2.1         2.001       64.20       4.37       51.270       0.046       0.0       0.0       0.8       1.31       51.9       8.8	PN 1.00 1.00	<b>Rai</b> (mm/) 00 65 01 65	n T nr) (m .29 .12	<b>5.C.</b> <b>hins)</b> 4.16 4.19	US/IL Σ (m) 52.800 51.500	<b>I.Area</b> (ha) 0.195 0.195	Σ Base Flow (1/ 0 0	<b>Fou</b> <b>3) (1/</b> .0 0 .0 0	1 Add s) (1 .0 .0	Flow /s) 3.4 3.4	<b>vel</b> (m/s) 2.86 2.58	Cap (1/s) 113.9 102.6	<b>Flow</b> (1/s) 37.9 37.9		
1.004       61.80       4.87       46.100       0.481       0.0       0.0       8.1       0.94       66.7*       88.8         1.005       58.05       5.76       45.850       0.601       0.0       0.0       9.4       1.39       221.6       103.9       \vee         1.006       55.82       6.36       45.500       0.702       0.0       0.0       10.6       1.32       209.5       116.7         1.007       55.80       6.36       45.300       0.702       0.0       0.0       10.6       3.81       605.6       116.7         2.000       65.32       4.15       51.500       0.011       0.0       0.0       0.2       1.62       64.5       2.1         2.001       64.20       4.37       51.270       0.046       0.0       0.0       0.8       1.31       51.9       8.8	PN 1.00 1.00	<b>Rai</b> (mm/) 00 65 01 65 02 64	n T nr) (m .29 .12 .73	<b>4.16</b> <b>4.19</b> <b>4.27</b>	US/IL Σ (m) 52.800 51.500 51.310	<b>I.Area</b> (ha) 0.195 0.195 0.215	Σ Base Flow (1/ 0 0 0	<b>Fou</b> <b>5)</b> (1/ .0 0 .0 0 .0 0	<b>1 Add</b> <b>5) (1</b> .0 .0 .0	Flow /s) 3.4 3.4 3.8	<b>vel</b> (m/s) 2.86 2.58 3.02	Cap (1/s) 113.9 102.6 119.9	Flow (1/s) 37.9 37.9 41.5		
1.005       58.05       5.76       45.850       0.601       0.0       0.0       9.4       1.39       221.6       103.9       \begin{bmatrix}         1.006       55.82       6.36       45.500       0.702       0.0       0.0       10.6       1.32       209.5       116.7         1.007       55.80       6.36       45.300       0.702       0.0       0.0       10.6       3.81       605.6       116.7         2.000       65.32       4.15       51.500       0.011       0.0       0.0       0.2       1.62       64.5       2.1         2.001       64.20       4.37       51.270       0.046       0.0       0.0       0.8       1.31       51.9       8.8	PN 1.00 1.00 1.00	<b>Rai</b> (mm/J 00 65 01 65 02 64 03 64	n T nr) (m .29 .12 .73 .12	<b>4.16</b> 4.19 4.27 4.39	US/IL 2 (m) 52.800 51.500 51.310 50.505	<b>I.Area</b> (ha) 0.195 0.195 0.215 0.465	Σ Base Flow (1/ 0 0 0 0 0	Fou s) (1/ .0 0 .0 0 .0 0 .0 0	<b>al Add</b> s) (1 .0 .0 .0 .0	Flow /s) 3.4 3.4 3.8 8.1	vel (m/s) 2.86 2.58 3.02 3.45	Cap (1/s) 113.9 102.6 119.9 243.6	Flow (1/s) 37.9 37.9 41.5 88.8		
1.006       55.82       6.36       45.500       0.702       0.0       0.0       10.6       1.32       209.5       116.7         1.007       55.80       6.36       45.300       0.702       0.0       0.0       10.6       3.81       605.6       116.7         2.000       65.32       4.15       51.500       0.011       0.0       0.0       0.2       1.62       64.5       2.1         2.001       64.20       4.37       51.270       0.046       0.0       0.0       0.8       1.31       51.9       8.8	PN 1.00 1.00 1.00 1.00	<b>Rai</b> (mm/J 00 65 01 65 02 64 03 64 04 61	n T nr) (m .29 .12 .73 .12 .80	4.16 4.19 4.27 4.39 4.87	US/IL Σ (m) 52.800 51.500 51.310 50.505 46.100	<b>I.Area</b> (ha) 0.195 0.195 0.215 0.465 0.481	Σ Base Flow (1/ 0 0 0 0 0 0 0	Fou 5) (1/ .0 0 .0 0 .0 0 .0 0 .0 0	<b>al Add</b> <b>s) (1</b> .0 .0 .0 .0 .0	Flow /s) 3.4 3.4 3.8 8.1 8.1	<b>vel</b> (m/s) 2.86 2.58 3.02 3.45 0.94	Cap (1/s) 113.9 102.6 119.9 243.6 66.7«	Flow (1/s) 37.9 37.9 41.5 88.8 88.8		
2.000       65.32       4.15       51.500       0.011       0.0       0.0       0.2       1.62       64.5       2.1         2.001       64.20       4.37       51.270       0.046       0.0       0.0       0.8       1.31       51.9       8.8	PN 1.00 1.00 1.00 1.00 1.00	Rai           (mm/l)           00         65           01         65           02         64           03         64           04         61           05         58	n T nr) (m .29 .12 .73 .12 .80 .05	4.16 4.19 4.27 4.39 4.87 5.76	US/IL Σ (m) 52.800 51.500 51.310 50.505 46.100 45.850	<b>I.Area</b> (ha) 0.195 0.215 0.215 0.465 0.481 0.601	Σ Base Flow (1/ 0 0 0 0 0 0 0 0 0	Fou 5) (1/ .0 0 .0 0 .0 0 .0 0 .0 0 .0 0	<b>al Add</b> <b>s) (1</b> .0 .0 .0 .0 .0 .0 .0	Flow /s) 3.4 3.4 3.8 8.1 8.1 9.4	vel (m/s) 2.86 2.58 3.02 3.45 0.94 1.39	Cap (1/s) 113.9 102.6 119.9 243.6 66.7« 221.6	<b>Flow</b> (1/s) 37.9 41.5 88.8 88.8		
2.000       65.32       4.15       51.500       0.011       0.0       0.0       0.2       1.62       64.5       2.1         2.001       64.20       4.37       51.270       0.046       0.0       0.0       0.8       1.31       51.9       8.8         ©1982-2018 Innovyze	PN 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.0	Rai           (mm/)           00         65           01         65           02         64           03         64           04         61           05         58           06         55           07         55	n T nr) (m .29 .12 .73 .12 .80 .05 .82 .80	4.16 4.19 4.27 4.39 4.87 5.76 6.36 6.36	US/IL Σ (m) 52.800 51.500 51.310 50.505 46.100 45.850 45.500	<b>I.Area</b> (ha) 0.195 0.215 0.465 0.481 0.601 0.702 0.702	Σ Base Flow (1/ 0 0 0 0 0 0 0 0 0 0	Fou a) (1/ b) (0 0 c) 0 0	<b>al Add</b> <b>s) (1</b> .0 .0 .0 .0 .0 .0 .0 .0 .0 .0	Flow /s) 3.4 3.4 3.8 8.1 8.1 9.4 10.6 10.6	<pre>vel (m/s) 2.86 2.58 3.02 3.45 0.94 1.39 1.32 3.81</pre>	Cap (1/s) 113.9 102.6 119.9 243.6 66.7« 221.6 209.5 605.6	Flow (1/s) 37.9 41.5 88.8 88.8 103.9 116.7 116.7		
2.001 64.20 4.37 51.270 0.046 0.0 0.0 0.8 1.31 51.9 8.8 ©1982-2018 Innovyze	PN 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00	Rai           (mm/l           00         65           01         65           02         64           03         64           04         61           05         58           06         55           07         55	n T nr) (m .29 .12 .73 .12 .80 .05 .82 .80	4.16 4.19 4.27 4.39 4.87 5.76 6.36 6.36	US/IL Σ (m) 52.800 51.500 51.310 50.505 46.100 45.850 45.500 45.300	<b>I.Area</b> (ha) 0.195 0.215 0.465 0.481 0.601 0.702 0.702	Σ Base Flow (1/ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	For .0 0 .0 0 .0 0 .0 0 .0 0 .0 0 .0 0 .0 0 .0 0	Add           s)         (1           .0         .0           .0         .0           .0         .0           .0         .0           .0         .0           .0         .0           .0         .0           .0         .0           .0         .0           .0         .0           .0         .0	Flow /s) 3.4 3.4 3.8 8.1 9.4 10.6 10.6	Vel (m/s) 2.86 2.58 3.02 3.45 0.94 1.39 1.32 3.81	Cap (1/s) 113.9 102.6 119.9 243.6 66.7« 221.6 209.5 605.6	Flow (1/s) 37.9 41.5 88.8 88.8 103.9 116.7 116.7		
©1982-2018 Innovyze	PN 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.0	Rai (mm/l 00 65 01 65 02 64 03 64 04 61 05 58 06 55 07 55 00 65	n T hr) (m .29 .12 .73 .12 .80 .05 .82 .80 .32	<b>2.C.</b> <b>ins)</b> 4.16 4.19 4.27 4.39 4.87 5.76 6.36 6.36 6.36 4.15	US/IL Σ (m) 52.800 51.500 51.310 50.505 46.100 45.850 45.500 45.300 51.500	<b>I.Area</b> (ha) 0.195 0.215 0.465 0.481 0.601 0.702 0.702 0.011	Σ Base Flow (1/ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	For 5) (1/ .0 0 .0 0 .0 0 .0 0 .0 0 .0 0 .0 0 .0	I         Add           s)         (1           .0         .0           .0         .0           .0         .0           .0         .0           .0         .0           .0         .0           .0         .0           .0         .0           .0         .0           .0         .0           .0         .0	Flow /s) 3.4 3.4 3.8 8.1 9.4 10.6 10.6 0.2	Vel (m/s) 2.86 2.58 3.02 3.45 0.94 1.39 1.32 3.81 1.62	Cap (1/s) 113.9 102.6 119.9 243.6 66.7« 221.6 209.5 605.6 64.5	Flow (1/s) 37.9 41.5 88.8 88.8 103.9 116.7 116.7 2.1		
	PN 1.00 1.00 1.00 1.00 1.00 1.00 1.00 2.00 2	Rai           (mm/l)           00         65           01         65           02         64           03         64           04         61           05         58           06         55           07         55           00         65           01         64	n T hr) (m .29 .12 .73 .12 .80 .05 .82 .80 .82 .80	<b>2.C.</b> <b>(ins)</b> <b>4.16</b> <b>4.19</b> <b>4.27</b> <b>4.39</b> <b>4.87</b> <b>5.76</b> <b>6.36</b> <b>6.36</b> <b>6.36</b> <b>4.15</b> <b>4.37</b>	US/IL Σ (m) 52.800 51.500 51.310 50.505 46.100 45.850 45.500 45.300 51.500 51.270	<b>I.Area</b> (ha) 0.195 0.215 0.465 0.481 0.601 0.702 0.702 0.011 0.046	Σ Base Flow (1/ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fou 3) (1/ .0 0 .0 0	<b>al Add</b> <b>s) (1</b> .0 .0 .0 .0 .0 .0 .0 .0 .0 .0	Flow /s) 3.4 3.4 3.8 8.1 9.4 10.6 10.6 0.2 0.8	<pre>vel (m/s) 2.86 2.58 3.02 3.45 0.94 1.39 1.32 3.81 1.62 1.31</pre>	Cap (1/s) 113.9 102.6 119.9 243.6 66.7« 221.6 209.5 605.6 605.6 64.5 51.9	Flow (1/s) 37.9 41.5 88.8 88.8 103.9 116.7 116.7 2.1 8.8		

Section of network containing attenuation tank. Capacity not representative of attenuation tank.

DBFL Consulting Engineers	Page 2
Ormond House 5 Year 30 Minute Event	
Upper Ormond Quay	
Dublin 7	Micro
Date 30/10/2019 14:56 Designed by Byrnese	Drainage
File NETWORK 29102019.MDX Checked by	Didiridge
Innovyze Network 2018.1	
Network Design Table for SW_1	
DN Longth Fall Clong TArga T.F. Page & UVD DTA Cogtic	
(m) (m) (1:X) (ha) (mins) Flow (1/s) (mm) SECT (mm)	Design
	_
2.002 51.867 0.725 71.5 0.124 0.00 0.0 0.600 0 300 Pipe/(	Conduit 🔒
2.003 19.921 0.980 20.3 0.021 0.00 0.0 0.000 0 500 Pipe/0	
3.000 22.856 0.700 32.7 0.012 4.00 0.0 0.600 o 225 Pipe/0	Conduit 🧂
4.000 21.155 0.300 70.5 0.013 4.00 0.0 0.600 o 225 Pipe/0	Conduit 🍵
2.004 25.546 0.280 91.2 0.028 0.00 0.0 0.600 o 375 Pipe/0	Conduit
5.000 16.586 0.225 73.7 0.013 4.00 0.0 0.600 o 225 Pipe/0	Conduit
2.005 47.281 1.385 34.1 0.226 0.00 0.0 0.600 o 450 Pipe/0	Conduit 🔒
2.006 4.782 0.200 23.9 0.016 0.00 0.0 0.600 o 450 Pipe/0	Conduit 🧕
2.007 39.490 0.050 789.8 0.000 0.00 0.0 0.600 o 450 Pipe/0	Conduit 🥚
6.000 14.267 0.175 81.5 0.025 4.00 0.0 0.600 o 225 Pipe/	Conduit 🦀
6.001 25.123 0.610 41.2 0.021 0.00 0.0 0.600 o 225 Pipe/0	Conduit
7.000 14.233 0.175 81.3 0.035 4.00 0.0 0.600 o 225 Pipe/0	Conduit 🍦
	Jamdu i t
6.003 2.745 0.068 40.4 0.004 0.00 0.0 0.600 0 225 Pipe/C	Conduit 🔒
Network Results Table	
PN Rain T.C. US/IL $\Sigma$ I.Area $\Sigma$ Base Foul Add Flow Vel	Cap Flow
(mm/hr) (mins) (m) (ha) Flow (l/s) (l/s) (l/s) (m/s)	(1/s) $(1/s)$
2.002 61.96 4.84 51.025 0.170 0.0 0.0 2.9 1.86	131.6 31.4
2.003         61.53         4.93         50.300         0.191         0.0         0.0         3.2         3.50	247.6 35.0
3.000 65.26 4.17 50.700 0.012 0.0 0.0 0.2 2.30	91.4 2.3
4.000 64.94 4.23 49.690 0.013 0.0 0.0 0.2 1.56	62.0 2.5
2.004 60.53 5.16 49.240 0.244 0.0 0.0 4.0 1.90	209.6 44.0
5.000 65.17 4.18 49.335 0.013 0.0 0.0 0.2 1.52	60.6 2.5

