#### Project

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

**Report Title** 

Infrastructure Design Report

Client

**Cornel Living Ltd.** 





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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 412 apartments, 7 houses, residential amenities (a gym; a variety of tenant amenity lounges including a concierge; a single storey multipurpose pavilion building within the communal courtyard), a childcare facility and café / retail unit on a 2.15 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. Infiltration test results are included in Appendix B.

#### **1.6. Proposed Development**

The proposed development ("the site") comprises of 412 apartments, 7 houses, residential amenities (a gym; a variety of tenant amenity lounges including a concierge; a single storey multipurpose pavilion building within the communal courtyard), a childcare facility and café / retail unit and associated engineering infrastructure including access for vehicles and pedestrians from the Old Bray Road, surface water drainage, foul drainage and water supply infrastructure. Proposed foul drainage infrastructure includes provision of a 2,150 m<sup>3</sup> balancing storage tank which will facilitate a potential future upgrade of the Foxrock Catchment by Irish Water. Foul drainage flows from the development will be routed via a pump station which is to be incorporated within the balancing storage tank.



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

#### 2. SITE ACCESS

#### 2.1. 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.

The access arrangement described above serves as the vehicular access route to the basement carpark and to the podium area (set down only) and provides a more formalised access when compared to the existing access arrangements for the AIB carpark. A layby is also provided adjacent to Block E use by delivery vehicles.

No direct vehicle access for residents is provided to the seven houses located along the eastern boundary (this is intended as a pedestrian zone), however, fire tender access to this area and access to the ESB sub-station and foul drainage pumping station in the eastern corner of the site is facilitated via the podium (removable bollards are located on the southern side of the podium).

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. Also refer to DBFL Drawing 180208-DBFL-XX-XX-DR-C-2010 (Pedestrian and Cycle Linkage Plan).

- Provides pedestrian access to the podium area of the development from two locations along Old Bray Road (i.e. direct, dedicated, attractive and safe linkage to a range of local amenities and local service destinations in Cornelscourt Village).
- A pedestrian crossing is provided at the key pedestrian desire line on approach to the podium area (at the point where vehicles approach the podium area) allowing pedestrian to informally assert a degree of priority.

- At the northern corner of the site, provision is made for cycle access from the adjacent bicycle parking area at basement level to the existing cycle track located along the N11.Pedestrian access is also facilitated at this location from the development to the proposed footpath along the N11 (this proposed footpath aligns with objectives in the Bus Connects Emerging Preferred Route for Bray to the City Centre).
- Dedicated cycle access to bicycle parking areas at basement level is also provided at two locations along the eastern side of the basement (accessed from Old Bray Road via the shared surface which runs from the podium area, along the southern site boundary before turning north towards the cycle access points at the eastern side of the basement).
- As a secondary means of accessing bicycle parking at basement level, wheeled channels adjacent to stairs from podium level are also provided.
- The cycle access points noted above are completely separate from the vehicle access ramp to the basement.
- Provision is also made for a potential future cycle / pedestrian link at the eastern corner of the site (linking the proposed development to the existing park at the northern end of Willow Grove).

#### 2.2. Vehicle Tracking

The proposed site layout has been tracked (using AutoTrack software) to demonstrate that large vehicles such as a high-reach fire tender can access the site, travel onto the podium slab and access the houses along the eastern boundary (refer to DBFL Drawings 180208-XX-XX-DR-C-2003, 180208-XX-XX-DR-C-2004 and 180208-XX-XX-DR-C-2005).

#### 2.3. 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.

#### 2.4. Traffic and 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).

#### 3. SURFACE WATER DRAINAGE

#### 3.1. 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)

#### 3.2. Basis of Design

#### 3.2.1. 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 vortex flow control devices (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 tanks, 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 filter drains** located in their rear gardens (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 southwestern and south-eastern boundaries) 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).

#### 3.2.2. Compliance with Surface Water Drainage Policy

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

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

• Criterion 1:

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

• Criterion 2:

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

• Criterion 3:

Level of Service (Flooding) for the Site – Satisfied by reviewing available flood hazard information (e.g. Eastern CFRAM Study) relating to the 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.

#### 3.2.3. Proposed Runoff Coefficients and Factored Impermeable Areas

#### Proposed Runoff Coefficients

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

• 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) drain via filter drains. 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 – 30% 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 – 47% 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.

		Catch	mont A	Catabrant B		Catchment C		Catchment D		Total (m2)	
		Catchi		Catchin		Catchi		Cattin		101a	
	Runoff	Gross Areas	Factored	Gross Area	Factored						
	Coefficients	(m2)	Areas (m2)	(m2)	Areas (m2)						
Roofs (Houses ) Draining Via SUDs	0.85	-	-	94	79	251	213	407	346	751	639
Green Roofs (Apartment Buildings) - Sedum Blanket	0.95	1,505	1,430	1,125	1,069	1,847	1,755	956	908	5,433	5,161
Green Areas on Podium (Over Drainage Board)	0.85	-	-	503	427	852	724	688	585	2,043	1,736
Permeable Paved Areas on Podium (Over Drainage Board)	0.9	-	-	1,903	1,712	991	892	459	413	3,352	3,017
Paved Areas Draining to Gullys (adjacent to Old Bray Road)	0.95	477	453	-	-	-	-	-	-	477	453
Permeable Paved Areas – Draining via Tree Pits with Overflow to Gullies	0.7	-	-	-	-	585	409	321	225	906	634
Soft Landscaping	0.53	1,251	663	597	316	4,347	2,304	1,960	1,039	8,154	4,322
	•	3233.400	2546.184	4220.400	3603.952	8872.600	6297.395	4789.700	3514.553	21116.100	15962.084

Table 3.1 Proposed Runoff Coefficients and Factored Impermeable Areas

#### 3.2.4. 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 Class >8°

Therefore, Soil Type 4

Table 4.5 The classification of soils index of writter rain acceptance , by writter rain acceptance rate from soil survey data.

Drainage	Depth	Slope classes									
Group	impermeable	n gytun He McCun	0 - 2*			2 - 8*	and the		>8"	25423	
	myer (cm)	E SA		Permea	bility rate	s above im	permeabl	e layers		1.73	
		Rapid	(2) Medium	Slow (30	Rapid (1)	(2) Medium	Slow (3)	(1) Rapid	Medium.	Slow	
	>80				1		(=** - ); }	1	2	3	
1	40 - 80					2		3		4	
	<40		1-1078		· · · · · · · · · · · · · · · · · · ·			1999 - Carlos - Carlo			
	>80	2							119	1994	
2	40 - 80	2	131.5		•	1	4			1.1	
	<40	3	6.12.50	1.011	and the						
	>80		100	1.000		12.1	12.5		- · ·		
3	40 - 80	1.0	o coste	8201.94		5	1.328	10000000000000000000000000000000000000	1.5		
	<40	1.11.1	15 343				1.000	11.25.2			

Winter rain acceptance indices: 1, very high; 2, high; 3, moderate; 4, low; 5, very low. Upland peat and peaty soils are in Class 5. Urban areas are unclassified.

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.2.11 Ha (for purposes of total surface water catchment area)

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

SOIL – Soil Type 4

Qbar = 13.16 l/sec (equivalent to 6.24 l/sec/Ha)

#### 3.2.5. 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:**

٠	Return period for pipe work design	5 years
•	Return period for attenuation design	100 years
•	Soil Type	4
•	Allowable Outflow	6.24 l/sec/ha
•	Time of entry	4 minutes
•	M5 - 60	16.4 mm
•	M5 – 2 Day	60.1 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 F for Surface Water Network Design Calculations. Surface Water Calculations have been carried out using Microdrainage WinDes analysis software.

#### 3.2.6. 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 450mm 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) 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 13.0 l/sec
- Surface water discharge will also pass via a Class 1 full retention fuel / oil separator (sized in accordance with permitted discharge from the site)

#### 3.2.7. Attenuation Calculation

Attenuation volumes have been calculated based on an allowable outflow / greenfield runoff rate of 6.24 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). In total 779m<sup>3</sup> of stormwater storage is provided.

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 (cascades into Catchment B)	Aquacell Underground Chamber	0.323 Ha	0.255 Ha	2 l/s	107.4m <sup>3</sup>	129.2m <sup>3</sup>
В	Aquacell Underground Chamber	0.422Ha	0.360 Ha	5.7 l/s	133.8m <sup>3</sup>	144m <sup>3</sup>
C (cascades into Catchment D)	Stormtech Underground Chamber	0.887 Ha	0.630 Ha	5.0 l/s	260.3m <sup>3</sup>	342.3m <sup>3</sup>
D	Stormtech Underground Chamber	0.478 Ha	0.351 Ha	7.3 l/s	146m <sup>3</sup>	154m <sup>3</sup>
Total		2.11 Ha	1.596 Ha	-	647.5m <sup>3</sup>	769.5m <sup>3</sup>

Note, Catchment B (5.7 l/s) & Catchment D (7.3 l/s) share a single discharge point. i.e. Qbar 13 l/s (i.e. in accordance with allowable Greenfield Runoff Rate Calculated in Section 3.2.4).

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

#### 3.2.8. Interception Volume

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

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

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

#### 3.2.9. 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.

#### 3.3. Flood Risk

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

#### 3.4. Surface Water Quality Impact

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

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

- Surface water network designed in accordance with GDSDS requirements
- Incorporates SUDS features e.g. 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.

#### 4. FOUL DRAINAGE

#### 4.1. Existing Foul Drainage

An existing foul drain (225 diameter) is located adjacent to the site's eastern corner, at the northern end of Willow Grove. An existing combined sewer (300 diameter) is located approx. 240m from the eastern corner of the site (in the verge adjacent to the N11). Refer to Figure 4.1 and the Irish Water Network Plan included in Appendix A.

Both the foul sewer and combined sewer noted above ultimately outfall to Shanganagh WWTP.



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

#### 4.2. Design Strategy

As per earlier comments regarding surface water drainage, the site falls from its south-west corner towards its north-east corner forming a single foul drainage catchment.

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

Refer to DBFL Drawings 180208-XX-XX-DR-C-3001 and 180208-XX-XX-DR-C-3002 for the proposed foul drainage infrastructure described above.

#### 4.3. Pre-Connection Feedback from Irish Water

The applicants and DBFL have engaged in significant consultation on foul drainage provisions for the subject site with Irish Water. Following these detailed discussions and submission of design proposals an updated Confirmation of Feasibility has been received from Irish Water(included in Appendix D).

- A key design requirement during these discussions was the provision of a 2,150 m3 balancing storage tank within the subject site to accommodate for additional storm storage within the wider catchment (this is also referenced in the updated confirmation of feasibility letter). The proposed development makes provision for the on-site 2,150 m3 balancing storage tank (located in the eastern corner of the site) which will facilitate a potential future upgrade of the Foxrock catchment by Irish Water. The applicant will continue to engage with Irish Water with regard to the scope of works and delivery strategy for the balancing storage tank. The proposed arrangement of the balancing storage tank is shown on the drawings 180208-DBFL-XX-XX-DR-C-3001 (Site Services Layout Sheet 1), 180208-DBFL-XX-XX-DR-C-3004 (Site Services Layout Sheet 2) and 180208-DBFL-XX-XX-XX-DR-C-3004 (Site Services Layout Sheet 2).
- In addition to the new catchment storm storage tank a new 825mm diameter combined sewer will be constructed, traversing the site from the entrance at Old Bray Road to the 2,150 m3 balancing storage tank (located in the eastern corner of the site). This pipeline will also facilitate a potential future upgrade of the Foxrock catchment by Irish Water. Refer to drawings 180208-DBFL-XX-XX-DR-C-3001 (Site Services Layout Sheet 1) and 180208-DBFL-XX-XX-DR-C-3040 (IW Interceptor Sewer Long Sections)
- Provision of the balancing storage tank and 825mm diameter combined sewer as noted above is not required to facilitate the proposed development itself but will

form part of future upgrades within the wider Foxrock catchment by Irish Water. The site is therefore delivering a positive element of future foul infrastructure for the local area and general drainage catchment.

- As part of the proposal referred to in the Confirmation of Feasibility and to service the development in the short term the storm storage facility includes an on-site pumping station / storage in order to store foul drainage flows from the development during heavy rainfall conditions should the existing combined sewer network downstream come under pressure. The on-site pump station is to be integrated within the 2,150 m3 balancing storage tank. As noted in the confirmation of feasibility letter from Irish Water dated 4th October 2021 "Design of the pump station and related equipment has to be agreed with IW at connection application stage. Some enhanced features in terms of telemetry, pump resilience will be required at this foul pump station". Emergency storage is facilitated at this pump station for both 24-hour and 48-hour foul drainage flows from the development. As noted previously, design of the pump station will be agreed with Irish Water at connection application stage (this will include integration of the pump station with the 2,150 m3 balancing storage which the development is providing to facilitate potential future upgrades of the wider Foxrock catchment by Irish Water). Refer to drawing 180208-DBFL-XX-XX-DR-C-3050 (Foul Pump Station Layout & Section).
- Post catchment storm events stored foul flows from the development are then returned to proposed 300 diameter pipeline which outfalls from the site's eastern corner, towards northern end of Willow Grove and onwards along the verge adjacent to the N11 prior to discharge to manhole SO22257704 on the existing combined sewer network (approx. 240m from the eastern corner of the site). The proposed 300 diameter pipeline will also facilitate potential future upgrades of the wider Foxrock catchment by Irish Water. Refer to drawing 180208-DBFL-XX-XX-DR-C-3004 (Site Services Layout Sheet 2). The 300mm outfall also receives flows from the site foul pump station during its standard operation, (ie outside storm events). The telemetry provisions referred to above will be used to control the operation of and discharge from the site pump station.
- Vehicle access for servicing / maintenance of the proposed foul pump station / storage tank is facilitated via the site access from Old Bray Road and the podium area (removable bollards are located on the southern side of the podium allowing access via the shared surface which runs from the podium area, along the southern site boundary before turning north towards the pump station / balancing storage).

#### 4.4. 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 G 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

#### 4.5. Foul Drainage – Environmental Impacts

#### **Residential**

#### Waste Water Discharge Calculation

#### (as outlined in Irish Water's Code of Practice for Wastewater Infrastructure)

No. of Dwellings	419
Post Development Average Discharge (DWF)	2.16 l/sec
Post Development Peak Discharge (DWF)	12.96 l/sec
Daily Foul Discharge Volume (446l per dwelling)	186,874 l/Day

#### Café / Retail Unit / Concierge / Residential Amenity / Childcare Facility

#### Waste Water Discharge Calculation

#### (as outlined in Irish Water's Code of Practice for Wastewater Infrastructure)

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	0.13 l/sec
(based on 8 hour occupancy)	
Post Development Peak Discharge	0.78 l/sec
(6 X DWF)	
Daily Foul Discharge Volume (50l per person)	3,750 l/Day

#### 5. Water Supply

#### 5.1. Existing Public Watermains

Existing public water supply infrastructure is located along Old Bray Road (24" Cast Iron Watermain, 9" 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

#### 5.2. 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:

 Provision of a water connection is feasible subject to construction of a 40m long watermain between the site and an existing 9' watermain on Old Bray Road.

#### 5.3. Proposed Watermain Layout

As noted previously, existing 24" Cast Iron, 9" 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.

In line with the pre-connection feedback received from Irish Water, it is proposed to take a 200mm diameter connection off the existing 9" Cast Iron public water supply line (located along the Old Bray Road).

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.

#### 5.4. 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.

#### 5.5. Materials

Proposed water mains are to be HDPE 100 SDR17.

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

#### 5.6. Water Demand

#### **Residential**

Water Demand has been calculated in accordance with the guidelines outlined in Irish Water's Code of Practice for Water Infrastructure:

•	No. of Dwellings	419
•	Average Occupancy Ration (Persons Per Dwelling)	2.7
•	Per-Capita Consumption (I/person/day)	150
•	Average Domestic Daily Demand (I/sec)	2.0
•	Post Development Average Hour Water Demand (I/sec)	2.5
	(1.25 x Average Domestic Daily Demand)	
•	Post Development Peak Hour Water Demand (I/sec)	12.5
	(5.0 x Post Development Average Hour Water Demand)	

#### Café / Retail Unit / Concierge / Residential Amenity / Creche

Water Demand has been calculated in accordance with the guidelines outlined in Irish Water's Code of Practice for Water Infrastructure:

•	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 (l/sec)	0.13
	(based on 8 hour occupancy)	
•	Post Development Average Hour Water Demand (I/sec)	0.16
	(1.25 x Average Domestic Daily Demand)	
•	Post Development Peak Hour Water Demand (I/sec)	0.8
	(5.0 x Post Development Average Hour Water Demand)	

**APPENDIX A** 

**IRISH WATER NETWORK PLANS** 



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

WATER

ÉIREANN : IRISH

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. © Irish Water

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# Legend

Stormwater Gravity Mains (Irish Water Owned)

Surface

Stormwater Gravity Mains (Non-Irish Water Owned)

--- Surface

Storm Manholes

Catchpit

## 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.

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



**APPENDIX B** 

**GII TRIAL PIT LOGS** 



	Grou	ind In	vestigatic www.gii.	Site Cornelscourt Trial Pit Number					
Machine : JCB Method :		Dimens	Dimensions			Level (mOD)	Client DBFL		Job Number 8354-01-19
		Locatio	n		Dates 21	/01/2019	Engineer		Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Rec	ords	Level (mOD)	Level Depth (mOD) (m) Description (Thickness)		Legend S	
Plan .  				· · · ·			Brown slightly sandy slight MADE GROUND: Brown s CLAY. Firm brown slightly sandy Complete at 1.90m Complete at 1.90m	tly gravelly TOPSOIL. slightly sandy slightly gravel slightly gravelly CLAY.	
· ·					· ·		Scale (approx) 1:25	Logged By Tmcl	Figure No. 8354-01-19.IT01

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

	Ground Investigations Ireland Ltd							Site Cornelscourt		
Machine : JCB Method :		Dimens	Dimensions			Level (mOD)	Client DBFL		Job Number 8354-01-19	
		Locatio	on		Dates 21	/01/2019	Engineer		Sheet 1/1	
Depth (m)	Sample / Test	s Water Depth (m)	Field R	ecords	Level (mOD)	Depth (ṁ) (Thickness)	Description		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 encountere Trial pit stable. Infiltration test completed in	tly gravelly TOPSOIL. phtly sandy slightly gravelly C ightly sandy gravelly CLAY w ad.	DLAY. → → → → → → → → → → → → → → → → → → →	
							mai pit packtilled on comple	euon or inititration test.		
					- -					
			-			5	Scale (approx) 1:25	Logged By Tmcl	Figure No. 8354-01-19.IT02	

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved
	Ground Investigations Ire www.gii.ie					Ltd	Site Cornelscourt	Trial Pit Number IT03	
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 Red	cords	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend S
						(0.25)	Brown slightly sandy slight	ly gravelly TOPSOIL.	
						(0.25)	Firm to stiff light brown slig with rare sub-angular cob	htly sandy slightly gravelly C bles.	LAY
						0.50	Firm to stiff brown slightly	sandy gravelly CLAY with rai	re 0 10 0
							sub-angular cobbles.		
						- (0.80)			
						(0.80)			0 <u>.0</u> 0 6.00 .00
									0 <u>.0</u> 0
						1.30	Firm to stiff grey mottled b	rown slightly sandy gravelly	
						-		nes.	10 10 0 10 10 0 10 10 10
						(0.60)			
						- 100			
						- 1.90	Complete at 1.90m		
						-			
						-			
						-			
						-			
						-			
						-			
						Ē			
						-			
						-			
						Ē,			
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	Ireland	Ltd	Site Cornelscourt	Trial Pit Number <b>TP-01</b>	
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 slight fragments of conrete and p 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 s granite and limestone. Rar	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 Groundwater encountered a	t 1 40m (Slight seepage) 2	10m (medium
						seepage) and 2.80m (mediu Trial pit sidewall collapsed b Trial pit terminated at 3.0m F	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 Ire www.gii.ie				Ltd	Site Cornelscourt		Trial Pit Number <b>TP02</b>
Machine : J	СВ	Dimensi	ons	Ground	Level (mOD)	Client DBFL		Job Number 8354-01-19
		Location	1	Dates 21	1/01/2019	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) (	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         Infiltration test completed in         Trial pit backfilled on completed	ly gravelly TOPSOIL. phtly sandy slightly gravelly Coles. sandy gravelly CLAY with raises rown slightly sandy gravelly of the second	CLAY     0     10     0       0     0     0     0     0       10     0     0
				·				
		·		·	· · ·	Scale (approx)	Logged By	Figure No.
						1.20	THU	555-1-19.1103

	Gro	und In	vestigati www.gi	ons Ire i.ie	land	Ltd	Site Cornelscourt		Trial Pit Number TP03
Machine:J Method:	СВ	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 / 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 6 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
						(2.10)			
						3.00	Terminated due to sidew Complete at 3.00m	alls collapsing.	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

Machine : JCB Method :       Dimensions       Ground Level (mOD)       Client DBFL       Job Number 8354-01-1         Location       Dates 22/01/2019       Engineer       Sheet 1/1         Depth (m)       Sample / Tests       Water (m)       Field Records       Level (mOD)       Depth (mOD)       Depth (mOD)       Depth (mOD)       Description       Legend Engineer         Image: Construction of the constructi	TP04			land	ons ire i.ie	Ground Investigations I www.gii.ie					
Location     Dates 22/01/2019     Engineer     Sheet 1/1       Depth (m)     Sample / Tests     Water Depth (m)     Field Records     Level (mOD)     Depth (Thickness)     Description     Legend       -     -     -     -     -     -     -     -       -     -     -     -     -     -     -     -       -     -     -     -     -     -     -     -       -     -     -     -     -     -     -     -       -     -     -     -     -     -     -     -       -     -     -     -     -     -     -     -       -     -     -     -     -     -     -     -       -     -     -     -     -     -     -     -       -     -     -     -     -     -     -     -       -     -     -     -     -     -     -     -       -     -     -     -     -     -     -     -       -     -     -     -     -     -     -     -       -     -     -     -     - <td< td=""><td>l<b>ob lumber</b> 354-01-19</td><td></td><td>Client DBFL</td><td>Level (mOD)</td><td>Ground</td><td></td><td>ons</td><td>Dimensi</td><td></td><td>JCB</td><td>Machine : J Method :</td></td<>	l <b>ob lumber</b> 354-01-19		Client DBFL	Level (mOD)	Ground		ons	Dimensi		JCB	Machine : J Method :
Depth (m)       Sample / Tests       Water Depth (m)       Field Records       Level (mOD)       Depth (m)       Depth (m)       Description       Legend         - <td>Sheet 1/1</td> <td></td> <td>Engineer</td> <td>/01/2019</td> <td>Dates 22</td> <td></td> <td>1</td> <td>Location</td> <td></td> <td></td> <td></td>	Sheet 1/1		Engineer	/01/2019	Dates 22		1	Location			
Image: Second state of the second s	gend S	escription	D	Depth (m) (Thickness)	Level (mOD)	ecords	Field R	Water Depth (m)	ple / Tests	Samp	Depth (m)
-       0.30         -       (0.30)         -       (0.30)         -       0.60         Firm to stiff grey mottled brown slightly sandy gravelly CLAY         -       with rare sub-angular cobbles and rare boulders.		ly gravelly TOPSOIL with grass	Brown slightly sandy sligh rootetls.	 (0.30)							
O.60     Firm to stiff grey mottled brown slightly sandy gravelly CLAY     with rare sub-angular cobbles and rare boulders.	<u> </u>	ndy slightly gravelly CLAY.	Firm light brown slightly sa	0.30 (0.30)							
		rown slightly sandy gravelly CLAY oles and rare boulders.	Firm to stiff grey mottled b with rare sub-angular cobl	0.60							
Plan	팀장님역도 위험장님께 당시하는 이 위상님께 방상 이 있는 것 같은 것 같	ghtly sandy gravelly CLAY with	Stiff light orange/brown sli rare sub-rounded cobbles	(1.50) (1.50) (1.40) (1.40) (1.40)							Plan
No Groundwater encountered. Trial pit stable.		əd.	No Groundwater encountere Trial pit stable.	- F	-			•		•	
Trial pit backfilled on completion.		tion.	Trial pit backfilled on comple	-	-						· ·
					-	·		·			· ·
				•	-	·		·			
				•	-						· ·
.       .	<b>o.</b> -19 TP04	Logged By Figure	Scale (approx)	S	•						

	Grou	ind In	vestigat www.g	tions Ire gii.ie	eland	Ltd	Site Cornelscourt		ר ז -	Trial Pit Number TP-06
Machine : J Method :	CB	Dimens	ions		Ground	Level (mOD)	Client DBFL		83	<b>Job</b> Number 354-01-19
		Locatio	<b>n</b> (Handheld G	iPS)	Dates 21	1/01/2019	Engineer		5	Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field F	Records	Level (mOD)	Depth (m) (Thickness)	D	escription	Le	Kater Konege
(m)	Sample / Tests	Depth (m)	Field F	Records	(mOD)	(Thickness) (0.20) (0.20) (0.30) (0.30) (0.30) (0.80) (0.80) (1.40) (	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 sligh subangular cobbles.         Trial pit terminated.         Complete at 2.90m         Remarks         Groundwater encountered a Trial pit terminated due to si	escription grey slightly sandy CLAY w to coarse gravel. slightly gravelly CLAY with a slightly gravelly CLAY with r estone and granite. tly sandy gravelly CLAY wit thy sandy gravelly CLAY wit the setone and granite.	th rare	
· ·	· ·		· ·			· · ·	Scale (approx)		Figure N	lo.
							1:25	TMcl	8354-01-	-19.TP-06

	Gro	und In	vestigatio	ons Ire i.ie	eland	Ltd	Site Cornelscourt	Trial Pit Number TP07A	
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 Ster
						(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

	Ground Investigations Ire www.gii.ie				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.		<u>6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</u>
								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)			6 
						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

	Ground Investigations Ire					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 In www.gii.ie					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

	G	Grou	nd In	vestię ww	gatior w.gii.ie	ns Ire	land	Ltd		Site Cornelscourt		Trial Pit Number TP-14
Machine : J Method :	ICB		Dimensi	ions			Ground Level (mOD)		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 signify gravely CLAY v unded cobbles. ightly gravelly CLAY with ran a strong hydrocarbon odour.	re <u>6 0 0</u>
								- - - - - - - - -	0)			2000 200 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	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
Plan .					-	(Intextiess) (0.25) (0.55) (0.55) (0.50) (0.50) (1.30) (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 0.9	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)       (b)       (a)       (b)       (a)       (b)       (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> s	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 <b>TP20</b>
Machine : . Method :	JCB		Dimens	ions	-		Ground Level (mOD)		Client DBFL		Job Number 8354-01-19
			Location	n			Dates 21	ates 21/01/2019		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

	Grou	nd In	vestigations www.gii.ie	Ireland	Ltd	Site Cornelscourt		Trial Pit Number IT01
Machine : Jo Method :	СВ	Dimens	ions	Ground	Level (mOD) 53.25	Client		Job Number 8354-01-19
		Locatio 72	n 2326.2 E 725877.3 N	Dates 21	/01/2019	Engineer DBFL		Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend
				53.05	(0.20)	Brown slightly sandy slight	lly gravelly TOPSOIL.	
					(0.30)	CLAY.	aigntiy sandy sightly gravel	ly .
Plan .				52.75	0.50	Firm brown slightly sandy Complete at 1.90m	slightly gravelly CLAY.	
				-		Scale (approx)	Logged By	Figure No.
						1:25	Imcl	8354-01-19.IT01

	Grou	nd In	vestigations li www.gii.ie	reland	Ltd	Site Cornelscourt		Trial Pit Number IT02
Machine : J	СВ	Dimens	ions	Ground	Level (mOD)	Client		Job
Method :					48.87			8354-01-19
		Locatio	n	Dates		Engineer		Sheet
		72	2441.6 E 725841.6 N	21	/01/2019	DBFL		1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	(mOD)	Depth (m) (Thickness)	D	escription	Legend Vate
					(0.30)	Brown slightly sandy slight	ly gravelly TOPSOIL.	
				48.57	0.30	Firm to stiff light brown slig	htly sandy slightly gravelly C	LAY.
				47 47	- (1.10)			
					(0.50)	Stiff grey mottled brown sil rare sub-angular cobbles.	ghtly sandy gravelly CLAY w	th <u><u><u>a</u></u><u>a</u><u>a</u><u>a</u><u>a</u><u>a</u><u>a</u><u>a</u><u>a</u><u>a</u><u>a</u><u>a</u><u></u></u>
				46.97	1.90	Complete at 1.90m		0.000
Plan .					· · ·	Remarks		
						No Groundwater encountere Trial pit stable. Infiltration test completed in Trial pit backfilled on comple	d. trial pit. tion of infiltration test.	
				-		Scale (approx)	Logged By	Figure No.
						1:25	Tmol	8354-01-19.IT02

	Grou	nd In	vestigations Ire www.gii.ie	land	Ltd	Site Cornelscourt		Trial Pit Number IT03
Machine : J	СВ	Dimens	ions	Ground	Level (mOD)	Client		Job
Method :								Number 8354-01-19
		Locatio	n	Datas		Engineer		Sheet
		Locatio		21	/01/2019	DBFL		1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend
					(0.25)	Brown slightly sandy slight	ly gravelly TOPSOIL.	
					0.25	Firm to stiff light brown slig with rare sub-angular cobb	htly sandy slightly gravelly C bles.	LAY 6 0 0 0
					0.50	Firm to stiff brown slightly sub-angular cobbles.	sandy gravelly CLAY with rar	e 6 0 0 0
					(0.80)	Firm to stiff grey mottled b with rare sub-angular cobt	rown slightly sandy gravelly o	
Plan						Remarks		
						No Groundwater encountere	ed.	
		·		•		Infiltration test completed in Trial pit backfilled on completed	trial pit. tion of infiltration test.	
				-				
				-		Scale (approx)	Logged By	Figure No.
						1:25	Tmcl	8354-01-19.IT03

# IT01 Soakaway Test to BRE Digest 365 Trial Pit Dimensions: 1.50m x 0.40m 1.90m (L x W x D)

Date	Time	Water (m t	level ogl)		
22/01/2019	0	-0.890			
22/01/2019	66	-0.890			
22/01/2019	148	-0.900			
22/01/2019	211	-0.900			
22/01/2019	352	-0.910			
		*Soakaway	failed - Pit	backfilled	
Start depth	Depth of Pit		Diff	75% full	25%full
0.89	1.900		1.010	1.1425	1.6475





## IT02 Soakaway Test to BRE Digest 365 Trial Pit Dimensions: 1.90m x 0.40m 1.90m (L x W x D)

Date	Time	Water level (m bgl)	
22/01/2019	0	-0.760	
22/01/2019	45	-0.800	
22/01/2019	119	-0.820	
22/01/2019	325	-0.820	

		*Soakaway failed - Pit	backfilled	
Start depth	Depth of Pit	Diff	75% full	25%full
0.76	1.900	1.140	1.045	1.615





# IT03 Soakaway Test to BRE Digest 365 Trial Pit Dimensions: 1.5m x 0.50m 2.0m (L x W x D)

Date	Time	Water level (m bgl)
14/09/2016	0	-0.700
14/09/2016	55	-0.700
14/09/2016	130	-0.700
14/09/2016	337	-0.710

	*Soakaway failed - Pit backfilled							
Start depth	Depth of Pit	Diff	75% full	25%full				
0.70	1.900	1.200	1	1.6				





