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Ballymun Plaza

Dublin County Council

Project reference: 60556950

Infrastructure Report

7 August 2020

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
01	16/07/2020	DRAFT	BM	Brendan Mitchell	Associate Director
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1. Introduction

AECOM Ireland have been appointed by Dublin County Council (DCC) to prepare an engineering infrastructure report in support of Part 8 Planning Application for the re-design of the Ballymun Plaza, Dublin.

The current layout of the Plaza comprises a combination of hardstanding (concrete surface) and greenfield area, and it is now DCC's intention to redevelop Ballymun Plaza. The site is bounded to the north and east by Shangan Road, to the west by the R108 and to the south by an existing commercial development.

The overall area of the site is 6,375m² and it is predominantly flat, with existing levels in the range of 61.7m – 60.5m.

Refer to Figure 1 - Site Location (Extract from Google Maps) for location of the proposed development.

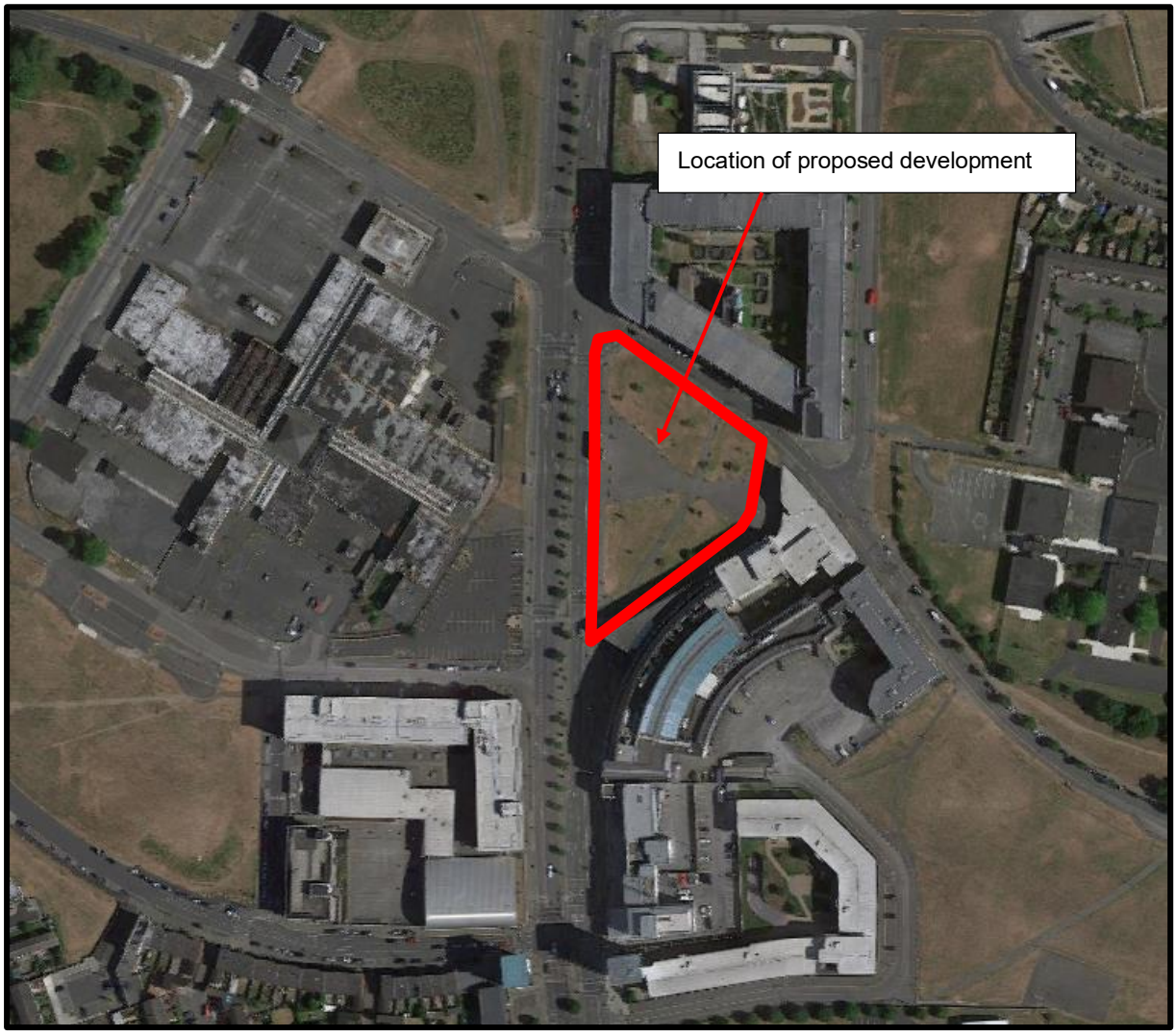


Figure 1 - Site Location (Extract from Google Maps)

2. Drainage Infrastructure

2.1 Existing Drainage Infrastructure

Existing Record Drawings were retrieved from Dublin City Council, in order to establish the location of the existing drainage infrastructure in the area.

In relation to the existing surface water network, the following networks were identified:

- There is an existing 225mm diameter surface water sewer that runs south-west direction along Shangan Road;
- There is an existing 900mm diameter surface water sewer running south along the R108.

Regarding the existing wastewater network, the following networks were identified:

- There is an existing rising main running northward along the R108;
- There is an existing 300mm foul water sewer running southward along the R108;
- There is an existing 300mm foul water sewer that runs south-west direction along Shangan Road.

For existing record drawings of the existing drainage infrastructure, please refer to Appendix A.