			©1982-2018 T	nnow	70					
6.003	63.74	4.46 45.468	0.135	0.0	0.0	2.3	2.07	82.1	25.6	
6.002	63.85	4.44 47.255	0.131	0.0	0.0	2.3	2.94	116.9	24.9	
7.000	65.27	4.16 47.430	0.035	0.0	0.0	0.6	1.45	57.7	6.8	
						2.70			2.0	
6.001	64.21	4.37 47.865	0.046	0.0	0.0	0.8	2.04	81.3	8.8	
6.000	65.27	4.16 48.040	0.025	0.0	0.0	0.4	1.45	57.6	4.9	
2.007	55.75	0.52 45.500	0.499	0.0	0.0	0.0	0.72	113.0	00.1	
2 007	55 95	6 32 45 300	0 499	0 0	0 0	8 0	0 72	113 8	88 4	
2.006	59.49	5.40 45.500	0.499	0.0	0.0	8.0	4.17	663.4	88.4	
2.005	59.57	5.38 48.885	0.483	0.0	0.0	7.8	3.49	554.9	85.7	
5.000	65.17	4.18 49.335	0.013	0.0	0.0	0.2	1.52	60.6	2.5	
2.004	60.53	5.16 49.240	0.244	0.0	0.0	4.0	1.90	209.6	44.0	
	2.004 5.000 2.005 2.006 2.007 6.000 6.001 7.000 6.002 6.003	2.004       60.53         5.000       65.17         2.005       59.57         2.006       59.49         2.007       55.95         6.000       65.27         6.001       64.21         7.000       65.27         6.002       63.85         6.003       63.74	2.004       60.53       5.16       49.240         5.000       65.17       4.18       49.335         2.005       59.57       5.38       48.885         2.006       59.49       5.40       45.500         2.007       55.95       6.32       45.300         6.000       65.27       4.16       48.040         6.001       64.21       4.37       47.865         7.000       65.27       4.16       47.430         6.002       63.85       4.44       47.255         6.003       63.74       4.46       45.468	2.004 $60.53$ $5.16$ $49.240$ $0.244$ $5.000$ $65.17$ $4.18$ $49.335$ $0.013$ $2.005$ $59.57$ $5.38$ $48.885$ $0.483$ $2.006$ $59.49$ $5.40$ $45.500$ $0.499$ $2.007$ $55.95$ $6.32$ $45.300$ $0.499$ $6.000$ $65.27$ $4.16$ $48.040$ $0.025$ $6.001$ $64.21$ $4.37$ $47.865$ $0.046$ $7.000$ $65.27$ $4.16$ $47.430$ $0.035$ $6.002$ $63.85$ $4.44$ $47.255$ $0.131$ $6.003$ $63.74$ $4.46$ $45.468$ $0.135$	2.004 $60.53$ $5.16$ $49.240$ $0.244$ $0.0$ $5.000$ $65.17$ $4.18$ $49.335$ $0.013$ $0.0$ $2.005$ $59.57$ $5.38$ $48.885$ $0.483$ $0.0$ $2.006$ $59.49$ $5.40$ $45.500$ $0.499$ $0.0$ $2.007$ $55.95$ $6.32$ $45.300$ $0.499$ $0.0$ $6.000$ $65.27$ $4.16$ $48.040$ $0.025$ $0.0$ $6.001$ $64.21$ $4.37$ $47.865$ $0.046$ $0.0$ $7.000$ $65.27$ $4.16$ $47.430$ $0.035$ $0.0$ $6.002$ $63.85$ $4.44$ $47.255$ $0.131$ $0.0$ $6.003$ $63.74$ $4.46$ $45.468$ $0.135$ $0.0$	2.004 $60.53$ $5.16$ $49.240$ $0.244$ $0.0$ $0.0$ $5.000$ $65.17$ $4.18$ $49.335$ $0.013$ $0.0$ $0.0$ $2.005$ $59.57$ $5.38$ $48.885$ $0.483$ $0.0$ $0.0$ $2.006$ $59.49$ $5.40$ $45.500$ $0.499$ $0.0$ $0.0$ $2.007$ $55.95$ $6.32$ $45.300$ $0.499$ $0.0$ $0.0$ $6.000$ $65.27$ $4.16$ $48.040$ $0.025$ $0.0$ $0.0$ $6.001$ $64.21$ $4.37$ $47.865$ $0.046$ $0.0$ $0.0$ $7.000$ $65.27$ $4.16$ $47.430$ $0.035$ $0.0$ $0.0$ $6.002$ $63.85$ $4.44$ $47.255$ $0.131$ $0.0$ $0.0$ $6.003$ $63.74$ $4.46$ $45.468$ $0.135$ $0.0$ $0.0$	2.004 $60.53$ $5.16$ $49.240$ $0.244$ $0.0$ $0.0$ $4.0$ $5.000$ $65.17$ $4.18$ $49.335$ $0.013$ $0.0$ $0.0$ $0.2$ $2.005$ $59.57$ $5.38$ $48.885$ $0.483$ $0.0$ $0.0$ $7.8$ $2.006$ $59.49$ $5.40$ $45.500$ $0.499$ $0.0$ $0.0$ $8.0$ $2.007$ $55.95$ $6.32$ $45.300$ $0.499$ $0.0$ $0.0$ $8.0$ $6.000$ $65.27$ $4.16$ $48.040$ $0.025$ $0.0$ $0.0$ $0.4$ $6.001$ $64.21$ $4.37$ $47.865$ $0.046$ $0.0$ $0.0$ $0.8$ $7.000$ $65.27$ $4.16$ $47.430$ $0.035$ $0.0$ $0.0$ $0.6$ $6.002$ $63.85$ $4.44$ $47.255$ $0.131$ $0.0$ $0.0$ $2.3$ $6.003$ $63.74$ $4.46$ $45.468$ $0.135$ $0.0$ $0.0$ $2.3$	2.004 $60.53$ $5.16$ $49.240$ $0.244$ $0.0$ $0.0$ $4.0$ $1.90$ $5.000$ $65.17$ $4.18$ $49.335$ $0.013$ $0.0$ $0.0$ $0.2$ $1.52$ $2.005$ $59.57$ $5.38$ $48.885$ $0.483$ $0.0$ $0.0$ $7.8$ $3.49$ $2.006$ $59.49$ $5.40$ $45.500$ $0.499$ $0.0$ $0.0$ $8.0$ $4.17$ $2.007$ $55.95$ $6.32$ $45.300$ $0.499$ $0.0$ $0.0$ $8.0$ $4.17$ $2.007$ $55.95$ $6.32$ $45.300$ $0.499$ $0.0$ $0.0$ $8.0$ $0.72$ $6.000$ $65.27$ $4.16$ $48.040$ $0.025$ $0.0$ $0.0$ $0.4$ $1.45$ $6.001$ $64.21$ $4.37$ $47.865$ $0.046$ $0.0$ $0.0$ $0.8$ $2.04$ $7.000$ $65.27$ $4.16$ $47.430$ $0.035$ $0.0$ $0.0$ $0.6$ $1.45$ $6.002$ $63.85$ $4.44$ $47.255$ $0.131$ $0.0$ $0.0$ $2.3$ $2.94$ $6.003$ $63.74$ $4.46$ $45.468$ $0.135$ $0.0$ $0.0$ $2.3$ $2.07$	2.004 $60.53$ $5.16$ $49.240$ $0.244$ $0.0$ $0.0$ $4.0$ $1.90$ $209.6$ $5.000$ $65.17$ $4.18$ $49.335$ $0.013$ $0.0$ $0.0$ $0.2$ $1.52$ $60.6$ $2.005$ $59.57$ $5.38$ $48.885$ $0.483$ $0.0$ $0.0$ $7.8$ $3.49$ $554.9$ $2.006$ $59.49$ $5.40$ $45.500$ $0.499$ $0.0$ $0.0$ $8.0$ $4.17$ $663.4$ $2.007$ $55.95$ $6.32$ $45.300$ $0.499$ $0.0$ $0.0$ $8.0$ $4.17$ $663.4$ $2.007$ $55.95$ $6.32$ $45.300$ $0.499$ $0.0$ $0.0$ $8.0$ $0.72$ $113.8$ $6.000$ $65.27$ $4.16$ $48.040$ $0.025$ $0.0$ $0.0$ $0.4$ $1.45$ $57.6$ $6.001$ $64.21$ $4.37$ $47.865$ $0.046$ $0.0$ $0.0$ $0.8$ $2.04$ $81.3$ $7.000$ $65.27$ $4.16$ $47.430$ $0.035$ $0.0$ $0.0$ $0.6$ $1.45$ $57.7$ $6.002$ $63.85$ $4.44$ $47.255$ $0.131$ $0.0$ $0.0$ $2.3$ $2.94$ $116.9$ $6.003$ $63.74$ $4.46$ $45.468$ $0.135$ $0.0$ $0.0$ $2.3$ $2.07$ $82.1$	2.004 $60.53$ $5.16$ $49.240$ $0.244$ $0.0$ $0.0$ $4.0$ $1.90$ $209.6$ $44.0$ $5.000$ $65.17$ $4.18$ $49.335$ $0.013$ $0.0$ $0.0$ $0.2$ $1.52$ $60.6$ $2.5$ $2.005$ $59.57$ $5.38$ $48.885$ $0.483$ $0.0$ $0.0$ $7.8$ $3.49$ $554.9$ $85.7$ $2.006$ $59.49$ $5.40$ $45.500$ $0.499$ $0.0$ $0.0$ $8.0$ $4.17$ $663.4$ $88.4$ $2.007$ $55.95$ $6.32$ $45.300$ $0.499$ $0.0$ $0.0$ $8.0$ $0.72$ $113.8$ $88.4$ $6.000$ $65.27$ $4.16$ $48.040$ $0.025$ $0.0$ $0.0$ $0.4$ $1.45$ $57.6$ $4.9$ $6.001$ $64.21$ $4.37$ $47.865$ $0.046$ $0.0$ $0.0$ $0.8$ $2.04$ $81.3$ $8.8$ $7.000$ $65.27$ $4.16$ $47.430$ $0.035$ $0.0$ $0.0$ $0.6$ $1.45$ $57.7$ $6.8$ $6.002$ $63.85$ $4.44$ $47.255$ $0.131$ $0.0$ $0.0$ $2.3$ $2.04$ $81.1$ $24.9$ $6.003$ $63.74$ $4.46$ $45.468$ $0.135$ $0.0$ $0.0$ $2.3$ $2.07$ $82.1$ $25.6$