**APPENDIX C** 

ATTENUATION CALCULATION

DBFL Consu.	DBFL Consulting Engineers									
Ormond House Catchment A Source Control										
Upper Ormond Quay						-				
Dublin 7								Micco		
Date 12/11	/2021 08:4	5		Designed b	by Byrne	eSe				
File cas A	-B.casx			Checked by	7			Diamacj		
Innovyze				Source Cor	ntrol 20	020.1				
	<u>(</u>	Cascade	e Summa	ary of Resu	lts for	A.srcx				
		U	pstream	Outflow To	Overflow	т То				
		St:	ructure	8						
			(None	) B.srcx	(No	one)				
Half Drain Time : 533 minutes.										
	Storm	Max	Max	Max	Max	Max	Max	Status		
	Event	Level	Depth 1	Infiltration	Control	Σ Outflow	Volume			
		(m)	(m)	(1/s)	(l/s)	(l/s)	(m³)			
			0 646							
15	min Summer	48.051	0.646	0.0	1.3	1.3	36.5	OK		
15 30	min Summer min Summer	48.051 48.289	0.646 0.884	0.0	1.3 1.4	1.3 1.4	36.5 50.0	ОК		
15 30 60	min Summer min Summer min Summer	48.051 48.289 48.525	0.646 0.884 1.120	0.0 0.0 0.0	1.3 1.4 1.5	1.3 1.4 1.5	36.5 50.0 63.3	0 K 0 K		
15 30 60 120	min Summer min Summer min Summer	48.051 48.289 48.525 48.757	0.646 0.884 1.120 1.352	0.0 0.0 0.0 0.0	1.3 1.4 1.5 1.7	1.3 1.4 1.5 1.7	36.5 50.0 63.3 76.4	0 K 0 K 0 K 0 K		
15 30 60 120 180	min Summer min Summer min Summer min Summer	48.051 48.289 48.525 48.757 48.876	0.646 0.884 1.120 1.352 1.471	0.0 0.0 0.0 0.0 0.0	1.3 1.4 1.5 1.7 1.7	1.3 1.4 1.5 1.7 1.7	36.5 50.0 63.3 76.4 83.1	0 K 0 K 0 K 0 K		
15 30 60 120 180 240	min Summer min Summer min Summer min Summer min Summer min Summer	48.051 48.289 48.525 48.757 48.876 48.946	0.646 0.884 1.120 1.352 1.471 1.541	0.0 0.0 0.0 0.0 0.0 0.0	1.3 1.4 1.5 1.7 1.7 1.8	1.3 1.4 1.5 1.7 1.7 1.8	36.5 50.0 63.3 76.4 83.1 87.1	0 K 0 K 0 K 0 K 0 K		
15 30 60 120 180 240 360	min Summer min Summer min Summer min Summer min Summer min Summer	48.051 48.289 48.525 48.757 48.876 48.946 49.011	0.646 0.884 1.120 1.352 1.471 1.541 1.606	0.0 0.0 0.0 0.0 0.0 0.0 0.0	1.3 1.4 1.5 1.7 1.7 1.8 1.8	1.3 1.4 1.5 1.7 1.7 1.8 1.8	36.5 50.0 63.3 76.4 83.1 87.1 90.8	0 K 0 K 0 K 0 K 0 K 0 K		
15 30 60 120 180 240 360 480	min Summer min Summer min Summer min Summer min Summer min Summer min Summer	48.051 48.289 48.525 48.757 48.876 48.946 49.011 49.034	0.646 0.884 1.120 1.352 1.471 1.541 1.606 1.629	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	1.3 1.4 1.5 1.7 1.7 1.8 1.8 1.8	1.3 1.4 1.5 1.7 1.7 1.8 1.8 1.8	36.5 50.0 63.3 76.4 83.1 87.1 90.8 92.1	0 K 0 K 0 K 0 K 0 K 0 K 0 K		
15 30 60 120 180 240 360 480 600	min Summer min Summer min Summer min Summer min Summer min Summer min Summer min Summer	48.051 48.289 48.525 48.757 48.876 48.946 49.011 49.034 49.044	0.646 0.884 1.120 1.352 1.471 1.541 1.606 1.629 1.639	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	1.3 1.4 1.5 1.7 1.7 1.8 1.8 1.8 1.8	1.3 1.4 1.5 1.7 1.7 1.8 1.8 1.8 1.8	36.5 50.0 63.3 76.4 83.1 87.1 90.8 92.1 92.6	0 K 0 K 0 K 0 K 0 K 0 K 0 K		
15 30 60 120 180 240 360 480 600 720	min Summer min Summer min Summer min Summer min Summer min Summer min Summer min Summer min Summer	48.051 48.289 48.525 48.757 48.876 48.946 49.011 49.034 49.044 49.046	0.646 0.884 1.120 1.352 1.471 1.541 1.606 1.629 1.639 1.641	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	1.3 1.4 1.5 1.7 1.7 1.8 1.8 1.8 1.8 1.8	1.3 1.4 1.5 1.7 1.7 1.8 1.8 1.8 1.8 1.8	36.5 50.0 63.3 76.4 83.1 87.1 90.8 92.1 92.6 92.7	0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K		
15 30 60 120 180 240 360 480 600 720 960	min Summer min Summer	48.051 48.289 48.525 48.757 48.876 48.946 49.011 49.034 49.044 49.046 49.035	0.646 0.884 1.120 1.352 1.471 1.541 1.606 1.629 1.639 1.641 1.630	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	1.3 1.4 1.5 1.7 1.7 1.8 1.8 1.8 1.8 1.8 1.8 1.8	1.3 1.4 1.5 1.7 1.7 1.8 1.8 1.8 1.8 1.8 1.8 1.8	36.5 50.0 63.3 76.4 83.1 87.1 90.8 92.1 92.6 92.7 92.1	0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K		
15 30 60 120 180 240 360 480 600 720 960 1440	min Summer min Summer	48.051 48.289 48.525 48.757 48.876 48.946 49.011 49.034 49.044 49.046 49.035 48.991	0.646 0.884 1.120 1.352 1.471 1.541 1.606 1.629 1.639 1.641 1.630 1.586	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	1.3 1.4 1.5 1.7 1.7 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	1.3 1.4 1.5 1.7 1.7 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	36.5 50.0 63.3 76.4 83.1 87.1 90.8 92.1 92.6 92.7 92.1 89.7	0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K		
15 30 60 120 180 240 360 480 600 720 960 1440 2160	min Summer min Summer	48.051 48.289 48.525 48.757 48.876 48.946 49.011 49.034 49.044 49.046 49.035 48.991 48.907	0.646 0.884 1.120 1.352 1.471 1.541 1.606 1.629 1.639 1.641 1.630 1.586 1.502	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	1.3 1.4 1.5 1.7 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	1.3 1.4 1.5 1.7 1.7 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	36.5 50.0 63.3 76.4 83.1 90.8 92.1 92.6 92.7 92.1 89.7 84.9	0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K		
15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880	min Summer min Summer	48.051 48.289 48.525 48.757 48.876 48.946 49.011 49.034 49.044 49.046 49.035 48.991 48.907 48.814	0.646 0.884 1.120 1.352 1.471 1.541 1.606 1.629 1.639 1.641 1.630 1.586 1.502 1.409	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	1.3 1.4 1.5 1.7 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	1.3 1.4 1.5 1.7 1.7 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	36.5 50.0 63.3 76.4 83.1 90.8 92.1 92.6 92.7 92.1 89.7 84.9 79.6	0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K		
15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320	min Summer min Summer	48.051 48.289 48.525 48.757 48.876 48.946 49.011 49.034 49.044 49.046 49.035 48.991 48.907 48.814 48.630	0.646 0.884 1.120 1.352 1.471 1.541 1.606 1.629 1.639 1.641 1.630 1.586 1.502 1.409 1.225	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	1.3 1.4 1.5 1.7 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	1.3 1.4 1.5 1.7 1.7 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	36.5 50.0 63.3 76.4 83.1 90.8 92.1 92.6 92.7 92.1 89.7 84.9 79.6 69.2	0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K		
15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320 5760	min Summer min Summer	48.051 48.289 48.525 48.757 48.876 48.946 49.011 49.034 49.044 49.046 49.035 48.991 48.907 48.814 48.630 48.462	0.646 0.884 1.120 1.352 1.471 1.541 1.606 1.629 1.639 1.641 1.630 1.586 1.502 1.409 1.225 1.057	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	1.3 1.4 1.5 1.7 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	1.3 1.4 1.5 1.7 1.7 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	36.5 50.0 63.3 76.4 83.1 90.8 92.1 92.6 92.7 92.1 89.7 84.9 79.6 69.2 59.7	0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K 0 K		

	Storm		Rain	Flooded	Discharge	Time-Peak	
	Event		(mm/hr)	Volume	Volume	(mins)	
				(m³)	(m³)		
15	min	Summer	78.546	0.0	37.4	23	
30	min	Summer	54.456	0.0	51.9	37	
60	min	Summer	35.457	0.0	67.8	68	
120	min	Summer	22.431	0.0	85.7	126	
180	min	Summer	17.011	0.0	97.5	186	
240	min	Summer	13.956	0.0	106.7	246	
360	min	Summer	10.526	0.0	120.7	364	
480	min	Summer	8.606	0.0	131.6	418	
600	min	Summer	7.356	0.0	140.6	480	
720	min	Summer	6.469	0.0	148.4	546	
960	min	Summer	5.281	0.0	161.5	680	
1440	min	Summer	3.965	0.0	181.8	958	
2160	min	Summer	2.976	0.0	204.9	1372	
2880	min	Summer	2.425	0.0	222.6	1792	
4320	min	Summer	1.815	0.0	249.8	2596	
5760	min	Summer	1.476	0.0	271.0	3352	
7200	min	Summer	1.257	0.0	288.5	4112	
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DBFL Consulting Engineers		Page 2
Ormond House	Catchment A Source Control	
Upper Ormond Quay		
Dublin 7		Mirro
Date 12/11/2021 08:45	Designed by ByrneSe	Desinado
File cas A-B.casx	Checked by	Diamage
Innovyze	Source Control 2020.1	

### Cascade Summary of Results for A.srcx

	Storn Event	n -	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
8640	min	Summer	48.182	0.777	0.0	1.3	1.3	43.9	ОК
10080	min	Summer	48.061	0.656	0.0	1.3	1.3	37.1	ОК
15	min	Winter	48.130	0.725	0.0	1.3	1.3	41.0	ОК
30	min	Winter	48.399	0.994	0.0	1.5	1.5	56.2	ОК
60	min	Winter	48.669	1.264	0.0	1.6	1.6	71.4	ОК
120	min	Winter	48.937	1.532	0.0	1.8	1.8	86.6	ОК
180	min	Winter	49.080	1.675	0.0	1.8	1.8	94.7	ОК
240	min	Winter	49.169	1.764	0.0	1.9	1.9	99.7	ΟK
360	min	Winter	49.263	1.858	0.0	1.9	1.9	105.0	ΟK
480	min	Winter	49.297	1.892	0.0	1.9	1.9	107.0	ΟK
600	min	Winter	49.302	1.897	0.0	1.9	1.9	107.2	ΟK
720	min	Winter	49.305	1.900	0.0	1.9	1.9	107.4	ΟK
960	min	Winter	49.289	1.884	0.0	1.9	1.9	106.5	ΟK
1440	min	Winter	49.209	1.804	0.0	1.9	1.9	102.0	ΟK
2160	min	Winter	49.063	1.658	0.0	1.8	1.8	93.7	ΟK
2880	min	Winter	48.911	1.506	0.0	1.8	1.8	85.1	ΟK
4320	min	Winter	48.629	1.224	0.0	1.6	1.6	69.2	ОК
5760	min	Winter	48.389	0.984	0.0	1.4	1.4	55.6	ОК
7200	min	Winter	48.179	0.774	0.0	1.3	1.3	43.7	ΟK
8640	min	Winter	47.946	0.541	0.0	1.3	1.3	30.6	ΟK
10080	min	Winter	47.667	0.262	0.0	1.3	1.3	14.8	ОК

Storm		Rain	Flooded	Discharge	Time-Peak		
	Event		(mm/hr)	Volume	Volume	(mins)	
				(m³)	(m³)		
8640	min	Summer	1.103	0.0	303.6	4928	
10080	min	Summer	0.987	0.0	317.0	5656	
15	min	Winter	78.546	0.0	41.9	23	
30	min	Winter	54.456	0.0	58.2	37	
60	min	Winter	35.457	0.0	75.9	66	
120	min	Winter	22.431	0.0	96.0	124	
180	min	Winter	17.011	0.0	109.2	182	
240	min	Winter	13.956	0.0	119.5	240	
360	min	Winter	10.526	0.0	135.2	350	
480	min	Winter	8.606	0.0	147.4	456	
600	min	Winter	7.356	0.0	157.5	540	
720	min	Winter	6.469	0.0	166.2	572	
960	min	Winter	5.281	0.0	180.8	726	
1440	min	Winter	3.965	0.0	203.6	1040	
2160	min	Winter	2.976	0.0	229.4	1480	
2880	min	Winter	2.425	0.0	249.3	1908	
4320	min	Winter	1.815	0.0	279.8	2768	
5760	min	Winter	1.476	0.0	303.5	3576	
7200	min	Winter	1.257	0.0	323.2	4392	
8640	min	Winter	1.103	0.0	340.1	5280	
10080	min	Winter	0.987	0.0	355.1	5552	
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DBFL Consulting Engineers		Page 3
Ormond House	Catchment A Source Control	
Upper Ormond Quay		
Dublin 7		Mirro
Date 12/11/2021 08:45	Designed by ByrneSe	Drainago
File cas A-B.casx	Checked by	Diamade
Innovyze	Source Control 2020.1	
Cascade Rai	nfall Details for A.srcx	
Rainfall Model	FSR Winter Storms	Yes
Return Period (years) Region Scotla	and and Ireland Cv (Summer) 0.	840
M5-60 (mm)	16.400 Shortest Storm (mins)	15
Ratio R	0.273 Longest Storm (mins) 10	080
Summer Storms	Yes Climate Change %	+10
	ne Area Diagram	
1		
Tot	al Area (ha) 0.255	
Time (mins	) Area Time (mins) Area	
From: To:	(ha) From: To: (ha)	
0	4 0.000 4 8 0.255	

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Ormond House       Catchment A Source Control         Upper Ormond Quay       Dublin 7         Date 12/11/2021 08:45       Designed by ByrneSe         File cas A-B.casx       Checked by         Innovyze       Source Control 2020.1         Cascade Model Details for A.srcx         Storage is Online Cover Level (m) 49.805         Cellular Storage Structure         Infiltration Coefficient Base (m/hr) 0.00000         Popth (m) Area (m²) Inf. Area (m²)         Depth (m) Area (m²) Inf. Area (m²)         2.000       59.5         0.000       59.5         0.000       59.5         Unit Reference MD-SHE-0057-2000-2000         Design Flow (1/s)       2.00         Flush-Flo**       Calculated         Objective       Minimise upstream storage         Application       Surface
Upper Ormond Quay Dublin 7 Date 12/11/2021 08:45 File cas A-B.casx Innovyze Checked by Innovyze Cascade Model Details for A.srcx Storage is Online Cover Level (m) 49.805 Cellular Storage Structure Invert Level (m) 47.405 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Depth (m) Area (m²) Inf. Area (m²) 0.000 59.5 0.0 2.001 0.0 0.0 Depth (m) Area (m²) Inf. Area (m²) 0.000 59.5 0.0 2.001 0.0 0.0 Hydro-Brake@ Optimum Outflow Control Unit Reference MD-SHE-0057-2000-2000 Design Head (m) 2.000 Design Flow (1/s) 2.0 Flush-Flo <sup>m</sup> Calculated Objective Minimise upstream storage Application Sump Available Yes
Dublin 7       Date 12/11/2021 08:45       Designed by ByrneSe       Micro         File cas A-B.casx       Checked by       Innovyze       Source Control 2020.1         Cascade Model Details for A.srcx         Storage is Online Cover Level (m) 49.805         Cellular Storage Structure         Invert Level (m) 47.405 Safety Factor 2.0         Infiltration Coefficient Base (m/hr) 0.0000         Depth (m) Area (m²) Inf. Area (m²)         0.000       59.5       0.0       2.001       0.0       0.0         Unit Reference MD-SHE-0057-2000-2000         Design Head (m)       2.00         Design Flow (1/s)       2.0         Flush-Flo <sup>™</sup> Calculated         Objective Minimise upstream storage         Application
Date 12/11/2021 08:45 File cas A-B.casx Innovyze Cascade Model Details for A.srcx Storage is Online Cover Level (m) 49.805 Cellular Storage Structure Invert Level (m) 47.405 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 Depth (m) Area (m <sup>2</sup> ) Inf. Area (m <sup>2</sup> ) Depth (m) Area (m <sup>2</sup> ) Inf. Area (m <sup>2</sup> ) 0.000 59.5 0.0 2.001 0.0 0.0 Hydro-Brake@ Optimum Outflow Control Unit Reference MD-SHE-0057-2000-2000 Design Flow (1/s) 2.0 Flush-Flo <sup>m</sup> Calculated Objective Minimise upstream storage Application Surface Sump Available Yes
File cas A-B.casx File cas A-B.casx Checked by Innovyze Cascade Model Details for A.srcx Storage is Online Cover Level (m) 49.805 Cellular Storage Structure Invert Level (m) 47.405 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Depth (m) Area (m <sup>2</sup> ) Inf. Area (m <sup>2</sup> ) Depth (m) Area (m <sup>2</sup> ) Inf. Area (m <sup>2</sup> ) 0.000 59.5 0.0 2.001 0.0 0.0 Depth (m) Area (m <sup>2</sup> ) Inf. Area (m <sup>2</sup> ) Depth (m) Area (m <sup>2</sup> ) Inf. Area (m <sup>2</sup> ) 0.000 59.5 0.0 Hydro-Brake® Optimum Outflow Control Unit Reference MD-SHE-0057-2000-2000 Design Head (m) 2.000 Design Flow (1/s) 2.0 Flush-Flo <sup>m</sup> Calculated Objective Minimise upstream storage Application Surface Sump Available Yes
Innovyze Source Control 2020.1 Cascade Model Details for A.srcx Storage is Online Cover Level (m) 49.805 Cellular Storage Structure Invert Level (m) 47.405 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 Depth (m) Area (m <sup>2</sup> ) Inf. Area (m <sup>2</sup> ) Depth (m) Area (m <sup>2</sup> ) Inf. Area (m <sup>2</sup> ) 0.000 59.5 0.0 2.001 0.0 0.0 Hydro-Brake@ Optimum Outflow Control Unit Reference MD-SHE-0057-2000-2000 Design Head (m) 2.000 Design Flow (1/s) 2.0 Flush-Flo <sup>m</sup> Calculated Objective Minimise upstream storage Application Surface Sump Available Yes
Source Control 2020.1         Cascade Model Details for A.srcx         Storage is Online Cover Level (m) 49.805         Cellular Storage Structure         Invert Level (m) 47.405 Safety Factor 2.0         Infiltration Coefficient Base (m/hr) 0.00000         Depth (m) Area (m²) Infiltration Coefficient Side (m/hr) 0.00000         Depth (m) Area (m²) Inf. Area (m²)         0.000       59.5       0.0         2.000       59.5       0.0         Unit Reference MD-SHE-0057-2000-2000         Design Head (m)         Louin Control         Unit Reference MD-SHE-0057-2000-2000         Design Head (m)       2.000         Design Flow (1/s)       2.0         Flush-Flo**       Calculated         Objective Minimise upstream storage         Application         Sump Available
Cascade Model Details for A.srcx         Storage is Online Cover Level (m) 49.805         Cellular Storage Structure         Invert Level (m) 47.405 Safety Factor 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)         0.000 59.5 0.0         2.001 0.0 0.0         One Design Head (m)         Link Reference MD-SHE-0057-2000-2000         Design Flow (1/s)         Design Flow (1/s)         Calculated         Objective Minimise upstream storage         Application
Storage is Online Cover Level (m) 49.805 <u>Cellular Storage Structure</u> Invert Level (m) 47.405 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.0000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 Depth (m) Area (m <sup>2</sup> ) Inf. Area (m <sup>2</sup> ) Depth (m) Area (m <sup>2</sup> ) Inf. Area (m <sup>2</sup> ) 0.000 59.5 0.0 2.001 0.0 0.0 2.000 59.5 0.0 2.001 0.0 0.0 <u>Hydro-Brake@ Optimum Outflow Control</u> Unit Reference MD-SHE-0057-2000-2000 Design Head (m) 2.000 Design Flow (1/s) 2.0 Flush-Flo <sup>m</sup> Calculated Objective Minimise upstream storage Application Surface Sump Available Yes
Cellular Storage Structure         Invert Level (m) 47.405 Safety Factor 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       59.5       0.0       2.001       0.0       0.0         2.000       59.5       0.0       2.001       0.0       0.0         Unit Reference MD-SHE-0057-2000-2000         Design Head (m)       2.000         Design Flow (1/s)       2.0         Flush-Flo™       Calculated         Objective Minimise upstream storage         Application       Surp Available
Invert Level (m) 47.405 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 Depth (m) Area (m <sup>2</sup> ) Inf. Area (m <sup>2</sup> ) Depth (m) Area (m <sup>2</sup> ) Inf. Area (m <sup>2</sup> ) 0.000 59.5 0.0 2.001 0.0 0.0 2.000 59.5 0.0 2.001 0.0 0.0 <u>Hydro-Brake® Optimum Outflow Control</u> Unit Reference MD-SHE-0057-2000-2000 Design Head (m) 2.000 Design Flow (1/s) 2.0 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes
Invert Level (m) 47.403 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 Depth (m) Area (m <sup>2</sup> ) Inf. Area (m <sup>2</sup> ) Depth (m) Area (m <sup>2</sup> ) Inf. Area (m <sup>2</sup> ) 0.000 59.5 0.0 2.001 0.0 0.0 2.000 59.5 0.0 0.0 Hydro-Brake® Optimum Outflow Control Unit Reference MD-SHE-0057-2000-2000 Design Head (m) 2.000 Design Flow (1/s) 2.0 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes
Depth (m) Area (m²) Inf. Area (m²)       Depth (m) Area (m²) Inf. Area (m²)         0.000       59.5       0.0       2.001       0.0       0.0         2.000       59.5       0.0       2.001       0.0       0.0         Hydro-Brake® Optimum Outflow Control         Unit Reference MD-SHE-0057-2000-2000         Design Head (m)       2.000         Design Flow (1/s)       2.0         Flush-Flo™       Calculated         Objective       Minimise upstream storage         Application       Sump Available
0.000 59.5 0.0 2.001 0.0 0.0 2.000 59.5 0.0 Unit Reference MD-SHE-0057-2000-2000 Design Head (m) 2.000 Design Flow (1/s) 2.0 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes
2.000 59.5 0.0 <u>Hydro-Brake® Optimum Outflow Control</u> Unit Reference MD-SHE-0057-2000-2000-2000 Design Head (m) 2.000 Design Flow (1/s) 2.0 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes
Hydro-Brake® Optimum Outflow Control Unit Reference MD-SHE-0057-2000-2000-2000 Design Head (m) 2.000 Design Flow (1/s) 2.0 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes
Unit Reference MD-SHE-0057-2000-2000 Design Head (m) 2.000 Design Flow (1/s) 2.0 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes
Unit Reference MD-SHE-0057-2000-2000 Design Head (m) 2.000 Design Flow (l/s) 2.0 Flush-Flo <sup>TM</sup> Calculated Objective Minimise upstream storage Application Surface Sump Available Yes
Design Head (m) 2.000 Design Flow (1/s) 2.0 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes
Design Flow (l/s) 2.0 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes
Flusn-Floim     Calculated       Objective     Minimise upstream storage       Application     Surface       Sump Available     Yes
Application Surface Sump Available Yes
Sump Available Yes
Diameter (mm) 57
Invert Level $(m)$ 47.405
Minimum Outlet Pipe Diameter (mm) 75
Suggested Manhole Diameter (mm) 1200
Control Points Head (m) Flow (1/s)
Design Point (Calculated) 2.000 2.0
Flush-Flo™ 0.247 1.3
Kick-Flo® 0.506 1.1
Mean Flow over Head Range - 1.5
The hydrological calculations have been based on the Head/Discharge relationship for t 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 1.2 1.200 1.6 3.000 2.4 7.000 3.6
0.200 1.3 1.400 1.7 3.500 2.6 7.500 3.7
0.300 1.3 1.600 1.8 4.000 2.7 8.000 3.8
0.400 1.3 1.800 1.9 4.500 2.9 8.500 3.9
0.500 1.1 2.000 2.0 5.000 3.0 9.000 4.0
0.600 1.2 2.200 2.1 5.500 3.2 9.500 4.1
0.800 1.3 2.400 2.2 6.000 3.3
1.000 1.5 2.600 2.3 6.500 3.4
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Ormond House Upper Ormond Quay Dublin 7 Date 12/11/2021 08:46 Designed by ByrneSe	ge										
Upper Ormond Quay Dublin 7 Date 12/11/2021 08:46 Designed by ByrneSe	ige										
Dublin 7 Date 12/11/2021 08:46 Designed by ByrneSe Designed by ByrneSe	ige										
Date 12/11/2021 08:46 Designed by ByrneSe Designed	ige										
	ige										
File cas A-B.casx Checked by											
Innowyze Source Control 2020 1											
Cascade Summary of Results for B.srcx											
Upstream Outflow To Overflow To											
Structures											
A.srcx (None) (None)											
Half Drain Time : 241 minutes											
Hall Drain Time : 241 minutes.											
Storm Max Max Max Max Max Max Status											
Event Level Depth Infiltration Control E Outflow Volume											
$(m)$ $(m)$ $(1/s)$ $(1/s)$ $(m^3)$											
15 min Summer 46.220 0.620 0.0 4.8 4.8 50.4 O K											
30 min Summer 46.449 0.849 0.0 4.8 4.8 68.9 O K											
60 min Summer 46.671 1.071 0.0 4.8 4.8 87.0 O K											
120 min Summer 46.869 1.269 0.0 4.8 4.8 103.1 O K											
180 min Summer 46.956 1.356 0.0 4.8 4.8 110.1 O K											
240 min Summer 46.997 1.397 0.0 4.8 4.8 113.5 O K											
360 min Summer 47.019 1.419 0.0 4.8 4.8 115.3 O K											
480 min Summer 47.020 1.420 0.0 4.9 4.9 115.3 O K											
600 min Summer 47.010 1.410 0.0 4.8 4.8 114.5 O K											
720 min Summer 46.996 1.396 0.0 4.8 4.8 113.4 O K											
960 min Summer 46.961 1.361 0.0 4.8 4.8 110.5 O K											
1440 min Summer 46.873 1.273 0.0 4.8 4.8 103.4 O K											
2160 min Summer 46.726 1.126 0.0 4.8 4.8 91.5 O K											
2880 min Summer 46.556 0.956 0.0 4.8 4.8 77.7 O K											
4320 min Summer 46.129 0.529 0.0 4.8 4.8 43.0 OK											
5760 min Summer 45.929 0.329 0.0 4.8 4.8 26.7 O K											
7200 min Summer 45.828 0.228 0.0 4.5 4.5 18.6 O K											

	Storm		Storm H		Rain	Flooded	Discharge	Time-Peak	
	Event		(mm/hr)	Volume	Volume	(mins)			
				(m³)	(m³)				
15	min	Summer	78.546	0.0	90.2	22			
30	min	Summer	54 456	0 0	125 1	37			
60	min	Summer	35 457	0.0	163 4	66			
120	min	Summer	22,431	0.0	206.7	126			
180	min	Summer	17.011	0.0	235.2	186			
240	min	Summer	13.956	0.0	257.3	244			
360	min	Summer	10.526	0.0	291.1	318			
480	min	Summer	8.606	0.0	317.3	386			
600	min	Summer	7.356	0.0	339.0	450			
720	min	Summer	6.469	0.0	357.7	518			
960	min	Summer	5.281	0.0	389.3	660			
1440	min	Summer	3.965	0.0	438.3	942			
2160	min	Summer	2.976	0.0	494.0	1368			
2880	min	Summer	2.425	0.0	536.7	1792			
4320	min	Summer	1.815	0.0	602.4	2424			
5760	min	Summer	1.476	0.0	653.6	3064			
7200	min	Summer	1.257	0.0	695.8	3744			
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DBFL Consulting Engineers		Page 2
Ormond House	Catchment B Source Control	
Upper Ormond Quay		
Dublin 7		Mirro
Date 12/11/2021 08:46	Designed by ByrneSe	Desinado
File cas A-B.casx	Checked by	Diamage
Innovyze	Source Control 2020.1	

### Cascade Summary of Results for B.srcx

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
8640	min Sı	ummer	45.779	0.179	0.0	4.3	4.3	14.6	ОК
10080	min Su	ummer	45.752	0.152	0.0	4.1	4.1	12.4	ОК
15	min Wi	inter	46.299	0.699	0.0	4.8	4.8	56.7	ОК
30	min Wi	inter	46.559	0.959	0.0	4.8	4.8	77.9	ОК
60	min Wi	inter	46.809	1.209	0.0	4.8	4.8	98.2	ОК
120	min Wi	inter	47.041	1.441	0.0	4.9	4.9	117.1	ОК
180	min Wi	inter	47.150	1.550	0.0	5.1	5.1	125.9	ОК
240	min Wi	inter	47.209	1.609	0.0	5.1	5.1	130.7	ОК
360	min Wi	inter	47.248	1.648	0.0	5.2	5.2	133.8	ОК
480	min Wi	inter	47.240	1.640	0.0	5.2	5.2	133.2	ОК
600	min Wi	inter	47.228	1.628	0.0	5.2	5.2	132.2	ΟK
720	min Wi	inter	47.206	1.606	0.0	5.1	5.1	130.5	ΟK
960	min Wi	inter	47.147	1.547	0.0	5.0	5.0	125.7	ΟK
1440	min Wi	inter	47.002	1.402	0.0	4.8	4.8	113.9	ΟK
2160	min Wi	inter	46.761	1.161	0.0	4.8	4.8	94.3	ΟK
2880	min Wi	inter	46.400	0.800	0.0	4.8	4.8	65.0	ΟK
4320	min Wi	inter	45.920	0.320	0.0	4.8	4.8	26.0	ΟK
5760	min Wi	inter	45.775	0.175	0.0	4.3	4.3	14.3	ОК
7200	min Wi	inter	45.731	0.131	0.0	3.9	3.9	10.6	ΟK
8640	min Wi	inter	45.716	0.116	0.0	3.7	3.7	9.4	ОК
10080	min Wi	inter	45.707	0.107	0.0	3.4	3.4	8.7	ΟK

	Storm	Rain	Flooded	Discharge	Time-Peak	
	Event	(mm/hr)	Volume	Volume	(mins)	
			(m³)	(m³)		
8640	min Summer	1.103	0.0	732.3	4408	
10080	min Summer	0.987	0.0	764.5	5136	
15	min Winter	78.546	0.0	101.0	22	
30	min Winter	54.456	0.0	140.1	37	
60	min Winter	35.457	0.0	183.0	66	
120	min Winter	22.431	0.0	231.5	124	
180	min Winter	17.011	0.0	263.4	180	
240	min Winter	13.956	0.0	288.1	238	
360	min Winter	10.526	0.0	326.0	346	
480	min Winter	8.606	0.0	355.3	404	
600	min Winter	7.356	0.0	379.7	474	
720	min Winter	6.469	0.0	400.7	554	
960	min Winter	5.281	0.0	436.0	710	
1440	min Winter	3.965	0.0	490.8	1026	
2160	min Winter	2.976	0.0	553.3	1480	
2880	min Winter	2.425	0.0	601.1	1908	
4320	min Winter	1.815	0.0	674.7	2468	
5760	min Winter	1.476	0.0	732.0	3112	
7200	min Winter	1.257	0.0	779.4	3624	
8640	min Winter	1.103	0.0	820.2	4352	
10080	min Winter	0.987	0.0	856.2	5128	
20000			0.0	55012	0120	
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DBFL Consulting Engineers		Page 3
Ormond House	Catchment B Source Control	
Upper Ormond Quay		
Dublin 7		Micco
Date 12/11/2021 08:46	Designed by ByrneSe	
File cas A-B.casx	Checked by	Digingly
	Source Control 2020 1	
Cascade Rair	fall Details for B.srcx	
Rainfall Model	ESR Winter Storms	Yes
Return Period (years)	100 Cv (Summer) 0	.750
Region Scotla	nd and Ireland Cv (Winter) 0	.840
M5-60 (mm)	16.400 Shortest Storm (mins)	15
Ratio R Summer Storms	U.2/3 Longest Storm (mins) 10 Yes Climate Change %	+10
Tin	ne Area Diagram	
Tota	al Area (ha) 0.360	
Time (mins)	Area Time (mins) Area	
From: To:	(ha) From: To: (ha)	
0 4	4 8 0.360	

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DBFL Consulting Engineers	DBFL Consulting Engineers									
Ormond House	Catchmer	nt B Sour	ce Control							
Upper Ormond Quay										
Dublin 7				Mirro						
Date 12/11/2021 08:46	Designed	Dcainage								
File cas A-B.casx	Checked	by		Diamag						
Innovyze	Source C	ontrol 2	2020.1							
Cascade Model Details for B.srcx										
Storage is Online Cover Level (m) 48.000										
Cellular Storage Structure										
Inver Infiltration Coefficient Infiltration Coefficient	Invert Level (m) 45.600 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000									
Depth (m) Area (m²) Inf. Are	ea (m²) De <u>r</u>	oth (m) A	rea (m²) Ir	uf. Area (m²)						
0.000 85.5	0.0	2.001	0.0	0.0						
2.000 03.5	0.0									
Hydro-Brake®	Optimum	Outflow	Control							
IInit	Reference	MD-SHE-0	098-5700-20	00-5700						
Desig	n Head (m)	ND SHE U	000 0700 20	2.000						
Design	Flow (l/s)			5.7						
	Flush-Flo™		Cal	culated						
	Objective	Minimis	e upstream	storage						
A	pplication			Surface						
Dia	meter (mm)			98						
Invert	Level (m)			45.600						
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)	2.000	5.7							
1	Flush-Flo™	0.430	4.8							
	Kick-Flo®	0.874	3.9							
Mean Flow over H	lead Range	-	4.6							
The hydrological calculations have k Hydro-Brake® Optimum as specified. Hydro-Brake Optimum® be utilised the invalidated	een based Should ano n these st	on the He ther type orage rou	ad/Discharg of control ting calcul	e relationship for th device other than a ations will be						
Depth (m) Flow (1/s) Depth (m) Flow	w (l/s) Der	oth (m) F	low (l/s)	epth (m) Flow (l/s)						
0.100 3.2 1.200	4.5	3.000	6.9	7.000 10.3						
0.200 4.4 1.400	4.8	3.500	7.4	7.500 10.6						
0.300 4.7 1.600	5.1	4.000	7.9	8.000 11.0						
0.400 4.8 1.800	5.4	4.500	8.3	8.500 11.3						
0.500 4.8 2.000	5.7	5.000	8.8	9.000 11.6						
0.600 4.7 2.200	5.9	5.500	9.2	9.500 11.9						
0.800 4.3 2.400	6.2	6.000	9.6							
1.000 4.1 2.000	0.4	6.500	9.9							
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DBFL Consulting Engi	neers						Page	1			
Ormond House		Cat	abaaaat	C Course (	Control						
Upper Ormond Quay	Upper Ormond Ouav										
Dublin 7	~ ·										
	- Micr	0									
Date 18/11/2021 16:2	Drair	าลต่อ									
File cas C-D.CASX	Didi	iage									
Innovyze		Sou	rce Con	trol 202	0.1						
Cascade Summary of Results for C.srcx											
	Upsti	ream Out	flow To	Overflow T	0						
	Struct	ures									
	( 1	Ione)	Derov	(None	)						
	(1	ione /	D.BICA	(NOIIE	/						
	Half	Drain Ti	me : 443	3 minutes.							
Storm	Max Ma	ix M	lax	Max	Max	Max	Status				
Event	Level Der	oth Infil	tration	Control S	Outflow	Volume					
	(m) (r	n) (1	./s)	(1/s)	(1/s)	(m³)					
15 min Summer	47.376 0.3	378	0.0	5.0	5.0	89.3	ОК				
30 min Summer	47.514 0.5	516	0.0	5.0	5.0	122.0	ОК				
60 min Summer	47.651 0.6	553	0.0	5.0	5.0	154.3	ΟK				
120 min Summer	47.784 0.7	786	0.0	5.0	5.0	185.8	O K				
180 min Summer	47.854 0.8	356	0.0	5.0	5.0	202.5	O K				
240 min Summer	47.899 0.9	901	0.0	5.0	5.0	213.0	ОК				
360 min Summer	47.939 0.9	941	0.0	5.0	5.0	222.5	ОК				
480 min Summer	47.948 0.9	950 NE 1	0.0	5.0	5.0	224.6	OK				
720 min Summer	47.949 0.5	251 247	0.0	5.0	5.0	224.9	OK				
960 min Summer	47 930 0 9	322	0.0	5.0	5.0	224.0	0 K				
1440 min Summer	47.880 0.8	382	0.0	5.0	5.0	208.5	ОК				
2160 min Summer	47.781 0.7	783	0.0	5.0	5.0	185.0	ОК				
2880 min Summer	47.683 0.6	585	0.0	5.0	5.0	161.8	ΟK				
4320 min Summer	47.511 0.5	513	0.0	5.0	5.0	121.2	O K				
5760 min Summer	47.382 0.3	384	0.0	5.0	5.0	90.7	ΟK				
7200 min Summer	47.291 0.2	293	0.0	4.8	4.8	69.2	ОК				
	<b>G h a a a a</b>	Dada	<b>1</b> 1	Di sel seco		-1-					
	Storm	Rain (mm/hm)	Flooded	Volumo	Time-Pe	ear v					
	Evenc	(1007/112)	(m <sup>3</sup> )	(m <sup>3</sup> )	(mins	)					
			(	(							
15	min Summer	78.546	0.0	91.4		22					
30	min Summer	54.456	0.0	127.1		37					
60	min Summer	35.457	0.0	166.9		66					
120	min Summer	22.431	0.0	211.2	1	.26					
180	min Summer	12 056	0.0	240.3	]	-86 246					
240	min Summer	10 506	0.0	∠03.U 207 ⊑	2	840 864					
480	min Summer	8.606	0.0	324.3	2	44					
600	min Summer	7.356	0.0	346.6	5	504					
720	min Summer	6.469	0.0	365.7	5	68					
960	min Summer	5.281	0.0	398.0	e	598					
1440	min Summer	3.965	0.0	448.0	9	984					
2160	min Summer	2.976	0.0	505.7	13	868					
2880	min Summer	2.425	0.0	549.4	17	760					
4320	min Summer	1.815	0.0	616.3	24	12					
5760	min Summer	1 057	0.0	669.3 710 ⊑	31	_ / b \ 8.8					
/200	aution on the second	1.45/	0.0	114.5	30						