For the purpose of this Planning Application, it is noted that no foul water networks nor connections will be proposed to serve the development.

2.2 Proposed Drainage Infrastructure

It is proposed to discharge the surface water runoff into the existing 900mm surface water sewer along the R108m, to the existing surface water manhole.

The proposed surface water sewers have been designed using Innovyze Micro Drainage software in accordance with the Greater Dublin Strategic Drainage Study (GDSDS). A model was developed with an M5-60 of 16.10mm, a ratio R of 0.275 and a rainfall intensity of 50 mm/hr. A return period of 5 years was used throughout for pipeline design (refer to Appendix B for detailed design surface water calculations).

The Qbar frm the proposed development has been calculated using the IH124 Equation:

$Qbar = 0.00108\ AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$

Given the subject Site Characteristics:

Area = 0.638 Ha
Standard Average Annual Rainfall (SAAR) = 942mm
Soil Type Value = 0.47 (Soil Type 4)

The IH124 Equation relates for site bigger than 50Ha, therefore the calculated Qbar for the proposed development is as follows:

Qbar (50ha) = 342l/s
Qbar (site) = 342 l/s / 50 = 6.84l/s * **Site Area** = 6.84 * 0.638 = 4.4 l/s

Based on the total area of the proposed development (6,375m²), the impermeable area (4,204m²) and the calculated Qbar (4.4l/s), the required storage volume for the proposed development is 218m³.

As per the Dublin County Council's comments on the previous drainage proposal, in order to provide the required storage volume on site, it is now proposed to provide a significant amount of Sustainable Urban Drainage Systems (SuDS), in the form of Rain Gardens and Filter drains. No attenuation tanks and permeable paving have been proposed.

The following SuDS proposals are detailed below:

Rain Gardens

Rain gardens are shallow landscaped depressions that can reduce run-off rates and volumes and treat pollution. They are particularly effective in delivering interception and can also provide attractive landscape features that are self-irrigating.