Grmond House       S Year 30 Minute Event         Upper Ormond Quay       Dublin 7         Date 30/10/2019 14:56       Designed by Eyrnese         File NETWORK 29102019.MDX       Design Table for SW_1         Network 2018.1         Network 2018.1         PN Length Fall Slope I.Area T.E. Base k HYD DIA Section Type Auto (m) (m) (1:X) (ha) (mins) Flow (1/s) (m) SECT (mm) Design 2.008 8.381 0.150 55.9 0.000 0.00 0.00 0.0 0.000 o 225 Pipe/Conduit         1.008 15.070 0.060 251.2 0.000 0.00       0.0 0.00 0.00 0.225 Pipe/Conduit         1.009 25.604 0.170 150.6 0.000 0.00       0.0 0.00 0.0255 Pipe/Conduit         Metwork Results Table         FN Rain T.C. US/IL E 1.Area E Base Foul Add Flow Vel Cap Flow (mm/hr) (mins) (m) (ha) Flow (1/s) (1/s) (1/s) (m/s) (1/s) (1/	DBFL Consulting E	ngineers		Page 3
Upper Ormond Quay Dublin 7 Date 30/10/2019 14:56 File NETWORK 29102019.MDX Innovyze Network Design Table for SW_1 PN Length Fall Slope I.Area T.E. Base k HYD DIA Section Type Auto (m) (m) (1:X) (ha) (mins) Flow (1/s) (mm) SECT (mm) 2.008 8.381 0.150 55.9 0.000 0.00 0.0 0.0 0.600 o 300 Pipe/Conduit 1.008 15.070 0.060 251.2 0.000 0.00 0.0 0.0 0.600 o 225 Pipe/Conduit 1.009 25.604 0.170 150.6 0.000 0.00 0.0 0.0 0.600 o 225 Pipe/Conduit Network Results Table PN Rain T.C. US/IL 2 I.Area 2 Base Foul Add Flow Vel Cap Flow (mm/hr) (mins) (m) (ha) Flow (1/s) (1/s) (m/s) (1/s) (1/s) 2.008 55.72 6.39 45.400 0.634 0.0 0.0 1.009 53.35 7.09 45.190 1.336 0.0 0.0 NOT REPRESENTATIVE OF FLOWS DOWN STREAM OF HYDROBRAKE.	Ormond House	5	Year 30 Minute Event	
Dublin 7       Designed by Byrnese       Dicional         Date 30/10/2019 14:56       Designed by Byrnese       Dicional         File NETWORK 29102019.MDX       Checked by       Dicional         Innovyze         Network 2018.1         Network 2018.1         PN Length Fall Slope I.Area T.E. Base k HTD DIA Section Type Auto (m) (m) (1:X) (ha) (mins) Flow (1/s) (mm) SECT (mm) Design         2.008 8.381 0.150 55.9 0.000 0.00 0.0 0.0 0.600 o 300 Pipe/Conduit         1.008 15.070 0.060 251.2 0.000 0.00 0.0 0.0 0.600 o 225 Pipe/Conduit         Network Results Table         PN Rain T.C. US/IL 2 I.Area 2 Base Foul Add Flow Vel Cap Flow (mm/hr) (mins) (m) (ha) Flow (1/s) (1/s) (1/s) (m/s) (1/s) (1/s) (1/s)         2.008 55.72 6.39 45.400 0.634 0.0 0.0         9.6 2.11 149.0 105.2         1.008 54.66 6.69 45.250 1.336 0.0 0.0         1.008 54.66 6.69 45.250 1.336 0.0 0.0         1.008 54.22.7 6         NCT REPRESENTATIVE OF FLOWS DOWN         STREAM OF HYDROBRAKE.	Upper Ormond Quay			
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File NETWORK 29102019.MDX       Checked by         Innovyze       Network 2018.1         Network 2018.1         Network Design Table for SW_1         FN Length Fall Slope I.Area T.E. Base k HYD DIA Section Type Auto (m) (m) (1:X) (ha) (mins) Flow (1/s) (mm) SECT (mm) Design 2.008 8.381 0.150 55.9 0.000 0.00 0.00 0.0 0.600 o 300 Pipe/Conduit         1.008 15.070 0.060 251.2 0.000 0.00 0.00 0.00 0.00 0.225 Pipe/Conduit       Image: Colspan="2">Operation of the section Type Auton Design         Network Results 7 able         FN Rain T.C. US/IL E I.Area E Base Foul Add Flow Vel Cap Flow (mm/hr) (mins) (m) (ha) Flow (1/s) (1/s) (1/s) (m/s) (1/s) (1/s) (1/s)         2.008 55.72 6.39 45.400 0.634 0.0 0.0         9.6 2.11 149.0 105.2         1.008 54.66 6.69 45.250 1.336 0.0 0.0       19.8 0.82 32.6 € 217.6         1.009 53.35 7.09 45.190 1.336 0.0 0.0       19.8 1.06 42.3 × 217.6         NOT REPRESENTATIVE OF FLOWS DOWN STREAM OF HYDROBRAKE.	Date 30/10/2019 1	4:56 De	esigned by Byrnese	Drainage
Innovyze         Network 2018.1           Network 2018.1           Network Design Table for SW_1           PN Length Fall Slope I.Area T.E. Base k HYD DIA Section Type Auto (m) (m) (1:x) (ha) (mins) Flow (1/s) (mm) SECT (mm) Design           2.008 8.381 0.150 55.9 0.000 0.00 0.00 0.0 0.600 o 300 Pipe/Conduit           1.008 15.070 0.060 251.2 0.000 0.00 0.00 0.0 0.600 o 225 Pipe/Conduit           Network Results Table           PN Rain T.C. US/IL 2 I.Area 2 Base Foul Add Flow Vel Cap Flow (mm/hr) (mins) (m) (ha) Flow (1/s) (1/s) (1/s) (m/s) (1/s) (1/s)           2.008 55.72 6.39 45.400 0.634 0.0 0.0           9.6 2.11 149.0 105.2           1.008 54.66 6.69 45.250 1.336 0.0 0.0           1.008 54.66 6.69 45.250 1.336 0.0 0.0           1.008 54.66 6.69 45.250 1.336 0.0 0.0           1.88 0.82 32.6* 217.6           NOT REPRESENTATIVE OF FLOWS DOWN           STREAM OF HYDROBRAKE.	File NETWORK 2910	2019.MDX Cł	necked by	Brainiage.
Network Design Table for SW 1         PN       Length       Fall       Slope       I.Area       T.E.       Base       k       HTD       DIA       Section       Type       Auto Design         2.008       8.381       0.150       55.9       0.000       0.00       0.00       0.600       0       300       Pipe/Conduit       Image: Conduit       Image: Condui	Innovyze	Ne	etwork 2018.1	
FN       Length       Fall       Slope       I.Area       T.E.       Base       k       HYD       DIA       Section       Type       Auto         2.008       8.381       0.150       55.9       0.000       0.00       0.0       0.600       o       300       Pipe/Conduit       Image: conduct the second seco		Network Des	ign Table for SW_1	
2.008 8.381 0.150 55.9 0.000 0.00 0.00 0.0 0.600 o 300 Pipe/Conduit 1.008 15.070 0.060 251.2 0.000 0.00 0.00 0.0 0.600 o 225 Pipe/Conduit 1.009 25.604 0.170 150.6 0.000 0.00 0.00 0.0 0.600 o 225 Pipe/Conduit Network Results Table FN Rain T.C. US/IL Z I.Area Z Base Foul Add Flow Vel Cap Flow (mm/hr) (mins) (m) (ha) Flow (1/s) (1/s) (1/s) (m/s) (1/s) (1/s) 2.008 55.72 6.39 45.400 0.634 0.0 0.0 1.009 53.35 7.09 45.190 1.336 0.0 0.0 I9.8 0.82 32.6* 217.6 I9.8 1.06 42.3* 217.6 NOT REPRESENTATIVE OF FLOWS DOWN STREAM OF HYDROBRAKE.	PN Length Fall (m) (m)	Slope I.Area T.E. (1:X) (ha) (mins)	Base k HYD DIA Flow (l/s) (mm) SECT (mm)	Section Type Auto Design
1.008 15.070 0.060 251.2 0.000 0.00 0.00 0.0 0.00 0.00 0.225 Pipe/Conduit 1.009 25.604 0.170 150.6 0.000 0.00 0.00 0.00 0.00 0.225 Pipe/Conduit Network Results Table PN Rain T.C. US/IL E I.Area E Base Foul Add Flow Vel Cap Flow (mm/hr) (mins) (m) (ha) Flow (1/s) (1/s) (1/s) (1/s) (1/s) (1/s) (1/s) (1/s) 2.008 55.72 6.39 45.400 0.634 0.0 0.0 9.6 2.11 149.0 105.2 1.008 54.66 6.69 45.250 1.336 0.0 0.0 19.8 0.82 32.6« 217.6 1.009 53.35 7.09 45.190 1.336 0.0 0.0 19.8 1.06 42.3« 217.6 NOT REPRESENTATIVE OF FLOWS DOWN STREAM OF HYDROBRAKE.	2.008 8.381 0.150	55.9 0.000 0.00	0.0 0.600 o 300	Pipe/Conduit 🍵
Network Results Table           FN         Rain         T.C.         US/IL         E I.Area         E Base         Foul Add Flow         Vel         Cap         Flow           2.008         55.72         6.39         45.400         0.634         0.0         0.0         9.6         2.11         149.0         105.2           1.008         54.66         6.69         45.250         1.336         0.0         0.0         19.8         0.82         32.6<	1.008 15.070 0.060 1.009 25.604 0.170	251.20.0000.00150.60.0000.00	0.0 0.600 o 225 0.0 0.600 o 225	Pipe/Conduit 🔒 Pipe/Conduit 🍵
PN       Rain (mm/hr)       T.C. (mins)       US/IL (m)       E I.Area (ha)       E Base Foul Flow (1/s)       Foul (1/s)       Add Flow (1/s)       Vel (n/s)       Cap (1/s)       Flow (1/s)         2.008       55.72       6.39       45.400       0.634       0.0       0.0       9.6       2.11       149.0       105.2         1.008       54.66       6.69       45.250       1.336       0.0       0.0       19.8       0.82       32.6       217.6         1.009       53.35       7.09       45.190       1.336       0.0       0.0       19.8       1.06       42.3       217.6         NOT REPRESENTATIVE OF FLOWS DOWN STREAM OF HYDROBRAKE.		Network	Results Table	
2.008 55.72 6.39 45.400 0.634 0.0 0.0 1.008 54.66 6.69 45.250 1.336 0.0 0.0 1.009 53.35 7.09 45.190 1.336 0.0 0.0 NOT REPRESENTATIVE OF FLOWS DOWN STREAM OF HYDROBRAKE.	PN Rain 1 (mm/hr) (m	C.C. US/IL Σ I.Area hins) (m) (ha)	α Σ Base Foul Add Flow Flow (l/s) (l/s) (l/s)	Vel Cap Flow (m/s) (l/s) (l/s)
1.008 54.66 6.69 45.250 1.336 0.0 0.0 1.009 53.35 7.09 45.190 1.336 0.0 0.0 NOT REPRESENTATIVE OF FLOWS DOWN STREAM OF HYDROBRAKE.	2.008 55.72	6.39 <b>45.4</b> 00 0.634	e 0.0 0.0 9.6	2.11 149.0 105.2
NOT REPRESENTATIVE OF FLOWS DOWN STREAM OF HYDROBRAKE.	1.008 54.66 1.009 53.35	6.6945.2501.3367.0945.1901.336	5 0.0 0.0 19.8 5 0.0 0.0 19.8	0.82 32.6« 217.6 1.06 42.3« 217.6
		NOT REPRESE STREAM OF H	ENTATIVE OF FLOWS DOWN IYDROBRAKE.	

DBFL Consulting Engineers		Page 4
Ormond House	5 Year 30 Minute Event	
Upper Ormond Quay		
Dublin 7		Micro
Date 30/10/2019 14:56	Designed by Byrnese	Drainago
File NETWORK 29102019.MDX	Checked by	Drainage
Innovyze	Network 2018.1	

### Manhole Schedules for SW\_1

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)
S10	54.310	1.510	Open Manhole	1200	1.000	52.800	225				
S9	53.200	1.700	Open Manhole	1200	1.001	51.500	225	1.000	51.500	225	
S8	53.300	1.990	Open Manhole	1200	1.002	51.310	225	1.001	51.310	225	
S7	52.500	1.995	Open Manhole	1200	1.003	50.505	300	1.002	50.580	225	
S6	52.660	6.560	Open Manhole	1200	1.004	46.100	300	1.003	49.336	300	3236
S5	49.800	3.950	Open Manhole	1350	1.005	45.850	450	1.004	46.000	300	
S4	48.130	2.630	Open Manhole	1350	1.006	45.500	450	1.005	45.500	450	
S3	48.000	2.700	Open Manhole	1350	1.007	45.300	450	1.006	45.300	450	
S2-9	53.500	2.000	Open Manhole	1200	2.000	51.500	225				
S2-8	53.000	1.730	Open Manhole	1200	2.001	51.270	225	2.000	51.270	225	
S2-7	52.870	1.845	Open Manhole	1200	2.002	51.025	300	2.001	51.100	225	
S2-6	52.000	1.700	Open Manhole	1200	2.003	50.300	300	2.002	50.300	300	
S1-5-3	52.150	1.450	Open Manhole	1200	3.000	50.700	225				
S2-5-1	51.600	1.910	Open Manhole	1200	4.000	49.690	225				
S2-5	51.400	2.160	Open Manhole	1350	2.004	49.240	375	2.003	49.320	300	5
								3.000	50.000	225	610
								4.000	49.390	225	
S1-4-1	50.900	1.565	Open Manhole	1200	5.000	49.335	225				
S2-4	50.650	1.765	Open Manhole	1350	2.005	48.885	450	2.004	48.960	375	
								5.000	49.110	225	
S2-3	49.200	3.700	Open Manhole	1350	2.006	45.500	450	2.005	47.500	450	2000
S2-2	49.100	3.800	Open Manhole	1350	2.007	45.300	450	2.006	45.300	450	
S2-1-4	51.500	3.460	Open Manhole	1200	6.000	48.040	225				
S2-1-3	49.150	1.285	Open Manhole	1200	6.001	47.865	225	6.000	47.865	225	
S2-1-2-1	49.000	1.570	Open Manhole	1200	7.000	47.430	225				
S2-1-2	48.490	1.235	Open Manhole	1200	6.002	47.255	225	6.001	47.255	225	
								7.000	47.255	225	
S2-1-1	48.280	2.812	Open Manhole	1200	6.003	45.468	225	6.002	46.623	225	1155
S2-1	48.280	3.030	Open Manhole	1350	2.008	45.400	300	2.007	45.250	450	
								6.003	45.400	225	
s2	48.000	2.750	Open Manhole	1350	1.008	45.250	225	1.007	45.250	450	
								2.008	45.250	300	
s1	47.750	2.560	Open Manhole	1200	1.009	45.190	225	1.008	45.190	225	
	46.800	1.780	Open Manhole	0		OUTFALL		1.009	45.020	225	

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DBFL Consul	ting	Engir	neers							Page 5	
Ormond Hous	e			5	5 Year 30	Minute E	vent				
Upper Ormon	d Qua	У									
Dublin 7										Micco	1
Date 30/10/	2019	14:56	5	1	Designe	d by By	rnese	2		MILIU	
Eilo NETWOR	v 201	02010	, MDX		Chockod	by	1100			Uraina	90
FILE NEIWOR	K Z91	UZUIS	9.MDA								J .
Innovyze				1	Network	2018.1					
			PI	PELINE	SCHEDU	LES for	SW_1	<u>-</u>			
				Ups	tream M	lannole					
DN	Hyd	Diam	мц	C Level	T Level	D Denth		мц	ми ртам	т.*W	
- FN	Sect	(mm)	Name	(m)	т.пелет (m)	(m)	Conn	ection	(mm	)	
	2000	(1111)	manie	()	()	(11)	00111		(	,	
1.000	0	225	S10	54.310	52.800	1.285	Open	Manhole		1200	
1.001	0	225	S9	53.200	51.500	1.475	Open	Manhole		1200	
1.002	0	225	S8	53.300	51.310	1.765	Open	Manhole		1200	
1.003	0	300	S7	52.500	50.505	1.695	Open	Manhole		1200	
1.004	0	300	S6	52.660	46.100	6.260	Open	Manhole		1200	
1.005	0	450	S5	49.800	45.850	3.500	Open	Manhole		1350	
1.006	0	450	S4	48.130	45.500	2.180	Open	Manhole		1350	
1.007	0	450	S3	48.000	45.300	2.250	Open	Manhole		1350	
2 000		225	a2 0		E1 E00	1 775	0.000.000	Newbele		1200	
2.000	0	225	52-9	53.500	51.500 E1 270	1 505	Open	Manhole		1200	
2.001	0	225	52-0	53.000	51.270	1 505	Open	Manhole		1200	
2.002	0	200	52-1 C2 6	52.070	51.025	1 400	Open	Manhole		1200	
2.003	0	300	52-0	52.000	50.500	1.400	open	Mailliote		1200	
3.000	0	225	S1-5-3	52.150	50.700	1.225	Open	Manhole		1200	
							-				
4.000	0	225	S2-5-1	51.600	49.690	1.685	Open	Manhole		1200	
2.004	0	375	S2-5	51.400	49.240	1.785	Open	Manhole		1350	
5 000	0	225	c1_1_1	50 900	10 225	1 240	Opon	Manholo		1200	
5.000	0	225	DI I I	50.500	47.555	1.340	open	Maimore		1200	
				Down	stream	Manhole	2				
PN	Length		oe MH	C.Level	T.Level	D.Depth		мн	мн ртам		
	(m)	(1:)	() Name	(m)	(m)	(m)	Con	nection	(mn	() ()	
1.000	27.363	3 21.	.0 S9	53.200	51.500	1.475	Open	Manhole		1200	
1.001	4.921	L 25.	.9 S8	53.300	51.310	1.765	Open	Manhole		1200	
1.002	13.874	£ 19.	.0 S7	52.500	50.580	1.695	Open	Manhole		1200	
1.003	24.541	L 21.	.0 56	52.660	49.336	3.024	Open	Manhole		1200	
1.004	27.483	3 274.	.8 55	49.800	46.000	3.500	Open	Manhole		1350	
1.005	74.071	L 211.	.6 54	48.130	45.500	2.180	Open	Manhole		1350	
1.006	4/.333	3 236.	./ 53	48.000	45.300	2.250	Open	Mannole		1350	
1.007	1.434	± 28.	./ 52	48.000	45.250	2.300	open	Mannoie		1350	
2,000	14.990	) 65.	2 52-8	53.000	51,270	1.505	Open	Manhole		1200	
2.001	17.058	3 100	3 52-7	52.870	51,100	1.545	Open	Manhole		1200	
2.002	51.86	7 71.	5 S2-6	52.000	50.300	1.400	Open	Manhole		1200	
2.003	19.921	L 20.	.3 S2-5	51.400	49.320	1.780	Open	Manhole		1350	
			-								
3.000	22.856	5 32.	.7 S2-5	51.400	50.000	1.175	Open	Manhole		1350	
4.000	21.155	5 70.	.5 S2-5	51.400	49.390	1.785	Open	Manhole		1350	
0.001	05 54		0 00 -		10 000	1 01-	0	May 1977		1050	
2.004	25.546	o 91.	.2 S2-4	50.650	48.960	1.315	Open	Manhole		1350	
5.000	16.586	5 7.3	.7 S2-4	50.650	49.110	1.315	Open	Manhole		1350	
5.000			1		0	1.010					
				©1982	2-2018	Innovyze	е				