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DBFL Consulting Engineers		Page 2
Ormond House	Catchment C Source Control	
Upper Ormond Quay		
Dublin 7		Mirro
Date 18/11/2021 16:29	Designed by ByrneSe	Desinado
File cas C-D.CASX	Checked by	Diamage
Innovyze	Source Control 2020.1	•

### Cascade Summary of Results for C.srcx

	Storm Event	1	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	47.228	0.230	0.0	4.7	4.7	54.3	ОК
10080	min S	Summer	47.184	0.186	0.0	4.4	4.4	44.1	ОК
15	min N	Winter	47.423	0.425	0.0	5.0	5.0	100.4	ОК
30	min N	Winter	47.579	0.581	0.0	5.0	5.0	137.3	ОК
60	min N	Winter	47.736	0.738	0.0	5.0	5.0	174.3	ОК
120	min N	Winter	47.894	0.896	0.0	5.0	5.0	211.8	ОК
180	min N	Winter	47.978	0.980	0.0	5.0	5.0	231.8	ОК
240	min N	Winter	48.030	1.032	0.0	5.0	5.0	243.9	ОК
360	min N	Winter	48.082	1.084	0.0	5.0	5.0	256.3	ОК
480	min N	Winter	48.099	1.101	0.0	5.0	5.0	260.3	ОК
600	min N	Winter	48.098	1.100	0.0	5.0	5.0	260.0	ОК
720	min N	Winter	48.089	1.091	0.0	5.0	5.0	257.8	ОК
960	min N	Winter	48.067	1.069	0.0	5.0	5.0	252.7	ОК
1440	min N	Winter	47.994	0.996	0.0	5.0	5.0	235.6	ОК
2160	min N	Winter	47.835	0.837	0.0	5.0	5.0	197.9	ОК
2880	min N	Winter	47.665	0.667	0.0	5.0	5.0	157.7	ОК
4320	min N	Winter	47.410	0.412	0.0	5.0	5.0	97.4	ΟK
5760	min N	Winter	47.257	0.259	0.0	4.8	4.8	61.3	ΟK
7200	min N	Winter	47.174	0.176	0.0	4.4	4.4	41.6	ОК
8640	min N	Winter	47.128	0.130	0.0	4.0	4.0	30.8	ОК
10080	min N	Winter	47.111	0.113	0.0	3.6	3.6	26.6	ОК

	Storm		Flooded	Discharge	Time-Peak	
	Event	(mm/hr)	Volume	Volume	(mins)	
			(m³)	(m³)		
8640	min Summer	1,103	0.0	749.7	4576	
10080	min Summer	0.987	0.0	782.4	5248	
15	min Winter	78.546	0.0	102.5	22	
30	min Winter	54.456	0.0	142.5	37	
60	min Winter	35.457	0.0	186.9	66	
120	min Winter	22.431	0.0	236.6	124	
180	min Winter	17.011	0.0	269.2	182	
240	min Winter	13.956	0.0	294.5	240	
360	min Winter	10.526	0.0	333.3	352	
480	min Winter	8.606	0.0	363.3	462	
600	min Winter	7.356	0.0	388.2	564	
720	min Winter	6.469	0.0	409.6	592	
960	min Winter	5.281	0.0	445.7	744	
1440	min Winter	3.965	0.0	501.6	1058	
2160	min Winter	2.976	0.0	566.4	1500	
2880	min Winter	2.425	0.0	615.4	1876	
4320	min Winter	1.815	0.0	690.4	2596	
5760	min Winter	1.476	0.0	749.7	3232	
7200	min Winter	1.257	0.0	798.1	3888	
8640	min Winter	1.103	0.0	839.8	4496	
10080	min Winter	0.987	0.0	876.5	5144	
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DBFL Consulting Engineers		Page 3
Ormond House	Catchment C Source Control	
Upper Ormond Quay		
Dublin 7		Micco
Date 18/11/2021 16:29	Designed by ByrneSe	Desipage
File cas C-D.CASX	Checked by	Dialitaye
Innovyze	Source Control 2020.1	
Cascade F	Painfall Details for C srcx	
	amail became for c.sick	
Rainfall Model	FSR Winter Storms	Yes
Return Period (years)	100 Cv (Summer) 0.	750
Region Sco	otland and Ireland Cv (Winter) 0.	840
M5-60 (mm)	16.400 Shortest Storm (mins)	15
Ratio R	0.273 Longest Storm (mins) 10	080
Summer Scorms	res crimate change «	+10
	Time Area Diagram	
	Total Area (ha) 0.630	
	· · · · · · · · · · · · · · ·	
Time (m From: I	ins) Area Time (mins) Area Co: (ha) From: To: (ha)	
0	4 0 000 4 8 0 630	
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DBFL Consulting Engineers				Pag	re 4							
Ormond House	Catchme	nt C Sour	ce Contro	I .								
Upper Ormond Quay	-											
Dublin 7				Mi	rm							
Date 18/11/2021 16:29	neSe	Dr	ainado									
File cas C-D.CASX	File cas C-D.CASX Checked by											
Innovyze	Source (	Control 2	2020.1									
Cascade Model Details for C.srcx												
Storage is Online Cover Level (m) 49.690												
Cellular Storage Structure												
Inve Infiltration Coefficient Infiltration Coefficient	rt Level (1 Base (m/h: Side (m/h:	m) 46.998 r) 0.00000 r) 0.00000	3 Safety Fa ) Pore	actor 2.0 osity 0.80								
Depth (m) Area (m²) Inf. Ar	ea (m²) De	pth (m) A	rea (m²) I	nf. Area (m²)								
0.000 295.5 1.440 295.5	0.0	1.445	0.0	0.0								
Hydro-Brake@	) Optimum	Outflow	Control									
Unit	t Reference	e MD-SHE-0	099-5000-1	445-5000								
Design	Flow (l/s)	)		5.0								
	Flush-Flo <sup>T</sup>	М	Ca	lculated								
	Objective	e Minimis	e upstream	storage								
	Application	1		Surface								
Sum	ameter (mm)	2		165								
Invert	t Level (m)	)		46.998								
Minimum Outlet Pipe Dia	ameter (mm)	)		150								
Suggested Manhole Dia	ameter (mm)	)		1200								
Control Po	oints	Head (m)	Flow (l/s	)								
Design Point (C	alculated)	1.445	5.	0								
	Flush-Flo™	0.434	5.	0								
Maar Dave and	Kick-Flo®	0.883	4.	0								
Mean Flow over	Head Range	-	4.	4								
The hydrological calculations have D Hydro-Brake® Optimum as specified. Hydro-Brake Optimum® be utilised the invalidated	been based Should and en these st	on the He other type corage rou	ad/Dischar of contro ting calcu	ge relationshi l device other lations will b	p for the than a e							
Depth (m) Flow (1/s) Depth (m) Flo	w (l/s) De	pth (m) F	low (l/s)	Depth (m) Flow	(1/s)							
0.100 3.3 1.200	4.6	3.000	7.0	7.000	10.5							
0.200 4.5 1.400	4.9	3.500	7.6	7.500	10.9							
0.300 4.9 1.600	5.2	4.000	8.1	8.000	11.2							
0.400 5.0 1.800	5.5	4.500	8.5	8.500	11.5							
0.500 5.0 2.000	5.8	5.000	9.0	9.000	11.8							
	6.1	5.500	9.4	9.500	12.2							
0.800         4.4         2.400           1.000         4.2         2.600	6.3 6.6	6.000 6.500	9.8 10.1									
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DBFL Consul	ting Engi	neers							Page	1		
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Ormond Hous	e			Cate	hment		Control					
Upper Ormon	ld Quay			Oald			Control					
Dublin 7	Dublin 7											
Date 18/11/	2021 16:2	8		Dest	ianed h	w Byrnes	<u>ام</u>			U		
Eilo coc C-	D CACY	0		Cho	akod bu	, .			Drai	naqe		
FILE Cas C-	D.CASA			Chec	INEU DY		0 1					
THHOVYZE				Sour	ide con	ILLOI ZUZ	10.1					
Cascade Summary of Results for D srev												
	cubcute building of Rebuild for D.BICK											
	Structures											
			C.srcx	2	(None)	(None	e)					
		н	alf Dra	іп ті	me: 174	4 minutes						
		п	arr Dra									
	Storm	Max	Max	м	ax	Max	Max	Max	Status			
	Event	Level	Depth 1	Infilt	tration	Control <b>S</b>	Outflow	Volume				
		(m)	(m)	(1	/s)	(l/s)	(l/s)	(m³)				
15	min Summer	46.024	0.474		0.0	7.3	7.3	49.9	ОК			
30	min Summer	46.200	0.650		0.0	7.3	7.3	68.5	ОК			
60	min Summer	46.381	0.831		0.0	7.3	7.3	87.5	ΟK			
120	min Summer	46.568	1.018		0.0	7.3	7.3	107.1	ОК			
180	min Summer	46.653	1.103		0.0	7.3	7.3	116.1	ОК			
240	min Summer	46.696	1.146		0.0	7.3	7.3	120.6	ΟK			
360	min Summer	46.735	1.185		0.0	7.3	7.3	124.7	ΟK			
480	min Summer	46.750	1.200		0.0	7.3	7.3	126.3	ОК			
600	min Summer	46.757	1.207		0.0	7.3	7.3	127.0	ОК			
720	min Summer	46.758	1.208		0.0	7.3	7.3	127.2	ОК			
960	min Summer	46.752	1.202		0.0	7.3	7.3	126.5	ОК			
1440	min Summer	46.729	1.179		0.0	7.3	7.3	124.1	ОК			
2160	min Summer	46.699	1.149		0.0	7.3	7.3	121.0	ОК			
2880	min Summer	46.658	1.108		0.0	7.3	7.3	116.7	ОК			
4320	min Summer	46.510	0.960		0.0	7.3	7.3	101.1	ОК			
5760	min Summer	46.133	0.583		0.0	7.3	7.3	61.4	ОК			
7200	min Summer	45.958	0.408		0.0	7.3	7.3	42.9	ОК			
		Storm	R	ain	Flooded	Discharge	e Time-Pe	ak				
		Event	( mn	n/hr)	Volume	Volume	(mins	)				
					(m³)	(m³)						
	1 5	min Cum	mor 70	) E1C	0 0	1 / 2	4	22				
	3U T D	min Sum	mer 54	1 456	0.0	192	≖ N	23 37				
	20 20	min Sum	mer 25	457	0.0	190. 250	8	5, 68				
	120	min Sum	mer 22	2.431	0.0	329	0 1	26				
	120	min Sum	mer 17	7.011	0.0	325.	~ <b>3</b> 1	86				
	240	min Sum	mer 13	3.956	0.0	409	5 5	244				
	210	min Sum	mer 10	526	0.0	462	ς : 2	356				
	280 280	min Sum	mer 9	8 606	0.0	505	1 4	112				
	-30 600	min Sum	mer 7	1 356	0.0	520		176				
	720	min Sum	mer f	. 350 5 469	0.0	555.	, <u>,</u> 5, 1	538				
	720			. 105	0.0	505.						

	000		Dunner	1.330	0.0	555.1	1,0
	720	min	Summer	6.469	0.0	569.5	538
	960	min	Summer	5.281	0.0	619.7	676
1	L440	min	Summer	3.965	0.0	697.7	954
2	2160	min	Summer	2.976	0.0	787.5	1412
2	2880	min	Summer	2.425	0.0	855.5	1880
4	1320	min	Summer	1.815	0.0	959.7	2892
5	5760	min	Summer	1.476	0.0	1042.2	3344
7	7200	min	Summer	1.257	0.0	1109.5	3960
			©19	82-2020	Innovyz	e	

DBFL Consulting Engineers		Page 2
Ormond House	Catchment D Source Control	
Upper Ormond Quay		
Dublin 7		Mirro
Date 18/11/2021 16:28	Designed by ByrneSe	Desinado
File cas C-D.CASX	Checked by	Diamage
Innovyze	Source Control 2020.1	•

#### Cascade Summary of Results for D.srcx

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640	min §	Summer	45.850	0.300	0.0	7.1	7.1	31.5	ОК
10080	min S	Summer	45.783	0.233	0.0	6.9	6.9	24.5	ОК
15	min V	Winter	46.083	0.533	0.0	7.3	7.3	56.1	ОК
30	min V	Winter	46.282	0.732	0.0	7.3	7.3	77.1	ОК
60	min V	Winter	46.491	0.941	0.0	7.3	7.3	99.1	ОК
120	min V	Winter	46.687	1.137	0.0	7.3	7.3	119.7	ОК
180	min V	Winter	46.786	1.236	0.0	7.3	7.3	130.2	ОК
240	min V	Winter	46.849	1.299	0.0	7.3	7.3	136.8	ОК
360	min V	Winter	46.913	1.363	0.0	7.3	7.3	143.5	ОК
480	min V	Winter	46.934	1.384	0.0	7.3	7.3	145.7	ΟK
600	min V	Winter	46.936	1.386	0.0	7.3	7.3	145.9	ОК
720	min V	Winter	46.937	1.387	0.0	7.3	7.3	146.0	ОК
960	min V	Winter	46.922	1.372	0.0	7.3	7.3	144.5	ОК
1440	min V	Winter	46.862	1.312	0.0	7.3	7.3	138.1	ОК
2160	min V	Winter	46.788	1.238	0.0	7.3	7.3	130.3	ОК
2880	min V	Winter	46.730	1.180	0.0	7.3	7.3	124.2	ОК
4320	min V	Winter	46.270	0.720	0.0	7.3	7.3	75.8	O K
5760	min V	Winter	45.910	0.360	0.0	7.3	7.3	37.9	ΟK
7200	min V	Winter	45.770	0.220	0.0	6.8	6.8	23.1	O K
8640	min V	Winter	45.705	0.155	0.0	6.2	6.2	16.3	ОК
10080	min V	Winter	45.682	0.132	0.0	5.7	5.7	13.9	ΟK

	Stor	m	Rain	Flooded	Discharge	Time-Peak	
	Even	t	(mm/hr)	Volume	Volume	(mins)	
				(m³)	(m³)		
8640	min	Summer	1.103	0.0	1167.5	4584	
10080	min	Summer	0.987	0.0	1218.3	5248	
15	min	Winter	78.546	0.0	159.7	22	
30	min	Winter	54.456	0.0	221.9	37	
60	min	Winter	35.457	0.0	291.1	66	
120	min	Winter	22.431	0.0	368.5	124	
180	min	Winter	17.011	0.0	419.3	182	
240	min	Winter	13.956	0.0	458.7	238	
360	min	Winter	10.526	0.0	519.0	350	
480	min	Winter	8.606	0.0	565.7	456	
600	min	Winter	7.356	0.0	604.5	496	
720	min	Winter	6.469	0.0	637.9	568	
960	min	Winter	5.281	0.0	694.1	724	
1440	min	Winter	3.965	0.0	781.2	1028	
2160	min	Winter	2.976	0.0	882.0	1476	
2880	min	Winter	2.425	0.0	958.3	2024	
4320	min	Winter	1.815	0.0	1075.1	2856	
5760	min	Winter	1.476	0.0	1167.3	3320	
7200	min	Winter	1.257	0.0	1242.7	3896	
8640	min	Winter	1.103	0.0	1307.7	4504	
10080	min	Winter	0.987	0.0	1364.8	5144	
		©	1982-20	20 Inno	vyze		

DBFL Consulting Engineers		Page 3
Ormond House	Catchment D Source Control	
Upper Ormond Quay		
Dublin 7		Micro
Date 18/11/2021 16:28	Designed by ByrneSe	Dcainago
File cas C-D.CASX	Checked by	Diamage
Innovyze	Source Control 2020.1	
<u>Cascade Rain</u>	nfall Details for D.srcx	
Rainfall Model	ESR Winter Storms	Yes
Return Period (years)	100 Cv (Summer) 0	.750
Region Scotla	and and Ireland Cv (Winter) 0	.840
M5-60 (mm)	16.400 Shortest Storm (mins)	15
Summer Storms	Yes Climate Change %	+10
	-	
<u>Tit</u>	ne Area Diagram	
Tot	al Area (ha) 0.351	
Time (mins)	) Area   Time (mins) Area	
From: To:	(ha) From: To: (ha)	
0 4	4 0.000 4 8 0.351	
©19	32-2020 Innovyze	

DBFL Consulting Engineers										
Ormond House	Catchme									
Upper Ormond Quay										
Dublin 7				Micco						
Date 18/11/2021 16:28	Designed									
File cas C-D.CASX	Checked	by		Digitigh						
Innovyze	Source C	ontrol 2	2020.1							
Cascade Model Details for D.srcx										
Storage is Online Cover Level (m) 48.190										
Cellula	Cellular Storage Structure									
Inver	rt Level (m	45.550	) Safety Fact	tor 2.0						
Infiltration Coefficient Infiltration Coefficient	Base (m/hr Side (m/hr	<ul><li>) 0.00000</li><li>) 0.00000</li></ul>	) Porosi	ity 0.82						
Depth (m) Area (m²) Inf. Are	ea (m²) Deg	oth (m) Ai	rea (m²) Inf	. Area (m²)						
0.000 128.4 1.440 128.4	0.0	1.445	0.0	0.0						
Under Destro	Ontimum	0.1+ flor	Gentuel							
<u>nyuro-brake</u>	Ορετιιαιί	OULLIOW	CONCLOT							
Unit	Reference	MD-SHE-0	119-7300-144	5-7300						
Desig	n Head (m)			1.445						
Design	Flow (l/s)			7.3						
	Flush-Flo™		Calc	ulated						
	Objective	Minimis	e upstream s	torage						
A	pplication		S	uriace Nac						
Sump	motor (mm)			110						
Invert	Level (m)			45,550						
Minimum Outlet Pipe Dia	meter (mm)			15.550						
Suggested Manhole Dia	meter (mm)			1200						
Control Po	ints	Head (m)	Flow (l/s)							
Design Point (Ca	alculated)	1.445	7.3							
I	flush-Flo™	0.422	7.3							
	Kick-Flo®	0.886	5.8							
Mean Flow over H	lead Range	-	6.4							
The hydrological calculations have h	een based	on the He	ad /Discharge	relationship for the						
Hydro-Brake® Optimum as specified.	Should ano	ther type	of control	device other than a						
Hydro-Brake Optimum® be utilised the	n these st	orage rou	ting calcula	tions will be						
invalidated										
	( <b>-</b> ( )   -									
Depth (m) Flow (1/S) Depth (m) Flow	v (1/S) Der	otn (m) Fl	LOW (1/S) De	ptn (m) Flow (1/s)						
0.100 4.2 1.200	6.7	3.000	10.3	7.000 15.4						
0.200 6.6 1.400	7.2	3.500	11.1	7.500 15.9						
0.300 7.1 1.600	7.7	4.000	11.8	8.000 16.4						
0.400 7.3 1.800	8.1	4.500	12.5	8.500 16.9						
0.500 7.2 2.000	8.5	5.000	13.1	9.000 17.4						
0.600 7.1 2.200	8.9	5.500	13.7	9.500 17.8						
	9.3	6.000	14.3							
1.000 6.1 2.800	9.0	0.500	14.9							
<u>@19</u>	32-2020 T	nnovvze								

APPENDIX D

# CORRESPONDANCE WITH IRISH WATER



Brendan Keogh - DBFL Consulting Engineers

Ormond House Upper Ormond Quay Dublin 7 Dublin D07W704

4 October 2021

# Re: CDS20003703 pre-connection enquiry - Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 475 units at Old Bray Road, Cornelscourt, Dublin 18, Co. Dublin

Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Old Bray Road, Cornelscourt, Dublin 18, Co. Dublin (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	OUTCOME OF PRE-CONNECTION ENQUIRY <u>THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A</u> <u>CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH</u> <u>TO PROCEED.</u>						
Water Connection	Feasible Subject to upgrades						
Wastewater Connection	Feasible Subject to upgrades						
SITE SPECIFIC COMMENTS							
Water Connection	Feasible subject to approximately 40m of new 150mm ID pipe to be laid to connect the development to the existing 9" Cast Iron water main, which in turn is connected to the existing strategic 24" Cast Iron trunk main. A boundary valve on the 9" pipe will need to be opened. A bulk meter is to be installed along this connection main.						
Wastewater Connection	Construction of an on-site pumping station and storage tank is required to pump only foul water into the proposed combined sewer. In heavy rainfall conditions and if the combined sewer is under pressure the developers flow will cease, and the flow will be stored in the proposed tank. It will then be returned to the system when the system returns to capacity. Design of the pump station and related equipment has to be agreed with IW at connection application stage. Some enhanced features in terms of telemetry, pump resilience will be required at this foul pump station. The 2150m3 tank should						

Stiúrthóirí / Directors: Cathal Marley (Chairman), Niall Gleeson, Eamon Gallen, Yvonne Harris, Brendan Murphy, Maria O'Dwyer 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

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

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

www.water.ie

IW-HP-





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

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

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

## **General Notes:**

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

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

Yours sincerely,

Gronne Massis

Yvonne Harris Head of Customer Operations

**APPENDIX E** 

# BUS CONNECTS CBC BRAY TO CITY CENTRE

BusConnects Core Bus Corridors 13: Bray > City Centre

MAP 31: Emerging Preferred Route



**SECTION 6** 

**APPENDIX F** 

# SURFACE WATER DRAINAGE NETWORK DESIGN

DBFL Consulting Engineers		Page 1										
Ormond House	5 year 30 minute event											
Upper Ormond Quay	- ,											
Dublin 7		Mirro										
Date 18/11/2021 15:54	Designed by ByrneSe	Dcainago										
File 180208.MDX	Checked by	Diginada										
Innovyze	Network 2020.1											
STORM SEWER DES	IGN by the Modified Rational N	lethod										
Design Criteria for Storm												
Pipe Sizes STANDARD Manhole Sizes STANDARD												
FSR Rainf	all Model - Scotland and Ireland											
Return Period (ye	ars) 5 (mm) 16 400 add Eleve ( Clim	PIMP (%) 100										
Rat	io R 0.273 Minimum Backd	lrop Height (m) 0.200										
Maximum Rainfall (mm	/hr) 50 Maximum Backd	lrop Height (m) 1.500										
Maximum Time of Concentration (m	ins) 30 Min Design Depth for Op	otimisation (m) 1.200										
Foul Sewage (1/s Volumetric Rupoff Co	/na) U.UUU Min Vel for Auto Des eff. 0.750 Min Slope for Opti	sign only $(m/s)$ 1.00 misation $(1:x)$ 500										
De	signed with Level Soffits											
Network Design Table for Storm												
« – I:	ndicates pipe capacity < flow											
PN Length Fall Slope I.Area	T.E. Base k HYD DIA	Section Type Auto										
PN Length Fall Slope I.Area (m) (m) (1:X) (ha)	n T.E. Base k HYD DIA (mins) Flow (l/s) (mm) SECT (mm)	Section Type Auto Design										
PN Length Fall Slope I.Area (m) (m) (1:X) (ha) S1.000 28.120 1.406 20.0 0.087	T.E.         Base         k         HYD         DIA           (mins)         Flow (1/s) (mm)         SECT (mm)           7         4.00         0.0         0.600         o         225	Section Type Auto Design Pipe/Conduit										
PN         Length         Fall         Slope         I.Area           (m)         (m)         (1:X)         (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016	T.E.         Base         k         HYD         DIA           (mins)         Flow (1/s)         (mm)         SECT         (mm)           7         4.00         0.0         0.600         0         225           5         0.00         0.0         0.600         0         225	Section Type Auto Design Pipe/Conduit										
PN         Length         Fall         Slope         I.Area           (m)         (m)         (1:X)         (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112	T.E.         Base         k         HYD         DIA           (mins)         Flow (1/s)         (mm)         SECT         (mm)           4.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225	Section Type Auto Design Pipe/Conduit Pipe/Conduit										
PN         Length         Fall         Slope         I.Area           (m)         (m)         (1:X)         (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112           S1.003         13.811         0.068         203.1         0.022	T.E.         Base         k         HYD         DIA           (mins)         Flow (1/s)         (mm)         SECT         (mm)           7         4.00         0.0         0.600         o         225           5         0.00         0.0         0.600         o         225           2         0.00         0.0         0.600         o         225           0         0.00         0.0         0.600         o         225           0         0.00         0.0         0.600         o         225	Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit										
PN         Length         Fall         Slope         I.Area           (m)         (m)         (1:X)         (ha)           \$1.000         28.120         1.406         20.0         0.087           \$1.001         13.000         0.650         20.0         0.016           \$1.002         40.694         2.035         20.0         0.112           \$1.003         13.811         0.068         203.1         0.022           \$1.004         10.315         0.298         34.6         0.013	T.E.         Base         k         HYD         DIA           (mins)         Flow (1/s)         (mm)         SECT         (mm)           4.00         0.0         0.600         0         225           0.00         0.00         0.600         0         225           0.00         0.00         0.600         0         225           0.00         0.00         0.600         0         225           0.00         0.00         0.600         0         225           0.00         0.00         0.600         0         225           0.00         0.00         0.600         0         225           0.00         0.00         0.600         0         225           0.00         0.00         0.600         0         225	Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit										
PN         Length         Fall         Slope         I.Area           (m)         (m)         (1:X)         (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112           S1.003         13.811         0.068         203.1         0.022           S1.004         10.315         0.298         34.6         0.019           S1.005         9.547         0.274         34.8         0.009           S1.006         38.736         1.171         33.1         0.334	T.E.         Base         k         HYD         DIA           (mins)         Flow (1/s)         (mm)         SECT         (mm)           7         4.00         0.0         0.600         0         225           5         0.00         0.0         0.600         0         225           2         0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225	Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit										
PN         Length         Fall         Slope         I.Area           (m)         (m)         (1:X)         (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112           S1.003         13.811         0.068         203.1         0.022           S1.004         10.315         0.298         34.6         0.019           S1.005         9.547         0.274         34.8         0.009           S1.006         38.736         1.171         33.1         0.334           S1.007         24         814         0.062         400.2         0.014	T.E.         Base         k         HYD         DIA           (mins)         Flow (1/s)         (mm)         SECT         (mm)           4.00         0.0         0.600         0         225           5.0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         200	Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit										
PN         Length (m)         Fall (m)         Slope (1:X)         I.Area (ha)           \$\$1.000         28.120         1.406         20.0         0.087           \$\$1.001         13.000         0.650         20.0         0.016           \$\$1.002         40.694         2.035         20.0         0.112           \$\$1.003         13.811         0.068         203.1         0.022           \$\$1.004         10.315         0.298         34.6         0.019           \$\$1.005         9.547         0.274         34.8         0.009           \$\$1.006         38.736         1.171         33.1         0.334           \$\$1.007         24.814         0.062         400.2         0.014           \$\$1.008         29.044         0.290         100.2         0.007	T.E.         Base         k         HYD         DIA           (mins)         Flow (1/s)         (mm)         SECT         (mm)           4.00         0.0         0.600         0         225           0.00         0.00         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         300           0.00         0.0         0.600         300         300           0.00         0.0         0.600         225         300	Section Type Auto Design										
PN         Length (m)         Fall (m)         Slope (1:X)         I.Area (ha)           \$\$1.000         28.120         1.406         20.0         0.087           \$\$1.001         13.000         0.650         20.0         0.016           \$\$1.002         40.694         2.035         20.0         0.112           \$\$1.003         13.811         0.068         203.1         0.022           \$\$1.004         10.315         0.298         34.6         0.019           \$\$1.005         9.547         0.274         34.8         0.002           \$\$1.006         38.736         1.171         33.1         0.334           \$\$1.007         24.814         0.062         400.2         0.014           \$\$1.008         29.044         0.290         100.2         0.007	T.E.         Base         k         HYD         DIA           (mins)         Flow (1/s)         (mm)         SECT         (mm)           4.00         0.0         0.600         0         225           5.0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00	Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit										
PN         Length (m)         Fall (m)         Slope (1:X)         I.Area (ha)           \$1.000         28.120         1.406         20.0         0.087           \$1.001         13.000         0.650         20.0         0.016           \$1.002         40.694         2.035         20.0         0.112           \$1.003         13.811         0.068         203.1         0.022           \$1.004         10.315         0.298         34.6         0.019           \$1.005         9.547         0.274         34.8         0.002           \$1.006         38.736         1.171         33.1         0.334           \$1.007         24.814         0.062         400.2         0.014           \$1.008         29.044         0.290         100.2         0.007           \$2.000         41.175         0.789         52.2         0.133	A       T.E.       Base       k       HYD       DIA         (mins)       Flow (1/s)       (mm)       SECT       (mm)         7       4.00       0.0       0.600       0       225         5       0.00       0.0       0.600       0       225         2       0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       300         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.4.00       0.0       0.600       0       225 <td>Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit</td>	Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit										
PN         Length (m)         Fall (m)         Slope (1:X)         I.Area (ha)           \$\$1.000         28.120         1.406         20.0         0.087           \$\$1.001         13.000         0.650         20.0         0.016           \$\$1.002         40.694         2.035         20.0         0.112           \$\$1.003         13.811         0.068         203.1         0.022           \$\$1.004         10.315         0.298         34.6         0.019           \$\$1.005         9.547         0.274         34.8         0.002           \$\$1.006         38.736         1.171         33.1         0.334           \$\$1.007         24.814         0.062         400.2         0.014           \$\$1.008         29.044         0.290         100.2         0.007           \$\$2.000         41.175         0.789         52.2         0.135	A       T.E.       Base       k       HYD       DIA         (mins)       Flow (1/s)       (mm)       SECT       (mm)         7       4.00       0.0       0.600       0       225         5       0.00       0.0       0.600       0       225         2       0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       300         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.4.00       0.0       0.600       0       225         0.4.00       0.0       0.600       0       225 </td <td>Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit</td>	Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit										
PN         Length (m)         Fall (m)         Slope (1:X)         I.Area (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112           S1.003         13.811         0.068         203.1         0.022           S1.004         10.315         0.298         34.6         0.019           S1.005         9.547         0.274         34.8         0.009           S1.006         38.736         1.171         33.1         0.334           S1.007         24.814         0.062         400.2         0.014           S1.008         29.044         0.290         100.2         0.007           S2.000         41.175         0.789         52.2         0.133           M         M         M         M         M	T.E.       Base       k       HYD       DIA         (mins)       Flow (1/s)       (mm)       SECT       (mm)         4.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       300         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.400       0.0       0.600       0       225         0.400       0.0       0.600       0       225         0.400       0.0       0.600 </td <td>Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Vel Cap Flow (m/s) (1/s)</td>	Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Vel Cap Flow (m/s) (1/s)										
PN         Length (m)         Fall (m)         Slope (1:x)         I.Area (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112           S1.003         13.811         0.068         203.1         0.022           S1.004         10.315         0.298         34.6         0.019           S1.005         9.547         0.274         34.8         0.009           S1.006         38.736         1.171         33.1         0.334           S1.008         29.044         0.290         100.2         0.007           S2.000         41.175         0.789         52.2         0.133           M         PN         Rain         T.C.         US/IL           (mm/hr)         (mins)         (m)         M	A       T.E.       Base       k       HYD       DIA         (mins)       Flow (1/s)       (mm)       SECT       (mm)         2       4.00       0.0       0.600       0       225         5       0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       300         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.4.00       0.0       0.600       0       225         0.4.00       0.0       0.600       0       225         0.10       0.600       0       225         0.10	Section TypeAuto DesignPipe/ConduitImage: ConduitPipe/ConduitImage: ConduitPipe/ConduitImage: ConduitPipe/ConduitImage: ConduitPipe/ConduitImage: ConduitPipe/ConduitImage: ConduitPipe/ConduitImage: ConduitPipe/ConduitImage: ConduitPipe/ConduitImage: ConduitPipe/ConduitImage: ConduitVelCapCapFlow(m/s)(1/s)(1/s)(1/s)										
PN         Length (m)         Fall (m)         Slope (1:x)         I.Area (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112           S1.003         13.811         0.068         203.1         0.022           S1.004         10.315         0.298         34.6         0.019           S1.005         9.547         0.274         34.8         0.002           S1.006         38.736         1.171         33.1         0.334           S1.007         24.814         0.062         400.2         0.014           S1.008         29.044         0.290         100.2         0.007           S2.000         41.175         0.789         52.2         0.133           M         M         M         M         M         M           Length         T.C.         US/IL         M         M	A       T.E.       Base       k       HYD       DIA         (mins)       Flow (1/s)       (mm)       SECT       (mm)         7       4.00       0.0       0.600       0       225         5       0.00       0.0       0.600       0       225         2       0.00       0.0       0.600       0       225         2       0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       300         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       22	Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit										
PN         Length (m)         Fall (m)         Slope (1:x)         I.Area (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112           S1.003         13.811         0.068         203.1         0.022           S1.004         10.315         0.298         34.6         0.019           S1.005         9.547         0.274         34.8         0.002           S1.006         38.736         1.171         33.1         0.334           S1.007         24.814         0.062         400.2         0.014           S1.008         29.044         0.290         100.2         0.007           S2.000         41.175         0.789         52.2         0.133           M         PN           Rain         T.C.         US/IL           (mm/hr)         (mins)         (m)           S1.000         50.00         4.16         52.275           S1.001         50.00         4.23         50.869	A         T.E.         Base         k         HYD         DIA           (mins)         Flow (1/s)         (mm)         SECT         (mm)           7         4.00         0.0         0.600         0         225           5         0.00         0.0         0.600         0         225           2         0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         300           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           16         4.00         0.0         0.600         0         225           16         4.00         0.0         0.600         0         225           16         1	Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit										
PN         Length (m)         Fall (m)         Slope (1:x)         I.Area (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112           S1.003         13.811         0.068         203.1         0.022           S1.004         10.315         0.298         34.6         0.019           S1.005         9.547         0.274         34.8         0.002           S1.006         38.736         1.171         33.1         0.334           S1.007         24.814         0.062         400.2         0.014           S1.008         29.044         0.290         100.2         0.007           S2.000         41.175         0.789         52.2         0.133           M         M           PN         Rain         T.C.         US/IL           (mm/hr)         (mins)         (m)         13.001         50.00         4.16         52.275           S1.001         50.00         4.23         50.869         51.002         50.004 <t< td=""><td>A         T.E.         Base         k         HYD         DIA           (mins)         Flow (1/s)         (mm)         SECT         (mm)           7         4.00         0.0         0.600         0         225           5         0.00         0.0         0.600         0         225           2         0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         300           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.103         0.0         0.0</td><td>Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit</td></t<>	A         T.E.         Base         k         HYD         DIA           (mins)         Flow (1/s)         (mm)         SECT         (mm)           7         4.00         0.0         0.600         0         225           5         0.00         0.0         0.600         0         225           2         0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         300           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.103         0.0         0.0	Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit										
PN         Length (m)         Fall (m)         Slope (l:x)         I.Area (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112           S1.003         13.811         0.068         203.1         0.022           S1.004         10.315         0.298         34.6         0.019           S1.005         9.547         0.274         34.8         0.002           S1.006         38.736         1.171         33.1         0.334           S1.007         24.814         0.062         400.2         0.014           S1.008         29.044         0.290         100.2         0.007           S2.000         41.175         0.789         52.2         0.133           M         PN         Rain         T.C.         US/IL           (mm/hr)         (mins)         (m)           S1.000         50.00         4.16         52.275           S1.001         50.00         4.23         50.869           S1.002         50.00	A       T.E.       Base       k       HYD       DIA         (mins)       Flow (1/s)       (mm)       SECT       (mm)         2       4.00       0.0       0.600       0       225         5       0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       225         0.00       0.0       0.600       0       300         2       0.00       0.0       0.600       0       300         2       0.00       0.0       0.600       0       225         3       4.00       0.0       0.600       0       225         4       0.00       0.0       0.600       0       225         4       0.00       0.0       0.600       0       225         4       0.00       0.0       0.600       0       225         4	Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit										
PN         Length (m)         Fall (m)         Slope (1:X)         I.Area (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112           S1.003         13.811         0.068         203.1         0.022           S1.004         10.315         0.298         34.6         0.019           S1.005         9.547         0.274         34.8         0.002           S1.006         38.736         1.171         33.1         0.334           S1.007         24.814         0.062         400.2         0.014           S1.008         29.044         0.290         100.2         0.007           S2.000         41.175         0.789         52.2         0.139           M         PN         Rain         T.C.         US/IL           (mm/hr)         (mins)         (m)         M           S1.000         50.00         4.16         52.275           S1.001         50.00         4.23         50.869           S1.002         50.	A         T.E.         Base         k         HYD         DIA           (mins)         Flow (1/s)         (mm)         SECT         (mm)           2         4.00         0.0         0.600         0         225           5         0.00         0.0         0.600         0         225           2         0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         300           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600	Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit										
PN         Length (m)         Fall (m)         Slope (1:X)         I.Area (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112           S1.003         13.811         0.068         203.1         0.022           S1.004         10.315         0.298         34.6         0.019           S1.005         9.547         0.274         34.8         0.002           S1.006         38.736         1.171         33.1         0.334           S1.007         24.814         0.062         400.2         0.007           S2.000         41.175         0.789         52.2         0.139           S2.000         41.175         0.789         52.2         0.139           M         PN         Rain         T.C.         US/IL           (mm/hr)         (mins)         (m)         1.001         50.00         4.16         52.275           S1.001         50.00         4.16         52.275         51.001         50.00         4.23         50.869     <	A         T.E.         Base         k         HYD         DIA           (mins)         Flow (l/s)         (mm)         SECT         (mm)           2         4.00         0.0         0.600         0         225           5         0.00         0.0         0.600         0         225           2         0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         300           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600	Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/C										
PN         Length (m)         Fall (m)         Slope (1:X)         I.Area (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112           S1.003         13.811         0.068         203.1         0.022           S1.004         10.315         0.298         34.6         0.019           S1.005         9.547         0.274         34.8         0.002           S1.006         38.736         1.171         33.1         0.334           S1.007         24.814         0.062         400.2         0.007           S2.000         41.175         0.789         52.2         0.133           S2.000         41.175         0.789         52.2         0.134           M         (mm/hr)         (mins)         (m)           S1.000         50.00         4.16         52.275           S1.001         50.00         4.23         50.869           S1.002         50.00         4.23         50.869           S1.003         50.00         4.74         49.508 </td <td>A         T.E.         Base         k         HYD         DIA           (mins)         Flow (l/s)         (mm)         SECT         (mm)           2         4.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.00         0.00         225</td> <td>Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit</td>	A         T.E.         Base         k         HYD         DIA           (mins)         Flow (l/s)         (mm)         SECT         (mm)           2         4.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.00         0.00         225	Section Type Auto Design Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit										
PN         Length (m)         Fall (m)         Slope (1:X)         I.Area (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112           S1.003         13.811         0.068         203.1         0.023           S1.004         10.315         0.298         34.6         0.019           S1.005         9.547         0.274         34.8         0.009           S1.006         38.736         1.171         33.1         0.334           S1.007         24.814         0.062         400.2         0.007           S2.000         41.175         0.789         52.2         0.133           S2.000         41.175         0.789         52.2         0.133           M         (mm/hr)         (mins)         (m)         M           S1.000         50.00         4.16         52.275         S1.001         50.00         4.23         50.869           S1.002         50.00         4.16         52.275         S1.001         50.00         4.72         47.473      <	A         T.E.         Base         k         HYD         DIA           (mins)         Flow (1/s)         (mm)         SECT         (mm)           2         4.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         300           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225     <	Section Type       Auto Design         Pipe/Conduit       Image: Section Type         Section Type       Image: Section Type         Question Type       Image: Section Type										
PN         Length (m)         Fall (m)         Slope (1:x)         I.Area (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112           S1.003         13.811         0.068         203.1         0.022           S1.004         10.315         0.298         34.6         0.019           S1.005         9.547         0.274         34.8         0.002           S1.006         38.736         1.171         33.1         0.334           S1.007         24.814         0.062         400.2         0.007           S2.000         41.175         0.789         52.2         0.139           M         Rain         T.C.         US/IL         Main           (mm/hr)         (mins)         (m)         Main         Main           S1.000         50.00         4.16         52.275         S1.001         50.00         4.23         50.869           S1.002         50.00         4.16         52.275         S1.001         50.00         4.747473           S1.002	A       T.E.       Base       k       HYD       DIA         (mins)       Flow (1/s)       (mm)       SECT       (mm)         2       4.00       0.0       0.600 $\sim$ 225         0.00       0.0       0.600 $\sim$ 225         0.103       0.0       0.600 $\sim$ 225         0.087       0.0       0.0       1.2         0.103 <td>Section Type Auto Design Pipe/Conduit Pipe/C</td>	Section Type Auto Design Pipe/Conduit Pipe/C										
PN         Length (m)         Fall (m)         Slope (1:x)         I.Area (ha)           S1.000         28.120         1.406         20.0         0.087           S1.001         13.000         0.650         20.0         0.016           S1.002         40.694         2.035         20.0         0.112           S1.003         13.811         0.068         203.1         0.022           S1.004         10.315         0.298         34.6         0.013           S1.005         9.547         0.274         34.8         0.002           S1.006         38.736         1.171         33.1         0.334           S1.007         24.814         0.062         400.2         0.007           S2.000         41.175         0.789         52.2         0.133           M         M         1.002         50.00         4.16         52.275           S1.001         50.00         4.16         52.275         51.001         50.00         4.23         50.869           S1.002         50.00         4.16         52.275         51.001         50.00         4.72         47.473           S1.003         50.00         4.16         52.275         51.0	A         T.E.         Base         k         HYD         DIA           (mins)         Flow (1/s)         (mm)         SECT         (mm)           2         4.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         225           0.00         0.0         0.600         0         300           0.00         0.0         0.600         0         225           6         4.00         0.0         0.600         0         225           6         4.00         0.0         0.600         0         225           6         4.00         0.0         0.0         1.2         0.103         0.0         1.4 <t< td=""><td>Section Type Auto Design         Pipe/Conduit         Pipe/Conduit</td></t<>	Section Type Auto Design         Pipe/Conduit										