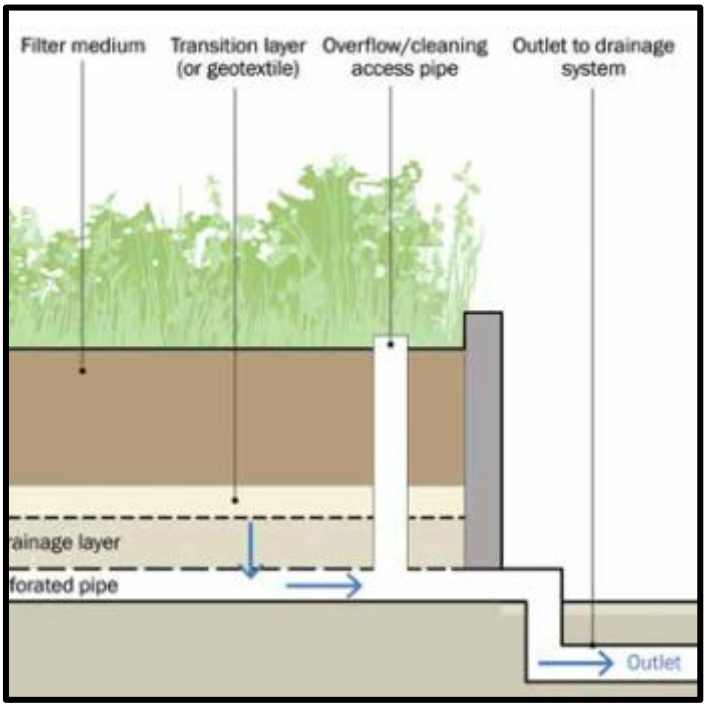


Figure 2 - Example of Rain Garden (extract from Ciria C753 - SuDS Manual)

Rain gardens, as part of Bio-Retention systems are comprised of:

1. **Depth of extended detention** – This is temporary storage of water on the surface to capture the volume that requires treatment and (if necessary) provides attenuation. Maximum depth 150-300mm.
2. **Vegetation**- Vegetation has benefits in that it uptakes pollutants in the soil. It will also prevent erosion of the surface soil layers and help maintain a filter medium.
3. **Filter medium**- This material is normally sand based with some source of organic matter and slow release plant nutrients to maintain healthy plant growth. It filters out pollutants and controls the rate at which water filters through the system. An absolute minimum of 400mm is recommended. Proprietary filter media that have enhanced performance may be used to reduce the depth of filter medium.
4. **Transition layer** – This is required to prevent the washing of fines from the filter medium into the drainage layer. To achieve this, it should be at least 100m deep and should be designed using standard geotechnical filter criteria. Alternatively, a geotextile can be used.
5. **Drainage Layer**- The purpose of this layer is to collect water from the filter medium and allow it to reach the perforated pipes easily. The drainage layer should provide adequate cover to the perforated pipes (typically 100mm).

The proposed rain garden locations are shown in the figure below; the storage volume was calculated taking into account the following:

- Filter medium depth (400mm) 45% porosity
- Transition layer depth (100mm) 45% porosity
- Drainage Layer (100mm) 50% porosity

The overall storage volume within the proposed Rain gardens is 118 m³. Refer to Table 1 for summary of storage provided.

Table 1 – Summary of Proposed Rain Gardens

Proposed Storage Measure	Area (m²)	Depth (m)	Volume Provided (m³)
Rain Garden 1	400	0.60	110
Rain Garden 2	100	0.60	27.5
Rain Garden 3	180	0.60	49.4
Total Storage Volume			186.9

Filter drains

Filter drains are shallow trenches filled with stone/gravel that create temporary subsurface storage for the attenuation, conveyance and filtration of surface water runoff.

The storage volume was calculated taking into account a width of 1m, approximate depth of 650mm, divided into 150/200mm of grass on top to allow water to infiltrate within the approximate 500mm stone layer underneath, and a 45% stone porosity within the stone layer. It is also noted that it is proposed a 100mm of difference between filter drain location and paths in order to allow water to pond in case of extreme rainfall event.

The overall storage volume within the proposed filter drains is 139 m³. Refer to Table 2 for summary of proposed filter drains.