DBFL Consulting Engineers		Page 6
Ormond House	5 Year 30 Minute Event	
Upper Ormond Quay		
Dublin 7		Mirro
Date 30/10/2019 14:56	Designed by Byrnese	Dcainago
File NETWORK 29102019.MDX	Checked by	Diamage
Innovyze	Network 2018.1	

### PIPELINE SCHEDULES for SW\_1

### 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)
2.005	0	450	S2-4	50.650	48.885	1.315	Open Manhole	1350
2.006	0	450	S2-3	49.200	45.500	3.250	Open Manhole	1350
2.007	0	450	S2-2	49.100	45.300	3.350	Open Manhole	1350
6.000	0	225	S2-1-4	51.500	48.040	3.235	Open Manhole	1200
6.001	0	225	S2-1-3	49.150	47.865	1.060	Open Manhole	1200
7.000	0	225	S2-1-2-1	49.000	47.430	1.345	Open Manhole	1200
6.002	0	225	S2-1-2	48.490	47.255	1.010	Open Manhole	1200
6.003	0	225	S2-1-1	48.280	45.468	2.587	Open Manhole	1200
2.008	0	300	S2-1	48.280	45.400	2.580	Open Manhole	1350
			_					
1.008	0	225	S2	48.000	45.250	2.525	Open Manhole	1350
1.009	0	225	S1	47.750	45.190	2.335	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)
2.005	47.281	34.1	S2-3	49.200	47.500	1.250	Open Manhole	1350
2.006	4.782	23.9	S2-2	49.100	45.300	3.350	Open Manhole	1350
2.007	39.490	789.8	S2-1	48.280	45.250	2.580	Open Manhole	1350
6.000	14.267	81.5	S2-1-3	49.150	47.865	1.060	Open Manhole	1200
6.001	25.123	41.2	S2-1-2	48.490	47.255	1.010	Open Manhole	1200
7.000	14.233	81.3	S2-1-2	48.490	47.255	1.010	Open Manhole	1200
6.002	12.633	20.0	S2-1-1	48.280	46.623	1.432	Open Manhole	1200
6.003	2.745	40.4	S2-1	48.280	45.400	2.655	Open Manhole	1350
2.008	8.381	55.9	S2	48.000	45.250	2.450	Open Manhole	1350
1.008	15.070	251.2	S1	47.750	45.190	2.335	Open Manhole	1200
1.009	25.604	150.6		46.800	45.020	1.555	Open Manhole	0
		Fr	ee Flo	wing Ou	tfall I	Details	for SW_1	
	C	Dutfall	Outf	all C. I	evel I.	Level	Min D,L	w
	Pip	e Numb	er Na	me (1	m)	(m) I.	Level (mm) (	(mm)
							(m)	

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46.800 45.020 0.000 0 0

1.009

DBFL Consulting Engineers				Pa	ge 7
Ormond House	5 Year 30 Mi	inute Event			
Upper Ormond Quay					
Dublin 7				M	licro
Date 30/10/2019 14:56	Designed	by Byrnese			
File NETWORK 29102019.MDX	Checked b	У			anaye
Innovyze	Network 2	018.1			
Online	Controls	for SW_1			
Hadaa Dualas Outinum Marka		(DN: 1 00F	<b>TT</b> = 1		
Hydro-Brake® Optimum Manno	1e: S5, DS	5/PN: 1.005	, volu	me (m³):	/.5
Unit	Reference N	MD-SHE-0060-2	2000-160	0-2000	
Desig	n Head (m)			1.600	
Design	Flow (l/s)			2.0	
	Flush-Flo™		Calc	ulated	
۸	objective	Minimise ups	cream s	torage urface	
	Available		5	Yes	
Dia	meter (mm)			60	
Invert	Level (m)			46.000	
Minimum Outlet Pipe Dia	meter (mm)			75	
Suggested Manhole Dia	meter (mm)			1200	
Control Po	ints H	ead (m) Flow	(l/s)		
Design Point (Ca	alculated)	1.600	2.0		
I	Flush-Flo™	0.263	1.5		
	Kick-Flo®	0.536	1.2		
Mean Flow over H	lead Range	-	1.5		
The hydrological calculations have h	een based or	the Head/Di	echarge	relationsh	in for the
Hvdro-Brake® Optimum as specified.	Should anoth	er type of c	ontrol	device othe	r than a
Hydro-Brake Optimum® be utilised the	n these stor	age routing	calcula	tions will	be
invalidated					
Depth (m) Flow (1/s) Depth (m) Flow	v (1/g) Dent	h (m) Flow (	1/g)   De	nth (m) Flo	w (1/g)
		II (III) FIOW (	1/5/ 00		W (1/5)
0.100 1.3 1.200	1.8	3.000	2.7	7.000	4.0
0.200 1.5 1.400	1.9	3.500	2.9	7.500	4.1
	2.0	4.000	3.0	8.000	4.2
0.500 1.3 2.000	2.2	5.000	3.4	9.000	4.4
0.600 1.3 2.200	2.3	5.500	3.5	9.500	4.6
0.800 1.5 2.400	2.4	6.000	3.7		
1.000 1.6 2.600	2.5	6.500	3.8		
Undra Brakan Ontimum Manha	o. 03 DG	/DN • 1 007	Volum	o (m3)• 1	1 0
	ע, נב ישו	/ EIN · I.UU/,	, vorun		<u> </u>
Unit	Reference M	MD-SHE-0090-4	200-144	5-4200	
Desig	n Head (m)			1.445	
Design	Flow (l/s)			4.2	
	Flush-Flo™	Mini.	Calc	ulated	
	objective	Minimise ups	stream s	torage	
A Sumr	Available		5	Yes	
Dia	meter (mm)			90	
Invert	Level (m)			45.300	
Minimum Outlet Pipe Dia	meter (mm)			150	
Suggested Manhole Dia	meter (mm)			1200	
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DBFL Consultin	g Engine	ers				Pa	age 8		
Ormond House			5 Year 30 I	Minute Even	t				
Upper Ormond Q	uay								
Dublin 7						N	Aicco		
Date 30/10/201	9 14:56		Designed	l by Byrne	se				
File NETWORK 2	9102019.	MDX	Checked	by			lallage		
Innovyze			Network	2018.1					
<u>Hydro-Bra</u>	ike® Opt	imum Manho	ole: S3, D	S/PN: 1.00	)7, Volu	me (m³):	11.2		
		Control P	oints	Head (m) Fl	.ow (l/s)				
	Des	ign Point ((	Calculated)	1.445	4.2				
			Flush-Flo™	0.398	4.0				
	Moo	n Flow over	Kick-Flo®	0.808	3.2				
	Mea	I FIOW OVER	Head Range	-	3.0				
The hydrologica Hydro-Brake® Op Hydro-Brake Opt invalidated	al calcula otimum as cimum® be	ations have specified. utilised th	been based Should and hen these st	on the Head ther type of orage routin	/Discharge f control ng calcula	e relations device othe ations will	nip for the er than a be		
Depth (m) Flow	7 (1/s) De	epth (m) Flo	ow (l/s) Deg	oth (m) Flow	v (l/s) De	epth (m) Fl	ow (1/s)		
0.100	2.8	1.200	3.8	3.000	5.9	7.000	8.8		
0.200	3.7	1.400	4.1	3.500	6.3	7.500	9.1		
0.300	3.9	1.600	4.4	4.000	6.8	8.000	9.4		
0.400	4.0	1.800	4.6	4.500	7.1	8.500	9.6		
0.500	4.0	2.000	4.9	5.000	7.5	9.000	9.9		
0.600	3.9	2.200	5.1	5.500	7.8	9.500	10.2		
1 000	3.3	2.400	5.3	6.500	8.2				
Hydro-Brak	Hydro-Brake® Optimum Manhole: S2-1, DS/PN: 2.008, Volume (m³): 10.2								
		Uni	t Reference	MD-SHE-009	0-4200-144	45-4200			
		Desi	.gn Head (m)			1.445			
		Design	I FIOW (I/S) Flugh-Flo™		Cal	4.2 Culated			
			Objective	Minimise	upstream s	storage			
			Application		-	Surface			
		Sum	np Available			Yes			
		Di	ameter (mm)			90			
		Inver	t Level (m)			45.400			
	Suggested	Manhole Di	ameter (mm)			1200			
	buggebtet	Mainore Di	amecer (mm)			1200			
		Control P	oints	Head (m) Fl	.ow (1/s)				
	Des	ign Point (0	Calculated)	1.445	4.2				
			Flush-Flo™	0.398	4.0				
	Mea	n Flow over	Head Range	0.808	3.2 3.6				
	ricd.	T TIOM OVEL	neua kange	_	5.0				
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated									
Depth (m) Flow	7 (l/s) D	epth (m) Flo	ow (l/s) De	pth (m) Flow	v (l/s) De	epth (m) Fl	ow (l/s)		
0.100	2.8	0.300	3.9	0.500	4.0	0.800	3.3		
0.200	3.7	0.400	4.0	0.600	3.9	1.000	3.5		
		©19	982-2018 I	nnovyze					

DBFL Consult		Page 9						
Ormond House	1		5 Year	30 Minute E				
Upper Ormond	Quay							
Dublin 7						Mirro		
Date 30/10/2	019 14:5	б	Desig	ned by By	rnese		Dcainago	
File NETWORK	Diamage							
Innovyze Network 2018.1								
Hydro-Brake® Optimum Manhole: S2-1, DS/PN: 2.008, Volume (m³)								
Depth (m) F	low (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow $(1/s)$	Depth (m)	Flow (l/s)	
1.200	3.8	2.400	5.3	5.000	7.5	8.000	9.4	
1.400	4.1	2.600	5.5	5.500	7.8	8.500	9.6	
1.600	4.4	3.000	5.9	6.000	8.2	9.000	9.9	
1.800 4.6 3.500 6.3 6.500 8.5 9.50							10.2	
2.000	4.9	4.000	6.8	7.000	8.8			
2.200	5.1	4.500	7.1	7.500	9.1			

Ormond House Upper Ormond Qua Dublin 7 Date 30/10/2019 File NETWORK 29: Innovyze <u>Summ</u>	ay 14:5 10201 ary c	6 9.MDX	5 D C N	Year 30 M esigned hecked b	by Byr	rnese	
Upper Ormond Qua Dublin 7 Date 30/10/2019 File NETWORK 29 Innovyze <u>Summ</u> Mar	14:5 10201 ary c	6 9.MDX	D C N	esigned hecked b	by Byr y	mese	
Dublin 7 Date 30/10/2019 File NETWORK 29 Innovyze <u>Summ</u> Mar	14:5 10201 ary c	6 9.MDX	D C N	esigned hecked b	by Byr y	nese	— Micro Drainagi
Date 30/10/2019 File NETWORK 293 Innovyze <u>Summ</u> Mar	14:5 10201 ary c	6 9.MDX	D C N	esigned hecked b	by Byr y	nese	Drainag
File NETWORK 29 Innovyze <u>Summ</u> Mar	10201 ary c	9.MDX	C	hecked b	y		
Innovyze <u>Summ</u> Mar	ary c	of Peg	N	otwork 2	1		
<u>Summ</u>	ary c	of Pag	11		- 018 1		
<u>Summ</u> Mar	ary c	of Pog		CCWOIN 2	010.1		
Mar		JT NCO	ults for	30 minu	te 5 v	ear Winter (S	SW 1)
Mar							<u></u>
	gin fo	or Floo	d Risk War	ning (mm)	300.0	DVD Status	OFF
			Analysis	3 Timestep	Fine	Inertia Status	OFF
			E	TS Status	ON		
		Water	Surcharged	l Flooded		Pipe	
US/	′мн	Level	Depth	Volume	Flow /	Overflow Flow	
PN Na	me	(m)	(m)	(m³)	Cap.	(l/s) (l/s)	Status
1.000	SIU 5	52.882	-0.143		0.29	30.1	OK.
1.001	28 2	51.012	-0.113		0.49	30.0	OK
1.002	S7 5	50.619	-0.186	5 0.000	0.31	67.9	OK
1.004	S6 4	46.444	0.044	L 0.000	0.03	1.8	SURCHARGED
1.005	S5 4	46.445	0.145	0.000	0.01	1.5	OK
1.006	S4 4	45.586	-0.364	£ 0.000	0.08	15.5	OK
1.007	S3 4	45.414	-0.336	0.000	0.01	2.2	OK
2.000	S2-9 5	51.526	-0.199	0.000	0.03	1.7	OK
2.001	SZ-8 5	51.326 51.114	-0.169	0.000	0.14	6.6 22 7	OK
2.002	52-7 S S2-6 S	50.370	-0.230	0.000	0.12	25.7	OK
3.000 S1	-5-3 5	50.723	-0.202	2 0.000	0.02	1.9	OK
4.000 S2	-5-1 4	49.717	-0.198	0.000	0.04	2.0	OK
2.004	S2-5 4	49.350	-0.265	0.000	0.19	34.2	OK
5.000 S1	-4-1 4	49.363	-0.197	0.000	0.04	2.0	OK
2.005	S2-4 4	48.995	-0.340	0.000	0.13	67.4	OK
2.006	52-3 4 92-2 4	45.601 45.620	-0.289		0.28	69.7	OK
6.000 S2	-1-4 4	48.081	-0.184	0.000	0.08	3.9	OK
6.001 S2	-1-3 4	47.910	-0.180	0.000	0.09	6.8	OK
7.000 S2-1	-2-1 4	47.479	-0.176	0.000	0.11	5.4	OK
6.002 S2	-1-2 4	47.321	-0.159	0.000	0.19	19.1	OK
6.003 S2	-1-1 4	45.619	-0.074	£ 0.000	0.54	19.7	OK
2.008	SZ-1 4	45.619 45.210	-0.081		0.04	3.8	OK
1 009	S1 4	45 248	-0.150		0.21	5.9	OK
	UT -	10.710	0.10/	0.000	0.10	5.9	010