DBFL Consulting Engineers											Pag	ge 2			
Ormond House 5 year 30 minute event															
Upper Ormond Quay															
Dublin	7													Mi	irm
Date 18	3/11,	/20	21 15	5:54			De	signe	ed by	Byrne	eSe				
File 18	30208	З.М	DX				Ch	Checked by						DI	ainaye
Innovyz	ze						Ne	tworł	2020	0.1					
Network Design Tabl									able f	for St	corm				
PN	Leng	th	Fall	Slop	еI.	Area	T.E.	Ва	ase	k	HYD	DIA	Secti	on Typ	e Auto
	(m	)	(m)	(1:X	) (	ha)	(mins)	Flow	(l/s)	(mm.)	SECT	(mm)			Design
g2 001	19 <i>4</i>	69	0 483	40	3 0	018	0 00		0 0	0 600	0	300	Dine	Condui	+ •
S2.001	13.5	66	0.136	99.	8 0	.010	0.00		0.0	0.600	0	450	Pipe/	Condui	t 🔒
S2.003	22.0	24	0.220	100.	1 0	.157	0.00		0.0	0.600	0	450	Pipe/	Condui	t 🦷
S2.004	45.3	94	0.117	388.	0 0	.269	0.00		0.0	0.600	0	450	Pipe/	Condui	t 🧕
S2.005	11.8	27	0.118	100.	2 0	.053	0.00		0.0	0.600	0	300	Pipe/	Condui	t 🦰
S2.006	22.2	71	0.223	99.	9 0	.201	0.00		0.0	0.600	0	375	Pipe/	Condui	t 🦺
S2.007	22.6	11	0.040	565.	3 0	.096	0.00		0.0	0.600	0	375	Pipe/	Condui	t 👸
S2.008	7.0	89	0.169	41.	9 0	.000	0.00		0.0	0.600	0	225	Pipe/	Condui	t 👸
S1.009	17.3	06	0.109	158.	8 0	.000	0.00		0.0	0.600	0	225	Pipe/	Condui	t 🧯
S1.010	28.2	13	0.188	150.	1 0	.000	0.00		0.0	0.600	0	225	Pipe/	Condui	τ 🛑
Network Results Table															
PN	r	Rai	.n 7	r.c.	US/	IL Σ	I.Area	Σ	Base	Foul	Add	Flow	Vel	Cap	Flow
	()	mm/l	nr) (n	ains)	(m	)	(ha)	Flow	(l/s)	(l/s)	(1,	/s)	(m/s)	(l/s)	(l/s)
S2.0	01	50	.00	4.51	50.5	551	0.153		0.0	0.0		2.1	2.48	175.6	22.8
S2.0	02	50	.00	4.62	48.8	356	0.194		0.0	0.0		2.6	2.04	323.8	28.9
S2.0	03	50	.00	4.80	48.7	720	0.351		0.0	0.0		4.8	2.03	323.2	52.3
S2.0	04	50	.00	5.54	47.1	15	0.620		0.0	0.0		8.4	1.03	163.2	92.4
S2.0	05	50	.00	5.66	46.9	98	0.673		0.0	0.0		9.1	1.57	111.0	100.2
S2.0	06	50	.00	5.87	46.8	313	0.874		0.0	0.0		11.8	1.81	200.3	130.2
S2.0	07	50	.00	6.37	46.5	590	0.970		0.0	0.0		13.1	0.75	83.4«	144.5
S2.0	08	50	.00	6.43	46.5	50	0.970		0.0	0.0		13.1	2.03	80.5«	144.5
S1.0	09	50	.00	6.70	44.7	700	1.585		0.0	0.0		21.5	1.04	41.2«	236.1
S1.0	10	50	.00	7.15	44.5	591	1.585		0.0	0.0		21.5	1.06	42.3«	236.1
						C	)1982-2	2020	Innov	yze					

DBFL Consulting Engineers		Page 3
Ormond House	5 vear 30 minute event	
Upper Ormond Quay		
Dublin 7		Mirro
Date 18/11/2021 15:54	Designed by ByrneSe	Dcainago
File 180208.MDX	Checked by	Diamage
Innovyze	Network 2020.1	

### Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S12	54 150	1 875	Open Manhole	1200	S1 000	52 275	225				
S11	53,000	2.131	Open Manhole	1200	S1.001	50.869	225	S1.000	50.869	225	
S10	52.455	2.947	Open Manhole	1200	S1.002	49.508	225	S1.001	50.219	225	711
S9	50.365	2.892	Open Manhole	1200	s1.003	47.473	225	s1.002	47.473	225	
S8	49.758	2.353	Open Manhole	1200	S1.004	47.405	225	S1.003	47.405	225	
S7	49.250	2.143	Open Manhole	1200	S1.005	47.107	225	S1.004	47.107	225	
S6	49.110	2.277	Open Manhole	1200	S1.006	46.833	300	S1.005	46.833	225	
S5	48.450	2.788	Open Manhole	1200	S1.007	45.662	300	S1.006	45.662	300	
S4	48.750	3.150	Open Manhole	1200	S1.008	45.600	225	s1.007	45.600	300	
S3-9	52.800	1.425	Open Manhole	1200	s2.000	51.375	225				
S3-8	52.560	2.009	Open Manhole	1200	S2.001	50.551	300	s2.000	50.586	225	
S3-7	51.650	2.794	Open Manhole	1350	S2.002	48.856	450	S2.001	50.068	300	1062
S3-6	51.250	2.530	Open Manhole	1350	S2.003	48.720	450	S2.002	48.720	450	
S3-5	51.530	4.415	Open Manhole	1350	S2.004	47.115	450	S2.003	48.500	450	1385
S3-4	49.690	2.692	Open Manhole	1350	S2.005	46.998	300	S2.004	46.998	450	
S3-3	49.790	2.977	Open Manhole	1350	S2.006	46.813	375	S2.005	46.880	300	
S3-2	48.810	2.220	Open Manhole	1350	S2.007	46.590	375	S2.006	46.590	375	
S3-1	48.190	1.640	Open Manhole	1350	S2.008	46.550	225	S2.007	46.550	375	
S3	47.990	3.290	Open Manhole	1200	S1.009	44.700	225	S1.008	45.310	225	610
								S2.008	46.381	225	1681
S2	47.650	3.059	Open Manhole	1200	S1.010	44.591	225	S1.009	44.591	225	
S	45.950	1.547	Open Manhole	0		OUTFALL		S1.010	44.403	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S12	722307.088	725897.535	722307.088	725897.535	Required	•
S11	722335.025	725894.337	722335.025	725894.337	Required	
S10	722337.699	725907.059	722337.699	725907.059	Required	1
S9	722358.078	725942.283	722358.078	725942.283	Required	- I 
						$\mathcal{T}_{\mathcal{T}}$

DBFL Consult	ing Engine	Pers				Page 4
Ormond House	2		5 VOCT 20			
Upper Ormono	d Quay		b year 30 m	iniule event		
Dublin 7	~ 1					Micco
Date 18/11/2	2021 15:54		Designed b	by ByrneSe		
File 180208	.MDX		Checked by	7		Digitige
Innovyze			Network 20	020.1		
		Manhole	Schedules	for Storm		
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S	8 722371.889	725942.211	722371.889	725942.211	Required	
S'	7 722382.180	725941.500	722382.180	725941.500	Required	
S	5 722389.828	725935.786	722389.828	725935.786	Required	1
S	5 722420.338	725911.918	722420.338	725911.918	Required	
Sʻ	4 722440.020	725896.807	722440.020	725896.807	Required	1
S3-9	9 722336.143	725812.287	722336.143	725812.287	Required	
S3-8	3 722361.102	725779.539	722361.102	725779.539	Required	
S3-'	7 722375.134	725766.043	722375.134	725766.043	Required	
S3-(	5 722387.996	725770.355	722387.996	725770.355	Required	1
S3-!	5 722402.179	725787.205	722402.179	725787.205	Required	1
S3-4	4 722427.388	725824.956	722427.388	725824.956	Required	4
S3-:	3 722432.100	725835.803	722432.100	725835.803	Required	4
S3-2	2 722445.326	725853.722	722445.326	725853.722	Required	4
S3-1	1 722458.315	725872.230	722458.315	725872.230	Required	4
s	3 722462.255	725878.123	722462.255	725878.123	Required	200

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DBFL Consulting Engineers		Page 5
Ormond House	5 year 30 minute event	
Upper Ormond Quay	,	
Dublin 7		Mirro
Date 18/11/2021 15:54	Designed by ByrneSe	Drainage
File 180208.MDX	Checked by	Diamage
Innovyze	Network 2020.1	
Marsha	le Orbeduler fan Otenn	
Manno	le schedules for storm	
MH Manhole Manhole Name Easting Northing (m) (m)	Intersection Intersection Manhol g Easting Northing Access (m) (m)	e Layout 3 (North)
S2 722475.901 725867.4	79 722475.901 725867.479 Require	:d '
S 722500.163 725853.04	31 No Entr	Y .
C	1982-2020 Innovyze	

DBFL Consult	ing E	ngine	eers						Page 6
Ormond House				:	5 year 3	0 minute	event		
Upper Ormond	Quay				,				
Dublin 7									Micro
Date 18/11/2	021 1	5:54		:	Designe	d by By	rneSe		Desinado
File 180208.1	MDX				Checked	by			Diamage
Innovyze					Network	2020.1			
			PIE	PELINE	SCHEDUL	ES for	Storm		
				Ups	tream M	lanhole			
PN	Hyd	Diam	мн	C.Level	I.Level	D.Depth	МН	MH DIAM.	, L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)	
S1 000	0	225	S12	54 150	52 275	1 650	Open Manhole		1200
S1.000 S1.001	0	225	S12 S11	53.000	50.869	1.906	Open Manhole		1200
S1.002	0	225	S10	52.455	49.508	2.722	Open Manhole		1200
S1.003	0	225	S9	50.365	47.473	2.667	Open Manhole		1200
S1.004	0	225	S8	49.758	47.405	2.128	Open Manhole		1200
S1.005	0	225	S7	49.250	47.107	1.918	Open Manhole		1200
S1.006	0	300	S6	49.110	46.833	1.977	Open Manhole		1200
S1.007	0	300	S5	48.450	45.662	2.488	Open Manhole		1200
S1.008	0	225	S4	48.750	45.600	2.925	Open Manhole		1200
92 000	0	225	93-9	52 800	51 375	1 200	Open Manhole		1200
S2.000 S2.000	0	300	53-8	52.560	50 551	1 709	Open Manhole		1200
S2.001	0	450	53-7	51 650	48 856	2 344	Open Manhole		1350
S2.002	0	450	53-6	51 250	48 720	2.080	Open Manhole		1350
S2.003	0	450	53-5	51 530	47 115	3 965	Open Manhole		1350
S2 005	0	300	53-4	49 690	46 998	2 392	Open Manhole		1350
52.006	0	375	53-3	49.790	46.813	2.602	Open Manhole		1350
S2.007	0	375	S3-2	48.810	46.590	1.845	Open Manhole		1350
S2.008	0	225	S3-1	48.190	46.550	1.415	Open Manhole		1350
S1.009	0	225	53	47,990	44.700	3.065	Open Manhole		1200
							1		
				Down	stream	Manhole	2		
PN 1	Length	Slope	e MH	C.Level	l I.Level	l D.Depth	n MH	MH DIAM	I., L*W
	(m)	(1:X)	) Name	(m)	(m)	(m)	Connection	( mr	n)
S1.000	28.120	20.0	) S11	53.000	50.869	9 1.906	5 Open Manhol	e	1200
S1.001	13.000	20.0	) S10	52.45	5 50.219	9 2.011	Open Manhol	e	1200
S1.002 4	40.694	20.0	) S9	50.365	5 47.473	3 2.667	7 Open Manhol	e	1200
S1.003	13.811	203.1	1 S8	49.758	8 47.40	5 2.128	B Open Manhol	e	1200
S1.004 1	10.315	34.6	5 S7	49.250	47.10	7 1.918	B Open Manhol	e	1200
S1.005	9.547	34.8	3 S6	49.110	46.833	3 2.052	2 Open Manhol	е	1200
S1.006	38.736	33.1	1 S5	48.450	45.662	2 2.488	3 Open Manhol	e	1200
S1.007 2	24.814	400.2	2 S4	48.750	45.600	2.850	) Open Manhol	e	1200
S1.008 2	29.044	100.2	2 S3	47.990	45.31	2.455	5 Open Manhol	e	1200
S2.000 4	41.175	52.2	2 S3-8	52.56	50.586	5 1.749	9 Open Manhol	e	1200
S2.001	19.469	40.3	3 S3-7	51.650	50.068	3 1.282	2 Open Manhol	e	1350
S2.002	13.566	99.8	3 S3-6	51.250	48.720	2.080	) Open Manhol	e	1350
S2.003	22.024	100.1	1 S3-5	51.530	48.50	2.580	) Open Manhol	e	1350
S2.004	45.394	388.0	) S3-4	49.690	46.998	3 2.242	2 Open Manhol	e	1350
S2.005	11.827	100.2	2 S3-3	49.790	46.880	2.610	) Open Manhol	e	1350
S2.006	22.271	99.9	9 S3-2	48.810	46.590	1.845	5 Open Manhol	e	1350
S2.007	22.611	565.3	3 S3-1	48.190	46.550	1.265	5 Open Manhol	e	1350
S2.008	7.089	41.9	9 S3	47.990	46.383	1 1.384	4 Open Manhol	e	1200
S1.009	17.306	158.8	8 S2	47.650	0 44.593	1 2.834	4 Open Manhol	e	1200
				©1982	2-2020	Innovyz	e		

DBFL Consulting Engineers		Page 7
Ormond House	5 vear 30 minute event	
Upper Ormond Quay		
Dublin 7		Micco
Date 18/11/2021 15:54	Designed by ByrneSe	
File 180208.MDX	Checked by	Diamaye
Innovyze	Network 2020.1	
PIPELINE	SCHEDULES for Storm	
Up	stream Manhole	
DN Und Diem MU (Lious)		T 410
Sect (mm) Name (m)	(m) (m) Connection (mm)	, ц^w )
S1.010 o 225 S2 47.650	44.591 2.834 Open Manhole	1200
Dow	nstream Manhole	
PN Length Slope MH C.Leve	el I.Level D.Depth MH MH DIA	M., L*W
(m) (1:X) Name (m)	(m) (m) Connection (m	m)
S1.010 28.213 150.1 S 45.9	50 44.403 1.322 Open Manhole	0
Free Flowing	Outfall Details for Storm	
Outfall Outfall C	. Level I. Level Min D,L W	
Pipe Number Name	(m) (m) 1. Level (mm) (mm) (m)	
	()	
S1.010 S	45.950 44.403 44.500 0 0	
Simulatio	on Criteria for Storm	
	SI CITCEITA TOT SCOTI	
Volumetric Runoff Coeff 1	.000 Additional Flow - % of Total Flo	ow 10.000
Areal Reduction Factor 1	.000 MADD Factor * 10m <sup>3</sup> /ha Storag	ge 2.000
Hot Start (mins)	0 Inlet Coefficier	nt 0.800
Hot Start Level (mm) Manhole Headloss Coeff (Clobal) 0	U Flow per Person per Day (1/per/day	y) 0.000
Foul Sewage per hectare (1/s) 0	.000 Output Interval (min	s) 1
Number of Input Hydrogr	aphs 0 Number of Storage Structures 4	
Number of Offline Cont	rols 0 Number of Real Time Controls 0	
Synthet	ic Rainfall Details	
Rainfall Model	FSR Profile Type Wi	nter
Region Scotlar	nd and Ireland Cv (Winter) 1	
M5-60 (mm)	16.400 Storm Duration (mins)	30
Ratio R	0.273	

DBFL Consulting Engineers					Page 8
Ormond House	5 vear 30	minute eve	ent		
Upper Ormond Quay	o your oo		0110		
Dublin 7					Micco
Date 18/11/2021 15:54	Designed	by Byrne	Se		
File 180208.MDX	Checked	0V			urainage
	Network	2020 1			
	NCCWOIN	2020.1			
Online	Controls	for Stor	<u>m</u>		
Hydro-Brake® Optimum Manhol	.e: S8, DS	5/PN: S1.	004, Vo	lume (m³	): 3.2
IInit	Reference	MD-SHE-005	57-2000-20	100-2000	
Desig	n Head (m)	NE SIE 003	7 2000 20	2.000	
Design	Flow (l/s)			2.0	
	Flush-Flo™		Ca	lculated	
	Objective	Minimise	upstream	storage	
A	pplication			Surface	
Dia	Available			res 57	
Invert	Level (m)			47.405	
Minimum Outlet Pipe Dia	meter (mm)			75	
Suggested Manhole Dia	meter (mm)			1200	
Control Po	ints	Head (m) F	low (l/s)		
Design Point (Ca	(lculated)	2.000	2.0		
I	lush-Flo™	0.247	1.3		
	Kick-Flo®	0.506	1.1		
Mean Flow over H	Iead Range	-	1.5		
The hydrological calculations have b Hydro-Brake® Optimum as specified. Hydro-Brake Optimum® be utilised the invalidated	een based o Should anot n these sto	on the Head ther type c orage routi	l/Discharg of control .ng calcul	ge relatio L device o Lations wi	onship for the other than a ill be
Depth (m) Flow (1/s) Depth (m) Flow	r (l/s) Dep	th (m) Flo	w (l/s)   I	Depth (m)	Flow (l/s)
0.100 1.2 1.200	1.6	3.000	2.4	7.000	3.6
0.200 1.3 1.400	1.7	3.500	2.6	7.500	3.7
0.300 1.3 1.600	1.8	4.000	2.7	8.000	3.8
0.400 1.3 1.800	1.9	4.500	2.9	8.500	3.9
0.500 1.1 2.000	2.0	5.000	3.0	9.000	4.0
	2.1	5.500	3.2	9.500	4.1
1.000 1.5 2.600	2.2	6.500	3.3		
Hydro-Brake® Optimum Manhol	.e: S4, DS	5/PN: S1.	008, Voi	lume (m³	): 5.2
Unit	Reference	MD-SHE-009	8-5700-20	00-5700	
Desig	n Head (m)			2.000	
Design	Flow (l/s)			5.7	
	Flush-Flo™		Ca	Lculated	
	Ubjective	Minimise	upstream	storage	
A Cumus	Available			Surlace Vec	
sump nia	meter (mm)			98	
Invert.	Level (m)			45.600	
Minimum Outlet Pipe Dia	meter (mm)			150	
Suggested Manhole Dia	meter (mm)			1200	
©198	32-2020 Ir	novyze			

DBFL Consulting H	Ingin	leers				I	Page 9
Ormond House			5 year 30	) minute eve	nt	ſ	
Upper Ormond Ouay	7		J year J		71 IL		
Dublin 7	•						Micco
Date 18/11/2021	15:54		Designe	d by Byrne	Se		MILIU
File 180208 MDY	19.91		Checked	by			Drainage
Turnerse			Natural	2020 1			
Innovyze			Network	2020.1			
Hydro-Brake	® Opt	timum Manho	le: S4, I	DS/PN: S1.	008, Volu	ume (m³)	: 5.2
		Control Po	oints	Head (m) F	Low (l/s)		
	De	sign Point (C	alculated)	2.000	5.7		
			Flush-Flo™	0.430	4.8		
			Kick-Flo®	0.874	3.9		
	Me	an Flow over	Head Range	-	4.6		
The hydrological of Hydro-Brake® Optin Hydro-Brake Optinn invalidated	calcul num as um® be	lations have l s specified. e utilised the	peen based Should an en these s	on the Head other type o torage routi	/Discharge f control ng calcula	e relation device ot tions wil	ship for the her than a l be
Depth (m) Flow (	l/s) 1	Depth (m) Flo	w (l/s) De	epth (m) Flow	w (l/s) De	epth (m) F	low (l/s)
0.100	3.2	1,200	4.5	3.000	6.9	7.000	10.3
0.200	4.4	1.400	4.8	3.500	7.4	7.500	10.6
0.300	4.7	1.600	5.1	4.000	7.9	8.000	11.0
0.400	4.8	1.800	5.4	4.500	8.3	8.500	11.3
0.500	4.8	2.000	5.7	5.000	8.8	9.000	11.6
0.600	4.7	2.200	5.9	5.500	9.2	9.500	11.9
0.800	4.3	2.400	6.2	6.000	9.6		
1.000	4.1	2.000	0.4	0.500	9.9		
Hydro-Brake®	Opti	mum Manhole	e: S3-4,	DS/PN: S2.	005, Vol	ume (m³)	: 10.9
		Unit	Reference	e MD-SHE-009	9-5000-145	0-5000	
		Desig	gn Head (m	)		1.450	
		Design	Flow (l/s	)	_	5.0	
			Flush-Flo	M	Calc	ulated	
			Objective	e Minimise	upstream s	torage	
		Cum	Application	.1	2	Vog	
		Dia	ameter (mm	)		99	
		Invert	: Level (m	, )		46.998	
Minir	num Oi	tlet Pipe Dia	ameter (mm	)		150	
Sug	ggeste	ed Manhole Dia	ameter (mm	)		1200	
		Control Po	oints	Head (m) F	low (l/s)		
	De	sign Point (C	alculated)	1.450	5.0		
			Flush-Flo™	0.432	5.0		
			Kick-Flo®	0.882	4.0		
	Me	an Flow over	Head Range	-	4.4		
The hydrological o Hydro-Brake® Optin Hydro-Brake Optinn invalidated	calcul num as um® be	lations have s specified. e utilised the	ceen based Should an en these s	on the Head other type o torage routi	/Discharge f control ng calcula	e relation device ot tions wil	ship for the her than a l be
Depth (m) Flow (	l/s)	Depth (m) Flo	w (l/s) De	epth (m) Flow	w (l/s) De	epth (m) F	low (l/s)
0.100	3.2	0.300	4.9	0.500	5.0	0.800	4.4
0.200	4.5	0.400	5.0	0.600	4.9	1.000	4.2
		©19	82-2020 3	Innovyze			

Ormond House	ING FUGTUE	ers					Page 10
			5 year 30	minute ev	ent		
Upper Ormond	Quay						
Dublin 7							Mirro
Date 18/11/20	21 15:54		Designed	by Byrne	eSe		Drainage
File 180208.M	ÍDX		Checked	by			Diginage
Innovyze			Network	2020.1			
<u>Hydro-Bra</u>	ke® Optin	um Manhol	e: S3-4, I	DS/PN: S2	.005, Vol	Lume (m³	9): 10.9
Depth (m) Fl	ow (l/s) D	epth (m) Flo	ow (l/s) Der	oth (m) Flo	ow (l/s) D	epth (m)	Flow (l/s)
1.200	4.6	2.400	6.3	5.000	8.9	8.000	11.2
1.400	4.9	2.600	6.6	5.500	9.3	8.500	11.5
1.600	5.2	3.000	7.0	6.000	9.7	9.000	11.8
1.800	5.5	3.500	7.5	6.500		9.500	12.1
2.000	5.8	4.500	8.0	7.500	10.8		
2.200	0.1	1.500	0.5	1.500	10.0		
Hydro-Bra	ake® Opti	mum Manhol	_e: S3-1,	DS/PN: S2	2.008, Vo	lume (m	<sup>3</sup> ): 4.7
		Uni	t Reference	MD-SHE-01	19-7300-14	50-7300	
		Desi	.gn Head (m)			1.450	
		Design	Flow (l/s)			7.3	
			Flush-Flo™		Cal	culated	
			Objective	Minimise	upstream	storage	
		Curr	Application			Surface	
		Sui	p Available			110	
		DI	aniecer (nnn)			16 550	
	Minimum Out	inver ig ogig tol-	c Level (III)			40.550	
	Suggested	l Manhole Di	ameter (mm)			1200	
		Control P	oints	Head (m) H	?low (l/s)		
	Des	ign Point ((	Calculated)	1.450	7.3		
	205	1911 101110 ((	Flush-Flo™	0.433	7.3		
			Kick-Flo®	0.900	5.8		
	Mea	n Flow over	Head Range	-	6.4		
mba budualagi	cal calcula	ations have	been based			a relatio	
Hydro-Brake® Hydro-Brake O invalidated	ptimum® be	specified. utilised th	Should ano nen these st	on the Head ther type orage rout	d/Dischargo of control ing calculo	device c ations wi	nship for the ther than a ll be
He Hydrologi Hydro-Brake® Hydro-Brake O invalidated Depth (m) Fl	optimum® be	specified. utilised th epth (m) Flo	Should ano ien these st	on the Head ther type orage rout oth (m) Flo	d/Discharg of control ing calcula ow (l/s)	device c ations wi	nship for the other than a ll be Flow (1/s)
He Hydrologi Hydro-Brake® Hydro-Brake O invalidated Depth (m) FL 0.100	ow (1/s) Do	specified. utilised th epth (m) Flo	Should ano ien these st ow (1/s) Der 6.7	on the Head ther type o orage rout oth (m) Flo 3.000	d/Discharg of control ing calcul pw (1/s) D 10.3	device c ations wi epth (m) 7.000	nship for the ther than a .11 be Flow (1/s) 15.4
He Hydrologi Hydro-Brake® Hydro-Brake O invalidated Depth (m) FL 0.100 0.200	ow (1/s) D 4.2 6.6	<pre>specified. utilised th epth (m) Flo 1.200 1.400</pre>	Should ano ien these st ow (1/s) Deg 6.7 7.2	on the Head ther type orage rout oth (m) Flo 3.000 3.500	d/Discharg of control ing calcul pw (1/s) D 10.3 11.1	device c ations wi <b>epth (m)</b> 7.000 7.500	<pre>mship for the ther than a ll be Flow (1/s) 15.4 15.9 </pre>
He Hydrologi Hydro-Brake® Hydro-Brake O invalidated Depth (m) FL 0.100 0.200 0.300	ow (1/s) D 4.2 6.6 7.1	<pre>specified. utilised th  ppth (m) Flo  1.200 1.400 1.600 1.600</pre>	Should ano ien these st ow (1/s) Deg 6.7 7.2 7.6	on the Head ther type or orage rout (m) Flo 3.000 3.500 4.000 4.000	d/Discharg of control ing calcul <b>Dw (1/s) D</b> 10.3 11.1 11.8	device c ations wi ppth (m) 7.000 7.500 8.000	nship for the ther than a 11 be Flow (1/s) 15.4 15.9 16.4
He Hydrologi Hydro-Brake® Hydro-Brake O invalidated Depth (m) Fl 0.100 0.200 0.300 0.400	ow (1/s) D 4.2 6.6 7.1 7.3	<pre>specified. utilised tf epth (m) Flo 1.200 1.400 1.600 1.800 2.000</pre>	Should ano nen these st ow (1/s) Deg 6.7 7.2 7.6 8.1	on the Head ther type or orage rout (m) Flo 3.000 3.500 4.000 4.500 5.000	d/Discharg of control ing calcul <b>Dw (1/s) D</b> 10.3 11.1 11.8 12.5	device c ations wi <b>epth (m)</b> 7.000 7.500 8.000 8.500	nship for the ther than a 11 be Flow (1/s) 15.4 15.9 16.4 16.9
He Hydrologi Hydro-Brake® Hydro-Brake O invalidated Depth (m) Fl 0.100 0.200 0.300 0.400 0.500	ow (1/s) D 4.2 6.6 7.1 7.3 7.3 7.3	<pre>specified. utilised tf  ppth (m) Flo  1.200 1.400 1.600 1.800 2.000 2.200</pre>	Should ano nen these st ow (1/s) Deg 6.7 7.2 7.6 8.1 8.5 8.5	on the Head ther type or orage rout 3.000 3.500 4.000 4.500 5.000	d/Discharg of control ing calcul <b>Dw (1/s) D</b> 10.3 11.1 11.8 12.5 13.1	device c ations wi 7.000 7.500 8.000 8.500 9.000	nship for the ther than a ll be <b>Flow (1/s)</b> 15.4 15.9 16.4 16.9 17.3
He Hydrologi Hydro-Brake® Hydro-Brake O invalidated Depth (m) Fl 0.100 0.200 0.300 0.400 0.500 0.600 0.600	ow (1/s) D 4.2 6.6 7.1 7.3 7.3 7.2 6.6	<pre>specified. utilised tf  ppth (m) Flo  1.200 1.400 1.600 1.800 2.000 2.200 2.400</pre>	Should ano nen these st ow (1/s) Deg 6.7 7.2 7.6 8.1 8.5 8.9 0.2	on the Head ther type or orage rout 3.000 3.500 4.000 4.500 5.000 5.500 6.000	d/Discharg of control ing calcul <b>Dw (1/s) D</b> 10.3 11.1 11.8 12.5 13.1 13.7	device c ations wi 7.000 7.500 8.000 8.500 9.000 9.500	nship for the other than a ll be Flow (1/s) 15.4 15.9 16.4 16.9 17.3 17.8
He Hydrologi Hydro-Brake® Hydro-Brake O invalidated Depth (m) Fl 0.100 0.200 0.300 0.400 0.500 0.600 0.600 0.800 1.000	ow (1/s) D 4.2 6.6 7.1 7.3 7.3 7.2 6.6 6.1	<pre>specified. utilised tf  pth (m) Flo  1.200 1.400 1.600 1.800 2.000 2.200 2.400 2.600</pre>	Should ano nen these st (1/s) Deg 6.7 7.2 7.6 8.1 8.5 8.9 9.2 9.6	on the Head ther type orage rout 3.000 3.500 4.000 4.500 5.500 6.000 6.500	d/Discharg of control ing calcula <b>bw</b> (1/s) D 10.3 11.1 11.8 12.5 13.1 13.7 14.3 14.8	device c ations wi 7.000 7.500 8.000 8.500 9.000 9.500	mship for the other than a .11 be Flow (1/s) 15.4 15.9 16.4 16.9 17.3 17.8
He Hydrologi Hydro-Brake® Hydro-Brake O invalidated Depth (m) Fl 0.100 0.200 0.300 0.400 0.500 0.600 0.800 1.000	ow (1/s) D 4.2 6.6 7.1 7.3 7.3 7.2 6.6 6.1	specified. utilised th epth (m) Flo 1.200 1.400 1.600 1.800 2.000 2.200 2.400 2.600	Should ano nen these st (1/s) Deg 6.7 7.2 7.6 8.1 8.5 8.9 9.2 9.6	on the Head ther type ( orage rout (m) Flo 3.000 3.500 4.000 4.500 5.000 5.500 6.000 6.500	d/Discharg of control ing calcula <b>bw</b> (1/s) D 10.3 11.1 11.8 12.5 13.1 13.7 14.3 14.8	epth (m) 7.000 7.500 8.000 8.500 9.000 9.500	mship for the other than a 11 be <b>Flow (1/s)</b> 15.4 15.9 16.4 16.9 17.3 17.8
He Hydrologi Hydro-Brake® Hydro-Brake O invalidated Depth (m) Fl 0.100 0.200 0.300 0.400 0.500 0.600 0.800 1.000	ow (1/s) D 4.2 6.6 7.1 7.3 7.2 6.6 6.1	specified. utilised th epth (m) Flo 1.200 1.400 1.600 1.800 2.000 2.200 2.400 2.600	Should ano nen these st (1/s) Der 6.7 7.2 7.6 8.1 8.5 8.9 9.2 9.6 9.6	on the Head ther type or orage rout 3.000 3.500 4.000 4.500 5.500 6.000 6.500 6.500	d/Discharg of control ing calcul <b>bw</b> (1/s) D 10.3 11.1 11.8 12.5 13.1 13.7 14.3 14.8	device c ations wi 7.000 7.500 8.000 8.500 9.000 9.500	mship for the other than a 11 be Flow (1/s) 15.4 15.9 16.4 16.9 17.3 17.8