Table 2 – Summary of Proposed Filter Drains

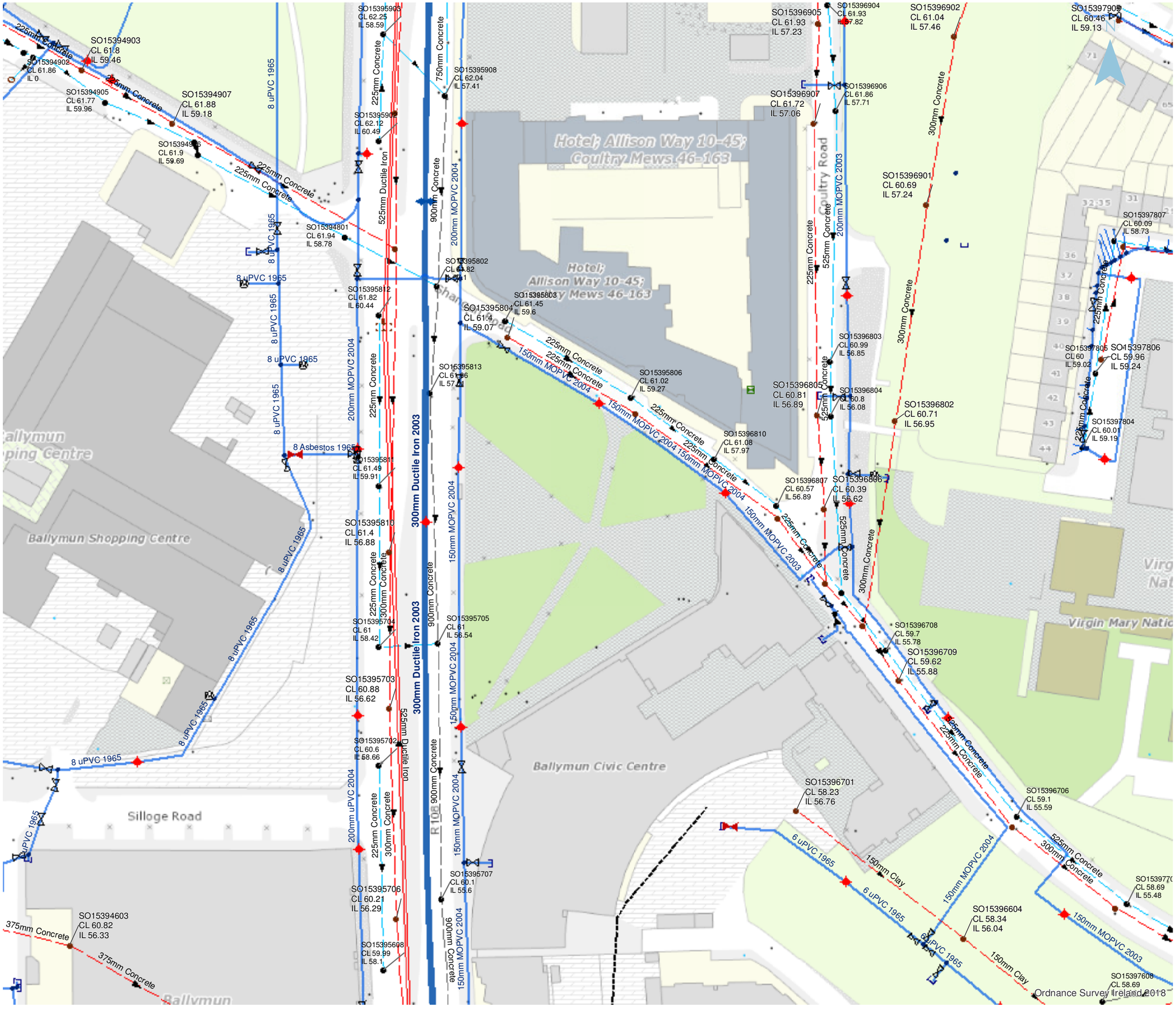
Proposed Storage Measure	Length (m)	Width (m)	Depth (m)	Void Ratio	Volume Provided (m³)
Filter Drain 1	90	1	0.50	0.45	20
Filter Drain 2	60	1	0.50	0.45	13
Filter Drain 3	65	1	0.50	0.45	14.6
Filter Drain 4	37	1	0.50	0.45	8
Total Storage Volume					55.6

The overall storage volume provided for the proposed development is 242.5m³; the required storage volume is 218m³, therefore it is proposed sufficient storage volume, providing an extra 24.5m³ of storage on site.

For locations of proposed SuDS measures please refer to AECOM Drawing PR224944-ACM-XX-00-DR-CE-00-0502.

It is also noted that foul water and watermain supply have not been designed as not required as part of the proposed development.