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DBFL Consul	Pag	ge 1										
Ormond Hous	е			100	) Year Peak	Event						
Upper Ormon	d Quay	7										
Dublin 7										M	irm	
Date 30/10/	2019 1	4:54		De	signed by	Byrne	ese					
File NETWOR	к 2910	)2019.M	IDX	Ch	ecked by					DI	anaye	
Innovyze				Ne	twork 201	8.1						
	STOR	M SEWE	R DESI	GN by	the Modif	ied R	atior	nal M	letho	<u>d</u>		
			Des	ign Cr	iteria fo	r SW_	1					
		Pip	e Sizes	STANDA	RD Manhole	Sizes	STAND	ARD				
		FSI	R Rainfa	all Mode	el - Scotlar	nd and	Irela	nd				
	Reti	ırn Peri	lod (yea	rs)	100					PIMP (	%) 100	
			M5-60 (	mm) 16.	400	Add F	'low /	Clin	ate Cl	hange ( oight (	%) 10 m) 0 200	
	Maximum Rainfall (mm/hr) 100 Maximum Backdrop Height (m) 1.500											
Maximum Time	Maximum Time of Concentration (mins) 30 Min Design Depth for Optimisation (m) 1.200											
	Foul Sewage (1/s/ha) 0.000 Min Vel for Auto Design only (m/s) 1.00											
	Volume	tric Rur	noff Coe	eff. 0.	750 Mi	in Slop	pe for	Opti	misat:	ion (1:	X) 500	
			Des	signed w	vith Level S	Soffits	3					
Network Design Table for SW_1												
« - Indicates pipe capacity < flow												
PN Lengt	h Fall	Slope	I.Area	T.E.	Base	k	HYD	DIA	Secti	on Type	e Auto	
(m)	(m)	(1:X)	(ha)	(mins)	Flow (l/s)	(mm)	SECT	(mm)			Design	
1.000 27.36	3 1.300	21.0	0.195	4.00	0.0	0.600	0	225	Pipe/	Condui	: 🔒	
1.001 4.92	1 0.190	25.9	0.000	0.00	0.0	0.600	0	225	Pipe/	Condui	: 🦺	
1.002 13.87	4 0.730	19.0	0.020	0.00	0.0	0.600	0	225	Pipe/	Conduit	E 🔒	
1.003 24.54	1 1.169 3 0 100	) 21.0 ) 274 8	0.250	0.00	0.0	0.600	0	300	Pipe/	Conduit	- 🛗	
1.005 74.07	1 0.350	) 211.6	0.120	0.00	0.0	0.600	0	450	Pipe/	Conduit	- U - A	
1.006 47.33	3 0.200	236.7	0.101	0.00	0.0	0.600	0	450	Pipe/	Condui	: 👸	
1.007 1.43	4 0.050	28.7	0.000	0.00	0.0	0.600	0	450	Pipe/	Conduit	: 🧴	
2.000 14.99	0 0.230	) 65.2	0.011	4.00	0.0	0.600	0	225	Pipe/	Conduit	- 🔺	
2.001 17.05	8 0.170	100.3	0.035	0.00	0.0	0.600	0	225	Pipe/	Conduit	- U - 🔒	
			Ne	etwork	Results :	[able						
DN E	ain	Τ.C. Τ	15/TT. <b>P</b>	I. Area	S. Base	Foul	PPP	Flow	Vel	Can	Flow	
(m	a/hr) (:	mins)	(m)	(ha)	Flow (1/s)	(1/s)	(1/	's)	(m/s)	(1/s)	(1/s)	
1.000 1	00.00	4.16 5	2.800	0.195	0.0	0.0		5.3	2.86	113.9	58.1	
1.001 1	00.00	4.19 5	1.500	0.195	0.0	0.0		5.3	2.58	102.6	58.1	
1.002 1	0.00	4.27 5	1.310	0.215	0.0	0.0		5.8	3.02	119.9	64.1	
1 004 1	00.00	4.39 5	0.505 6 100	U.465 0 491	0.0	0.0		⊥∠.6 13 ∩	3.45	243.0 66 7 <i>4</i>	143 3	
1.005 1	0.00	5.76 4	5.850	0.601	0.0	0.0		16.3	1.39	221.6	179.0	
1.006 1	00.00	6.36 4	5.500	0.702	0.0	0.0		19.0	1.32	209.5	209.1	
1.007 1	00.00	6.36 <mark>4</mark>	5.300	0.702	0.0	0.0		19.0	3.81	605.6	209.1	
0.000		4 1 5 -	1 500	0 01-	0.0	0.0		0 0	1 60			
2.000 1	00.00 00.00	4.15 5 4.37 5	1.500 1.270	0.011 0.046	0.0 0.0	U.O 0.0		0.3 1.2	⊥.62 1.31	ь4.5 51.9	3.3 13.7	
			(	D1982-2	2018 Innov	vyze						

Section of network containing attenuation tank. Capacity not representative of attenuation tank.

DBFL C	onsult	ing E	ngine	eers						Pac	ae 2
Ormond	House	2			10	0 Year Peak	Event				-
Upper	Ormond	Quay									
Dublin	7									M	icco
Date 3	0/10/2	019 1	4:54		De	signed by	Byrn	ese			
File N	ETWORK	2910	2019	. MDX	Cł	necked by	-			U	allidye
Innovy	ze				Ne	etwork 201	8.1				
				Netw	ork Des	ign Table	for S	SW_1			
PN	Length	Fall	Slop	e I.Are	a T.E.	Base	k	HYD DIA	Sectio	on Type	e Auto
	(m)	(m)	(1:X	) (ha)	(mins)	Flow (l/s)	(mm)	SECT (mm)	)		Design
2,002	51.867	0.725	71.	5 0.12	4 0.00	0.0	0.600	0 300	) Pipe/(	onduit	- 🔺
2.003	19.921	0.980	20.	3 0.02	1 0.00	0.0	0.600	o 300	) Pipe/(	Conduit	- U
											-
3.000	22.856	0.700	32.	7 0.01	2 4.00	0.0	0.600	o 225	Pipe/(	Conduit	= 🔒
4.000	21.155	0.300	70.	5 0.01	3 4.00	0.0	0.600	o 225	Pipe/0	Conduit	:
2.004	25.546	0.280	91.	2 0.02	8 0.00	0.0	0.600	o 375	Pipe/0	Conduit	- 🍵
5.000	16.586	0.225	73.	7 0.01	3 4.00	0.0	0.600	o 225	Pipe/0	Conduit	:
2 005	47 281	1 385	34	1 0 22	6 0 00	0 0	0 600	0 450	Dine/(	onduit	- <u>A</u>
2.005	4.782	0.200	23.	9 0.01	6 0.00	0.0	0.600	o 450	) Pipe/(	Conduit	- U
2.007	39.490	0.050	789.	в 0.00	0 0.00	0.0	0.600	o 450	) Pipe/(	Conduit	= 🍈
6 000	14 067	0 175	01	- 0.00	F 4 00	0.0	0 600		Dime	1 a maint d	
6.001	25.123	0.175	81. 41.	$   \begin{array}{ccc}     5 & 0.02 \\     2 & 0.02   \end{array} $	5 4.00 1 0.00	0.0	0.600	0 22	pipe/(	Conduit	- 🕛 : 🔒
7 000	14 233	0 175	81	3 0 0 3	5 4 0 0	0 0	0 600	0 221	- Dine/(	onduit	- <u> </u>
1.000	11.200	0.1/5	01.	0.05	5 1.00	0.0	0.000	0 11	1190/0	ondur	- 🖷
6.002	12.633	0.632	20.	0.05	0 0.00	0.0	0.600	o 225	Pipe/C	Conduit	: 🧕
6.003	2.745	0.068	40.	4 0.00	4 0.00	0.0	0.600	0 225	pipe/(	Conduit	E 🛑
					Network	Results '	Table				
PN	r Rai	n T	. <b>C</b> .	IIS/TI.	Σ T Area	Σ Base	Foul	Add Flow	Vel	Cap	Flow
	(mm/l	nr) (m	ins)	(m)	(ha)	Flow (1/s)	(1/s)	(1/s)	(m/s)	(1/s)	(1/s)
				-1 00-	0 1 7 0				1 0 6	101 6	50 6
2.00	02 100. 03 100	00	4.84 4 93	51.025	0.170	0.0	0.0	4.6	1.86 3.50	131.6	50.6 56 9
2.0	100		1.25	50.500	0.191	0.0	0.0	5.2	5.50	217.0	50.5
3.0	00 100	.00	4.17	50.700	0.012	0.0	0.0	0.3	2.30	91.4	3.6
4.0	00 100	.00	4.23	49.690	0.013	0.0	0.0	0.4	1.56	62.0	3.9
2.0	04 100	.00	5.16	49.240	0.244	0.0	0.0	6.6	1.90	209.6	72.7
5.0	00 100	.00	4.18	49.335	0.013	0.0	0.0	0.4	1.52	60.6	3.9
2.0	05 100	.00	5.38	48.885	0.483	0.0	0.0	13.1	3.49	554.9	143.9
2 01	06 100	0.0	5 40	45 500	0 400	0 0	0 0	13 5	4 17	663 1	148 7

5.40 45.500 0.499 0.0 0.0 

 2.006
 100.00
 5.40
 45.500
 0.499
 0.0
 0.0
 13.5
 4.17
 663.4
 148.7

 2.007
 100.00
 6.32
 45.300
 0.499
 0.0
 0.0
 13.5
 0.72
 113.8«
 148.7

 2.006 100.00 13.5 0.7 1.45 57.6 7.4 1.2 2.04 81.3 13.7 6.000100.004.1648.0400.0256.001100.004.3747.8650.046 0.0 0.0 0.0 0.0 7.000 100.00 4.16 47.430 0.035 0.0 0.0 0.9 1.45 57.7 10.4 3.52.94116.939.03.72.0782.140.2 6.002 100.00 6.003 100.00 0.0 0.0 4.44 47.255 0.131 0.0 4.46 45.468 0.135 0.0

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Section of network containing attenuation tank. Capacity not representative of attenuation tank.

DBFL Consulting Engi	ineers		Pa	.ge 3
Ormond House	10	0 Year Peak Event		
Upper Ormond Quay				<u> </u>
Dublin 7			N	licro
Date 30/10/2019 14:5	54 De	signed by Byrne	ese	rainage
File NETWORK 2910201	19.MDX Ch	lecked by		rainage
Innovyze	Ne	twork 2018.1		
	Network Des	ign Table for S	<u>SW_1</u>	
PN Length Fall Sl (m) (m) (1	ope I.Area T.E. :X) (ha) (mins)	Base k Flow (l/s) (mm)	HYD DIA Section Typ SECT (mm)	pe Auto Design
2.008 8.381 0.150 5	5.9 0.000 0.00	0.0 0.600	o <mark>300</mark> Pipe/Condui	t
1.008 15.070 0.060 25 1.009 25.604 0.170 15	1.20.0000.000.60.0000.00	0.0 0.600 0.0 0.600	o 225 Pipe/Condui o 225 Pipe/Condui	.t 🧌 .t 🍵
	Network	Results Table		
PN Rain T.C. (mm/hr) (mins	US/IL Σ I.Area ) (m) (ha)	Σ Base Foul Flow (l/s) (l/s)	Add Flow Vel Cap (l/s) (m/s) (l/s)	Flow (l/s)
2.008 100.00 6.3	9 45.400 0.634	0.0 0.0	17.2 2.11 <b>149.0</b> «	188.9
1.008 100.00 6.6 1.009 98.48 7.0	945.2501.336945.1901.336	0.0 0.0 0.0 0.0	36.2 0.82 32.6« 36.2 1.06 42.3«	398.0 398.0
NOT REPRES	SENTATIVE OF FLOV 0 OF WINDES RESU	VS DOWN STREAM _TS.	OF HYDROBRAKE.	
	©1982-	2018 Innovyze		

DBFL Co	nsulti	ng Eng	ginee	ers						Page 4		
Ormond	House				100 Yea	ar Peak	Event					
Upper O	rmond	Quay										
Dublin	7									Mirro		
Date 30	/10/20	19 14	:54		Desig	ned by	y Byrnese			Drainar		
File NE	TWORK	29102	019.№	1DX	Check	ed by				יטומוומע	JC	
Innovyz	е				Netwo	rk 201	18.1					
						_						
				Manho	ble Sched	ules	tor SW_1					
мц	мц	MU		мц	MU		Ding Out			Binog In		
Name	CL (m)	Depth	Con	nection	Diam.,L*W	PN	Invert	Diameter	PN	Invert	Diameter	Backdrop
		(m)			(mm)		Level (m)	(mm)		Level (m)	(mm )	(mm)
S10	54.310	1.510	Open	Manhole	1200	1.000	52.800	225				
S9	53.200	1.700	Open	Manhole	1200	1.001	51.500	225	1.000	51.500	225	
S8	53.300	1.990	Open	Manhole	1200	1.002	51.310	225	1.001	51.310	225	
S7	52.500	1.995	Open	Manhole	1200	1.003	50.505	300	1.002	50.580	225	
S6	52.660	6.560	Open	Manhole	1200	1.004	46.100	300	1.003	49.336	300	3236
S5	49.800	3.950	Open	Manhole	1350	1.005	45.850	450	1.004	46.000	300	
S4	48.130	2.630	Open	Manhole	1350	1.006	45.500	450	1.005	45.500	450	
S3	48.000	2.700	Open	Manhole	1350	1.007	45.300	450	1.006	45.300	450	
S2-9	53.500	2.000	Open	Manhole	1200	2.000	51.500	225				
S2-8	53.000	1.730	Open	Manhole	1200	2.001	51.270	225	2.000	51.270	225	
S2-7	52.870	1.845	Open	Manhole	1200	2.002	51.025	300	2.001	51.100	225	
S2-6	52.000	1.700	Open	Manhole	1200	2.003	50.300	300	2.002	50.300	300	
S1-5-3	52.150	1.450	Open	Manhole	1200	3.000	50.700	225				
S2-5-1	51.600	1.910	Open	Manhole	1200	4.000	49.690	225				
S2-5	51.400	2.160	Open	Manhole	1350	2.004	49.240	375	2.003	49.320	300	5
									3.000	50.000	225	610
									4.000	49.390	225	
S1-4-1	50.900	1.565	Open	Manhole	1200	5.000	49.335	225				
S2-4	50.650	1.765	Open	Manhole	1350	2.005	48.885	450	2.004	48.960	375	
									5.000	49.110	225	
S2-3	49.200	3.700	Open	Manhole	1350	2.006	45.500	450	2.005	47.500	450	2000
S2-2	49.100	3.800	Open	Manhole	1350	2.007	45.300	450	2.006	45.300	450	
S2-1-4	51.500	3.460	Open	Manhole	1200	6.000	48.040	225				
S2-1-3	49.150	1.285	Open	Manhole	1200	6.001	47.865	225	6.000	47.865	225	
S2-1-2-1	49.000	1.570	Open	Manhole	1200	7.000	47.430	225				
S2-1-2	48.490	1.235	Open	Manhole	1200	6.002	47.255	225	6.001	47.255	225	
									7.000	47.255	225	
S2-1-1	48.280	2.812	Open	Manhole	1200	6.003	45.468	225	6.002	46.623	225	1155
S2-1	48.280	3.030	Open	Manhole	1350	2.008	45.400	300	2.007	45.250	450	
									6.003	45.400	225	
S2	48.000	2.750	Open	Manhole	1350	1.008	45.250	225	1.007	45.250	450	
									2.008	45.250	300	
S1	47.750	2.560	Open	Manhole	1200	1.009	45.190	225	1.008	45.190	225	
	46.800	1.780	Open	Manhole	0		OUTFALL		1.009	45.020	225	