DBFL Consulting Engineers				Page 11
Ormond House	5 year	30 minute e	vent	
Upper Ormond Quay	,			
Dublin 7				Mirro
Date 18/11/2021 15:54	Design	ed by Byrr	ieSe	Drainage
File 180208.MDX	Checke	ed by		brainage
Innovyze	Networ	rk 2020.1		
<u>Storage</u> Cellular Storage	Structu e Manho	ires for St	 /PN: S1.004	
Inve Infiltration Coefficient Infiltration Coefficient	rt Level Base (m Side (m	(m) 47.405 /hr) 0.00000 /hr) 0.00000	Safety Facto Porosit	r 2.0 y 0.95
Depth (m) Area (m <sup>2</sup> ) Inf. Ar	ea (m²)	Depth (m) Ar	ea (m²) Inf.	Area (m²)
0.000 68.0 2.000 68.0	0.0	2.001	0.0	0.0
<u>Cellular Storag</u>	e Manho	le: S4, DS	/PN: S1.008	
Inve Infiltration Coefficient Infiltration Coefficient	rt Level Base (m Side (m	(m) 45.600 /hr) 0.00000 /hr) 0.00000	Safety Factor Porosity	r 2.0 y 0.95
Depth (m) Area (m²) Inf. Ar	ea (m²)	Depth (m) Ar	ea (m²) Inf.	Area (m²)
0.000 76.0 2.000 76.0	0.0	2.001	0.0	0.0
<u>Cellular Storage</u>	Manhol	e: S3-4, D	S/PN: S2.00	5
Inve Infiltration Coefficient Infiltration Coefficient Depth (m) Area (m <sup>2</sup> ) Inf. Ar	rt Level Base (m Side (m ea (m²)	(m) 46.998 /hr) 0.00000 /hr) 0.00000 Depth (m) Ar	Safety Factor Porosity	r 2.0 y 0.80 Area (m²)
	cu (m )	Depen (m) A	cu (m ) 1111.	
0.000 295.5 1.450 295.5	0.0	1.451	0.0	0.0
<u>Cellular Storage</u>	Manhol	e: S3-1, D	S/PN: S2.00	8
Inve Infiltration Coefficient Infiltration Coefficient	rt Level Base (m Side (m	(m) 46.550 /hr) 0.00000 /hr) 0.00000	Safety Factor Porosity	r 2.0 y 0.82
Depth (m) Area (m <sup>2</sup> ) Inf. Ar	ea (m²)	Depth (m) Ar	ea (m²) Inf.	Area (m²)
0.000 128.2 1.450 128.2	0.0	1.451	0.0	0.0

DBFL Consulting Engineers		Page 12
Ormond House		
Upper Ormond Quay		
Dublin 7		Mirro
Date 18/11/2021 15:54	Designed by ByrneSe	Dcainago
File 180208.MDX	Checked by	Diamage
Innovyze	Network 2020.1	•

#### Summary of Results for 30 minute 5 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF DTS Status ON

WARNING: Half Drain Time has not been calculated as the structure is too full.

		Water	Surcharged	Flooded			Half Drain	Pipe	
	US/MH	Level	Depth	Volume	Flow /	Overflow	Time	Flow	
PN	Name	(m)	(m)	(m <sup>3</sup> )	Cap.	(l/s)	(mins)	(l/s)	Status
S1.000	S12	52.332	-0.168	0.000	0.15			16.0	OK
S1.001	S11	50.934	-0.160	0.000	0.18			18.5	OK
S1.002	S10	49.597	-0.136	0.000	0.34			37.2	OK
S1.003	S9	47.903	0.205	0.000	1.25			39.7	SURCHARGED
S1.004	S8	47.899	0.269	0.000	0.02			1.3	SURCHARGED
S1.005	S7	47.132	-0.200	0.000	0.03			2.0	OK
S1.006	S6	46.949	-0.184	0.000	0.32			57.4	OK
S1.007	S5	46.184	0.222	0.000	1.20			59.1	SURCHARGED
S1.008	S4	46.179	0.354	0.000	0.10			4.8	SURCHARGED
S2.000	S3-9	51.469	-0.131	0.000	0.36			24.6	OK
S2.001	S3-8	50.637	-0.214	0.000	0.18			27.7	OK
S2.002	S3-7	48.978	-0.328	0.000	0.17			34.6	OK
S2.003	S3-6	48.865	-0.305	0.000	0.23			60.5	OK
S2.004	S3-5	47.399	-0.166	0.000	0.71			104.0	OK
S2.005	S3-4	47.345	0.047	0.000	0.06			4.9	SURCHARGED
S2.006	S3-3	46.932	-0.256	0.000	0.22			37.4	OK
S2.007	S3-2	46.882	-0.083	0.000	0.83			52.8	OK
S2.008	S3-1	46.877	0.102	0.000	0.12			7.2	SURCHARGED
S1.009	S3	44.787	-0.138	0.000	0.32			11.6	OK
S1.010	S2	44.674	-0.142	0.000	0.30			11.6	OK

DBFII COIISUIC	ing Er	nginee	rs							Pag	e 1
Ormond House				30	year 600 m	inute	event				
Upper Ormond	Quay				,						· · · · ·
Dublin 7										Mi	rm
Date 18/11/2	021 15	5:53		Des	signed by	Byrne	eSe			Dc	ainado
File 180208.	MDX			Che	ecked by						anaye
Innovyze				Net	twork 2020	).1					
				•							
	STORM	I SEWE	R DESIC	IN by	the Modifi	ied Ra	ation	al M	ethoc	<u>l</u>	
			Desi	gn Cri	lteria for	Stor	<u>m</u>				
		Pipe	e Sizes	STANDAF	RD Manhole S	Sizes S	STANDA	RD			
		FSR	R Rainfa	ll Mode	l - Scotlan	d and	Irelar	nd			
	Retui	rn Peri	od (year	s)	5		<b>,</b>	a1 '		PIMP (%	s) 100
			M5-60 (n Ratio	m) 16. r 0.	400 273	Add F Min	10w / imum H	Backd	ate Ch rop He	ight (r	a) 0.200
Ν	aximum	Rainfa	ll (mm/h	nr)	50	Max	imum H	Backd	rop He	ight (r	n) 1.500
Maximum Time	of Cond	centrat	ion (mir	ns)	30 Min Des	ign De	pth fo	or Op	timisa	tion (r	n) 1.200
-	Foul	L Sewag	e (l/s/h	na) 0.	000 Min	Vel fo	r Auto	) Des	ign on	ly (m/s.	s) 1.00
	olumeti	ric Run	loII COEI	i. 0.	/50 M1	n Slop	e Ior	Opti	misati	on (1:2	() 500
			Des	igned w	ith Level S	offits					
		1	Networ	C Desi	gn Table f	Eor St	corm				
			« - Ind	licates	pipe capaci	.ty < f	low				
						-					
PN Length	Fall	Slope	I.Area	T.E.	Base	k	HYD	DIA	Secti	on Type	a Auto
PN Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Secti	on Type	e Auto Design
PN Length (m) S1.000 28.120	<b>Fall</b> (m) 1.406	<b>Slope</b> (1:X) 20.0	<b>I.Area</b> (ha) 0.087	<b>T.E.</b> (mins) 4.00	Base Flow (l/s)	<b>k</b> (mm) 0.600	HYD SECT	DIA (mm) 225	<b>Secti</b> Pipe/	<b>on Type</b> Conduit	e Auto Design
PN Length (m) S1.000 28.120 S1.001 13.000	<b>Fall</b> (m) 1.406 0.650	<b>Slope</b> (1:X) 20.0 20.0	<b>I.Area</b> (ha) 0.087 0.016	<b>T.E.</b> (mins) 4.00 0.00	Base Flow (1/s) 0.0 0.0	k (mm) 0.600 0.600	HYD SECT 0	DIA (mm) 225 225	Secti Pipe/ Pipe/	<b>On Type</b> Conduit Conduit	e Auto Design
PN Length (m) S1.000 28.120 S1.001 13.000 S1.002 40.694	Fall (m) 1.406 0.650 2.035	<b>slope</b> (1:X) 20.0 20.0 20.0	<b>I.Area</b> (ha) 0.087 0.016 0.112	<b>T.E.</b> (mins) 4.00 0.00 0.00	Base Flow (1/s) 0.0 0.0 0.0	k (mm) 0.600 0.600 0.600	HYD SECT 0 0	DIA (mm) 225 225 225	Secti Pipe/ Pipe/ Pipe/	Conduit Conduit Conduit	Auto Design
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811	Fall (m) 1.406 0.650 2.035 0.068	<pre>slope (1:x) 20.0 20.0 20.0 20.0 203.1</pre>	<b>I.Area</b> (ha) 0.087 0.016 0.112 0.021	<b>T.E.</b> (mins) 4.00 0.00 0.00 0.00	Base Flow (1/s) 0.0 0.0 0.0 0.0	k (mm) 0.600 0.600 0.600 0.600	HYD SECT 0 0 0	DIA (mm) 225 225 225 225	Secti Pipe/ Pipe/ Pipe/	on Type Conduit Conduit Conduit	Auto Design
PN Length (m) S1.000 28.120 S1.001 13.000 S1.002 40.694 S1.003 13.811 S1.004 10.315	Fall (m) 1.406 0.650 2.035 0.068 0.298	<pre>slope (1:x) 20.0 20.0 20.0 203.1 34.6 24.0</pre>	<pre>I.Area (ha) 0.087 0.016 0.112 0.021 0.019 2.005</pre>	T.E. (mins) 4.00 0.00 0.00 0.00 0.00	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0	k (mm) 0.600 0.600 0.600 0.600	<b>HYD</b> <b>SECT</b> 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	Conduit Conduit Conduit Conduit Conduit	Auto Design
PN Length (m) S1.000 28.120 S1.001 13.000 S1.002 40.694 S1.003 13.811 S1.004 10.315 S1.005 9.547	Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274	<b>Slope</b> (1:X) 20.0 20.0 20.0 203.1 34.6 34.8 23.1	<b>I.Area</b> (ha) 0.087 0.016 0.112 0.021 0.019 0.005	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0	k (mm) 0.600 0.600 0.600 0.600 0.600	HYD SECT 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 225	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	on Type Conduit Conduit Conduit Conduit Conduit	Auto Design
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811           \$1.004         10.315           \$1.005         9.547           \$1.006         38.736           \$1.007         24.814	Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.062	<pre>slope (1:x) 20.0 20.0 20.0 203.1 34.6 34.8 33.1 400.2</pre>	<pre>I.Area (ha) 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014</pre>	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600	HYD SECT 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 225 300	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	on Type Conduit Conduit Conduit Conduit Conduit Conduit	Auto Design
PN Length (m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1.008 29.044	Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.062 0.290	<pre>slope (1:x) 20.0 20.0 203.1 34.6 34.8 33.1 400.2 100.2</pre>	<pre>I.Area (ha) 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007</pre>	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600	HYD SECT 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 300 300 225	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit	Auto Design
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811           \$1.004         10.315           \$1.005         9.547           \$1.006         38.736           \$1.007         24.814           \$1.008         29.044	Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.062 0.290	<pre>slope (1:x) 20.0 20.0 203.1 34.6 34.8 33.1 400.2 100.2</pre>	<pre>I.Area (ha) 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007</pre>	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 300 300 225	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit	Auto Design
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811           \$1.004         10.315           \$1.005         9.547           \$1.006         38.736           \$1.007         24.814           \$1.008         29.044           \$2.000         41.175	Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.062 0.290 0.789	<pre>slope (1:x) 20.0 20.0 203.1 34.6 34.8 33.1 400.2 100.2 52.2</pre>	<pre>I.Area (ha) 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135</pre>	<b>T.E.</b> (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600	HYD SECT 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 300 300 225 225	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit	Auto Design
PN         Length (m)           \$\$1.000         28.120           \$\$1.001         13.000           \$\$1.001         13.000           \$\$1.002         40.694           \$\$1.003         13.811           \$\$1.004         10.315           \$\$1.005         9.547           \$\$1.006         38.736           \$\$1.007         24.814           \$\$1.008         29.044           \$\$2.000         41.175	Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.062 0.290 0.789	<pre>slope (1:x) 20.0 20.0 203.1 34.6 34.8 33.1 400.2 100.2 52.2</pre>	I.Area (ha) 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 2.600	HYD SECT 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 300 300 225 225	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	On Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit	Auto Design
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811           \$1.004         10.315           \$1.005         9.547           \$1.006         38.736           \$1.007         24.814           \$1.008         29.044           \$2.000         41.175	Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.062 0.290 0.789 0.789	<pre>slope (1:x) 20.0 20.0 20.0 203.1 34.6 34.8 33.1 400.2 100.2 52.2</pre>	I.Area (ha) 0.087 0.016 0.112 0.021 0.005 0.334 0.014 0.007 0.135 <u>Ne</u> US/IL E	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 twork I.Area	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 300 300 225 225 225	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel	Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit	Flow
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811           \$1.004         10.315           \$1.005         9.547           \$1.006         38.736           \$1.007         24.814           \$1.008         29.044           \$2.000         41.175	Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.062 0.290 0.789 0.789	<pre>slope (1:x) 20.0 20.0 203.1 34.6 34.8 33.1 400.2 100.2 52.2 52.2 C.C. Unins)</pre>	I.Area (ha) 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Ne</u> US/IL E (m)	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 twork I.Area (ha)	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 eable Foul (1/s)	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 300 300 225 225 225 225	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel (m/s)	Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit	Flow (1/s)
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811           \$1.004         10.315           \$1.005         9.547           \$1.006         38.736           \$1.007         24.814           \$1.008         29.044           \$2.000         41.175           PN         Ra           (mm           \$1.000         5	Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.062 0.290 0.789 0.789	<pre>slope (1:x) 20.0 20.0 203.1 34.6 34.8 33.1 400.2 100.2 52.2 52.2 c.c. uins) 4.16 5</pre>	I.Area (ha) 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Ne</u> ys/IL E (m) 2.275	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 twork I.Area (ha) 0.087	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 table Foul (l/s) 0.0	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 300 300 225 225 225 <b>Flow</b> (s) 1.2	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel (m/s) 2.94	Conduit Condui	Flow (1/s)
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811           \$1.004         10.315           \$1.005         9.547           \$1.006         38.736           \$1.007         24.814           \$1.008         29.044           \$2.000         41.175           PN         Ra           \$1.000         \$ \$1.001	Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.062 0.290 0.789 0.789	<pre>slope (1:x) 20.0 20.0 203.1 34.6 34.8 33.1 400.2 100.2 52.2 52.2 c.c. ins) 4.16 5 4.23 5</pre>	I.Area (ha) 0.087 0.016 0.112 0.021 0.005 0.334 0.014 0.007 0.135 <u>Ne</u> US/IL E (m) 2.275 0.869	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 twork I.Area (ha) 0.087 0.103	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.000 0.600 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 0.000 0.000 0.000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.000000	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 200 300 225 225 225 225 225 225 225 225 225 2	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel (m/s) 2.94 2.94	Conduit Condui	Flow (1/s) 13.0 15.3
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811           \$1.004         10.315           \$1.005         9.547           \$1.006         38.736           \$1.007         24.814           \$1.008         29.044           \$2.000         41.175           PN         Ra           \$1.000         5           \$1.001         5           \$1.001         5           \$1.002         5	Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.062 0.290 0.789 0.789	<pre>slope (1:x) 20.0 20.0 203.1 34.6 34.8 33.1 400.2 100.2 52.2 52.2 c.c. ins) 4.16 5 4.23 5 4.46 4</pre>	I.Area (ha) 0.087 0.016 0.112 0.021 0.005 0.334 0.014 0.007 0.135 <u>Ne</u> US/IL E (m) 2.275 0.869 9.508	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 twork I.Area (ha) 0.087 0.103 0.215	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.0000 0.000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000000	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 300 300 225 225 225 225 225 225 225 225 225 2	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel (m/s) 2.94 2.94	Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit 1000000000000000000000000000000000000	Flow (1/s) 13.0 15.3 32.0
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811           \$1.004         10.315           \$1.005         9.547           \$1.006         38.736           \$1.006         38.736           \$1.007         24.814           \$1.008         29.044           \$2.000         41.175           PN         Ra           \$1.001         5           \$1.001         5           \$1.002         5           \$1.002         5           \$1.003         5	Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.062 0.290 0.789 0.789 0.789	<pre>slope (1:x) 20.0 20.0 20.0 203.1 34.6 34.8 33.1 400.2 100.2 52.2 52.2 52.2 52.2 52.2 52.2 52.2</pre>	I.Area (ha) 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Ne</u> US/IL E (m) 2.275 0.869 9.508 7.473	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 twork I.Area (ha) 0.087 0.103 0.215 0.236	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000000	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 300 300 225 225 225 225 225 225 225 225 225 2	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel (m/s) 2.94 2.94 2.94 0.91	Conduit Condui	Flow (1/s) 13.0 15.3 32.0 35.2
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811           \$1.004         10.312           \$1.005         9.547           \$1.006         38.736           \$1.007         24.814           \$1.008         29.044           \$2.000         41.175           PN         Ra           \$1.001         5           \$1.002         5           \$1.003         5           \$1.003         5           \$1.004         5	Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.062 0.290 0.789 0.789 0.789	<pre>slope (1:x) 20.0 20.0 20.0 203.1 34.6 34.8 33.1 400.2 100.2 52.2 52.2 52.2 52.2 52.2 52.2 52.2</pre>	I.Area (ha) 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Ne</u> 0.5/IL E (m) 2.275 0.869 9.508 7.473 7.405	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 twork I.Area (ha) 0.087 0.103 0.215 0.236 0.255	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.000 0.600 0.0000 0.0000 0.0000 0.0000 0.000000	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 225 225 225 22	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel (m/s) 2.94 2.94 2.94 2.94 2.23	Conduit Condui	Flow (1/s) 13.0 15.3 32.0 35.2 38.0
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811           \$1.004         10.312           \$1.005         9.547           \$1.006         38.736           \$1.007         24.814           \$1.008         29.044           \$2.000         41.175           PN         Ra           \$1.001         5           \$1.002         5           \$1.003         5           \$1.004         5           \$1.004         5           \$1.005         5	<pre>Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.062 0.290 0.789 </pre>	<pre>slope (1:x) 20.0 20.0 20.0 203.1 34.6 34.8 33.1 400.2 100.2 52.2 52.2 52.2 52.2 52.2 52.2 52.2</pre>	I.Area (ha) 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Ne</u> US/IL E (m) 2.275 0.869 9.508 7.473 7.405 7.107	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 twork I.Area (ha) 0.087 0.103 0.215 0.236 0.255 0.260	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.000000	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 225 225 225 22	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel (m/s) 2.94 2.94 2.94 2.94 2.23 2.22	Conduit Condui	Flow (1/s) 13.0 15.3 32.0 35.2 38.0 38.7
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811           \$1.004         10.312           \$1.005         9.547           \$1.006         38.736           \$1.007         24.814           \$1.008         29.044           \$2.000         41.175           PN         Ra           \$1.001         5           \$1.002         5           \$1.003         5           \$1.004         5           \$1.005         5           \$1.005         5           \$1.004         5           \$1.005         5           \$1.005         5           \$1.005         5           \$1.005         5           \$1.006         5	<pre>Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.062 0.290 0.789 </pre>	<pre>slope (1:x) 20.0 20.0 20.0 20.1 34.6 34.8 33.1 400.2 100.2 52.2 52.2 52.2 52.2 52.2 52.2 52.2</pre>	I.Area (ha) 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Ne</u> US/IL E (m) 2.275 0.869 9.508 7.473 7.405 7.107 6.833	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 twork I.Area (ha) 0.087 0.103 0.215 0.236 0.255 0.260 0.594	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.0000 0.0000 0.0000 0.0000 0.000000	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 225 225 225 22	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel (m/s) 2.94 2.94 2.94 2.94 2.94 2.94 2.23 2.22 2.74	Conduit Condui	Flow (1/s) 13.0 15.3 32.0 35.2 38.0 38.7 88.5
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811           \$1.004         10.312           \$1.005         9.547           \$1.006         38.736           \$1.007         24.814           \$1.008         29.044           \$2.000         41.175           PN         Ra           (mm)         \$1.001           \$1.001         \$5           \$1.002         \$5           \$1.003         \$5           \$1.004         \$5           \$1.005         \$5           \$1.004         \$5           \$1.005         \$5           \$1.006         \$5           \$1.005         \$5           \$1.006         \$5           \$1.006         \$5           \$1.007         \$5	<pre>Fall (m) 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.062 0.290 0.789 0.789</pre>	<pre>slope (1:x) 20.0 20.0 20.0 20.1 34.6 34.8 33.1 400.2 100.2 52.2 52.2 52.2 52.2 52.2 52.2 52.2</pre>	I.Area (ha) 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Ne</u> US/IL E (m) 2.275 0.869 9.508 7.473 7.405 7.107 6.833 5.662	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 twork I.Area (ha) 0.087 0.103 0.215 0.236 0.255 0.260 0.594 0.608	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.0000 0.0000 0.0000 0.0000 0.000000	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 225 225 225 22	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel (m/s) 2.94 2.94 2.94 2.94 2.94 2.23 2.22 2.74 0.91	Conduit Condui	Flow (1/s) 13.0 15.3 32.0 35.2 38.0 38.7 88.5 90.6
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811           \$1.004         10.315           \$1.005         9.547           \$1.006         38.736           \$1.007         24.814           \$1.008         29.044           \$2.000         41.175           PN         Ra           (mm           \$1.001         5           \$1.001         5           \$1.001         5           \$1.003         5           \$1.004         5           \$1.005         5           \$1.006         5           \$1.007         5           \$1.008         5	<pre>Fall (m) 1.406 0.650 2.035 0.068 0.274 1.171 0.062 0.290 0.789</pre>	<pre>slope (1:x) 20.0 20.0 20.0 20.1 34.6 34.8 33.1 400.2 100.2 52.2 52.2 5.C. tins) 4.16 5 4.23 5 4.46 4 4.72 4 4.79 4 4.86 4 5.10 4 5.63 4 6.00 4</pre>	I.Area (ha) 0.087 0.016 0.112 0.021 0.005 0.334 0.014 0.007 0.135 <u>Ne</u> JS/IL E (m) 2.275 0.869 9.508 7.473 7.405 7.107 6.833 5.662 5.600	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 twork twork I.Area (ha) 0.087 0.103 0.215 0.236 0.255 0.260 0.594 0.608 0.615	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.00 0.00 0.0 0.	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 225 225 225 22	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel (m/s) 2.94 2.94 2.94 2.94 2.94 2.23 2.22 2.74 0.78 1.31	Conduit Solo Solo Solo Solo Solo Solo Solo Sol	Flow (1/s) 13.0 15.3 32.0 38.7 88.5 90.6 91.6
PN         Length (m)           \$1.000         28.120           \$1.001         13.000           \$1.002         40.694           \$1.003         13.811           \$1.004         10.315           \$1.005         9.547           \$1.006         38.736           \$1.007         24.814           \$1.008         29.044           \$2.000         41.175           PN         Ra           (mm)         \$1.000           \$1.001         \$5           \$1.001         \$5           \$1.002         \$5           \$1.003         \$5           \$1.004         \$5           \$1.005         \$5           \$1.006         \$5           \$1.006         \$5           \$1.007         \$5           \$1.008         \$5           \$2.000         \$5	<pre>Fall (m) 1.406 0.650 2.035 0.068 0.274 1.171 0.062 0.290 0.789  .in I /hr) (m 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.</pre>	<pre>slope (1:x) 20.0 20.0 20.0 203.1 34.6 34.8 33.1 400.2 100.2 52.2 52.2 52.2 52.2 52.2 54.46 44.72 44.79 44.86 4 5.10 4 5.63 4 6.00 4 4.38 5</pre>	I.Area (ha) 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Ne</u> US/IL E (m) 2.275 0.869 9.508 7.473 7.405 7.107 6.833 5.662 5.600 1.375	T.E. (mins) 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 twork I.Area (ha) 0.087 0.103 0.215 0.236 0.255 0.260 0.594 0.608 0.615 0.135	Base           Flow (1/s)           0.0	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.00 0.00 0.0 0.	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 225 225 225 22	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel (m/s) 2.94 2.94 2.94 0.91 2.23 2.22 2.74 0.78 1.31 1.81	Conduit Solo Solo Solo Solo Solo Solo Solo Sol	Auto Design Design 13.0 15.3 32.0 35.2 38.0 38.7 88.5 90.6 91.6 20.1

DBFL Co	onsı	ulti	ng E	ngine	eers									Pag	ge 2
Ormond	Нοι	use					30	vear	600 m	inute	event				
Upper (	Ormo	ond	Quay					,							
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Date 18	3/12	1/20	21 1	5:53			De	signe	ed by	Byrne	eSe				
File 18	3020	08.№	IDX				Ch	Checked by						DI	ainaye
Innovyz	ze						Ne	twork	2020	0.1					
					Net	work	. Desi	gn Ta	able f	for St	corm				
PN	Ler	ngth	Fall	Slop	e I. <i>I</i>	rea	T.E.	Ba	ase	k	HYD	DIA	Secti	on Typ	e Auto
	(:	m)	(m)	(1:X	) (ł	na)	(mins)	Flow	(l/s)	(mm.)	SECT	(mm)			Design
92 001	10	160	0 19	2 40	2 0	019	0 00		0 0	0 600	0	200	Ding	Condui	+ A
S2.001	13.	566	0.136	5 <del>4</del> 0. 5 99.	8 0.	018	0.00		0.0	0.600	0	450	Pipe/	Condui	t 🔒
S2.003	22.	024	0.220	0 100.	1 0.	157	0.00		0.0	0.600	0	450	Pipe/	Condui	t 🦷
S2.004	45.	394	0.11	7 388.	0 0.	269	0.00		0.0	0.600	0	450	Pipe/	Condui	t 🧂
S2.005	11.	827	0.118	3 100.	2 0.	053	0.00		0.0	0.600	0	300	Pipe/	Condui	t 🦰
S2.006	22.	.271	0.223	3 99.	9 0.	201	0.00		0.0	0.600	0	375	Pipe/	Condui	t 🤒
S2.007	22.	.611	0.040	J 565.	3 0.	096	0.00		0.0	0.600	0	375	Pipe/	Condui	t 🛗
52.000	/.	.009	0.10	9 41.	9 0.	000	0.00		0.0	0.000	0	225	PIDe/	Condui	L 🔲
S1.009	17.	306	0.109	9 158. 3 150	8 0. 1 0	000	0.00		0.0	0.600	0	225	Pipe/	Condui	t 🤒 + 🔺
51.010	20.	. 213	0.100	5 150.	I 0.	000	0.00		0.0	0.000	0	225	ripe/	Condui	د <mark>ال</mark>
						Ne	twork	Resu	lts T	able					
PN	ſ	Rai	in	т.с.	US/1	ĽΣ	I.Area	Σ	Base	Foul	Add	Flow	Vel	Cap	Flow
		(mm/	hr) (	mins)	(m)		(ha)	Flow	(l/s)	(l/s)	(1,	/s)	(m/s)	(l/s)	(1/s)
S2.0	01	50	.00	4.51	50.5	51	0.153		0.0	0.0		2.1	2.48	175.6	22.8
S2.0	02	50	.00	4.62	48.8	56	0.194		0.0	0.0		2.6	2.04	323.8	28.9
S2.0	03	50	.00	4.80	48.7	20	0.351		0.0	0.0		4.8	2.03	323.2	52.3
S2.0	04	50	.00	5.54	47.1	15	0.620		0.0	0.0		8.4	1.03	163.2	92.4
S2.0	05	50	.00	5.66	46.9	98 1 2	0.673		0.0	0.0		9.1	1.57	111.0	100.2
S2.0	00	50	.00	5.87	40.0	13 13	0.874		0.0	0.0		12 1	0.75	200.3	130.2
S2.0	08	50	.00	6.43	46.5	50	0.970		0.0	0.0		13.1	2.03	80.5«	144.5
S1.0	09	50	.00	6.70	44.7	00	1.585		0.0	0.0		21.5	1.04	41.2«	236.1
51.0	10	50	.00	/.15	44.5	91	1.303		0.0	0.0		21.5	1.00	42.3%	230.1
						©	1982-2	2020	Innov	yze					

DBFL Consulting Engineers		Page 3
Ormond House	30 year 600 minute event	
Upper Ormond Quay	<b>y y</b>	
Dublin 7		Mirro
Date 18/11/2021 15:53	Designed by ByrneSe	Dcainago
File 180208.MDX	Checked by	Diamage
Innovyze	Network 2020.1	

## Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S12	54 150	1 875	Open Manhole	1200	S1 000	52 275	225				
g11	53 000	2 131	Open Manhole	1200	S1 001	50 869	225	S1 000	50 869	225	
S10	52 455	2 947	Open Manhole	1200	S1 002	49 508	225	S1 001	50.005	225	711
29	50 365	2.947	Open Manhole	1200	S1 002	47.500	225	S1.001	47 473	225	/ 11
58	49 758	2 353	Open Manhole	1200	S1 004	47 405	225	S1 003	47 405	225	
57	49 250	2 143	Open Manhole	1200	S1 005	47 107	225	S1 004	47 107	225	
56	49 110	2 277	Open Manhole	1200	S1 006	46 833	300	S1 005	46 833	225	
55	48 450	2 788	Open Manhole	1200	S1 007	45 662	300	S1 006	45 662	300	
S4	48.750	3,150	Open Manhole	1200	S1.008	45,600	225	S1.007	45.600	300	
53-9	52,800	1.425	Open Manhole	1200	52.000	51,375	225	511007	101000		
53-8	52,560	2.009	Open Manhole	1200	S2.001	50.551	300	S2.000	50.586	225	
53-7	51,650	2.794	Open Manhole	1350	52.002	48.856	450	S2.001	50.068	300	1062
S3-6	51.250	2.530	Open Manhole	1350	S2.003	48.720	450	S2.002	48.720	450	1001
S3-5	51.530	4.415	Open Manhole	1350	S2.004	47.115	450	s2.003	48.500	450	1385
s3-4	49.690	2.692	Open Manhole	1350	S2.005	46.998	300	S2.004	46.998	450	
S3-3	49.790	2.977	Open Manhole	1350	S2.006	46.813	375	s2.005	46.880	300	
S3-2	48.810	2.220	Open Manhole	1350	S2.007	46.590	375	S2.006	46.590	375	
s3-1	48.190	1.640	Open Manhole	1350	S2.008	46.550	225	S2.007	46.550	375	
S3	47.990	3.290	Open Manhole	1200	s1.009	44.700	225	S1.008	45.310	225	610
								S2.008	46.381	225	1681
S2	47.650	3.059	Open Manhole	1200	s1.010	44.591	225	S1.009	44.591	225	
S	45.950	1.547	Open Manhole	0		OUTFALL		S1.010	44.403	225	

MH Name	Manhole Easting	Manhole Northing	Intersection Easting	Intersection Northing	Manhole Access	Layout (North)
S12	722307.088	725897.535	722307.088	725897.535	Required	
						•
S11	722335.025	725894.337	722335.025	725894.337	Required	
S10	722337.699	725907.059	722337.699	725907.059	Required	1
						1
S9	722358.078	725942.283	722358.078	725942.283	Required	<u>.</u>
						1

DBFL Consult	ing Engine	ers				Page 4
Ormond House			30 vear 600	) minute even	t	
Upper Ormond	Quay		, ,			
Dublin 7						Micro
Date 18/11/2	021 15:53		Designed k	by ByrneSe		Dcainago
File 180208.1	MDX		Checked by	7		Diamade
Innovyze			Network 20	020.1		
		Manhole	Schedules	for Storm		
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S8	722371.889	725942.211	722371.889	725942.211	Required	
S7	722382.180	725941.500	722382.180	725941.500	Required	
S6	722389.828	725935.786	722389.828	725935.786	Required	
S5	722420.338	725911.918	722420.338	725911.918	Required	
S4	722440.020	725896.807	722440.020	725896.807	Required	
S3-9	722336.143	725812.287	722336.143	725812.287	Required	
S3-8	722361.102	725779.539	722361.102	725779.539	Required	<u>_</u>
53-7	722375.134	725766.043	722375.134	725766.043	Required	<u>_</u>
		,25,00.015			icquircu	
S3-6	722387.996	725770.355	722387.996	725770.355	Required	-
S3-5	722402.179	725787.205	722402.179	725787.205	Required	1
S3-4	722427.388	725824.956	722427.388	725824.956	Required	1 January
S3-3	722432.100	725835.803	722432.100	725835.803	Required	1
S3-2	722445.326	725853.722	722445.326	725853.722	Required	11
S3-1	722458.315	725872.230	722458.315	725872.230	Required	11
S3	722462.255	725878.123	722462.255	725878.123	Required	$\langle -$
						$\frown$