Appendix A - Existing Record Drawings



UISCE ÉIREANN : IRISH WATER

Legend

- Unknown Meter ; Other Meter
- Sluice Valve Open
- Sluice Valve Closed
- Sluice Valve Closed
- Double Air Control Valve

Water Hydrants

Hydrant Function

- Fire Hydrant
- Telemetry Kiosk
- Cap
- Other Fittings

Water Distribution Mains

Owned By

- Irish Water
- Irish Water
- Irish Water
- Water Abandoned Lines

Sewer Manholes

Manhole Type

- Standard
- Hatchbox
- Other; Unknown
- Gravity - Foul
- Pumping - Foul

Storm Manholes

Manhole Type

- Standard
- Surface Gravity Mains
- Surface Gravity Mains Private

1:1,000 at A3

Last edited: 13/11/2018

Metres

0 5 10 20

Appendix B – Surface Water Details

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	16.100	Add Flow / Climate Change (%)	20
Ratio R	0.275	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.000
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.324	4-8	0.102

Total Area Contributing (ha) = 0.426

Total Pipe Volume (m³) = 13.174

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	47.582	0.317	150.1	0.077	4.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	38.738	0.258	150.1	0.076	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	30.712	0.205	149.8	0.059	4.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	17.342	0.116	149.5	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	27.528	0.184	149.6	0.034	4.00	0.0	0.600	o	225	Pipe/Conduit	
S3.001	23.403	0.156	150.0	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	33.480	0.223	150.0	0.009	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.62	59.700	0.077	0.0	0.0	2.1	1.28	90.5	12.4
S1.001	50.00	5.12	59.383	0.152	0.0	0.0	4.1	1.28	90.5	24.7
S2.000	50.00	4.48	59.500	0.059	0.0	0.0	1.6	1.07	42.4	9.5
S2.001	50.00	4.75	59.295	0.094	0.0	0.0	2.5	1.07	42.4	15.2
S3.000	50.00	4.43	59.000	0.034	0.0	0.0	0.9	1.07	42.4	5.6
S3.001	50.00	4.80	58.816	0.053	0.0	0.0	1.4	1.07	42.4	8.5
S2.002	50.00	5.32	58.660	0.155	0.0	0.0	4.2	1.07	42.4	25.2

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.002	6.817	0.045	151.5	0.004	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.000	27.174	0.679	40.0	0.062	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	6.108	0.061	100.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.002	50.00	5.41	58.362	0.311	0.0	0.0	8.4	1.28	90.1	50.6
S4.000	50.00	4.22	59.000	0.062	0.0	0.0	1.7	2.07	82.5	10.0
S1.003	50.00	4.08	58.200	0.000	4.4	0.0	0.7	1.31	52.0	4.4

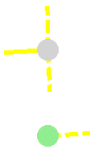
Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	61.250	1.550	Open Manhole	1200	S1.000	59.700	300				
S2	61.550	2.167	Open Manhole	1200	S1.001	59.383	300	S1.000	59.383	300	
S3	60.900	1.400	Open Manhole	1200	S2.000	59.500	225				
S4	60.500	1.205	Open Manhole	1200	S2.001	59.295	225	S2.000	59.295	225	
S5	60.600	1.600	Open Manhole	1200	S3.000	59.000	225				
S6	60.550	1.734	Open Manhole	1200	S3.001	58.816	225	S3.000	58.816	225	
S7	61.200	2.540	Open Manhole	1200	S2.002	58.660	225	S2.001	59.179	225	519
								S3.001	58.660	225	
S8	61.750	3.388	Open Manhole	1200	S1.002	58.362	300	S1.001	59.125	300	763
								S2.002	58.437	225	
S9	61.000	2.000	Open Manhole	1200	S4.000	59.000	225				
S10	61.150	2.950	Open Manhole	1200	S1.003	58.200	225	S1.002	58.317	300	192
								S4.000	58.321	225	121
S	60.000	1.861	Open Manhole	0		OUTFALL		S1.003	58.139	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	715506.339	739866.152	715506.339	739866.152	Required	
S2	715460.480	739853.464	715460.480	739853.464	Required	
S3	715526.977	739846.741	715526.977	739846.741	Required	
S4	715497.102	739839.623	715497.102	739839.623	Required	
S5	715525.992	739816.110	715525.992	739816.110	Required	
S6	715502.709	739801.424	715502.709	739801.424	Required	
S7	715493.080	739822.754	715493.080	739822.754	Required	
S8	715460.576	739814.726	715460.576	739814.726	Required	
S9	715462.002	739780.769	715462.002	739780.769	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S10	715460.662	739807.910	715460.662	739807.910	Required	
S	715454.566	739807.527			No Entry	



PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	300	S1	61.250	59.700	1.250	Open Manhole	1200
S1.001	o	300	S2	61.550	59.383	1.867	Open Manhole	1200
S2.000	o	225	S3	60.900	59.500	1.175	Open Manhole	1200
S2.001	o	225	S4	60.500	59.295	0.980	Open Manhole	1200
S3.000	o	225	S5	60.600	59.000	1.375	Open Manhole	1200
S3.001	o	225	S6	60.550	58.816	1.509	Open Manhole	1200
S2.002	o	225	S7	61.200	58.660	2.315	Open Manhole	1200
S1.002	o	300	S8	61.750	58.362	3.088	Open Manhole	1200
S4.000	o	225	S9	61.000	59.000	1.775	Open Manhole	1200
S1.003	o	225	S10	61.150	58.200	2.725	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	47.582	150.1	S2	61.550	59.383	1.867	Open Manhole	1200
S1.001	38.738	150.1	S8	61.750	59.125	2.325	Open Manhole	1200
S2.000	30.712	149.8	S4	60.500	59.295	0.980	Open Manhole	1200
S2.001	17.342	149.5	S7	61.200	59.179	1.796	Open Manhole	1200
S3.000	27.528	149.6	S6	60.550	58.816	1.509	Open Manhole	1200
S3.001	23.403	150.0	S7	61.200	58.660	2.315	Open Manhole	1200
S2.002	33.480	150.0	S8	61.750	58.437	3.088	Open Manhole	1200
S1.002	6.817	151.5	S10	61.150	58.317	2.533	Open Manhole	1200
S4.000	27.174	40.0	S10	61.150	58.321	2.604	Open Manhole	1200
S1.003	6.108	100.1	S	60.000	58.139	1.636	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.003	S	60.000	58.139	56.540	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0	Number of Offline Controls 0	Number of Time/Area Diagrams 0
Number of Online Controls 4	Number of Storage Structures 4	Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.500	Storm Duration (mins)	30
Ratio R	0.300		

Online Controls for Storm

Orifice Manhole: S2, DS/PN: S1.001, Volume (m³): 5.7

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 59.383

Orifice Manhole: S7, DS/PN: S2.002, Volume (m³): 4.4

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 58.660

Orifice Manhole: S8, DS/PN: S1.002, Volume (m³): 7.8

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 58.362

Hydro-Brake® Optimum Manhole: S10, DS/PN: S1.003, Volume (m³): 4.8

Unit Reference	MD-SHE-0104-4400-0650-4400
Design Head (m)	0.650
Design Flow (l/s)	4.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	104
Invert Level (m)	58.200
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.650	4.4	Kick-Flo®	0.452	3.7
Flush-Flo™	0.201	4.4	Mean Flow over Head Range	-	3.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.5	1.200	5.8	3.000	9.0	7.000	13.4
0.200	4.4	1.400	6.3	3.500	9.7	7.500	13.9
0.300	4.3	1.600	6.7	4.000	10.3	8.000	14.4
0.400	4.1	1.800	7.1	4.500	10.9	8.500	14.8
0.500	3.9	2.000	7.4	5.000	11.5	9.000	15.2
0.600	4.2	2.200	7.8	5.500	12.0	9.500	15.7
0.800	4.8	2.400	8.1	6.000	12.5		
1.000	5.4	2.600	8.4	6.500	13.0		

Storage Structures for Storm

Filter Drain Manhole: S1, DS/PN: S1.000

Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.225
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.500
Safety Factor	2.0	Number of Pipes	1
Porosity	0.45	Slope (1:X)	100.0
Invert Level (m)	59.700	Cap Volume Depth (m)	0.000
Trench Width (m)	1.0	Cap Infiltration Depth (m)	0.000
Trench Length (m)	40.0		

Complex Manhole: S2, DS/PN: S1.001

Filter Drain

Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.150
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.500
Safety Factor	2.0	Number of Pipes	1
Porosity	0.45	Slope (1:X)	100.0
Invert Level (m)	59.383	Cap Volume Depth (m)	0.000
Trench Width (m)	1.0	Cap Infiltration Depth (m)	0.000
Trench Length (m)	60.0		