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DBFL Consul	ting	Engi	neers						Page 5
Ormond Hous	е			-	LOO Year	Peak Ever	nt		
Upper Ormon	d Qua	У							
Dublin 7									Micco
Date 30/10/	2019	14:54	4		Designe	d by By	rnese		
File NETWOR	тото 10-201	0201	- 9 MDY		Checked	by			Drainage
FILE NEIWOR	K Z91	0201.	9.MDA			Dy 2010 1			
Innovyze					Network	2018.1			
			DI		aquedu		GUI 1		
			<u>P1</u>	PELINE	SCHEDU	LES IOT	SW_1		
				Ups	tream M	lanhole			
	_				_				
PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM.	, L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm	)
1.000	0	225	S10	54.310	52.800	1.285	Open Manhole		1200
1.001	0	225	S9	53.200	51.500	1.475	Open Manhole		1200
1.002	0	225	S8	53.300	51.310	1.765	Open Manhole		1200
1.003	0	300	S7	52.500	50.505	1.695	Open Manhole		1200
1.004	0	300	S6	52.660	46.100	6.260	Open Manhole		1200
1.005	0	450	S5	49.800	45.850	3.500	Open Manhole		1350
1 006	0	450	54	48 130	45 500	2 180	Open Manhole		1350
1 007	0	450	C3	48 000	45 300	2.100	Open Manhole		1350
1.007	0	100	55	40.000	43.300	2.230	open Mannore		1330
2.000	0	225	S2-9	53,500	51,500	1.775	Open Manhole		1200
2.001	0	225	S2-8	53.000	51.270	1.505	Open Manhole		1200
2.001	0	300	S2 0	52 870	51 025	1 545	Open Manhole		1200
2.002	0	300	S2 /	52.070	50 300	1 400	Open Manhole		1200
2.003	0	300	32-0	52.000	50.500	1.400	open Mainore		1200
3.000	0	225	S1-5-3	52.150	50.700	1.225	Open Manhole		1200
4.000	0	225	S2-5-1	51.600	49.690	1.685	Open Manhole		1200
2.004	0	375	S2-5	51.400	49.240	1.785	Open Manhole		1350
5.000	0	225	S1-4-1	50.900	49.335	1.340	Open Manhole		1200
				Down	stream	Manhole	2		
DN	Lengt	n slo	ne MH	C Level	T Level	D Depth	мн	мн ртам	т.*₩
FIN	(m)	(1:)	ye Mn X) Name	(m)	(m)	(m)	Connection	(mm	•, <u> </u>
	()	(	-,	()	()	()		(	-,
1.000	27.363	3 21	.0 S9	53.200	51.500	1.475	Open Manhole	2	1200
1.001	4.92	1 25	.9 S8	53.300	51.310	1.765	Open Manhole	2	1200
1.002	13.874	1 19	.0 S7	52.500	50.580	1.695	Open Manhole	2	1200
1.003	24.543	1 21	.0 S6	52.660	49.336	3.024	Open Manhole	3	1200
1.004	27.483	3 274	.8 S5	49.800	46.000	3.500	Open Manhole	5	1350
1.005	74.073	1 211	.6 S4	48.130	45.500	2.180	Open Manhole	5	1350
1.006	47.333	3 236	.7 S3	48.000	45.300	2.250	Open Manhole	2	1350
1.007	1.434	4 28	.7 S2	48.000	45.250	2.300	Open Manhole	2	1350
							-		
2.000	14.990	0 65	.2 S2-8	53.000	51.270	1.505	Open Manhole	2	1200
2.001	17.058	3 100	.3 S2-7	52.870	51.100	1.545	Open Manhole	2	1200
2,002	51.86	7 71	5 52-6	52,000	50.300	1,400	Open Manhole	2	1200
2.003	19.92	1 20	.3 52-5	51.400	49.320	1.780	Open Manhole	2	1350
2.005		_ 20	.5 52 5	51.100	12.520	1.,00	Spen mannore		1000
3.000	22.85	5 32	.7 S2-5	51.400	50.000	1.175	Open Manhole	2	1350
4.000	21.15	5 70	.5 S2-5	51.400	49.390	1.785	Open Manhole	5	1350
2.004	25.540	5 91	.2 S2-4	50.650	48.960	1.315	Open Manhole	2	1350
5.000	16.580	5 73	.7 S2-4	50.650	49.110	1.315	Open Manhole	2	1350
				©1982	2-2018	Innovyz	9		

DBFL Consulting Engineers		Page 6
Ormond House	100 Year Peak Event	
Upper Ormond Quay		
Dublin 7		Micro
Date 30/10/2019 14:54	Designed by Byrnese	Dcainago
File NETWORK 29102019.MDX	Checked by	Drainage
Innovyze	Network 2018.1	

#### PIPELINE SCHEDULES for SW\_1

#### 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)
2.005	0	450	S2-4	50.650	48.885	1.315	Open Manhole	1350
2.006	0	450	S2-3	49.200	45.500	3.250	Open Manhole	1350
2.007	0	450	S2-2	49.100	45.300	3.350	Open Manhole	1350
6.000	0	225	S2-1-4	51.500	48.040	3.235	Open Manhole	1200
6.001	0	225	S2-1-3	49.150	47.865	1.060	Open Manhole	1200
7.000	0	225	S2-1-2-1	49.000	47.430	1.345	Open Manhole	1200
6.002	0	225	S2-1-2	48.490	47.255	1.010	Open Manhole	1200
6.003	0	225	S2-1-1	48.280	45.468	2.587	Open Manhole	1200
2.008	0	300	S2-1	48.280	45.400	2.580	Open Manhole	1350
1.008	0	225	S2	48.000	45.250	2.525	Open Manhole	1350
1.009	0	225	S1	47.750	45.190	2.335	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)
2.005	47.281	34.1	S2-3	49.200	47.500	1.250	Open Manhole	1350
2.006 2.007	4.782 39.490	23.9 789.8	S2-2 S2-1	49.100 48.280	45.300 45.250	3.350 2.580	Open Manhole Open Manhole	1350 1350
6.000 6.001	14.267 25.123	81.5 41.2	S2-1-3 S2-1-2	49.150 48.490	47.865 47.255	1.060 1.010	Open Manhole Open Manhole	1200 1200
7.000	14.233	81.3	S2-1-2	48.490	47.255	1.010	Open Manhole	1200
6.002	12.633	20.0	S2-1-1	48.280	46.623	1.432	Open Manhole	1200
6.003	2.745	40.4	S2-1	48.280	45.400	2.655	Open Manhole	1350
2.008	8.381	55.9	S2	48.000	45.250	2.450	Open Manhole	1350
1.008	15.070	251.2	S1	47.750	45.190	2.335	Open Manhole	1200
1.009	25.604	150.6		46.800	45.020	1.555	Open Manhole	0
		Fr	ee Flo	wing Ou	tfall I	Details	for SW_1	
	c	Outfall	Outf	all C. L	evel I.	Level	Min D,L	W
	Pir	pe Numb	er Na	me (1	m)	(m) I.	Level (mm) ( (m)	(mm )

1.009 46.800 45.020 0.000 0 0 ©1982-2018 Innovyze

DBFL Con	sulting	g Engi	neers					Page 7				
Ormond H	ouse			100 Year I	Peak Event							
Upper Or	mond Qı	lay										
Dublin 7								Micro				
Date 30/	10/2019	9 14:5	4	Designe	d by Byrr	nese		Dcainago				
File NET	WORK 29	910201	9.MDX	Checked	by			Diamage				
Innovyze				Network	2018.1							
			Onlin	e Control	s for SW	_1						
Hvo	dro-Bra	ake® Or	otimum Manh	ole: S5.	DS/PN: 1	.005. Vol	ume (m³)	: 7.5				
						····						
			Uni	t Reference	MD-SHE-0	060-2000-1	600-2000					
			Desi	gn Head (m)			1.600					
	Flush-Flo™ Calculated											
	Objective Minimise upstream storage											
	Application Surface											
			Sum	p Available	2		Yes					
			Di	ameter (mm)			60					
	M	nimum O	Inver utlat Dipa Di	t Level (m			46.000					
	I*I⊥.	Suggest	ed Manhole Di	ameter (mm)			1200					
Control Points Head (m) Flow (1/s)												
		De	esign Point (C	Calculated)	1.600	2.0	)					
				Flush-Flom	0.263	1.5	5					
		26.		Kick-Flo®	0.536	1.2	-					
	Mean Flow over Head Range - 1.5											
The hvdr	rologica	l calcu	lations have	been based	on the He	ad/Dischar	ge relatio	nship for the				
Hydro-Br	rake® Op	timum a	s specified.	Should and	ther type	of contro	l device o	ther than a				
Hydro-Br	rake Opt	imum® b	e utilised th	en these st	corage rou	ting calcu	lations wi	ll be				
invalida	ated											
Depth (	m) Flow	(l/s)	Depth (m) Flo	ow (l/s) De	pth (m) F	low (1/s)	Depth (m)	Flow (l/s)				
0.1	.00	1.3	1.200	1.8	3.000	2.7	7.000	4.0				
0.2	200	1.5	1.400	1.9	3.500	2.9	7.500	4.1				
0.3	300	1.5	1.600	2.0	4.000	3.0	8.000	4.2				
0.4	100	1.5	1.800	2.1	4.500	3.2	8.500	4.3				
0.5	500	1.3	2.000	2.2	5.000	3.4	9.000	4.4				
0.0	300	1.3	2.200	2.3	5.500	3.5	9.500	4.0				
1.0	000	1.6	2.600	2.5	6.500	3.8						
		I		I		I						
Hyd	lro-Bra	ke® Op	timum Manho	ole: S3, I	DS/PN: 1.	007, Vol	ume (m³)	: 11.2				
			∏ni	t Reference	MD-SHE-0	090-4200-1	445-4200					
			Desi	gn Head (m			1.445					
			Design	Flow (l/s			4.2					
	Flush-Flo™ Calculated											
	Objective Minimise upstream storage											
			Cum	Appilcation	1		Surlace					
			Di	ameter (mm)	- 		90					
			Inver	t Level (m			45.300					
	Mi	nimum O	utlet Pipe Di	ameter (mm			150					
		Suggest	ed Manhole Di	ameter (mm)			1200					
I			©19	82-2018 1	nnovvze							

DBFL Consulting	Engir	neers					Page 8			
Ormond House			100 Year I	Peak Event						
Upper Ormond Qua	ay									
Dublin 7							Micco			
Date 30/10/2019	14:54	L	Designer	hy Byrne	CO.		MILIU			
Eilo NETWORK 201			Chockod	by	50		Drainage			
TILE NEIWORK 291		. MDX	Natarala	Dy						
Innovyze			Network	2018.1						
Hydro-Brak	e® Op	timum Manhc	ole: S3, I	S/PN: 1.0	07, Volu	me (m³):	11.2			
		Control P	oints	Head (m) F	low (l/s)					
	De	sign Point (C	Calculated)	1.445	4.2					
			Flush-Flo™	0.398	4.0					
			Kick-Flo®	0.808	3.2					
	Me	an Flow over	Head Range	-	3.6					
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) Flo	ow (l/s) De	pth (m) Flo	w (l/s) De	epth (m) H	flow (l/s)			
0 100	2 8	1 200	3 8	3 000	5 9	7 000	8 A			
0.200	3.7	1.400	4.1	3.500	6.3	7.500	9.1			
0.300	3.9	1.600	4.4	4.000	6.8	8.000	9.4			
0.400	4.0	1.800	4.6	4.500	7.1	8.500	9.6			
0.500	4.0	2.000	4.9	5.000	7.5	9.000	9.9			
0.600	3.9	2.200	5.1	5.500	7.8	9.500	10.2			
0.800	3.3	2.400	5.3	6.000	8.2					
1.000	3.5	2.600	5.5	6.500	8.5					
Hydro-Brake	® Opt	imum Manhol	e: S2-1,	DS/PN: 2.	008, Vol	<u>ume (m³)</u>	: 10.2			
		Uni	t Reference	MD-SHE-009	0-4200-144	1 445				
		Design	Flow (1/g)			4 2				
		Design	Flush-Flo <sup>T</sup>	1	Calc	rulated				
			Objective	. Minimise	upstream s	storage				
			Applicatior	L	-	Surface				
		Sum	p Available	2		Yes				
		Di	ameter (mm)			90				
		Inver	t Level (m)			45.400				
Min:	imum Ou	utlet Pipe Di	ameter (mm)			150				
Si	uggeste	ed Manhole Di	ameter (mm)			1200				
		Control P	oints	Head (m) F	low (l/s)					
	De	sign Point (C	Calculated)	1.445	4.2					
			Flush-Flo™	0.398	4.0					
			Kick-Flo®	0.808	3.2					
	Me	an Flow over	Head Range	-	3.6					
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) Flo	ow (l/s) De	pth (m) Flo	w (l/s) De	epth (m) H	Flow (l/s)			
0.100	2.8	0.300	3.9	0.500	4.0	0.800	3.3			
0.200	3.7	0.400	4.0	0.600	3.9	1.000	3.5			
		©19	82-2018 1	nnovyze						

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Ormond House	:		100 Ye	ar Peak Eve	nt		
Upper Ormond	Quay						
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Innovyze			Netwo	rk 2018.1	-		
Hydro-Br	rake® Opt	imum Man	hole: S2-	1, DS/PN:	2.008, V	olume (m³	): 10.2
Depth (m) F	low (1/s)	Depth (m)	Flow (1/s)	Depth (m)	Flow (1/s)	Depth (m)	Flow (1/s)
1.200	3.8	2.400	5.3	5.000	7.5	8.000	9.4
1.400	4.1	2.600	5.5	5.500	7.8	8.500	9.6
1.600	4.4	3.000	5.9	6.000	8.2	9.000	9.9
1.800	4.6	3.500	6.3	6.500	8.5	9.500	10.2
2.000	4.9	4.000	6.8	7.000	8.8		
2.200	5.1	4.500	7.1	7.500	9.1		