DBFL Consulting	Enginee	rs				Page 5
Ormond House			30 year 600	) minute even	t	
Upper Ormond Qu	lay		, , , , , , , , , , , , , , , , , , ,			
Dublin 7						Mirro
Date 18/11/2021	15:53		Designed b	by ByrneSe		Drainage
File 180208.MDX			Checked by	7		Diginiage
Innovyze			Network 20	020.1		
		Manhole	Schedules	for Storm		
MH M Name E	Manhole Masting (m)	Manhole : Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2 722	2475.901 7	25867.479	722475.901	725867.479	Required	No.
S 722	2500.163 7	25853.081			No Entry	· •
		©198	32-2020 Inn	lovyze		

DBFL Consult	ng E	ngine	ers						Page 6
Ormond House					30 vear (	600 mini	ute event		
Upper Ormond	Quay				oo your .				
Dublin 7									Micco
Date 18/11/20	)21 1	5:53			Designe		MILIU		
Eile 100000 N		5-55			Charled	br	THEBE		Drainage
FILE 180208.N	IDX					yd			
Innovyze					Network	2020.1			
						_			
			PIF	PELINE	SCHEDUL	ES for	Storm		
				Ups	tream M	anhole			
PN	нуа	Diam (mm)	MH (	(m)	1.Level	D.Deptn	MH I Connection	(mm)	, L*W
	Sect	(11111)	Name	(m)	(m)	(m)	Connection	(11111)	
S1.000	0	225	S12	54.150	52.275	1.650	Open Manhole		1200
S1.001	0	225	S11	53.000	50.869	1.906	Open Manhole		1200
S1.002	0	225	S10	52.455	49.508	2.722	Open Manhole		1200
S1.003	0	225	S9	50.365	47.473	2.667	Open Manhole		1200
S1.004	0	225	S8	49.758	47.405	2.128	Open Manhole		1200
S1.005	0	225	S7	49.250	47.107	1.918	Open Manhole		1200
S1.006	0	300	S6	49.110	46.833	1.977	Open Manhole		1200
S1.007	0	300	S5	48.450	45.662	2.488	Open Manhole		1200
S1.008	0	225	S4	48.750	45.600	2.925	Open Manhole		1200
S2.000	0	225	S3-9	52.800	51.375	1.200	Open Manhole		1200
S2.001	0	300	S3-8	52.560	50.551	1.709	Open Manhole		1200
S2.002	0	450	S3-7	51.650	48.856	2.344	Open Manhole		1350
S2.003	0	450	S3-6	51.250	48.720	2.080	Open Manhole		1350
S2.004	0	450	S3-5	51.530	47.115	3.965	Open Manhole		1350
S2.005	0	300	S3-4	49.690	46.998	2.392	Open Manhole		1350
S2.006	0	375	S3-3	49.790	46.813	2.602	Open Manhole		1350
S2.007	0	375	S3-2	48.810	46.590	1.845	Open Manhole		1350
S2.008	0	225	S3-1	48.190	46.550	1.415	Open Manhole		1350
S1.009	0	225	S3	47.990	44.700	3.065	Open Manhole		1200
				Down	stream	Manhole	2		
		_							_
PN I	ength	Slope	e MH	C.Leve	I I.Level	L D.Depti	n MH Connaction	MH DIAM	., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(1111	u )
S1.000 2	8.120	20.0	) S11	53.00	0 50.869	9 1.906	6 Open Manhole		1200
S1.001 1	3.000	20.0	) S10	52.45	5 50.219	2.011	1 Open Manhole		1200
S1.002 4	0.694	20.0	) S9	50.36	5 47.473	3 2.66	7 Open Manhole		1200
S1.003 1	3.811	203.1	S8	49.75	8 47.405	5 2.128	8 Open Manhole		1200
S1.004 1	0.315	34.6	5 S7	49.25	0 47.107	7 1.918	8 Open Manhole		1200
S1.005	9.547	34.8	8 S6	49.11	0 46.833	3 2.052	2 Open Manhole		1200
S1.006 3	8.736	33.1	. S5	48.45	45.662	2 2.488	8 Open Manhole		1200
S1.007 2	4.814	400.2	2 S4	48.75	0 45.600	2.850	) Open Manhole		1200
S1.008 2	9.044	100.2	2 S3	47.99	0 45.310	2.455	5 Open Manhole		1200
S2.000 4	1.175	52.2	2 S3-8	52.56	0 50.586	5 1.749	9 Open Manhole		1200
S2.001 1	9.469	40.3	8 S3-7	51.65	0 50.068	3 1.282	2 Open Manhole		1350
S2.002 1	3.566	99.8	8 S3-6	51.25	0 48.720	2.080	0 Open Manhole		1350
S2.003 2	2.024	100.1	S3-5	51.53	48.500	2.580	0 Open Manhole		1350
S2.004 4	5.394	388.0	) S3-4	49.69	0 46.998	3 2.242	2 Open Manhole		1350
S2.005 1	1.827	100.2	2 S3-3	49.79	0 46.880	2.610	0 Open Manhole		1350
S2.006 2	2.271	99.9	9 S3-2	48.81	0 46.590	1.845	5 Open Manhole		1350
S2.007 2	2.611	565.3	8 S3-1	48.19	0 46.550	1.265	5 Open Manhole		1350
S2.008	7.089	41.9	9 S3	47.99	0 46.381	L 1.384	4 Open Manhole		1200
S1 009 1	7.306	158 9	3 50	47 65	0 44 591	2.834	4 Open Manhole		1200
51.007 1			. 52	17.05					
				©1983	2-2020	Innovyz	e		

DBFL Consulting Engineers		Page 7
Ormond House	30 year 600 minute event	
Upper Ormond Quay		
Dublin 7		Mirro
Date 18/11/2021 15:53	Designed by ByrneSe	Dcainago
File 180208.MDX	Checked by	Diamada
Innovyze	Network 2020.1	
PIPELINE	SCHEDULES for Storm	
	stream Manhole	
PN Hyd Diam MH C.Level	I.Level D.Depth MH MH DIAM.	, L*W
Sect (mm) Name (m)	(m) (m) Connection (mm)	)
s1.010 o 225 s2 47.650	44.591 2.834 Open Manhole	1200
	-	
Dow	nstream Manhole	
PN Length Slope MH C.Lev	el I.Level D.Depth MH MH DIAM	1. / L*W
(m) (1:X) Name (m)	(m) (m) Connection (m	m)
S1.010 28.213 150.1 S 45.9	50 44.403 1.322 Open Manhole	0
		-
Free Flowing	Outfall Details for Storm	
Outfall Outfall C	Level I. Level Min D.L. W	
Pipe Number Name	(m) (m) I. Level (mm) (mm)	
	(m)	
S1.010 S	45.950 44.403 44.500 0 0	
Simulatio	on Criteria for Storm	
Malumaturi a Duma 66, Gala 66, 1		10 000
Areal Reduction Factor 1	.000 Additional Flow - % of Total Flo .000 MADD Factor * 10m <sup>3</sup> /ha Storac	w 10.000 me 2.000
Hot Start (mins)	0 Inlet Coefficier	nt 0.800
Hot Start Level (mm)	0 Flow per Person per Day (l/per/day	r) 0.000
Manhole Headloss Coeff (Global) 0	.500 Run Time (mins	3) 1200
Foul Sewage per hectare (1/s) 0	.000 Output Interval (mins	3) 10
Number of Input Hydrogr	aphs 0 Number of Storage Structures 4	
Number of Online Cont	rols 4 Number of Time/Area Diagrams 0	
Number of Offline Cont	rols 0 Number of Real Time Controls 0	
Synthet	ic Rainfall Details	
Rainfall Model	FSR Profile Type Wi	nter
Return Period (years)	30 Cv (Summer) 0	.750
M5-60 (mm)	16 400 Storm Duration (mins)	600
Ratio R	0.273	

DBFL Consulting Engineers					Page 8						
Ormond House	30 vear 60	)0 minute	event								
Upper Ormond Quay	oo you oo		ovont								
Dublin 7					Micco						
Date 18/11/2021 15:53	Designed	by Byrn	eSe								
File 180208_MDX	Checked 1	by			urainage						
	Network	2020 1									
111100 y 20	Network	2020.1									
Online Controls for Storm											
Hydro-Brake® Optimum Manhol	e: S8, D9	S/PN: S1	.004, Vo	lume (m³	): 3.2						
IInit	Poforondo	MD_CUF_00	57-2000-2	000-2000							
Desig	n Head (m)	MD-SHE-00	57-2000-2	2.000							
Design	Flow (l/s)			2.0							
	Flush-Flo™		Ca	lculated							
	Objective	Minimise	e upstream	storage							
A	pplication			Surface							
Sump	Available			Yes							
Dia	meter (mm)			57							
Invert Minimum Outlot Dire Dire	Level (m)			4/.4U5 75							
Suggested Manhole Dia	meter (mm)			1200							
Control Po	ints	Head (m)	Flow (l/s)	1							
Design Point (Ca	(lculated)	2.000	2.0	)							
F	lush-Flo™	0.247	1.3	3							
	Kick-Flo®	0.506	1.1	_							
Mean Flow over H	Iead Range	-	1.5	5							
The hydrological calculations have b Hydro-Brake® Optimum as specified. Hydro-Brake Optimum® be utilised the invalidated	een based o Should anot n these sto	on the Hea Cher type orage rout	d/Discharg of contro ing calcu	ge relatio l device o lations wi	onship for the other than a ill be						
Depth (m) Flow (1/s) Depth (m) Flow	r (l/s) Dep	th (m) Fl	ow (1/s)	Depth (m)	Flow (l/s)						
0.100 1.2 1.200	1.6	3.000	2.4	7.000	3.6						
0.200 1.3 1.400	1.7	3.500	2.6	7.500	3.7						
0.300 1.3 1.600	1.8	4.000	2.7	8.000	3.8						
0.400 1.3 1.800	1.9	4.500	2.9	8.500	3.9						
0.500 1.1 2.000	2.0	5.000	3.0	9.000	4.0						
0.600 1.2 2.200	2.1	5.500	3.2	9.500	4.1						
	2.2	6.000 6 500	3.3								
Hydro-Brake® Optimum Manhol	e: S4, DS	5/PN: S1	.008, Vo	lume (m³	): 5.2						
Unit	Reference	MD-SHE-00	98-5700-2	000-5700							
Desig	n Head (m)			2.000							
Design	Flow (l/s)			5.7							
	Flush-Flo™		Ca	lculated							
_	Objective	Minimise	upstream	storage							
A	pplication			Surface							
Sump	AVAILADIe			Yes							
Dia	Level (mm)			98 45 600							
Minimum Outlet Dino Dia	meter (mm)			150							
Suggested Manhole Dia	meter (mm)			1200							
	. ,										
©198	82-2020 Ir	novyze									

DBFL Consult	ing Engin	eers				]	Page 9				
Ormond House			30 vear 6	00 minute e	event	[					
Upper Ormond	Quay		oo year e		JVOIIL						
Dublin 7							Micco				
Date 18/11/2	021 15:53		Designed	l by Byrne	Se						
File 180208	MDX		Checked	by			Urainage				
Throw the			Notwork	2020 1							
TIIIOVYZE			Network	2020.1							
Hydro-Brake® Optimum Manhole: S4, DS/PN: S1.008, Volume (m³): 5.2											
		Control P	oints	Head (m) F	low (l/s)						
	Des	sign Point (	Calculated)	2.000	5.7						
			Flush-Flo™	0.430	4.8						
	Mo		Kick-Flo®	0.874	3.9						
	Mea	an Flow over	Head Range	-	4.0						
The hydrolog Hydro-Brake® Hydro-Brake invalidated	ical calcul Optimum as Optimum® be	ations have specified. utilised th	been based Should and hen these st	on the Head other type o corage routi	/Discharge f control ng calcula	relation device ot tions wil	ship for the her than a l be				
Depth (m) F	low (l/s) I	epth (m) Flo	ow (l/s) De	pth (m) Flo	w (l/s) De	pth (m) F	low (l/s)				
0.100	3.2	1.200	4.5	3.000	6.9	7.000	10.3				
0.200	4.4	1.400	4.8	3.500	7.4	7.500	10.6				
0.300	4.7	1.600	5.1	4.000	7.9	8.000	11.0				
0.400	4.8	1.800	5.4	4.500	8.3	8.500	11.3				
0.500	4.8	2.000	5.7	5.000	8.8	9.000	11.6				
0.600	4.7	2.200	5.9	5.500	9.2	9.500	11.9				
0.800	4.3	2.400	6.2	6.000	9.6						
1.000	4.1	2.000	0.4	0.500	9.9						
Hydro-Bra	ake® Opti	mum Manhol	e: S3-4,	DS/PN: S2.	005, Vol	ume (m³)	: 10.9				
		Uni	t Reference	MD-SHE-009	9-5000-145	0-5000					
		Desi	.gn Head (m)			1.450					
		Design	IFLOW (1/s)		G - 1 -	5.0					
			Flush-Flo	Minimido	Calc	ulated					
			Application	: MIIIIIIISe	upscream s	urface					
		Sum	n Available	<u>.</u>	b	Yes					
		Di	ameter (mm)			99					
		Inver	t Level (m)			46.998					
	Minimum Ou	tlet Pipe Di	ameter (mm)			150					
	Suggeste	d Manhole Di	ameter (mm)			1200					
		Control P	oints	Head (m) F	low (l/s)						
	Des	sign Point ((	Calculated)	1.450	5.0						
			Flush-Flo™	0.432	5.0						
			Kick-Flo®	0.882	4.0						
	Mea	an Flow over	Head Range	-	4.4						
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated											
Depth (m) F	low (l/s)	epth (m) Flo	ow (l/s) De	pth (m) Flo	w (l/s) De	pth (m) F	low (l/s)				
0.100	3.2	0.300	4.9	0.500	5.0	0.800	4.4				
0.200	4.5	0.400	5.0	0.600	4.9	1.000	4.2				
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DBFL Consultin	g Engine	eers					Page 10
Ormond House			30 year 6	00 minut	e event		
Upper Ormond Q	uay						
Dublin 7							Micro
Date 18/11/202	1 15:53		Designed	l by Byr	neSe		Drainage
File 180208.MD	X		Checked	by			Diginiage
Innovyze			Network	2020.1			
Hydro-Brak	e® Optin	uum Manhol	e: S3-4, 1	DS/PN: S	32.005, V	olume (m³	): 10.9
Depth (m) Flow	w (l/s) D	epth (m) Flo	ow (l/s) De	pth (m) H	low (l/s)	Depth (m)	Flow (l/s)
1.200	4.6	2.400	6.3	5.000	8.9	8.000	11.2
1.400	4.9	2.600	6.6	5.500	9.3	8.500	11.5
1.600	5.2	3.000	7.0	6.000	9.7	9.000	11.8
1.800	5.5	3.500	7.5	6.500	10.1	9.500	12.1
2.000	5.8	4.000	8.0	7.000	10.5		
2.200	0.1	4.500	0.5	7.500	10.0		
Hydro-Brał	ke® Opti	mum Manhol	le: S3-1,	DS/PN:	S2.008, T	Volume (m	<sup>3</sup> ): 4.7
		Uni	t Reference	MD-SHE-	0119-7300-1	450-7300	
		Desi	gn Head (m)			1.450	
		Design	Flow (l/s)			7.3	
			Flush-Flo™	1	Ca	alculated	
			Objective	Minimi	se upstream	n storage	
		a	Application	L		Surface	
		Sum	p Available			Yes	
		Di	ameter (mm)			119	
M	inimum Out	Iliver ig egipt tel-	ameter (mm)			40.550	
11.	Suggested	l Manhole Di	ameter (mm)			1200	
		Control P	oints	Head (m)	Flow (l/s	)	
	Des	ign Point ((	Calculated)	1.450	7.	3	
	200		Flush-Flo™	0.433	7.	3	
			Kick-Flo®	0.900	5.	8	
	Mea	n Flow over	Head Range	-	6.	4	
The hydrologic: Hydro-Brake® O Hydro-Brake Op invalidated	al calcula ptimum as timum® be	ations have specified. utilised th	been based Should anc en these st	on the He other type orage roo	ead/Dischar e of contro uting calcu	rge relatio ol device o alations wi	nship for the ther than a ll be
Depth (m) Flow	w (l/s) D	epth (m) Flo	ow (1/s) Deg	pth (m) H	low (l/s)	Depth (m)	Flow (l/s)
0.100	4.2	1.200	6.7	3.000	10.3	7.000	15.4
0.200	6.6	1.400	7.2	3.500	11.1	7.500	15.9
0.300	7.1	1.600	7.6	4.000	11.8	8.000	16.4
0.400	7.3	1.800	8.1	4.500	12.5	8.500	16.9
0.500	7.3	2.000	8.5	5.000	13.1	9.000	17.3
0.600	7.2	2.200	8.9	5.500	13.7	9.500	17.8
0.800	6.6	2.400	9.2	6.000	14.3		
1.000	6.1	2.600	9.6	6.500	14.8		
		©19	982-2020 I	nnovyze			

DBFL Consulting Engineers				Page 11
Ormond House	30 vea	r 600 minute	e event	
Upper Ormond Quay				
Dublin 7				Micro
Date 18/11/2021 15:53	Design	ed by Byrr	neSe	Drainage
File 180208.MDX	Checke	ed by		brainage
Innovyze	Networ	k 2020.1		
<u>Storage</u> Cellular Storage	Structu e Manho	ires for St	<u>torm</u> 5/PN: S1.004	
Inver Infiltration Coefficient Infiltration Coefficient	rt Level Base (m, Side (m,	(m) 47.405 /hr) 0.00000 /hr) 0.00000	Safety Facto Porosit	r 2.0 y 0.95
Depth (m) Area (m <sup>2</sup> ) Inf. Are	ea (m²)	Depth (m) Ar	rea (m²) Inf.	Area (m²)
0.000 68.0 2.000 68.0	0.0	2.001	0.0	0.0
<u>Cellular</u> Storage	e Manho	le: S4, DS	/PN: S1.008	
Inver Infiltration Coefficient Infiltration Coefficient	rt Level Base (m, Side (m,	(m) 45.600 /hr) 0.00000 /hr) 0.00000	Safety Facto Porosit	r 2.0 y 0.95
Depth (m) Area (m <sup>2</sup> ) Inf. Are	ea (m²)	Depth (m) Ar	rea (m²) Inf.	Area (m²)
0.000 76.0 2.000 76.0	0.0	2.001	0.0	0.0
<u>Cellular Storage</u>	Manhol	e: S3-4, D	S/PN: S2.00	5
Inver Infiltration Coefficient Infiltration Coefficient Depth (m) Area (m <sup>2</sup> ) Inf Are	rt Level Base (m, Side (m,	(m) 46.998 /hr) 0.00000 /hr) 0.00000	Safety Facto Porosit	r 2.0 y 0.80
	ea (m )	Depen (m) A	.ea (m ) 1111.	Area (m )
0.000 295.5 1.450 295.5	0.0	1.451	0.0	0.0
<u>Cellular Storage</u>	Manhol	e: S3-1, D	S/PN: S2.00	8
Inver Infiltration Coefficient Infiltration Coefficient	rt Level Base (m, Side (m,	(m) 46.550 /hr) 0.00000 /hr) 0.00000	Safety Facto Porosit	r 2.0 y 0.82
Depth (m) Area (m <sup>2</sup> ) Inf. Are	ea (m²)	Depth (m) Ar	rea (m²) Inf.	Area (m²)
0.000 128.2 1.450 128.2	0.0	1.451	0.0	0.0

DBFL Consulting Engineers		Page 12
Ormond House	30 year 600 minute event	
Upper Ormond Quay		
Dublin 7		Mirro
Date 18/11/2021 15:53	Designed by ByrneSe	Dcainago
File 180208.MDX	Checked by	Diamage
Innovyze	Network 2020.1	

## Summary of Results for 600 minute 30 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF DTS Status ON

WARNING: Half Drain Time has not been calculated as the structure is too full.

		Water	Surcharged	Flooded			Half Drain	Pipe	
	US/MH	Level	Depth	Volume	Flow /	Overflow	Time	Flow	
PN	Name	(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	Status
S1.000	S12	52.301	-0.199	0.000	0.03			3.6	OK
S1.001	S11	50.898	-0.196	0.000	0.04			4.2	OK
S1.002	S10	49.550	-0.183	0.000	0.08			8.8	OK
S1.003	S9	48.924	1.226	0.000	0.30			9.4	SURCHARGED
S1.004	S8	48.921	1.291	0.000	0.02		620	1.8	SURCHARGED
S1.005	S7	47.163	-0.169	0.000	0.02			1.8	OK
S1.006	S6	47.161	0.028	0.000	0.08			15.2	SURCHARGED
S1.007	S5	47.154	1.192	0.000	0.31			15.3	SURCHARGED
S1.008	S4	47.148	1.323	0.000	0.10		480	5.0	SURCHARGED
S2.000	S3-9	51.417	-0.183	0.000	0.08			5.5	OK
S2.001	S3-8	50.590	-0.261	0.000	0.04			6.3	OK
S2.002	S3-7	48.912	-0.394	0.000	0.04			7.9	OK
S2.003	S3-6	48.787	-0.383	0.000	0.05			14.4	OK
S2.004	S3-5	48.037	0.472	0.000	0.17			25.1	SURCHARGED
S2.005	S3-4	48.035	0.737	0.000	0.06		550	5.0	SURCHARGED
S2.006	S3-3	47.650	0.462	0.000	0.07			12.7	SURCHARGED
S2.007	S3-2	47.646	0.681	0.000	0.26			16.3	SURCHARGED
S2.008	S3-1	47.642	0.867	0.000	0.13			7.3	SURCHARGED
S1.009	S3	44.788	-0.137	0.000	0.32			11.9	OK
S1.010	S2	44.675	-0.141	0.000	0.30			11.9	OK

	lng Eng	lineers	S							Pag	e 1				
Ormond House				100	100 year 600 minute event										
Upper Ormond	Quay										· · · · ·				
Dublin 7										Mi					
Date 18/11/20	Desi	Designed by ByrneSe						ainago							
File 180208.M	IDX			Checked by							maye				
Innovyze				Netw	Network 2020.1										
	STORM	SEWER	DESIGN	by th	he Modifi	ed Ra	tion	al M	ethod	<u>.</u>					
Design Criteria for Storm															
Pipe Sizes STANDARD Manhole Sizes STANDARD															
FSR Rainfall Model - Scotland and Ireland															
	Return Period (years) 5 PIMP (%) 100														
		MS	Ratio R	16.40	73	Add F. Min:	LOW / imum E	ackd:	rop He	ange (% ight (m	) <u>10</u>				
Ma	aximum R	ainfall	l (mm/hr)	5	50	Max:	imum E	ackd:	rop He	ight (m	i) 1.500				
Maximum Time o	of Conce	ntratio	on (mins)	3	30 Min Des:	ign Dep	pth fo	or Op	timisa	tion (m	ı) 1.200				
	Foul	Sewage	(l/s/ha)	0.00	00 Min V	Vel for	r Auto	Des	ign on	ly (m/s	) 1.00				
Vo	olumetri	c Runoi	II COEII.	0.75	50 Mii	n Slope	e Ior	Opti	nisati	on (l:x	.) 500				
			Design	ned wit	th Level So	offits									
		Ne	etwork I	Design	n Table f	for St	orm								
		«	- Indic	ates p	oipe capaci	ty < f	low								
				-		-									
PN Length	Fall S	long T													
-	rurr c	торе т	.Area T	.E.	Base	k	HYD	DIA	Secti	on Type	a Auto				
(m)	(m) (	(1:X)	.Area T (ha) (m	.E. ins) F	Base Clow (l/s)	k (mm)	HYD SECT	DIA (mm)	Secti	on Type	Auto Design				
(m) S1.000 28.120	(m) (	(1:X)	.Area T (ha) (m 0.087	.E. ins) F 4.00	Base Clow (1/s)	k (mm) 0.600	HYD SECT O	DIA (mm) 225	Section Pipe/	<b>on Type</b> Conduit	Auto Design				
(m) S1.000 28.120 S1.001 13.000	(m) ( 1.406 0.650	20.0 20.0	.Area T (ha) (m. 0.087 0.016	.E. ins) F 4.00 0.00	Base Flow (1/s) 0.0 0.0	k (mm) 0.600 0.600	HYD SECT 0	DIA (mm) 225 225	Section Pipe/Pipe/	<b>on Type</b> Conduit Conduit	e Auto Design				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694	(m) ( 1.406 0.650 2.035	20.0 20.0 20.0	.Area T (ha) (m. 0.087 0.016 0.112	.E. ins) F 4.00 0.00 0.00	Base Flow (1/s) 0.0 0.0 0.0	k (mm) 0.600 0.600 0.600	HYD SECT 0 0 0	DIA (mm) 225 225 225	Pipe/ Pipe/ Pipe/	<b>on Type</b> Conduit Conduit Conduit	Auto Design				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811	(m) ( 1.406 0.650 2.035 0.068 2	20.0 20.0 20.0 20.0 203.1	.Area T (ha) (m. 0.087 0.016 0.112 0.021	.E. ins) F 4.00 0.00 0.00 0.00	Base 'low (l/s) 0.0 0.0 0.0 0.0	k (mm) 0.600 0.600 0.600 0.600	HYD SECT 0 0 0 0	DIA (mm) 225 225 225 225	Section Pipe/Pipe/Pipe/Pipe/Pipe/Pipe/Pipe/Pipe/	on Type Conduit Conduit Conduit	Auto Design				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 0.547	(m) ( 1.406 0.650 2.035 0.068 2 0.298	20.0 20.0 20.0 20.0 203.1 34.6	.Area T (ha) (m. 0.087 0.016 0.112 0.021 0.019	.E. ins) F 4.00 0.00 0.00 0.00 0.00	Base Clow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0	k (mm) 0.600 0.600 0.600 0.600	HYD SECT	DIA (mm) 225 225 225 225 225 225	Section Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	on Type Conduit Conduit Conduit Conduit Conduit	Auto Design				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 20 736	(m) ( 1.406 0.650 2.035 0.068 0.298 0.274	20.0 20.0 20.0 203.1 34.6 34.8	.Area T (ha) (m. 0.087 0.016 0.112 0.012 0.019 0.005 0.234	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Base Clow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600	HYD SECT 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 225	Section Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	on Type Conduit Conduit Conduit Conduit Conduit	Auto Design				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814	(m) ( 1.406 0.650 2.035 0.068 0.298 0.274 1.171 0.052	20.0 20.0 20.0 203.1 34.6 34.8 33.1	.Area T (ha) (m 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Base Clow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600	HYD SECT 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 225 300	Section Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	on Type Conduit Conduit Conduit Conduit Conduit Conduit	Auto Design				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1 008 29 044	(m) ( 1.406 0.650 2.035 0.068 0.274 1.171 0.062 4 0.290 1	20.0 20.0 20.0 203.1 34.6 33.1 400.2	.Area T (ha) (m 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Base Clow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 225 300 300 225	Section Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe//	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit	Auto Design				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1.008 29.044	(m) ( 1.406 0.650 2.035 0.068 2 0.298 0.274 1.171 0.062 4 0.290 1	20.0 20.0 20.0 203.1 34.6 34.8 33.1 400.2	.Area T (ha) (m 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Base Clow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 300 300 225	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit	Auto Design				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1.008 29.044 \$2.000 41.175	(m) ( 1.406 0.650 2.035 0.068 0.274 1.171 0.062 4 0.290 1 0.789	20.0 20.0 20.0 20.0 203.1 34.6 34.8 33.1 400.2 100.2 52.2	.Area T (ha) (m 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00	Base Clow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 300 300 225 225	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit	Auto Design				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1.008 29.044 \$2.000 41.175	(m) ( 1.406 0.650 2.035 0.068 2 0.298 0.274 1.171 0.062 4 0.290 1 0.789	20.0 20.0 20.0 203.1 34.6 34.8 33.1 400.2 100.2 52.2	.Area T (ha) (m. 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Netw</u>	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 0.00	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 300 300 225 225	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit	Auto Design				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1.008 29.044 \$2.000 41.175	(m) ( 1.406 0.650 2.035 0.068 0.274 1.171 0.062 4 0.290 1 0.789 in T.4	(1:x) 20.0 20.0 20.0 20.0 34.6 34.8 33.1 400.2 52.2 C. US	.Area T (ha) (m 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Netw</u> /IL Σ I.	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 4.00 0 ork R Area	Вазе Plow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 b.600 0.600 b.600	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 300 300 225 225 225	Secti Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Vel	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit	Flow				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1.008 29.044 \$2.000 41.175 PN Ra: (mm/	(m) ( 1.406 0.650 2.035 0.068 2 0.298 0.274 1.171 0.062 4 0.290 1 0.789 in T.( hr) (min	(1:x) 20.0 20.0 20.0 203.1 34.6 34.8 33.1 400.2 52.2 52.2 C. US, ms) (1	.Area T (ha) (m 0.087 0.016 0.012 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Netw</u> /IL Σ I. m) (h	.E. ins) F 4.00 0.00	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 able Foul (1/s)	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 300 300 225 225 225	Secti Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel (m/s)	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit	Flow (1/s)				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1.008 29.044 \$2.000 41.175 PN Ra: (mm/ \$1.000 50	(m) ( 1.406 0.650 2.035 0.068 2 0.298 0.274 1.171 0.062 4 0.290 1 0.789 in T.( hr) (min .00 4	(1:x) 20.0 20.0 20.0 20.0 203.1 34.6 34.8 33.1 400.2 52.2 C. US ns) (1 .16 52.	.Area T (ha) (m. 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Netw</u> /IL Σ I. m) (h	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 4.00 0.00 4.00 0.00 4.00 0.00 4.00 1.00	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.6000 0.6000 0.6000 0.6000 0.60000 0.60000 0.600000000	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 300 300 225 225 225 225 300 300 225 225 225 225 225 225 225 225 225 2	Secti Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Vel (m/s) 2.94	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit	Flow (1/s)				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1.008 29.044 \$2.000 41.175 PN Ra: (mm/ \$1.000 50 \$1.001 50	(m) ( 1.406 0.650 2.035 0.068 2 0.298 0.274 1.171 0.062 4 0.290 1 0.789 in T.( hr) (min .00 4 .00 4	(1:x) 20.0 20.0 20.0 20.0 20.0 34.6 34.8 33.1 400.2 52.2 C. US, ms) (1 .16 52. .23 50.	.Area T (ha) (m. 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Netw</u> /IL Σ I. m) (h .275 0 .869 0	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 4.00 York R Area a) F 0.087 0.103	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.6000 0.6000 0.6000 0.600000000	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 300 300 225 225 225 225 225 225 225 225 225 2	Secti Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Vel (m/s) 2.94 2.94	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit 116.9 116.9	Auto Design				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1.008 29.044 \$2.000 41.175 PN Ra: (mm/ \$1.000 50 \$1.001 50 \$1.002 50	(m) ( 1.406 0.650 2.035 0.068 2 0.298 0.274 1.171 0.062 4 0.290 1 0.789 in T.( hr) (min .00 4 .00 4 .00 4	(1:x) 20.0 20.0 20.0 20.0 20.1 34.6 34.8 33.1 400.2 52.2 C. US, ms) (1 .16 52. .23 50. .46 49.	.Area T (ha) (m. 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Netw</u> /IL Σ I. m) (h .275 0 .869 0	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 4.00 York R Area a) F 0.087 0.103 0.215	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.000 0.000 0.000 0.000 0.0000 0.0000 0.0000 0.000000	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 300 300 225 225 225 225 225 225 225 225 225 2	Secti Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Vel (m/s) 2.94 2.94 2.94	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit 116.9 116.9 116.9	Auto Design				
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(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1.008 29.044 \$2.000 41.175 PN Ra: (mm/ \$1.000 50 \$1.001 50 \$1.002 50 \$1.003 50 \$1.004 50	(m) ( 1.406 0.650 2.035 0.068 0.274 1.171 0.062 4 0.290 1 0.789 in T.( hr) (min .00 4 .00 .00	(1:x) 20.0 20.0 20.0 20.0 20.1 34.6 34.8 33.1 400.2 52.2 C. US ns) (1 .16 52. .23 50. .46 49. .72 47. .79 47.	.Area T (ha) (m 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Netw</u> /IL Σ I. m) (h .275 0 .869 0 .508 0 .473 0	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 4.00 4.00 4.00 0.087 0.103 0.215 0.236 0.255	Base           Plow (1/s)           0.0	k (mm) 0.600 0.0000 0.0000 0.0000 0.0000 0.000000	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 300 300 225 225 225 225 225 225 225 225 225 2	Secti Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Vel (m/s) 2.94 2.94 2.94 2.94 2.94 2.94 2.94	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit 116.9 116.9 116.9 116.9 116.9 36.3 88.7	Flow (1/s) 13.0 15.3 32.0 35.2 38.0				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1.008 29.044 \$2.000 41.175 PN Ra: (mm/ \$1.000 50 \$1.001 50 \$1.002 50 \$1.003 50 \$1.004 50 \$1.005 50	(m) ( 1.406 0.650 2.035 0.068 0.274 1.171 0.062 4 0.290 1 0.789 in T.( hr) (min .00 4 .00 .00	<pre>20.0 20.0 20.0 20.0 20.1 34.6 34.8 33.1 400.2 52.2 52.2 C. US ns) (1 .16 5223 5046 4972 4779 4786 47.</pre>	.Area T (ha) (m 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Netw</u> /IL Σ I. m) (h .275 0 .869 0 .508 0 .473 0 .405 0	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 4.00 4.00 4.00 0.087 0.103 0.215 0.236 0.255 0.260	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.0000 0.0000 0.0000 0.0000 0.000000	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 300 300 225 225 225 225 225 300 300 225 225 225 300 300 225 225 300 300 225 225 300 300 225 225 300 300 225 225 225 225 225 225 225 225 225 2	Secti Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// 2.94 2.94 2.94 2.94 2.94 2.23 2.22	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit 116.9 116.9 116.9 116.9 116.9 116.9 188.7 88.4	Flow (1/s) 13.0 15.3 32.0 35.2 38.0 38.7				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1.008 29.044 \$2.000 41.175 PN Ra: (mm/ \$1.000 50 \$1.001 50 \$1.002 50 \$1.003 50 \$1.005 50 \$1.005 50 \$1.006 50	(m) ( 1.406 0.650 2.035 0.068 0.274 1.171 0.062 4 0.290 1 0.789 in T.( hr) (min .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 5 .00 5 .00 5 .00 5 .00 .00	(1:x) 20.0 20.0 20.0 20.0 20.1 34.6 34.8 33.1 400.2 52.2 C. US ns) (1 .16 52. .23 50. .46 49. .72 47. .79 47. .86 47. .10 46.	.Area T (ha) (m 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Netw</u> /IL Σ I. m) (h .275 0 .869 0 .508 0 .473 0 .405 0 .107 0 .833 0	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 4.00 4.00 0.087 0.103 0.215 0.236 0.255 0.260 0.594	Base           Plow (1/s)           0.0	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.00 0.0 0.	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 225 225 225 22	Secti Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// 2.94 2.94 2.94 2.94 2.94 2.94 2.23 2.22 2.74	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit 116.9 116.9 116.9 116.9 116.9 116.9 116.9 116.9 116.9 116.9 116.9 116.9 116.9	Flow (1/s) 13.0 15.3 32.0 35.2 38.0 38.7 88.5				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1.008 29.044 \$2.000 41.175 PN Ra: (mm/ \$1.000 50 \$1.001 50 \$1.003 50 \$1.005 50 \$1.005 50 \$1.006 50 \$1.007 50	(m) ( 1.406 0.650 2.035 0.068 0.274 1.171 0.062 4 0.290 1 0.789 in T.( hr) (min .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 4 .00 5 .00 5 .00 5 .00 5 .00 5 .00 5 .00 5 .00 5 .00 5 .00 .00	(1:x) 20.0 20.0 20.0 20.0 34.6 34.8 33.1 400.2 52.2 52.2 C. US ns) (1 .16 52. .23 50. .46 49. .72 47. .79 47. .86 47. .10 46. .63 45.	.Area T (ha) (m 0.087 0.016 0.112 0.021 0.019 0.005 0.334 0.014 0.007 0.135 <u>Netw</u> /IL Σ I. m) (h .275 0 .869 0 .508 0 .473 0 .405 0 .107 0 .833 0 .662 0	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 4.00 4.00 0.087 0.103 0.215 0.236 0.255 0.260 0.594 0.608	Base           Plow (1/s)           0.0	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.00 0.0 0.	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 225 225 225 22	Secti Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// 2.94 2.74 0.78	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit 116.9	Flow (1/s) 13.0 15.3 32.0 35.2 38.0 38.7 88.5 90.6				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1.008 29.044 \$2.000 41.175 PN Ra: (mm/ \$1.000 50 \$1.001 50 \$1.002 50 \$1.003 50 \$1.004 50 \$1.005 50 \$1.006 50 \$1.007 50 \$1.008 50	(m) ( 1.406 0.650 2.035 0.068 2 0.298 0.274 1.171 0.062 4 0.290 1 0.789 in T.( hr) (mi) .00 4 .00 5 .00 5 .00 5	(1:x) 20.0 20.0 20.0 20.0 34.6 34.8 33.1 400.2 52.2 (1) 52.2 (1) (1) (1) (2) (2) (2) (2) (2) (2) (2) (2	.Area T (ha) (m 0.087 0.016 0.112 0.021 0.021 0.005 0.334 0.014 0.007 0.135 <u>Netw</u> /IL Σ I. m) (h .275 0 .869 0 .508 0 .473 0 .405 0 .833 0 .662 0	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 4.00 0.00 4.00 0.00 4.00 0.00 4.00 0.00 4.00 0.025 0.236 0.259 0.260 0.594 0.668 0.6615	Base           Plow (1/s)           0.0	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.00 0.0 0.	HYD SECT	DIA (mm) 225 225 225 225 225 225 225 225 225 22	Secti Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// 2.94 2.94 2.94 2.94 2.94 2.23 2.22 2.74 0.78 1.31	on Type Conduit Sol Sol Sol Sol Sol Sol Sol Sol Sol Sol	Flow (1/s) 13.0 15.3 32.0 35.2 38.0 38.7 88.5 90.6 91.6				
(m) \$1.000 28.120 \$1.001 13.000 \$1.002 40.694 \$1.003 13.811 \$1.004 10.315 \$1.005 9.547 \$1.006 38.736 \$1.007 24.814 \$1.008 29.044 \$2.000 41.175 PN Ra: (mm/ \$1.000 50 \$1.001 50 \$1.002 50 \$1.003 50 \$1.005 50 \$1.006 50 \$1.008 50 \$1.008 50 \$2.000 50	(m) ( 1.406 0.650 2.035 0.068 2 0.298 0.274 1.171 0.062 4 0.290 1 0.789 in T.( hr) (min .00 4 .00 5 .00 5 .00 6 .00 4	(1:x) 20.0 20.0 20.0 20.3.1 34.6 34.8 33.1 400.2 52.2 (100.2 52.2 (100.2 52.2 (100.2 52.2 (100.2 52.2 (100.2 52.2 (100.2 52.2 (100.2 (100.2 52.2 (100.2 (10.	.Area T (ha) (m 0.087 0.016 0.112 0.021 0.021 0.005 0.334 0.014 0.007 0.135 <u>Netw</u> /IL E I. m) (h .275 0 .869 0 .508 0 .473 0 .405 0 .508 0 .473 0 .662 0 .600 0	.E. ins) F 4.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4.00 0.00 4.00 0.00 4.00 0.00 0.00 1.03 0.215 0.236 0.255 0.260 0.594 0.615 0.135	Base Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	k (mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.00 0.0 0.	HYD SECT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DIA (mm) 225 225 225 225 225 225 225 225 225 22	Secti Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// Pipe// 2.94 2.94 2.94 2.94 2.94 2.23 2.22 2.74 0.78 1.31 1.81	on Type Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit 116.9 116.9 116.9 116.9 116.9 116.9 16.3 88.7 88.4 193.9 55.1« 51.9« 72.2	Flow (1/s) 13.0 15.3 32.0 35.2 38.0 38.7 88.5 90.6 91.6 20.1				
DBFL Co	ons	ulti	ng E	ngine	eers									Pag	ge 2
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Ormond	Ho	use					10	0 vea	r 600 i	minute	ever	nt			
Upper (	Orm	ond	Quay					J							
Dublin	7													Mi	rm
Date 18	3/1	1/20	)21 1	5:52			De	signe	ed by	Byrne	eSe				
File 18	302	08.0	IDX				Ch	ecked	l by						anaye
Innovyz	ze						Ne	twork	2020	).1					
					Net	wor	k Desi	gn Ta	able f	Eor St	corm				
PN	Ler	ngth	Fall	Slop	e I.	Area	T.E.	Ba	ase	k	HYD	DIA	Secti	on Typ	e Auto
	(	m)	(m)	(1:X	.) (1	na)	(mins)	Flow	(l/s)	(mm)	SECT	(mm)			Design
S2 001	19	469	0 483	2 40	3 0	018	0 00		0 0	0 600	0	300	Dine	Condui	+ A
S2.001	13	.566	0.136	5 99.	8 0	.010	0.00		0.0	0.600	0	450	Pipe/	'Condui	t 🔒
S2.003	22.	.024	0.220	100.	1 0	.157	0.00		0.0	0.600	0	450	Pipe/	Condui	t 🦷
S2.004	45	.394	0.117	7 388.	0 0	.269	0.00		0.0	0.600	0	450	Pipe/	Condui	t
S2.005	11.	.827	0.118	3 100.	2 0	.053	0.00		0.0	0.600	0	300	Pipe/	Condui	t 🦰
S2.006	22.	.271	0.223	3 99.	9 0	.201	0.00		0.0	0.600	0	375	Pipe/	Condui	t 🤒
S2.007	22.	.611	0.040	) 565.	3 0	.096	0.00		0.0	0.600	0	375	Pipe/	Condui	t 💾
52.008	1.	.089	0.169	9 41.	9 0	.000	0.00		0.0	0.600	0	225	Pipe/	Condui	t 🗂
S1.009	17.	.306	0.109	) 158.	8 0	.000	0.00		0.0	0.600	0	225	Pipe/	Condui	t 🦰
51.010	28.	. 213	0.180	5 150.	1 0	.000	0.00		0.0	0.600	0	225	Pipe/	Condui	ι 🧰
	Network Results Table														
PN	ſ	Rai	Ln	т.с.	US/:	ĽΣ	I.Area	ιΣ	Base	Foul	Add	Flow	Vel	Cap	Flow
		(mm/)	hr) (	mins)	(m)	)	(ha)	Flow	(l/s)	(l/s)	(1,	s)	(m/s)	(l/s)	(l/s)
S2.0	01	50	.00	4.51	50.5	51	0.153		0.0	0.0		2.1	2.48	175.6	22.8
S2.0	02	50	.00	4.62	48.8	56	0.194		0.0	0.0		2.6	2.04	323.8	28.9
S2.0	03	50	.00	4.80	48.7	20	0.351		0.0	0.0		4.8	2.03	323.2	52.3
S2.0	04	50	.00	5.54	47.1	15	0.620	)	0.0	0.0		8.4	1.03	163.2	92.4
S2.0	05	50	.00	5.66	46.9	98	0.673		0.0	0.0		9.1	1.57	111.0	100.2
S2.0	06	50	.00	5.87	46.8	13	0.874		0.0	0.0		11.8	1.81	200.3	130.2
S2.0	07	50	.00	6.37	46.5	90 50	0.970	)	0.0	0.0		13.1	0.75	83.4«	144.5
S2.0	08	50	.00	6.43	46.5	50	0.970		0.0	0.0		13.1	2.03	80.5«	144.5
S1.0	09	50	.00	6.70	44.7	00	1.585		0.0	0.0		21.5	1.04	41.2«	236.1
S1.0	10	50	.00	7.15	44.5	91	1.585		0.0	0.0		21.5	1.06	42.3«	236.1
						C	)1982-2	2020	Innov	yze					

DBFL Consulting Engineers		Page 3
Ormond House	100 vear 600 minute event	
Upper Ormond Quay		
Dublin 7		Mirro
Date 18/11/2021 15:52	Designed by ByrneSe	Dcainago
File 180208.MDX	Checked by	Diamage
Innovyze	Network 2020.1	

#### Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S12	54 150	1 875	Open Manhole	1200	S1 000	52 275	225				
S11	53.000	2,131	Open Manhole	1200	S1.001	50.869	225	S1.000	50.869	225	
S10	52.455	2.947	Open Manhole	1200	S1.002	49.508	225	S1.001	50.219	225	711
59	50.365	2.892	Open Manhole	1200	S1.003	47.473	225	S1.002	47.473	225	/ = =
58	49.758	2.353	Open Manhole	1200	S1.004	47.405	225	S1.003	47.405	225	
S7	49.250	2.143	Open Manhole	1200	s1.005	47.107	225	s1.004	47.107	225	
S6	49.110	2.277	Open Manhole	1200	S1.006	46.833	300	s1.005	46.833	225	
S5	48.450	2.788	Open Manhole	1200	S1.007	45.662	300	S1.006	45.662	300	
S4	48.750	3.150	Open Manhole	1200	S1.008	45.600	225	S1.007	45.600	300	
S3-9	52.800	1.425	Open Manhole	1200	S2.000	51.375	225				
S3-8	52.560	2.009	Open Manhole	1200	S2.001	50.551	300	s2.000	50.586	225	
S3-7	51.650	2.794	Open Manhole	1350	S2.002	48.856	450	S2.001	50.068	300	1062
S3-6	51.250	2.530	Open Manhole	1350	s2.003	48.720	450	S2.002	48.720	450	
S3-5	51.530	4.415	Open Manhole	1350	s2.004	47.115	450	S2.003	48.500	450	1385
S3-4	49.690	2.692	Open Manhole	1350	S2.005	46.998	300	S2.004	46.998	450	
S3-3	49.790	2.977	Open Manhole	1350	S2.006	46.813	375	S2.005	46.880	300	
S3-2	48.810	2.220	Open Manhole	1350	S2.007	46.590	375	S2.006	46.590	375	
S3-1	48.190	1.640	Open Manhole	1350	S2.008	46.550	225	S2.007	46.550	375	
S3	47.990	3.290	Open Manhole	1200	S1.009	44.700	225	S1.008	45.310	225	610
								S2.008	46.381	225	1681
S2	47.650	3.059	Open Manhole	1200	S1.010	44.591	225	S1.009	44.591	225	
S	45.950	1.547	Open Manhole	0		OUTFALL		s1.010	44.403	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S12	722307.088	725897.535	722307.088	725897.535	Required	
S11	722335.025	725894.337	722335.025	725894.337	Required	
S10	722337.699	725907.059	722337.699	725907.059	Required	1
S9	722358.078	725942.283	722358.078	725942.283	Required	I
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DBFL Consult	ing Engine	ers				Page 4		
Ormond House			100 year 60	0 minute eve	nt			
Upper Ormond	Quay							
Dublin 7	001 15.50		Decimal			Micro		
Date 18/11/20	UZI IS·5Z		Designed r	,		Drainage		
Throwyze	MDA		Network 20	20 1				
			Network 20	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
		Manhole	Schedules	Schedules for Storm				
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)		
S8	722371.889	725942.211	722371.889	725942.211	Required			
S7	722382.180	725941.500	722382.180	725941.500	Required			
S6	722389.828	725935.786	722389.828	725935.786	Required			
S5	722420.338	725911.918	722420.338	725911.918	Required			
S4	722440.020	725896.807	722440.020	725896.807	Required	Mark Contractor		
S3-9	722336.143	725812.287	722336.143	725812.287	Required	•		
S3-8	722361.102	725779.539	722361.102	725779.539	Required			
S3-7	722375.134	725766.043	722375.134	725766.043	Required	$\sim$		
S3-6	722387.996	725770.355	722387.996	725770.355	Required	1		
S3-5	722402.179	725787.205	722402.179	725787.205	Required	1		
S3-4	722427.388	725824.956	722427.388	725824.956	Required	4		
S3-3	722432.100	725835.803	722432.100	725835.803	Required	4		
S3-2	722445.326	725853.722	722445.326	725853.722	Required	4		
S3-1	722458.315	725872.230	722458.315	725872.230	Required	4		
S3	722462.255	725878.123	722462.255	725878.123	Required	$\mathbf{\hat{x}}$		
		©19	82-2020 Inn	lovyze				

DBFL Consulting Engineers			Page 5			
Ormond House	100 year 600	minute event				
Upper Ormond Quay						
Dublin 7			Mirro			
Date 18/11/2021 15:52	Designed by	ByrneSe	Drainago			
File 180208.MDX	Checked by		Diginadic			
Innovyze	Network 202	0.1				
<u>M</u>	anhole Schedules fo	Schedules for Storm				
MH Manhole Man Name Easting Nor (m)	whole Intersection In thing Easting (m) (m)	ntersection Manhole Lay Northing Access (Nor (m)	out th)			
S2 722475.901 7258	67.479 722475.901	725867.479 Required 🔪				
s 722500.163 7258	53.081	No Entry				
	01000 0000 -					
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DBFL Consult:	ing E	ngine	ers							Page	6
Ormond House					100 vear	<sup>.</sup> 600 mir	nute eve	ent			
Upper Ormond	Quay				, <b>,</b>						_
Dublin 7										Micc	
Date 18/11/20	021 1	5:52		:	Designe	d by By	rneSe			Depir	
File 180208.M	ΛDX				Checked by					DIdli	laye
Innovyze					Network	2020.1					
-											
			PII	PELINE	SCHEDUL	ES for	Storm				
				Ups	tream M	lanhole					
PN	Hyd	Diam	мн	C.Level	I.Level	D.Depth	МН	M	H DIAM.,	L*W	
	Sect	(mm)	Name	(m)	(m)	(m)	Connect	ion	(mm)		
S1 000	0	225	c12	54 150	52 275	1 650	Open Mar	hole		1200	
S1.000	0	225	S12 S11	53.000	50.869	1.906	Open Mar	nhole		1200	
S1.002	0	225	S10	52,455	49.508	2.722	Open Mar	nhole		1200	
S1.003	0	225	59	50.365	47,473	2.667	Open Mar	hole		1200	
S1 004	0	225	58	49 758	47 405	2 128	Open Mar	hole		1200	
S1.001	0	225	97	49 250	47 107	1 918	Open Mar	hole		1200	
S1.005	0	220	57	40 110	47.107	1 077	Open Mar	holo		1200	
S1.006	0	300	50	49.110	40.833	1.977	Open Mar	more		1200	
SI.007	0	300	55	48.450	45.002	2.400	Open Mar	holo		1200	
51.008	0	223	54	40.750	45.000	2.925	open Mar	шоте		1200	
S2.000	0	225	S3-9	52.800	51.375	1.200	Open Mar	nhole		1200	
S2.001	0	300	S3-8	52.560	50.551	1.709	Open Mar	nhole		1200	
S2.002	0	450	S3-7	51.650	48.856	2.344	Open Mar	nhole		1350	
S2.003	0	450	S3-6	51.250	48.720	2.080	Open Mar	nhole		1350	
S2.004	0	450	S3-5	51.530	47.115	3.965	Open Mar	nhole		1350	
\$2,005	0	300	S3-4	49.690	46,998	2, 392	Open Mar	nhole		1350	
52.006	0	375	53-3	49.790	46.813	2.602	Open Mar	hole		1350	
S2.000	0	375	93-2	48 810	46 590	1 845	Open Mar	hole		1350	
S2.008	0	225	S3-1	48.190	46.550	1.415	Open Mar	nhole		1350	
S1.009	0	225	53	47,990	44.700	3.065	Open Mar	nhole		1200	
	-										
				Down	stream	Manhole	2				
PN I	length	Slope	e MH	C.Level	l I.Level	L D.Deptl	h M	н	MH DIAM	., L*W	
	(m)	(1:X)	Name	(m)	(m)	(m)	Conne	ction	( mm	1)	
S1.000 2	28.120	20.0	) S11	53.000	50.869	9 1.906	6 Open M	anhole		1200	
S1.001 1	13.000	20.0	) S10	52.455	5 50.219	2.01	1 Open M	anhole		1200	
S1.002 4	10.694	20.0	) S9	50.365	5 47.473	3 2.66	7 Open M	anhole		1200	
S1.003 1	3.811	203.1	L S8	49.758	8 47.405	5 2.128	- 8 Open M	anhole		1200	
S1.004 1	0.315	34.6	5 57	49.250	47.10	7 1.918	8 Open M	anhole		1200	
S1.005	9.547	34.8	3 56	49.11(	46.83	3 2.053	2 Open M	anhole		1200	
S1.006	38.736	33.1		48.450	45.663	2 2 488	8 Open M	anhole		1200	
S1 007 3	24.814	400 3	2 94	48 750	) 45 KO	) 2.850	) Open M	anhole		1200	
S1.008 2	29.044	100.2	2 S3	47.990	45.310	2.45	5 Open M	anhole		1200	
~~ ~~~		50.0	~~ ~							1000	
S2.000 4	11.175	52.2	2 53-8	52.56			9 Open M	anhole		1200	
S2.001 1	19.409	40.3	5 53-7 0 02 6	51.050			2 Open M 0 Orer M	annoie		1350	
52.002	13.500	100 7	5 53-6 . c2 -	D1.250	J 48./20		o open M	amiore		1350	
S2.003 2	42.024	T00.1	L 53-5	51.530	48.500	2.580	u upen M	annole		1350	
S2.004 4	±5.394	388.0	ມ S3−4	49.69	J 46.998	3 2.242	∠ ∪pen M	annole		1350	
S2.005 1	11.827	100.2	2 53-3	49.790	J 46.880	2.61	U Upen M	annole		1350	
S2.006 2	22.271	99.9	9 S3-2	48.810	J 46.59(	1.84	5 Open M	annole		1350	
S2.007 2	22.611	565.3	3 S3-1	48.190	46.550	1.265	6 Open M	anhole		1350	
S2.008	7.089	41.9	9 S3	47.990	46.381	L 1.384	4 Open M	anhole		1200	
S1.009 1	17.306	158.8	3 S2	47.650	0 44.591	L 2.834	4 Open M	anhole		1200	
				©1982	2-2020	Innovyz	e				

DBFL Consulting Engineers		Page 7							
Ormond House	100 vear 600 minute event								
Upper Ormond Quay	,								
Dublin 7		Mirrn							
Date 18/11/2021 15:52	Designed by ByrneSe	Dcainago							
File 180208.MDX	Checked by	Diamage							
Innovyze	Network 2020.1								
PIPELINE	SCHEDULES for Storm								
	stream Manhole								
PN Hvd Diam MH C.Level	I.Level D.Depth MH MH DIAM.	. L*W							
Sect (mm) Name (m)	(m) (m) Connection (mm)								
	44 F01 2 924 Open Merhele	1200							
SI.010 0 225 SZ 47.650	44.591 2.834 Open Mannole	1200							
Dow	nstream Manhole								
PN Length Slope MH C.Leve	el I.Level D.Depth MH MH DIAM	1., L*W							
(m) (1:X) Name (m)	(m) (m) Connection (m	m)							
S1.010 28.213 150.1 S 45.99	50 44.403 1.322 Open Manhole	0							
Free Flowing Outfall Details for Storm									
Pipe Number Name	(m) (m) T. Level (mm) (mm)								
	(m)								
	45 959 44 499 44 599 9								
S1.010 S	45.950 44.403 44.500 0 0								
Simulatio	on Criteria for Storm								
Volumetric Runoff Coeff 1	.000 Additional Flow - % of Total Flo	ow 10.000							
Areal Reduction Factor 1	.000 MADD Factor * 10m <sup>3</sup> /ha Storag	je 2.000							
Hot Start (mins)	U Inlet Coefficier	(10.800)							
Manhole Headloss Coeff (Global) 0	.500 Run Time (mins	s) 1200							
Foul Sewage per hectare (1/s) 0	.000 Output Interval (mins	3) 10							
Mumber of Truth Mr. 1	appa 0 Number of Charges Charges 1								
Number of Input Hydrogr Number of Online Cont	rols 4 Number of Time/Area Diagrams 0								
Number of Offline Cont	rols 0 Number of Real Time Controls 0								
Synthet	ic Rainfall Details								
Rainfall Model	FSR Drofile Type Wi	nter							
Return Period (years)	100 Cv (Summer) 0	.750							
Region Scotlar	nd and Ireland Cv (Winter) 1	.000							
M5-60 (mm)	16.400 Storm Duration (mins)	600							
Ratio R	0.273								

DBFL Consulting Engineers				Page 8						
Ormond House	100 year 6	600 minute eve	ent							
Upper Ormond Quay	roo your (									
Dublin 7				Micro						
Date 18/11/2021 15:52	Designed	by ByrneSe								
File 180208.MDX	Checked 1	by		Diamaye						
Innovyze	Network	2020.1								
Online	Controls	for Storm								
Hadres Ducker October Marchel										
Hydro-Braket Optimum Mannos	e. so, D:	5/PN: 51.004,		). 3.2						
Unit	Reference	MD-SHE-0057-20	00-2000-2000							
Desig	n Head (m)		2.000							
Design	Flow (l/s)		2.0							
	r⊥usn-Flo™ Objective	Minimige unat	calculated							
A	pplication	minimise upst	Surface							
Sump	Available		Yes							
Dia	meter (mm)		57							
Invert	Level (m)		47.405							
Minimum Outlet Pipe Dia	meter (mm)		75							
Suggested Manhole Dia	meter (mm)		1200							
Control Po	ints	Head (m) Flow	(l/s)							
Design Point (Ca	(lculated)	2.000	2.0							
F	'lush-Flo™	0.247	1.3							
	Kick-Flo®	0.506	1.1							
Mean Flow over F	lead Range	-	1.5							
The hydrological calculations have b Hydro-Brake® Optimum as specified. Hydro-Brake Optimum® be utilised the invalidated	een based o Should anot n these sto	on the Head/Dis Ther type of co Drage routing c	charge relation ntrol device of alculations w	onship for the other than a ill be						
Depth (m) Flow (1/s) Depth (m) Flow	r (l/s) Dep	th (m) Flow (l	/s) Depth (m)	Flow (l/s)						
0.100 1.2 1.200	1.6	3.000	2.4 7.000	3.6						
0.200 1.3 1.400	1.7	3.500	2.6 7.500	3.7						
0.300 1.3 1.600	1.8	4.000	2.7 8.000	3.8						
0.400 1.3 1.800	1.9	4.500	2.9 8.500	3.9						
0.500 1.1 2.000	2.0	5.000	3.0 9.000	4.0						
	2.1	5.500	3.2 9.500	4.1						
1.000 1.5 2.600	2.2	6.500	3.4							
Hydro-Brake® Optimum Manhol	.e: S4, DS	5/PN: S1.008,	, Volume (m³	): 5.2						
Unit	Reference	MD-SHE-0098-57	00-2000-5700							
Desig	n Head (m)		2.000							
Design	Flow (l/s)		5.7							
	Flush-Flo™		Calculated							
	Objective	Minimise upst	ream storage							
A	Pprication		Suriace							
Sump	Diamater (mm) 00									
	$\frac{1}{1000}$									
Minimum Outlet Pipe Dia	meter (mm)		150							
Suggested Manhole Dia	meter (mm)		1200							
<u></u> @19۶	יד 2,2020 ו	movyze								

DBFL Consult	ing Engi	neers					Page 9			
Ormond House	2		100 year	600 minute	ovent					
Upper Ormono	d Ouay		Too year		event					
Dublin 7	~ -						Micco			
Date 18/11/2	2021 15:5	2	Designer	l by Byrne	Se					
File 180208			Checked	by	be		Drainage			
The 100200	. MDA		Natural	Dy 2020 1						
IMOVyze			Network	2020.1						
Hydro-	Brake® Op	timum Manhc	le: S4, I	S/PN: S1.	008, Volu	ume (m³)	: 5.2			
		Control P	oints	Head (m) F	low (l/s)					
	De	esign Point (C	Calculated)	2.000	5.7					
			Flush-Flo™	0.430	4.8					
			Kick-Flo®	0.874	3.9					
	Me	ean Flow over	Head Range	-	4.6					
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) 1	Flow (l/s)	Depth (m) Flo	w (l/s) De	pth (m) Flo	w (l/s) De	epth (m) I	'low (l/s)			
0.100	3.2	1.200	4.5	3.000	6.9	7.000	10.3			
0.200	4.4	1.400	4.8	3.500	7.4	7.500	10.6			
0.300	4.7	1.600	5.1	4.000	7.9	8.000	11.0			
0.400	4.8	1.800	5.4	4.500	8.3	8.500	11.3			
0.500	4.0	2.000	5.7	5.000	9.0	9.000	11.0			
0.800	4.3	2.200	6.2	6.000	9.6	2.300	11.9			
1.000	4.1	2.600	6.4	6.500	9.9					
<u>Hydro-Bi</u>	Hydro-Brake® Optimum Manhole: S3-4, DS/PN: S2.005, Volume (m³): 10.9 Unit Reference MD-SHE-0099-5000-1450-5000 Design Head (m) 1.450 Design Flow (1/s) 5.0 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface									
		Di	ameter (mm)			99				
		Inver	t Level (m)			46.998				
	Minimum O	utlet Pipe Di	ameter (mm)			150				
	Suggest	ed Manhole Di	ameter (mm)			1200				
		Control P	oints	Head (m) F	low (l/s)					
	De	esign Point (C	Calculated)	1.450	5.0					
			Flush-Flo™	0.432	5.0					
			Kick-Flo®	0.882	4.0					
	Me	ean Flow over	неаа Kange	-	4.4					
The hydrolog Hydro-Brake Hydro-Brake invalidated	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) 1	Flow (l/s)	Depth (m) Flo	w (l/s) De	pth (m) Flo	w (l/s) De	epth (m) H	flow (l/s)			
0.100	3.2	0.300	4.9	0.500	5.0	0.800	4.4			
0.200	4.5	0.400	5.0	0.600	4.9	1.000	4.2			
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DBFL Consulting Engineers					Page 10				
Ormond House	100 year	600 mini	ute event						
Upper Ormond Quay									
Dublin 7					Mirro				
Date 18/11/2021 15:52	Designed	l by Byr	neSe		Drainage				
File 180208.MDX	Checked	by			Diamage				
Innovyze	Network	2020.1							
Hydro-Brake® Optimum Manhole	e: S3-4, I	DS/PN: S	32.005, V	olume (m <sup>:</sup>	3): 10.9				
Depth (m) Flow (1/s) Depth (m) Flor	w (l/s) Dep	pth (m) H	flow (l/s)	Depth (m)	Flow (l/s)				
1.200 4.6 2.400	6.3	5.000	8.9	8.000	11.2				
1.400 4.9 2.600	6.6	5.500	9.3	8.500	11.5				
1.600 5.2 3.000	7.0	6.000	9.7	9.000	11.8				
1.800 5.5 3.500	7.5	6.500	10.1	9.500	12.1				
	8.0	7.000	10.5						
2.200 0.1 4.300	0.5	7.500	10.0						
Hydro-Brake® Optimum Manhole: S3-1, DS/PN: S2.008, Volume (m³): 4.7									
Unit Reference MD-SHE-0119-7300-1450-7300									
Desig	gn Head (m)			1.450					
Design	Flow $(l/s)$			7.3					
	Flush-Flo™		Ca	alculated					
	Objective	Minimi	se upstream	n storage					
P	Application			Surface					
Sump	Available			Yes					
Dia	ameter (mm)			16 550					
Minimum Outlet Dine Dia	meter (mm)			40.550					
Suggested Manhole Dia	ameter (mm)			1200					
Control Pc	oints	Head (m)	Flow (l/s	;)					
Design Point (C	alculated)	1.450	7.	3					
	Flush-Flo™	0.433	7.	3					
	Kick-Flo®	0.900	5.	8					
Mean Flow over 1	Head Range	-	6.	4					
The hydrological calculations have k 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 roo	ead/Dischar e of contro uting calco	rge relatic ol device c ulations wi	onship for the other than a ll be				
Depth (m) Flow (1/s) Depth (m) Flow	w (l/s) Dep	pth (m) E	'low (l/s)	Depth (m)	Flow (l/s)				
0.100 4.2 1.200	6.7	3.000	10.3	7.000	15.4				
0.200 6.6 1.400	7.2	3.500	11.1	7.500	15.9				
0.300 7.1 1.600	7.6	4.000	11.8	8.000	16.4				
0.400 7.3 1.800	8.1	4.500	12.5	8.500	16.9				
0.500 7.3 2.000	8.5	5.000	13.1	9.000	17.3				
0.600 7.2 2.200	8.9	5.500	13.7	9.500	17.8				
0.800 6.6 2.400	9.2	6.000	14.3						
1.000 6.1 2.600	9.6	6.500	14.8						
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DBFL Consulting Engineers				Page 11					
Ormond House	100 ve	ar 600 minut	e event						
Upper Ormond Quay	,								
Dublin 7				Mirro					
Date 18/11/2021 15:52	Design	ed by Byrn	eSe	Drainage					
File 180208.MDX	Checke	d by		brainage					
Innovyze	Networ								
<u>Storage</u> Cellular Storage	Structu e Manho	nres for St	<u>corm</u> /PN: S1.004						
Invert Level (m) 47.405 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000									
Depth (m) Area (m <sup>2</sup> ) Inf. Are	ea (m²)	Depth (m) Ar	ea (m²) Inf.	Area (m²)					
0.000 68.0 2.000 68.0	0.0	2.001	0.0	0.0					
Cellular Storage Manhole: S4, DS/PN: S1.008									
Inver Infiltration Coefficient Infiltration Coefficient	rt Level Base (m, Side (m,	(m) 45.600 /hr) 0.00000 /hr) 0.00000	Safety Factor Porosit	r 2.0 y 0.95					
Depth (m) Area (m <sup>2</sup> ) Inf. Are	ea (m²)	Depth (m) Ar	ea (m²) Inf.	Area (m²)					
0.000 76.0 2.000 76.0	0.0	2.001	0.0	0.0					
<u>Cellular Storage</u>	Manhol	e: S3-4, D	S/PN: S2.00	5					
Inver Infiltration Coefficient Infiltration Coefficient Depth (m) Area (m <sup>2</sup> ) Inf Ar	rt Level Base (m, Side (m,	(m) 46.998 /hr) 0.00000 /hr) 0.00000	Safety Factor Porosit	r 2.0 y 0.80					
	ea (m )		ea (m ) 1111.	Alea (m )					
0.000 295.5 1.450 295.5	0.0	1.451	0.0	0.0					
<u>Cellular Storage</u>	Manhol	e: S3-1, D	S/PN: S2.00	8					
Inver Infiltration Coefficient Infiltration Coefficient	rt Level Base (m, Side (m,	(m) 46.550 /hr) 0.00000 /hr) 0.00000	Safety Factor Porosit	r 2.0 y 0.82					
Depth (m) Area (m <sup>2</sup> ) Inf. Are	ea (m²)	Depth (m) Ar	ea (m²) Inf.	Area (m²)					
0.000 128.2 1.450 128.2	0.0	1.451	0.0	0.0					

DBFL Consulting Engineers		Page 12
Ormond House	100 year 600 minute event	
Upper Ormond Quay		
Dublin 7		Mirro
Date 18/11/2021 15:52	Designed by ByrneSe	Dcainago
File 180208.MDX	Checked by	Diamage
Innovyze	Network 2020.1	

#### Summary of Results for 600 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF DTS Status ON

WARNING: Half Drain Time has not been calculated as the structure is too full.