DBFL Consult	ing Eng	ineers					Page 10
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Dublin 7	~						Micro
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Date 30/10/2	001000		1		NA PAI	11696	Drainage
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Innovyze			1	Network 2	2018.1		
					100		
Sui	mmary o	I Resul	ts ior	720 minut	te 100	year Winter	(SW_1)
	Margin	for Floo	d Risk Wa	rning (mm)	300.0	DVD Status	OFF
			Analysi	s Timestep	Fine	Inertia Status	OFF
				DTS Status	ON		
		Water	Surcharge	d Flooded		Pipe	
	US/MH	Level	Depth	Volume	Flow /	Overflow Flow	,
PN	Name	(m)	(m)	(m³)	Cap.	(l/s) (l/s)	) Status
1.000	S10	52.839	-0.18	6 0.000	0.07	7.4	4 OK
1.001	S9	51.552	-0.17	3 0.000	0.12	7.4	4 OK
1.002	S8	51.352	-0.18	3 0.000	0.08	8.2	2 ОК
1.003	S7	50.562	-0.24	3 0.000	0.08	17.7	7 ОК
1.004	S6	49.345	2.94	5 0.000	0.05	2.8	8 SURCHARGED
1.005	S5	49.343	3.04	3 0.000	0.01	2.8	8 SURCHARGED
1.006	S4	45.584	-0.36	6 0.000	0.03	5.4	4 OK
1.007	S3	45.577	-0.17	0.000	0.02	3.8	B OK
2.000	S2-9	51.508	-0.21	7 0.000	0.01	0.4	4 OK
2.001	S2-8	51.298	-0.19	0.000	0.04	1.7	7 OK
2.002	S2-7	51.069	-0.25	6 0.000	0.05	6.5	o OK
2.003	S2-6	50.336	-0.26	4 0.000	0.03	/	3 OK
3.000	SI-5-3	50.706	-0.21	9 0.000	0.01	0.5	
4.000	52-5-1 92-5	49.099	-0.21		0.01	0.5	S OK
5 000	S1_4_1	49 345	-0.21	5 0.000	0.05	0.5	5 OK
2 005	S1 4 1 S2-4	48 940	-0.39	5 0.000	0.01	18 3	3 OK
2.006	S2-3	46.357	0.40	7 0.000	0.07	18.8	B SURCHARGED
2.007	S2-2	46.357	0.60	0.000	0.19	18.7	7 SURCHARGED
6.000	S2-1-4	48.060	-0.20	5 0.000	0.02	0.9	9 ОК
6.001	S2-1-3	47.888	-0.20	2 0.000	0.02	1.7	7 ОК
7.000	S2-1-2-1	47.454	-0.20	1 0.000	0.03	1.3	3 ОК
6.002	S2-1-2	47.287	-0.19	3 0.000	0.05	5.0	) OK
6.003	S2-1-1	46.356	0.66	3 0.000	0.14	5.0	) SURCHARGED
2.008	S2-1	46.355	0.65	5 0.000	0.04	4.0	) SURCHARGED
1.008	S2	45.328	-0.14	7 0.000	0.27	7.6	5 OK
1.009	S1	45.257	-0.15	0.000	0.19	7.6	5 OK

APPENDIX F – FOUL DRAINAGE NETWORK MODEL

DBFL Co	nsult	ing Er	ginee	rs								P	age	1
Ormond	House													
Upper O	rmond	Quay												
Dublin	7											N	Mirr	
Date 10	/10/2	019 11	:01		I	Design	ned by	Byr	rnese	2			Icai	าลตด
File NE	TWORK	07102	2019.2	.MDX	(	Checke	ed by						лап	nage
Innovyz	e				1	Netwoi	ck 201	8.1						
				F	OUL	SEWER	AGE DE	SIG	N					
				Des	ign	Crite	ria fo	or FS	S_1					
			Pipe	e Sizes	STAN	DARD M	anhole	Size	s STA	NDARD				
Ind	Indust dustria Domesti	crial F al Peak Calcul Freq Domes .c Peak	low (l/ Flow F ation M uency F tic (l/ Flow F	s/ha) Pactor Method Pactor S/ha) Pactor	0.0 0.0 EN 75 0.5 0.0 6.0	0 0 2 0 Min 3 0 M	Add M M Design in Vel Min Sl	l Flo Iinim Iaxim Dept for .ope	w / C um Ba um Ba h for Auto for C	limate ckdrop ckdrop Optim Design ptimis	e Chang o Heigh disation only sation	re (%) at (m) at (m) on (m) (m/s) (1:X)	1 0.20 1.50 1.20 0.7 50	0 0 0 5 0
				Des	signed	l with	Level	Soffi	lts					
				Netwo	rk De	esign	Table	for	FS_	1				
PN	Length (m)	ı Fall (m)	Slope (1:X)	Area (ha)	Unita	s E Flow	Base 7 (l/s)	k (mm	HY ) SE	D DI	A Sect	ion Ty	/pe . D	Auto esign
F1 000		1 1 1 1 0	22.0	0 000	202	0	0.0	1 50	20		Dime	(Condu		
F1.000 F1.001	25.080	9 1.140 9 0.170	22.0 49.7	0.000	392. 0.	0	0.0	1.50	00	0 22	5 Pipe	/Condu	iit	
F1.002	11.857	0.740	16.0	0.000	0.	0	0.0	1.50	00	0 22	5 Pipe	e/Condu	iit	ě
F1.003	51.076	5 1.726	29.6	0.000	1540.	0	0.0	1.50	00	o 22	5 Pipe	e/Condu	iit	ē
F1.004	71.801	0.401	179.1	0.000	1862.	0	0.0	1.50	00	o 22	5 Pipe	e/Condu	it	0
F1.005	48.781	0.570	85.6	0.000	420.	0	0.0	1.50	00	0 22	5 Pipe	e/Condu	iit	•
F2.000	20.346	5 0.230	88.5	0.000	392.	0	0.0	1.50	00	o 22	25 Pipe	/Condu	iit	0
F2.001	16.407	0.150	109.4	0.000	126.	0	0.0	1.50	00	o 22	25 Pipe	e/Condu	it	ē
F2.002	9.706	5 0.090	107.8	0.000	98.	0	0.0	1.50	00	0 22	5 Pipe	e/Condu	it	
F2.003	12.031	10.080	150.4	0.000	126.	0	0.0	1.50		0 22	25 Pipe	e/Condu	iit	
F2.004	45.455	9 1.140	39.9	0.000	140.	U	0.0	1.50	50	0 44	5 Pipe	e/Conat	110	•
F3.000	26.533	8 0.890	29.8	0.000	28.	0	0.0	1.50	00	o 22	25 Pipe	e/Condu	uit	•
				Ne	etwor	ck Res	ults '	Tabl	.e					
F	צע אי (	3/IL Σ (m)	Area (ha) F	Σ Base low (1,	e Σ /s)	Units	Add Fl (l/s	.ow P ) (	.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (1/s)	Flo (1/s	w 5)
<b>1</b>	000 50	EE0	0.000			202 0	1	0	E 1	1 60	0 /F	07 5	1.0	0
ידז. דו	001 51	. 410	0.000	(	). () ). ()	392.0	1	. 0	51 62	1.02	⊿.45 1 63	97.5 64 8	10. 10	ر 9
F1	002 51	.240	0.000	(	2.0 D.0	392.0	1	.0	47	1.81	2.88	114.3	10.	9
F1.	003 48	.747	0.000	(	0.0	1932.0	2	.2	83	1.83	2.11	84.1	24.	2
F1.	004 47	.021	0.000	(	0.0	3794.0	3	.1	184	0.98	0.86	34.1	33.	9
F1.	005 <mark>46</mark>	.620	0.000	(	0.0	4214.0	3	.2	142	1.35	1.24	49.4	35.	7
F2.	000 51	.500	0.000	(	0.0	392.0	1	.0	73	0.99	1.22	48.5	10.	9
F2.	001 51	.270	0.000	(	0.0	518.0	1	.1	83	0.95	1.10	43.6	12.	5
F2.	002 51	.120	0.000	(	0.0	616.0	1	.2	86	0.98	1.11	43.9	13.	7
F2.	003 51	.030	0.000	(	0.0	742.0	1	.4	99	0.89	0.94	37.2	15.	0
F2.	004 50	.950	0.000	(	0.0	882.0	1	.5	73	1.47	1.82	72.4	16.	3

F3.000 50.700 0.000 0.0 28.0 0.3 29 0.98 2.11 83.8 2.9 ©1982-2018 Innovyze

DBFL Consulting Engineers	Page 2
Ormond House	
Upper Ormond Quay	
Dublin 7	Micro
Date 10/10/2019 11:01 Designed by Byrnese	Drainage
File NETWORK 07102019.2.MDX Checked by	brainage
Innovyze Network 2018.1	
Network Design Table for FS_1	
PN Length Fall Slope Area Units Base k HYD DIA Section (m) (m) (1:X) (ha) Flow (l/s) (mm) SECT (mm)	on Type Auto Design
F2.005 26.059 0.560 46.5 0.000 28.0 0.0 1.500 o 225 Pipe/C	Conduit
F2.000       40.000       20.4       0.000       500.0       0.0       1.500       0       225       Fipe/C         F2.007       47.033       1.550       30.3       0.000       840.0       0.0       1.500       0       225       Pipe/C	Conduit
F1.006 41.753 1.000 41.8 0.000 0.0 0.0 1.500 o 225 Pipe/C	Conduit 🦀
Network Results Table	
PN US/IL $\Sigma$ Area $\Sigma$ Base $\Sigma$ Units Add Flow P.Dep P.Vel Vel	Cap Flow
(m) (ha) Flow (l/s) (l/s) (mm) (m/s) (m/s) (	(l/s) (l/s)
F2.005 49.810 0.000 0.0 938.0 1.5 77 1.40 1.69	67.0 16.8
F2.006 49.250 0.000 0.0 1498.0 1.9 76 1.79 2.16	85.8 21.3
F2.007         47.600         0.000         0.0         2338.0         2.4         88         1.86         2.09	83.0 26.6
F1.006 46.050 0.000 0.0 6552.0 4.0 129 1.88 1.78	70.7 44.5
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DBFL Consulting Engineers		Page 3
Ormond House		
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#### Manhole Schedules for FS\_1

MH Name	MH CL (m)	MH Depth (m)	Coni	MH nection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
F7	53.870	1.320	Open	Manhole	1200	F1.000	52.550	225				
F6	53.350	1.940	Open	Manhole	1200	F1.001	51.410	225	F1.000	51.410	225	
F5	53.300	2.060	Open	Manhole	1200	F1.002	51.240	225	F1.001	51.240	225	
F4	52.600	3.853	Open	Manhole	1200	F1.003	48.747	225	F1.002	50.500	225	1753
F3	48.280	1.259	Open	Manhole	1200	F1.004	47.021	225	F1.003	47.021	225	
F2	48.000	1.380	Open	Manhole	1200	F1.005	46.620	225	F1.004	46.620	225	
F1-8	55.580	4.080	Open	Manhole	1200	F2.000	51.500	225				
F1-7	53.000	1.730	Open	Manhole	1200	F2.001	51.270	225	F2.000	51.270	225	
F1-6	52.870	1.750	Open	Manhole	1200	F2.002	51.120	225	F2.001	51.120	225	
F1-5	52.600	1.570	Open	Manhole	1200	F2.003	51.030	225	F2.002	51.030	225	
F1-4	52.450	1.500	Open	Manhole	1200	F2.004	50.950	225	F2.003	50.950	225	
F1-3-1	52.150	1.450	Open	Manhole	1200	F3.000	50.700	225				
F1-3	51.400	1.590	Open	Manhole	1200	F2.005	49.810	225	F2.004	49.810	225	
									F3.000	49.810	225	
F1-2	50.650	1.400	Open	Manhole	1200	F2.006	49.250	225	F2.005	49.250	225	
F1-1	49.150	1.550	Open	Manhole	1200	F2.007	47.600	225	F2.006	47.600	225	
Fl	48.810	2.760	Open	Manhole	1200	F1.006	46.050	225	F1.005	46.050	225	
									F2.007	46.050	225	
FO	46.300	1.250	Open	Manhole	0		OUTFALL		F1.006	45.050	225	

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Upper Ormond	Qua	У						
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THHOVYZE					Network	2010.1		
			ът		COLIEDIU	EC for		
			PI	PELINE	SCHEDUL	LS IOT	FS_1	
				IIng	troom M	anhala		
				<u>ups</u>	стеаш М	amore		
PN	Hvd	Diam	мн	C.Level	I.Level	D.Depth	МН	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
F1.000	0	225	F7	53.870	52.550	1.095	Open Manhole	1200
F1.001	0	225	F6	53.350	51.410	1.715	Open Manhole	1200
F1.002	0	225	F5	53.300	51.240	1.835	Open Manhole	1200
F1.003	0	225	F4	52.600	48.747	3.628	Open Manhole	1200
F1.004	0	225	F3	48.280	47.021	1.034	Open Manhole	1200
F1.005	0	225	F2	48.000	46.620	1.155	Open Manhole	1200
F2.000	0	225	F1-8	55.580	51,500	3.855	Open Manhole	1200
F2.001	0	225	F1-7	53.000	51.270	1.505	Open Manhole	1200
F2 002	0	225	F1-6	52 870	51 120	1 525	Open Manhole	1200
F2.003	0	225	F1-5	52,600	51.030	1.345	Open Manhole	1200
F2.004	0	225	F1-4	52.450	50.950	1.275	Open Manhole	1200
F3.000	0	225	F1-3-1	52.150	50.700	1.225	Open Manhole	1200
F2.005	0	225	F1-3	51.400	49.810	1.365	Open Manhole	1200
F2.006	0	225	F1-2	50.650	49.250	1.175	Open Manhole	1200
F2.007	0	225	F1-1	49.150	47.600	1.325	Open Manhole	1200
F1.006	0	225	F1	48.810	46.050	2.535	Open Manhole	1200

#### Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
F1.000	25.080	22.0	F6	53.350	51.410	1.715	Open Manhole	1200
F1.001	8.449	49.7	F5	53.300	51.240	1.835	Open Manhole	1200
F1.002	11.857	16.0	F4	52.600	50.500	1.875	Open Manhole	1200
F1.003	51.076	29.6	F3	48.280	47.021	1.034	Open Manhole	1200
F1.004	71.801	179.1	F2	48.000	46.620	1.155	Open Manhole	1200
F1.005	48.781	85.6	F1	48.810	46.050	2.535	Open Manhole	1200
F2.000	20.346	88.5	F1-7	53.000	51.270	1.505	Open Manhole	1200
F2.001	16.407	109.4	F1-6	52.870	51.120	1.525	Open Manhole	1200
F2.002	9.706	107.8	F1-5	52.600	51.030	1.345	Open Manhole	1200
F2.003	12.031	150.4	F1-4	52.450	50.950	1.275	Open Manhole	1200
F2.004	45.459	39.9	F1-3	51.400	49.810	1.365	Open Manhole	1200
F3.000	26.533	29.8	F1-3	51.400	49.810	1.365	Open Manhole	1200
F2.005	26.059	46.5	F1-2	50.650	49.250	1.175	Open Manhole	1200
F2.006	46.875	28.4	F1-1	49.150	47.600	1.325	Open Manhole	1200
F2.007	47.033	30.3	F1	48.810	46.050	2.535	Open Manhole	1200
							-	
F1.006	41.753	41.8	FO	46.300	45.050	1.025	Open Manhole	0
							1	

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DBFL Consulting Engineers		Page 5
Ormond House		
Upper Ormond Quay		
Dublin 7		Mirro
Date 10/10/2019 11:01	Designed by Byrnese	Drainage
File NETWORK 07102019.2.MDX	Checked by	Diamage
Innovyze	Network 2018.1	
Free Flowing	Outfall Details for FS_1	
Outfall Outfall C	. Level I. Level Min D.L. W	
Pipe Number Name	(m) (m) I. Level (mm) (mm)	
	(m)	
F1.006 F0	46.300 45.050 0.000 0 0	
	00.0010 Tool of	
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APPENDIX G – BUS CONNECTS CBC BRAY TO CITY CENTRE



### APPENDIX H – SURFACE WATER AUDIT

JBA Project Code	2019s1156
Contract	Residential Development at Cornelscourt, Dublin 18
Client	Cornel Living Ltd.
Date	18 <sup>th</sup> October 2019
Author	Jamie Cullen
Subject	Stormwater Audit - Stage 1 Report



# 1 Residential Development at Cornelscourt Village, Old Bray Road, Cornelscourt, Dublin 18.

### 1.1 Introduction

JBA Consulting have been contracted by Cornel Living Ltd. to undertake a Stage 1 audit of the surface water drainage design by DBFL for the proposed residential development at Cornelscourt Village, Old Bray Road, Cornelscourt, Dublin 18.

The results of the audit are set out in the table below.

#### 1.2 Stage 1 Audit

Design Parameter	Audit Result
Proposed Development	The subject site is located adjacent to Cornelscourt Village with the N11 located to the north-east of the site.
	The proposed development will comprise 469 residential units made up of both houses and apartments together with residential amenity space, office space and a café.
	The total site area is stated to be C.2.05 hectares (ha).
	The subject of this Stage 1 stormwater audit is to review the proposed surface water drainage design and sustainable urban drainage system proposals for the proposed development.
Relevant Studies/Documents	The following documents were considered as part of this surface water audit: • The SuDS Manual (CIBIA C753):
	<ul> <li>Recommendations for Site Development Works for Housing Areas (DoEHLG);</li> <li>Greater Dublin Strategic Drainage Strategy (GDSDS);</li> </ul>
Key Considerations & Benefits of SUDs	<ul> <li>The key benefits and objectives of SuDS considered as part of this audit and listed below include:</li> <li>Reduction of run-off rates;</li> <li>Provision of volume storage;</li> <li>Volume treatment provided;</li> <li>Reduction in volume run-off;</li> <li>Water quality improvement;</li> <li>Biodiversity.</li> </ul>
Site Characteristics	<b>Soil:</b> The soil at the site has been indicated as being Soil type 3 (SPR 0.37) following site investigation by Ground Investigations Ireland in January 2019, typically brown slightly sandy gravelly topsoil overlying made ground and/or firm to stiff light brown slightly sandy slightly gravelly clay.
	Infiltration testing was carried out as part of the SI to 3nr infiltration test locations. Infiltration was not observed at any of the test locations.
	Therefore, for the calculation of QBAR the adoption of soil type 3 is considered conservative in terms of the design.
	Rainfall (basis for surface water pipeline network design): Rainfall parameters can be estimated using Met Éireann data, using the Flood Studies Report (FSR) values or the values in the GDSDS. The Met Éireann method can be more representative of a site if selected correctly. A comparison of values estimated by DBFL and JBA is shown below:



JBA

JBA

JBA Project Code Contract Client Date Author Subject 2019s1156 Residential Development at Cornelscourt, Dublin 18 Cornel Living Ltd. 18<sup>th</sup> October 2019 Jamie Cullen **Stormwater Audit - Stage 1 Report** 



	DBFIRainfall model:GDSIM5-60 (mm):16.40Ratio R:0.273	<b>- value</b> DS )mm }	<b>JBA Value</b> Met Éireann 16.40mm 0.273
	The above variances a	re within acceptable	limits.
	DBFL propose to discha	arge to existing surfa	ace water sewers bounding the site.
	Using an SPR value of the site area have been input data calculated th of 8.36l/sec is deemed	0.37 for the site, the calculated by DBFL is as 8.53 l/sec and acceptable.	greenfield runoff rates (QBAR) for as 8.36 l/sec. JBA, for the same as such the proposed discharge rate
	As the QBAR figure is g QBAR will be the limitin development.	greater than the 2l/se ig discharge for all s	ec/ha allowance in the GDSDS, torm events from the subject
	Windes Calculations The Windes models as the total equivalent imp	s submitted for the at permeable areas as	ttenuation calculations account for calculated.
	The surface water drai which is considered an	inage network has b appropriate standar	een designed to 5-year return period rd of design for sewer network design.
	Attenuation provision Change.	is made for the 1 i	n 100-year event plus 10% Climate
uDS Measures onsidered	DBFL have included th development. No refer	e following SUDs m ence has been made	easures within the proposed e to any other measures considered.
	SUDS Technology	Comments	
	Blue/Green Roofs	Green roofs are	proposed to all apartment blocks
	Swale/ Filter Drain / Infiltration trench	Bio-swale filter proposed to the r corner of the sit purposes of roof	drains (infiltration trenches) are rear of dwellings along south-east te for interception and infiltration surfaces.
	Permeable Paving	A drainage reser on the podium sla	voir (drainage board) is provided ab over basement
	Permeable Paving Petrol Interceptor	A drainage reser on the podium sla It is proposed to prior to discharge	rvoir (drainage board) is provided ab over basement include a hydrocarbon interceptor e from site.
	Permeable Paving Petrol Interceptor Surface Water Attenuation	A drainage reser on the podium sli lt is proposed to prior to discharge Attenuation will b A. 3 nr atte B. Bio-rete C. Drainag D. Bio-swa E. Green r	rvoir (drainage board) is provided ab over basement include a hydrocarbon interceptor e from site. De provided by way of: enuation systems. ention areas. le reservoir / board le filter drains oofs to apartment blocks.
	Permeable Paving Petrol Interceptor Surface Water Attenuation Site Run-off Rates	A drainage reser on the podium sla It is proposed to prior to discharge Attenuation will b A. 3 nr atte B. Bio-rete C. Drainag D. Bio-swa E. Green r DBFL propose to of QBAR for all s	rvoir (drainage board) is provided ab over basement include a hydrocarbon interceptor e from site. be provided by way of: enuation systems. ention areas. Je reservoir / board le filter drains oofs to apartment blocks. b limit discharge to the equivalent torm events.



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	Tree Root Structural Cell Systems, Bio- retention, rain garden	Bio retention are from bungalows the developmen Tree pits are pro	eas are provided for roof water along the south-west corner of t. ovided for internal streets.	
Surface Water Drainage Design	All surface water flows generated by the development will be attenuated and discharged to existing surface water sewer at a rate QBAR.			
SuDS Management Train	<b>Source Control</b> and <b>Site Control</b> are addressed by the use of SuDS devices (interception storage) and attenuation with outflow controlled by a Hydrobrake. A petrol interceptor has been proposed prior to discharge from site. As recommended with the SUDs Manual (Table 3.3) assuming effective pre-treatment is in place the following number of treatment train components are recommended:			
		No. of treatment train components	Comment/Proposals	
	Roof areas	recommended 1	Green roofs, Bio-swale filter drains and bio-retention areas have been proposed to intercept runoff from the roof of the houses	
	Residential roads, parking areas, commercial zones	2	Drainage reservoir / board is proposed for the podium slab ove basement and tree pits are proposed for internal streets. A full retention separator has been proposed for all flows prior to discharge from site.	r n
	Refuse collection, industrial areas, loading bays, lorry parks and highways.	3	Not applicable.	
	A hydrobrake desig of the attenuation s surface water sewe	ned for a linear discharg structures to limit flows t er.	ge profile will be provided at the outfa o a maximum of QBAR to the existi	ılls ng
Climate Change	An allowance of climate change for storage. This is th	10% increase in rainfal the rainfall intensities fo the minimum requirement	I depth factor has been included to the purposes of sizing the attenuation tof the GDSDS.	lor on
Volume Storage	DBFL have run a Windes model to assess the attenuation volumes provided. The proposed attenuation structure is sized such that surcharging to a level greater than 300mm below manhole cover level will not occur.			
Volume Run-off	No comparison of pre and post development storm volumes have been provided, however, as it is proposed to limit discharge to QBAR for all storm events, such a calculation is not deemed necessary.			
Treatment Volume / Water Quality Improvement	Interception storage is now proposed by way of bio-swale filter drains in rear gardens, green roofs, drainage boards, and tree pits.			



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Return Period	A 100-year return period plus 10% for climate change has been used in the design for the attenuation systems.		
Exceedance flows	DBFL have considered exceedance flows with the extent of SuDS features provide throughout the entire site. DBFL have incorporated additional gullies to minimise risk associated with blocked gullies.		
Health & Safety and Maintenance Issues	The proposed drainage system comprises SuDS devices, traditional road gullies, attenuation systems and underground pipes. These elements are considered acceptable from a Health & Safety perspective once supplier/manufacturers guides are followed and complied with during the detailed design, construction and operation. Optimum performance of the SuDS treatment train is subject to the frequency of maintenance provided. At detailed design stage, it is recommended that a maintenance regime be adopted.		
	Particular consideration is required at detailed design stage to the design, maintenance requirements and whole life plan (and replacement) of the SuDS system as a whole.		
	Regular maintenance of the flow control device will be required to remove any blockages, particularly in the wake of heavy rainfall events or local floods.		
	It is recommended that the petrol interceptor be fitted with an audible high-level silt and oil alarm for maintenance and safety purposes. Regular inspection and maintenance are recommended for the petrol interceptor. Please note that silt and debris removed from the petrol interceptor during maintenance will be classified as contaminated material and should only be handled and transported by a suitably licensed contractor and haulier and disposed of at a suitably licensed landfill only.		
Design Review Process	Upon review of the initial drainage design, JBA Consulting provided feedback, resulting in some modifications, namely:		
	<ul> <li>The discharge rate has been reduced to reflect the revised calculation of QBAR</li> <li>Runoff from green open spaces have been incorporated into the attenuation storage calculations</li> </ul>		
	<ul> <li>Attenuation storage has been increased due to a reduced calculation of QBAR and additional runoff from green open spaces</li> <li>Increased source control / interception by the provision of tree pits along the road bounding the eastern part.</li> </ul>		
	<ul> <li>of the site</li> <li>provision of a bio-retention area for houses along the southwest corner of the site</li> </ul>		
	<ul> <li>Additional road gullies have been provided to minimise risk of flooding should some gullies become blocked</li> </ul>		
	A summary of comments and record of the audit trail are appended to this report.		
	Based on this being at preliminary design stage and a Stage 1 Surface Water Audit, JBA Consulting's comments have all been satisfactorily addressed or sufficient commitment provided that details will be confirmed at detailed design stage.		

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Summary of items to be considered at Detailed Design Stage	<ul> <li>There are a number of items that can be addressed at detailed design stage. A summary of same are as follows:</li> <li>Full details of the green roof details to be developed and agreed.</li> <li>Proper detail design and construction of SuDS devices is paramount to ensure long term optimum hydraulic performance as well as</li> </ul>
	<ul> <li>maximisation of biodiversity opportunity. It is recommended that a collaborated approach to detail design is adopted between engineers, architects, ecologies and landscape architects.</li> <li>Maintenance regime for each of the components on site to be prepared and submitted to Dun Laoghaire Rathdown Co Council;</li> <li>Hydrobrake selection to be give due consideration to hydraulic performance, actual head behind the unit, maximum potential clear passage size and maintenance requirements.</li> </ul>
Audit Result	JBA Consulting considers that the surface water drainage design for the proposed development is acceptable and meets the requirements of the Stage 1 Stormwater Audit.
Audit Report Prepared by:	Jamie Cullen BEng (Hons) MSc. Assistant Engineer
pproved by: Declan White BE CEng MIEI IMaPS Principal Engineer	

#### Note:

JBA Consulting Engineers & Scientists Ltd. role on this project is as an independent reviewer/auditor. JBA Consulting Engineers & Scientists hold no design responsibility on this project. All issues raised and comments made by JBA are for the consideration of the Design Engineer (DBFL). Final design, construction supervision, with sign-off and/or commissioning of the surface water system so that the final product is fit for purpose with a suitable design, capacity and life-span, remains the responsibility of the Design Engineers.

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Appendix A – Audit Trail Record

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## JBA Consulting Stormwater Audit

Project: Residential Development at Cornelscourt, Dublin 18

Date: 10/09/2019

JBA Reviewers Leanne Leonard - Engineer

Item No.	JBA Review Comment	Comment/Clarification Request/Suggested Mitigation	Response from Client/Client Representative	Acceptable / Not
				Acceptable
	10/09/2019		10/10/2019	
Desuments	Infrastructure Design Desert dated Luce 2010			
provided	Drg. No. 180208-DBFL-XX-XX-DR-C-3001 Rev P0			
-	Drg. No. 180208-DBFL-XX-XX-DR-C-3003 Rev P0			
1	Allowable Greenfield Runoff Rate	DBFL to review	Refer to DBFL's Infrastructure Design Report, Section 3.2.4. Qbar is calculated as 8.36 l/sec.	
	For the input data indicated in section 3.2.4 of the infrastructure design report (Area = 2.11ha, SAAR = 945mm and SOII, Type 3), IBA estimate the			
	Qbar value to be 8.61l/sec which is lower than the 10l/sec as proposed			Acceptable
2	Attenuation Calculations	DBFL to review	Refer to updated Source Control Calculations for Catchment A, Catchment B & Catchment C. The results are summarised in	
	Pending item 1 above, the attenuation volumes may need to be revised given		DBFL's Infrastructure Design Report, Section 3.2.7.	
	a reduced Qbar value			Acceptable
2	Eastered Impermeable Area	DBEL to roviour	Table 2.1 has been undeted. Soft landscoping has a sumff so officient of 0.15. Also refer to DDFI's Infrastructure Design	
5	Table 3.1 indicates that soft landscaping areas will have zero runoff to the		Report, Section 3.2.3.	
	storm drainage system with no subsequent requirement for associated			
	storage. Given there is minimal infiltration potential, some runoff allowance			Acceptable
	may be required, especially for exceedance rainfall.			
	Design Stondards		Defente DDEL   Informative Device Device Continue 2.2.5. Datis   D   is noted as 0.272. This is also reflected in the Course	
4	The ratio "r" as indicated in section 3.2.5 of the infrastructure design report	DEFL to review	Control and Network Design Calculations.	
	is 0.25 whereas site specific rainfall from Met Eireann would suggest the "r"			Acceptable
	value is 0.273 (M5-60 = 16.4mm and M5-2 day is 60mm) thereby increasing			
	storage requirements			
5	SuDS Provision	DBFL to review and advise if additionla SuDS can be provided	RE: Road Along Eastern Boundary of Site. Surface water runoff from this paved area (permeable) will be directed to the	
	However, we note that the section of road along the eastern boundary of the		draining via tree pits and DBFL Drawing 3010 for a typical detail of same.	A second able
	site does not appear to have any interception provision.			Acceptable
6	Roof Drainage	DBFL to review and advise	A bioretention area has been included in the design as a SUDS measure for draining roofs located along the site's south-	
	Roof water to houses along eastern boundary are noted to connect to bio-		western boundary (refer to DBFL Drawing 3001). A typical detail for same is shown on DBFL Drawing 3012.	
	along south-western boundary are intercepted / connected to main storm			Acceptable
	network			