		Water	Surcharged	Flooded			Half Drain	Pipe	
	US/MH	Level	Depth	Volume	Flow /	Overflow	Time	Flow	
PN	Name	(m)	(m)	(m³)	Cap.	(1/s)	(mins)	(l/s)	Status
<b>a1</b> 000	01.0	F0 204	0 100	0 000	0 04			4 5	077
SI.000	SIZ	52.304	-0.196	0.000	0.04			4.5	OK.
S1.001	S11	50.902	-0.192	0.000	0.05			5.3	OK
S1.002	S10	49.726	-0.007	0.000	0.10			11.1	OK
S1.003	S9	49.721	2.023	0.000	0.37			11.8	SURCHARGED
S1.004	S8	49.718	2.088	0.000	0.03			2.0	FLOOD RISK
S1.005	S7	48.178	0.846	0.000	0.03			2.3	SURCHARGED
S1.006	S6	48.162	1.029	0.000	0.11			18.9	SURCHARGED
S1.007	S5	48.321	2.359	0.000	0.38			18.9	FLOOD RISK
S1.008	S4	48.466	2.641	0.000	0.13		570	6.2	FLOOD RISK
S2.000	S3-9	51.423	-0.177	0.000	0.10			6.9	OK
S2.001	S3-8	50.595	-0.256	0.000	0.05			7.9	OK
S2.002	S3-7	48.919	-0.387	0.000	0.05			10.0	OK
S2.003	S3-6	48.796	-0.374	0.000	0.07			18.0	OK
S2.004	S3-5	48.423	0.858	0.000	0.21			31.5	SURCHARGED
S2.005	S3-4	48.420	1.122	0.000	0.06		630	5.0	SURCHARGED
S2.006	S3-3	47.952	0.764	0.000	0.09			14.9	SURCHARGED
S2.007	S3-2	47.948	0.983	0.000	0.31			19.5	SURCHARGED
S2.008	S3-1	47.943	1.168	0.000	0.13			7.3	FLOOD RISK
S1.009	S3	44.795	-0.130	0.000	0.36			13.2	OK
S1.010	S2	44.682	-0.134	0.000	0.34			13.2	OK

DBFL C	Consul	lting I	Engi	neers						Page	1				
Ormond	l Hous	se			1	Critical E									
Upper	Ormor	nd Quay	Y												
Dublin	ı 7									Micr	n				
Date 1	8/11/	2021	15:4	9		Designe	d by E	ByrneSe		Dcai					
File 1	80208	B.MDX				Checked	by			ווסוט	lage				
Innovy	ze					Network	2020.	1							
	Summary of Critical Results by Maximum Level (Rank 1) for Storm Simulation Criteria Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 10.000 Hot Start (mins) 0 MADD Factor * 10m3/ba Storage 2.000														
Ма	nhole Foul S	Hot Headlos Sewage p	Hot Star Ss Cc per h	Start ( Start ( t Level eff (Gl ectare	actor 1. mins) (mm) obal) 0. (1/s) 0.	0 0 500 Flow 000	MADD per Pe	Factor * 1 Factor per D	0m³/ha Sto: t Coeffiec ay (l/per/o	rage 2.0 ient 0.8 day) 0.0	00 00 00 00				
		Numbe Nun Numk	er of mber per c	Input of Onli f Offli	Hydrogra ne Contr ne Contr	phs 0 Nu ols 4 Nu ols 0 Nu	mber of mber of mber of	Storage S Time/Area Real Time	tructures Diagrams Controls	4 0 0					
		R	ainfa M	all Mode Regio 5-60 (mr	Synthet el on Scotla n)	ic Rainfa	FSR FSR FSR FSR FSR FSR FSR FSR FSR FSR	<u>ails</u> Ratio Cv (Summer Cv (Winter	R 0.273 c) 0.750 c) 0.840						
		Marg	in fo	or Flood	l Risk Wa Analysi	arning (m is Timest DTS Stat	m) 300. ep Fir us (	.0 DVD ne Inertia DN	Status OFF Status OFF	7 7					
		Dura	ation	Profile n(s) (mi	e(s) ns)	15, 30, 6 720, 9	50, 120 50, 144	S , 180, 240 0, 2160, 2 7	ummer and T , 360, 480 880, 4320, 200, 8640,	Winter , 600, 5760, 10080					
	Ret	turn Pe: Clin	riod mate	(s) (yea Change	urs) (%)				5, 30 10, 1	0, 100 10, 10					
V	VARNING	G: Half	Drai	In Time	has not	been cal	culated	as the st	ructure is	too full					
	US/MH			Return	Climate	First	(X)	First (Y)	First (Z)	Overflow	Water Level				
PN	Name	Stor	rm	Period	Change	Surch	arge	Flood	Overflow	Act.	(m)				
S1.000	S12	15 Wi:	nter	100	+10%						52.364				
S1.001	S11	15 Wi	nter	100	+10%						50.971				
S1.002	S10	15 Wi	nter	100	+10%	E (1 E	~				49.666				
S1.003	S9	600 Wi	nter	100	+10%	5/15	Summer				49.230				
S1.004 S1 005	58	360 W1	nter	100	+108 +108	5/15	Winter				49.227				
S1.005	56	360 Wi	nter	100	+10%	100/100	Winter				47.488				
S1.007	S5	360 Wi	nter	100	+10%	5/15	Summer				47.480				
S1.008	S4	360 Wi	nter	100	+10%	5/15	Summer				47.474				
S2.000	S3-9	15 Wi	nter	100	+10%						51.530				
S2.001	S3-8	15 Wi	nter	100	+10%						50.686				
S2.002	S3-7	15 Wi	nter	100	+10%						49.050				
S2.003	S3-6	15 Wi	nter	100	+10%						48.959				
S2.004	S3-5	600 Wi	nter	100	+10%	5/360	Winter				48.276				
S2.005	S3-4	600 Wi	nter	100	+10%	5/30	Winter				48.274				
S2.006	53-3 53-2	720 Wi 720 Wi	nter	100	+⊥U% +10%	5/120	winter Winter				47.838				
					©1983	2-2020	Innovy	ze							

DBFL Consulting Engineers		Page 2
Ormond House		
Upper Ormond Quay		
Dublin 7		Mirro
Date 18/11/2021 15:49	Designed by ByrneSe	Desinado
File 180208.MDX	Checked by	Diamage
Innovyze	Network 2020.1	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m <sup>3</sup> )	Flow / Cap.	Overflow (1/s)	Half Drain Time (mins)	Pipe Flow (1/s)	Status	Level Exceeded
		()	( )	<u>r</u> -	(_/~/	(,	(=//		
S1.000	S12	-0.136	0.000	0.33			36.2	OK	
S1.001	S11	-0.123	0.000	0.42			42.8	OK	
S1.002	S10	-0.067	0.000	0.81			89.4	OK	
S1.003	S9	1.532	0.000	0.34			10.9	SURCHARGED	
S1.004	S8	1.597	0.000	0.03			1.9	SURCHARGED	
S1.005	S7	0.158	0.000	0.03			2.0	SURCHARGED	
S1.006	S6	0.355	0.000	0.14			24.5	SURCHARGED	
S1.007	S5	1.518	0.000	0.50			24.4	SURCHARGED	
S1.008	S4	1.649	0.000	0.11			5.5	SURCHARGED	
S2.000	S3-9	-0.070	0.000	0.81			55.8	OK	
S2.001	S3-8	-0.165	0.000	0.41			63.1	OK	
S2.002	S3-7	-0.256	0.000	0.38			79.8	OK	
S2.003	S3-6	-0.211	0.000	0.54			144.0	OK	
S2.004	S3-5	0.711	0.000	0.20			29.1	SURCHARGED	
S2.005	S3-4	0.976	0.000	0.06		580	5.0	SURCHARGED	
S2.006	S3-3	0.654	0.000	0.08			13.0	SURCHARGED	
S2.007	S3-2	0.873	0.000	0.26			16.7	SURCHARGED	

DBFL Consulting Engineers		Page 3
Ormond House		
Upper Ormond Quay		
Dublin 7		Mirro
Date 18/11/2021 15:49	Designed by ByrneSe	Dcainago
File 180208.MDX	Checked by	Diamage
Innovyze	Network 2020.1	•

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.008 S1.009 S1.010	S3-1 S3 S2	720 Winter 480 Winter 480 Winter	100 100 100	+10% +10% +10%	5/15 Winter				47.833 44.790 44.677

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (1/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S2.008	S3-1	1.058	0.000	0.13			7.3	SURCHARGED	
S1.009	S3	-0.135	0.000	0.34			12.4	OK	
S1.010	S2	-0.139	0.000	0.31			12.4	OK	

**APPENDIX G** 

FOUL DRAINAGE NETWORK DESIGN

DBFL Co	nsul	tin	ig En	ginee	rs								P	age 1	
Ormond	Hous	е				F	oul N	etwork							٦
Upper O	rmon	d Q	uay												
Dublin	7													Micro	
Date 18	/11/	202	21 16	:03		E	esigr	ied by	Byr	neSe	0			Drainado	C
File 18	0208	.MD	X			C	hecke	ed by	0 1					J	
Innovyze Network 2020.1															_
	FOUL SEWERAGE DESIGN														
Design Criteria for Foul - Unit															
Pipe Sizes STANDARD Manhole Sizes STANDARD															
	Indu	stri	ial Fl	.ow (1,	/s/ha)	0.00	)	Add	l Flov	w / C	Climate	e Chang	re (%)	10	
Ind	dustr	ial	Peak	Flow I	Factor Wethod W	0.00 752 M	)	N	linim: Javim:	um Ba	ackdrop	) Heigh	t (m)	0.200	
		CC	Frequ	lency l	Factor	0.50	) Min 1	Design	Deptl	n for	c Optim	visatio	n (m)	1.200	
	-	I	Domest	ic (1,	/s/ha)	0.00	) M:	in Vel	for i	Auto	Design	only	(m/s)	0.75	
	vomes	τιc	геак	F.TOM ]	ractor	ь.00	J	Min Sl	ope :	tor (	primis	ation	(T:X)	500	
					Des	igned	with	Level	Soffi	ts					
Network Design Table for Foul - Unit															
PN Length Fall Slope Area Units Base k HYD DIA Section Type Auto															
	(m)	)	(m)	(1:X)	(ha)		Flow	(l/s)	(mm	) Se	CT (mm	ı)	-	Design	
F1.000	27.0	44	0.276	98.0	0.000	1890.	0	0.0	1.50	0	o 22	5 Pipe	e/Condu	it 🔒	
F1.001	10.1	60	0.104	97.7	0.000	840.	0	0.0	1.50	0	o 22	5 Pipe	e/Condu	it 🧧	
F1.002	21.1	72 I	0.216	98.0	0.000	840. 490	0	0.0	1.50	0	0 22	5 Pipe	e/Condu	it 🦺	
F1.003	29.5	74	0.299	98.9	0.000	490. 210.	0	0.0	1.50	0	o 22	5 Pipe	e/Condu	it 🔒	
F1.005	10.9	07	0.110	99.2	0.000	0.	0	0.0	1.50	0	o 22	5 Pipe	e/Condu	it	
F2 000	47 Q	84	0 480	100 0	0 000	30	0	0 0	1 50	0	0 22	5 Dine	Condi	.i+ <b>≜</b>	
F2.000	34.1	25	1.465	23.3	0.000	10.	0	0.0	1.50	0	0 22	5 Pipe	/Condi	it 🔒	
F2.002	27.2	27	0.182	149.6	0.000	13.	0	0.0	1.50	0	0 22	5 Pipe	/Condi	it 🧍	
F2.003	51.9	26	2.478	21.0	0.000	34.	0	0.0	1.50	0	o 22	5 Pipe	e/Condu	it 🔒	
F2.004	43.7	56	0.730	59.9	0.000	20.	0	0.0	1.50	0	o 22	5 Pipe	e/Condu	it	
F1.006	11.0	93	0.118	94.0	0.000	0.	0	0.0	1.50	0	o 22	5 Pipe	e/Condu	uit	
					Ne	etwor	k Res	ults '	Tabl	e					
P	'n	us/:	IL E	Area	Σ Base	Σ	Units	Add Fl	ow P	.Dep	P.Vel	Vel	Cap	Flow	
		(m)	) (	ha) I	Flow (1/	s)		(l/s	) (	mm)	(m/s)	(m/s)	(l/s)	(1/s)	
F1.	000 4	47.0	20 0	.000	0	.0 1	890.0	2	.2	115	1.17	1.16	46.1	23.9	
F1.	001 4	46.7	44 0	.000	0	.0 2	730.0	2	.6	129	1.22	1.16	46.2	28.7	
F1.	002 4	46.6 16 1		.000	0	.0 3	1570.0	3	.0	141 147	1.26	1.16	46.1	32.9	
F1.	003 4	10.4 46 २	:⊿+± 0 (49 ∩	000	0		270 0	3	.∠ ⊰	150 × 1	⊥.∠/ 1 28	1.15	40.U 45 9	35.U 35.9	
F1.	005 4	10.3 46.0	50 0	.000	0	.0 4	270.0	3	.3	150	1.20 1.27	1.15	45.8	35.9	
			0		Ū	-						2			
F2.	000	51.2	275 0	.000	0	.0	30.0	0	.3	39	0.65	1.15	45.6	3.0	
F2.	002 ·	50.7 40 r	95 0 130 0	.000.	0	.0	40.0	0	.3 ⊿	30	1.12	2.38	94.8 27 י דיב	3.5 4 0	
FZ. 〒2	002 4	19.3 49 1	48 0	000	0	0	53.U 87 0	0	• <del>4</del> 5	50 25	0.01 1 21	2 51	37.3	₩.U 5 1	
F2.	004 4	46.6	<b>70</b> 0	.000	0	.0	107.0	0	.5	47	0.94	1.48	59.0	5.7	
<del>ا</del> بت	006	4 5 0	40 0	000	0	0 4	377 0	n	2	1/0	1 21	1 10	<u>⊿</u> л 1	36 1	
F.T.	006 4	±2.9	·+U 0	.000	0	1982	-2020	Tnno	. 3	149	1.31	1.18	4/.1	30.4	_
					(L		2020	11110	∙у∠е						

DBFL Consulting Engineers		Page 2
Ormond House	Foul Network	
Upper Ormond Quay	1 our Network	
Dublin 7		Micco
Date 18/11/2021 16:03	Designed by ByrneSe	
File 180208.MDX	Checked by	Drainage
Innovyze	Network 2020.1	
Network Desig	gn Table for Foul - Unit	
PN Length Fall Slope Area Uni (m) (m) (1:X) (ha)	ts Base k HYD DIA Section Flow (l/s) (mm) SECT (mm)	Type Auto Design
F1.007 2.753 0.028 98.3 0.000 0	.0 0.0 1.500 o 225 Pipe/Con	duit 🧂
Netwo	ork Results Table	
PN US/IL ΣArea ΣBase 3 (m) (ha) Flow (l/s)	E Units Add Flow P.Dep P.Vel Vel Ca (l/s) (mm) (m/s) (m/s) (l/	p Flow s) (l/s)
F1.007 45.822 0.000 0.0	4377.0 3.3 151 1.28 1.16 46	.0 36.4
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DBFL Consulting Engineers		Page 3
Ormond House	Foul Network	
Upper Ormond Quay		
Dublin 7		Mirro
Date 18/11/2021 16:03	Designed by ByrneSe	Dcainago
File 180208.MDX	Checked by	Diamage
Innovyze	Network 2020.1	

#### Manhole Schedules for Foul - Unit

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)
F7	49.200	2.180	Open Manhole	1200	F1.000	47.020	225				
F6	48.600	1.856	Open Manhole	1200	F1.001	46.744	225	F1.000	46.744	225	
F5	50.030	3.390	Open Manhole	1200	F1.002	46.640	225	F1.001	46.640	225	
F4	49.610	3.186	Open Manhole	1200	F1.003	46.424	225	F1.002	46.424	225	
F3	48.750	2.401	Open Manhole	1200	F1.004	46.349	225	F1.003	46.349	225	
F2	47.990	1.940	Open Manhole	1200	F1.005	46.050	225	F1.004	46.050	225	
F1-5	53.300	2.025	Open Manhole	1200	F2.000	51.275	225				
F1-4	52.686	1.891	Open Manhole	1200	F2.001	50.795	225	F2.000	50.795	225	
F1-3	51.408	2.078	Open Manhole	1200	F2.002	49.330	225	F2.001	49.330	225	
F1-2	51.119	1.971	Open Manhole	1200	F2.003	49.148	225	F2.002	49.148	225	
F1-1	49.700	3.030	Open Manhole	1200	F2.004	46.670	225	F2.003	46.670	225	
Fl	48.190	2.250	Open Manhole	1200	F1.006	45.940	225	F1.005	45.940	225	
								F2.004	45.940	225	
FO	47.710	1.888	Open Manhole	1200	F1.007	45.822	225	F1.006	45.822	225	
F	48.200	2.406	Open Manhole	0		OUTFALL		F1.007	45.794	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F7	722389.787	725933.572	722389.787	725933.572	Required	•
F6	722411.029	725916.836	722411.029	725916.836	Required	
F5	722416.405	725908.214	722416.405	725908.214	Required	
F4	722433.231	725895.362	722433.231	725895.362	Required	
F3	722440.477	725893.944	722440.477	725893.944	Required	
F2	722463.290	725875.124	722463.290	725875.124	Required	
F1-5	722331.608	725825.249	722331.608	725825.249	Required	

DBFL Consult	ing Engine	ers				Page 4
Ormond House			Foul Netwo	rk		
Upper Ormond	Quay					
Dublin 7						Mirro
Date 18/11/2	021 16:03		Designed b	oy ByrneSe		Drainage
File 180208.1	MDX		Checked by	[		Diamage
Innovyze			Network 20	020.1		
	Ī	Manhole Sc	hedules for	Foul - Uni	.t	
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F1-4	722359.865	725786.467	722359.865	725786.467	Required	$\mathcal{M}$
F1-3	722386.890	725765.631	722386.890	725765.631	Required	$\sim$
F1-2	722405.292	725785.698	722405.292	725785.698	Required	1
F1-1	722433.679	725829.177	722433.679	725829.177	Required	1
F1	722457.284	725866.020	722457.284	725866.020	Required	1
FO	722466.692	725860.142	722466.692	725860.142	Required	S
F	722465.255	725857.794			No Entry	1

DBFL Consulti	ng E	ngine	ers						Page 5
Ormond House					Foul Net	work			
Upper Ormond	Quay								
Dublin 7									Micco
Date 18/11/20	21 1	6:03			Designe	d by By	vrneSe		
File 180208.M	IDX				Checked	by			Diamaye
Innovyze					Network	2020.1			
		P	IPELI	NE SCH	IEDULES	for Fou	ul - Unit		
Upstream Manhole									
DN Und Diam MU (Lowel Tlevel D.Deeth MU MU DIAN									т.*w
EN	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm	.)
F1.000	0	225	F7	49.200	47.020	1.955	Open Manhole		1200
F1.001	0	⊿⊿⊃ 225	го FS	50,030	46,640	3,165	Open Manhole		1200
F1.002	0	225	F4	49.610	46.424	2,961	Open Manhole		1200
F1.004	0	225	F3	48.750	46.349	2.176	Open Manhole		1200
F1.005	0	225	F2	47.990	46.050	1.715	Open Manhole		1200
F2.000	0	225	F1-5	53.300	51.275	1.800	Open Manhole		1200
F2.001	0	225	F1-4	52.686	50.795	1.666	Open Manhole		1200
F2.002	0	225	F1-3	51.408	49.330	1.853	Open Manhole		1200
F2.003	0	225	F1-2	51.119	49.148	1.746	Open Manhole		1200
F2.004	0	225	F1-1	49.700	46.670	2.805	Open Manhole		1200
F1 006	0	225	<b>F</b> 1	48 190	45 940	2 0 2 5	Open Manhole		1200
F1.000	0	225	FO	47.710	45.822	1.663	Open Manhole		1200
				Dowr	nstream	Manhole	<u>e</u>		
PN T	ength	Slope	мн	C.Leve	l T.Leve	l D.Depti	h MH	мн рта	M., T.*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	. (1	am.)
			_						
F1.000 2	7.044	98.0	9 F6	48.60	0 46.744	4 1.63	l Open Manhol	е	1200
F1.001 1	0.160	97.7	F5	50.03	0 46.640	J 3.16	5 Open Manhol	е	1200
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**APPENDIX H** 

**STAGE 1 STORMWATER AUDIT** 

JBA Consulting Stormwater Audit - Stage 1 Feedback Form			
Project: Development at Cornelscourt - Stage 1 SWA			
Date:	08/11/2021		
JBA Reviewers	Michael O'Donoghue		
Project Number:	2021s1438		

Item No.	JBA Review Comment	Comment/Clarification Request/Suggested Mitigation	Response from Client/Client Representative	Acceptable / Not Acceptable
	10/11/2021	10/11/2021		
	Reference Documents 2021-05-20n11 (4)nb			
	180208-5 year 30 minute event			
	180208-100 year 600 event			
	180208-DBFL-XX-XX-DR-C-3001 Site Services Layout - Sheet 1			
	180208-DBFL-XX-XX-DR-C-3003-Surface Water Catchment Areas			
	180208-rep-001 IDR (Draft)			
	Catchment A Source Control			
	Catchment B Source Control			
	Catchment D Source Control			
	Met_Eireann_Rain_Data			
1	Calculations/180208-rep-001 IDR	1. It is recommended that the attenuation and network are	1. Attenuation was built in to the network model . see updated reports shows attenuation	
	1. The network and attenuation have been assessed separately, which doesn't fully	assessed as a complete system to imitate the impact the	structures.	
	implate how the network reacts to various rainfall events and doesn't indicate the impact of backwater effects.	storage systems have on the incoming network.	2.ToC demonstrated with attenuation structures in calculations	
	2. The time of concentration for the network and the attenuation structures don't	1. Provide network results from a 1 in 30 year event.	3. The time of entry set applies the rainfall instantaneously to the network	
	correlate across the separate sets of calculations. 3 Time of entry is set to zero for all entry points bar the head of the system despite	attenuation and network calculations.	4.contributing areas have been updated to be consistent across the appropriate Pipes/areas.	
	further nodes having contributing areas.	3. Provide reasoning for not providing ToE values for individual	added.	
	4. The contributing areas in the network calculations don't correlate with the areas	nodes downstream from the head of the line.	6.Updated network calculations provided show the attenuation structures, the network is designed	
	is .186, though the contributing area for Catchment A is 0.238 Ha.	calculation correspond to the attenuation calculations.	for 5 years and the 5year-30 minute, 30year-600minute, and 100year-600minute events are	
	5. A 50% runoff factor for permeable paving seems excessively low, given that no	5. A higher run-off factor should be considered for the	provided.	
	<ul><li>6. A network design for a 1 in 100 year event has been provided, however a 1 in 5 year</li></ul>	permeable paving, given the lack of infiltration. 80-85% run-off	7.Soil type has been changed to soil type 4, and runoff factor for green areas has been changed to 0.47 as discussed	See Note 5
	network is what is indicated in the IDR. The intensities are capped at 50mm/hr for this	would be more appropriate. 6. Provide clarity on network assessment for 1 in 100 year	U.47 as discussed.	
	1 in 100 network. In addition, it is unclear as to how the storage structures are catered for in the network calculations as only hydrobrakes are shown to be included. Normal	event, and provide results for 1 in 30 year event. Review		
	procedures would be to ensure the network has capacity for a 1 in 5 year event, and	intensities used for 1 in 100 assessement.		
	then that same network is assessed against a 1 in 30 and 1 in 100 year event, ensuring	7. Provide rationale for chosen SOIL type, taking infiltration		
	7. An SOIL classification of 3 has been used, yet the infiltration tests in all cases failed. This			
	suggests a SOIL type 4 may be more appropriate.			
	100200 DDEL W/ W/ DD C 2004 Che Camilana Laward, Chard 4			
Z	180208-DBFL-XX-XX-DR-C-3001 Site Services Layout - Sheet 1 180208-DBFL-XX-XX-DR-C-3003-Surface Water Catchment Areas	<ol> <li>Provide a prelim detail on the tree pit/gully connection.</li> <li>3. Ensure interception or treatment for all contributing areas</li> </ol>	<ol> <li>See tree pit detail attached to email.</li> <li>The entrance roadway is drained by traditional gullies and Aco channels, which worked up in</li> </ol>	
	180208-DBFL-XX-XX-DR-C-3004 Site Services Layout - Sheet 2	are considered.	grated detail during construction stage.	
	1. Gullies are shown on the permeable paving, which are noted as acting as overflow outlets	4. Rexonsider installing infiltration trenches in close proximity	3.footpath on the western side of the development is drained by a filter drain.	
	for the proposed tree pits. It is unclear how this would work as a tree pit overflow is located	to structures. Consider revising the outlet carrier drain to solid	4. The infiltration trench to the rear of the house are connected back to the network by a solid pipe	
	create anerobic conditions around the root structure.	5. Re-label drawing to correspond with nodes and links on	which runs between the buildings. No infiltration is intended next to the buildings.	
	2. There does not appear to be any proposed method of interception or treatment of the	calculations	5. Labeling in calculations and drawing are now consistent	
	3. The paved footway within Catchment A does not have any proposed method of			Acceptable
	interception or treatment.			
	site. C753 notes that any infiltration proposal should have a 5m clearance from any			
	structure. The outlet for the infiltration trenches are running between the properties and			
	5. It is difficult to correlate the calculations with the drawings due to the inconsistent			
	labelling.			
	Che levelletter			
3	The borehole logs indicate a high water table (approx. 1m BGL). This will require the	1. Ensure that attenuation and permeable paving systems are lined to prevent cross-contamination from groundwater	Attenuation system are to be wrapped in an impermeable membrane	
	permeable paving and the attenuation structures are lined to prevent cross-contamination			Acceptable
	nom groundwater.			
	Europedance Flaur	A Devide connection of the state of the	en standard de fa flend de conserva de 11 - 7 f	
4	Exceedence Flows Exceedence Flows should be considered as part of the scheme	1. Provide comment on surface flow paths in the case of exceedance flows. This may be covered within the Flood Pick	see attached draft Flood risk assessment section 5.3	Accentable
		Assessment.		Acceptable
	17/11/2021	17/11/2021		
	1. There are a number of inconsistencies with the existing drawings and the revised calculations. The attenuation provided at \$3-4 is 404 6m3 in the calculations but 243 2 m3	1. Crosscheck/update drawing with required values in calculations to ensure consistency.	1.All Attenuation volumes & flow rates allowed for in the calculations are represented on the	
	has been identified on the drawing. S3-1 has 176.2m3 in the calculations but 154m3 shown	2. Update the engineering report to reference updated Qbar value	drawings.	
	on the drawings. S3-1 has a flow rate of 7.31/s in the calculations, but 4.21/s on the drawing.	throughout. 3. Clarify why 0% cc is allowed for in the Critical Popula short	2.All references to soll type 3 have been removed (see updated report). 3 The Critical results sheet has been undated to include a climate change allowance of 10%.	
	calculations but 4.21/s in the drawing.	4. Review flood risk at M3-6, upstream of Attenuation Storage 3.	4. The max water level in manhole 3-6 is now 48.959, the adjacent FFL is 51.2. The Filter drain to the	
	2. The revised engineering report contains references to the older flow rates relating to the		rear of these houses connects to the main line between MH S3-5 & S3-4 which has an invert of	
5	3. The Critical results sheet states that climate change allowance is 0%.		46.998 therefore this should not cause flooding in the garden.	Acceptable
	4. MH 3-6 has a water level of 51.234m in the 1 in 100 event. The arrangement of the			
	gardens. The flood level is higher than the floor levels of the adjacent properties. A 500mm			
	clearance between flood levels and floor levels is required to comply with GDSDS.			

gardens. The flood level is higher than the floor levels of the adjacent properties. A 500mm clearance between flood levels and floor levels is required to comply with GDSDS.		

JBA Project Code	2021s1438
Contract	Development at Cornelscourt, Dublin 18
Client	Cornel Living Ltd
Date	12 <sup>th</sup> November 2021
Author	Michael O'Donoghue
Subject	Stormwater Audit - Stage 1 Report



### 1 Residential Development at Cornel Living, 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 Waterman-Moylan Engineering Consultants for the proposed development at Cornelscourt Village, Bray, 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 at Cornelscourt, Dublin 18.
	The proposed development comprises of 412 apartments, 7 houses, residential amenities (a gym, tenant amenity lounges, multi-purpose pavilion building) a childcare facility and a café.
	The site location is shown in Figure 1 below.
	Figure 1-1 Site Location
	The existing site is predominantly greenfield, with an existing temporary car park located in the north-west corner. The site generally falls from its western corner eastwards at a gradient of approximately 1/24. The total site area is 2.14 Ha. A SOIL type 3 was initially chosen for the site. All areas of the site are deemed to be positively drained by the system. This resulted in a Qbar of 8.36 l/s or 4l/s/ha. An existing 225mm diameter surface water drain is located ain the eastern corner of the site. This is the head of this line and is proposed to be used as the intended discharge point. The stormwater network will consist of a series of underground attenuation tanks with downstream flow control devices. It is noted that any storm run-off that enters the basement will be catered for within the foul drainage network via a petrol interceptor. 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 with any proposed amendments to the design to be
	incorporated into the construction stage drawings.



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Relevant Studies/Documents	The following doc The Sul Recomn (DoEHL) Greater Greater DLRCC Develop BRE Dig	uments were consi DS Manual (CIRIA ( nendations for Site G); Dublin Strategic Dr Dublin Regional Co Green Roof Guida ment Plan 2016-20 Jest 365	dered as part of this surface water audit: C753); e Development Works for Housing Areas ainage Strategy (GDSDS); ode of Practice for Drainage Works; nce Document (Appendix 16 of the County 22);			
Key Considerations & Benefits of SUDs	The key benefits a below include: • Reductio • Provision • Volume t • Reductio • Water qu • Biodivers	nd objectives of Su n of run-off rates; of volume storage reatment provided; n in volume run-off ality improvement; ity.	DS considered as part of this audit and listed			
Site Characteristics	Soil: The soil at the s accordance with I by GII Ltd. in Fet pits and dynamic trial pits to investi works were carrie	ite has been indic HR Wallingford pro- pruary/March 2019 probes. In-situ infil gate subsoil soaka ed out:	cated as being Soil Type 3 (SPR 0.37) in cedures. A site investigation was carried out , consisting of mechanically excavated trial tration tests were undertaken in three of the ge characteristics. The following exploratory			
	<ul> <li>16 no. m</li> <li>26 no. d</li> <li>3 no. in-</li> <li>13 No. w</li> <li>12 No. E</li> <li>9 No. Ca</li> <li>10 No. F</li> <li>4 No. Gr</li> </ul>	nechanically excava ynamic probes; situ infiltration tests vindow sample bore Dynamic Probes able Percussion bor Rotary Core Boreho roundwater monitor	ated trial pits to a depth of 3.3m; in trial pits; eholes reholes les ing wells			
	All trial pits encour of made ground. above the bedroo three of the in-sit with Soil Type 4.	All trial pits encountered a stratum of grey sandy gravelly clay beneath a stratum of made ground. Occasional gravel deposits were encountered immediately above the bedrock. This sandy gravelly clay gives reason for the failure of all three of the in-situ infiltration tests. The ground encountered is more consistent with Soil Type 4.				
	Groundwater mor levels ranged fror	Groundwater monitoring wells were installed at BH-03, 07, 08 & 11. Groundwater levels ranged from 0.96m to 2.27m BGL.				
	Any proposed underground attenuation units should be lined in instances where the groundwater levels are within 1m of the invert levels of the proposed systems.					
	Rainfall (basis fo Rainfall paramete Studies Report (l method can be m of values estimate	<b>Rainfall (basis for surface water pipeline network design):</b> 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:				
	Rainfall model: M5-60 (mm):	<b>DBFL value</b> Met Éireann 16.4 mm	<b>JBA Value</b> Met Éireann 16.4 mm			



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	Ratio R: 0.273 SAAR: 945	0.273 862
	The SAAR value contain results in a variance of conservative value The development will di of the site, into an existin An initial assessment of SOIL type 3 classificatio it was proposed to use a ground conditions on the the site.	ned within JBAs records differs from that of DBFLs, which approx. 1.5l/s. Using DBFL's value the QBar is thus the scharge into an existing storm network to the north-east ng 225mm dia. storm sewer. If the site designated the underlying strata as reflecting a n. However, following review of site investigation results, an SPR. of 0.47. This more accurately reflected the poor e site. This resulted in a revised Qbar being devised for
SuDS Measures Considered	DBFL have included the development. No refere	e following SUDs measures within the proposed nce has been made to any other measures considered.
	SUDS Technology Green Roofs	<b>Comments</b> 5,433m2 of green roof has been provided for within the development. The green roof is currently shown as covering the entirety of each of the development blocks. If the detailed design reverts to smaller green roof areas, then the calculations will require amendment.
	Swale/ Filter Drain / Infiltration trench	Filter drains are proposed within the rear gardens of the units to the south-east of the site. Filter drains will also be located adjacent to the footpaths that run adjacent to the green spaces on the perimeter of the site.
	Permeable Paving	Permeable paving has been proposed within the pedestrian zone over the basement podium as well as on the footways within the perimeter of the site. The permeable paving is not intended to provide iinfiltration, due to the poor ground conditions present on the site. An impermeable membrane is proposed beneath the paving to prevent cross- contamination from groundwater. 4736m2 of permeable paving is proposed within the site.
	Petrol Interceptor	A petrol interceptor is proposed upstream of the site outlet point.
	Surface Water Attenuation	4 no. sub-surface cellular storage systems are proposed within the system. This proprietary cellular storage system will provide 725m3 of storage.
	Site Run-off Rates	DBFL propose to limit discharge to a rate of 6.24 l/s/ha (Qbar of 13.16 l/s), which is the calculated greenfield run-off rate for the site.
	Detention Basins, Retention Ponds, Stormwater Wetlands	N/A

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	Tree Root Structural Cell Systems, Bio- retention, rain garden	Bio-retention tree the development the tree pits, whi sub-surface netv	e pits are proposed throughout t. Roadside gullies discharge into ch then overflow into the main vork.				
Surface Water Drainage Design	surface water hows generated by the development will be alternated within su surface attenuation before being discharged into the existing storm network 13.16 l/s, based on the greenfield run-off rate of 6.24 l/s/ha. The surface water design has been presented using MicroDrainage software.						
SuDS Management Train	Source Control and Site Control are addressed by the use of SuDS of (interception storage) and attenuation with outflow controlled by Hydro-B Petrol interceptors have been proposed prior to discharge from site. As recommended within the SUDs Manual (Table 26.7) assuming effective treatment is in place the following number of treatment train component recommended:						
		No. of treatment train components recommended	Comment/Proposals				
	Roof areas	1	In excess of 60% of the roof space on the development has been designed as green roof.				
	Residential roads, parking areas, commercial zones	2	Pervious paving has been proposed to all pedestrian walkways around the site as well as within the pedestrian hardscape on the basement podium. Where road gullies are proposed, these all discharge into bio- retention tree pits prior to entering the sub-surface network.				
	Refuse collection, industrial areas, loading bays, lorry parks and highways.	3	N/A				
	The above table su Hydro-Brakes desi outfalls of each att 13.16 l/s.	Immarises the SuDS Ma igned for a linear disch enuation structure to lin	nagement Train for the site. narge profile will be provided at th nit the ultimate flow to a maximum	ie of			
Climate Change	An allowance of 10 the rainfall intensit in compliance with	0% increase in flows has ies for the purposes of s the requirements of the	s been included for climate change for sizing the attenuation storage. This of GDSDS.	or is			
Volume Storage	DBFL have provided attenuation calculations using MicroDrainage for the attenuation volumes provided. MH S3-6 is deemed to be at FLOOD RISK. The critical storm events for these flood risk events is the 15-minute 100-year Winter event + 10% for climate change. The storage is designed as per River Protection Criteria 4.3 of the GDSDS,						





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	namely discharge rates are to mimic QBAR or 2l/s/ha whichever is the greater.
	Volumes account for the 100-year return storm event + 10% climate change.
Volume Run-off	A comparison between pre and post construction run-off was not provided.
Treatment Volume / Water Quality Improvement	Interception storage is proposed by way of pervious paving, silt traps, filter drains, bio-retention tree pits and green roofs.
Return Period	A 100-year return period plus 10% for climate change has been used in the design for the attenuation systems. This is in line with GDSDS.
	It is stated that the network has been designed for the 5-year return period, however, the rainfall intensities have been capped at 50mm/hr. A 50mm/hr intensity is not entirely reflective of a 5-year return period, but it's capping will not be a determining factor on the overall design.
Exceedance flows	DBFL have considered exceedance flows and included for the same within the Flood Risk Assessment.
Health & Safety and Maintenance Issues	<ul> <li>The proposed drainage system comprises SuDS devices, traditional road gullies, attenuation systems and underground pipes. These elements are considered acceptable from a Health &amp; Safety perspective once supplier/manufacturers guides are followed and complied with during the detailed design, construction and operation.</li> <li>A number of manholes are in excess of 3m deep, and will require specific maintenance procedures allocated to them.</li> <li>Optimum performance of the SuDS treatment train is subject to the frequency of maintenance provided.</li> </ul>
	Regular maintenance of the flow control devices 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	<ul> <li>Upon review of the detailed drainage design, JBA Consulting provided feedback to DBFL, namely:</li> <li>A 50% run-off factor was used for permeable paving, which seems disproportionately low. A 70% minimum is recommended.</li> <li>Volumetric run-offs should be set to 1 in the modelling, as reduced run-off factors are being considered.</li> <li>A SOIL Classification type 3 was considered, but given the impermeability of the soil observed in the trial holes, a SOIL type 4 was recommended.</li> <li>10% increase in rainfall volumes was included.</li> <li>A number of green areas were deemed to be contributing to the network, but no positive inlet was included. All green areas are to have filter drains to allow them to be included in the stormwater catchment.</li> </ul>
	A summary of comments and record of the audit trail are appended to this report.



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	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.
A	udit Report Prepared by:	Michael O'Donoghue BEng (Hons) CEng MIEl Senior Engineer

Approved by:	Chris Wason BEng MICE
	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. 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 – Feedback Form Record

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