Dry Swale

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Infiltration Coefficient Base (m/hr)	0.00000	Trench Infiltration Side (m/hr)	0.00000
Infiltration Coefficient Side (m/hr)	0.00000	Trench Porosity	0.45
Safety Factor	2.0	Side Slope (1:X)	4.0
Porosity	0.45	Slope (1:X)	100.0
Invert Level (m)	59.383	Cap Volume Depth (m)	0.000
Trench Height (m)	0.600	Cap Infiltration Depth (m)	0.000
Trench Width (m)	6.0	Include Swale Volume	Yes
Trench Length (m)	17.0		

Complex Manhole: S4, DS/PN: S2.001

Filter Drain

Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.150
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.500
Safety Factor	2.0	Number of Pipes	1
Porosity	0.45	Slope (1:X)	100.0
Invert Level (m)	59.095	Cap Volume Depth (m)	0.000
Trench Width (m)	1.0	Cap Infiltration Depth (m)	0.000
Trench Length (m)	90.0		

Dry Swale

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Dry Swale

Infiltration Coefficient Base (m/hr)	0.00000	Trench Infiltration Side (m/hr)	0.00000
Infiltration Coefficient Side (m/hr)	0.00000	Trench Porosity	0.45
Safety Factor	2.0	Side Slope (1:X)	4.0
Porosity	0.45	Slope (1:X)	100.0
Invert Level (m)	59.095	Cap Volume Depth (m)	0.000
Trench Height (m)	0.600	Cap Infiltration Depth (m)	0.000
Trench Width (m)	10.0	Include Swale Volume	Yes
Trench Length (m)	46.0		

Filter Drain

Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.150
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.500
Safety Factor	2.0	Number of Pipes	1
Porosity	0.45	Slope (1:X)	100.0
Invert Level (m)	59.095	Cap Volume Depth (m)	0.000
Trench Width (m)	1.0	Cap Infiltration Depth (m)	0.000
Trench Length (m)	65.0		

Dry Swale Manhole: S9, DS/PN: S4.000

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Infiltration Coefficient Base (m/hr)	0.00000	Trench Infiltration Side (m/hr)	0.00000
Infiltration Coefficient Side (m/hr)	0.00000	Trench Porosity	0.45
Safety Factor	2.0	Side Slope (1:X)	4.0
Porosity	0.45	Slope (1:X)	100.0
Invert Level (m)	59.250	Cap Volume Depth (m)	0.000
Trench Height (m)	0.600	Cap Infiltration Depth (m)	0.000
Trench Width (m)	6.0	Include Swale Volume	Yes
Trench Length (m)	30.0		

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 4 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm) 16.100	Cv (Summer) 0.750
Region England and Wales		Ratio R 0.275	Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)	1.0
Analysis Timestep 2.5 Second Increment (Extended)	
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S1	60 Winter	100	+20%					59.857	-0.143
S1.001	S2	60 Winter	100	+20%	30/15 Winter				59.849	0.166
S2.000	S3	240 Winter	100	+20%					59.654	-0.071
S2.001	S4	240 Winter	100	+20%	30/120 Winter				59.653	0.133
S3.000	S5	240 Winter	100	+20%	1/30 Winter				59.654	0.429
S3.001	S6	240 Winter	100	+20%	1/15 Summer				59.653	0.612
S2.002	S7	240 Winter	100	+20%	1/15 Summer				59.652	0.767
S1.002	S8	240 Winter	100	+20%	1/15 Summer				59.659	0.997
S4.000	S9	180 Winter	100	+20%	1/30 Winter				59.587	0.362
S1.003	S10	180 Winter	100	+20%	1/15 Summer				59.584	1.159

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.000	0.20		17.0	OK	
S1.001	S2	0.000	0.12		10.1	SURCHARGED	
S2.000	S3	0.000	0.14		5.5	OK	
S2.001	S4	0.000	0.13		4.9	SURCHARGED	
S3.000	S5	0.000	0.08		3.3	SURCHARGED	
S3.001	S6	0.000	0.13		5.0	SURCHARGED	
S2.002	S7	0.000	0.13		5.1	SURCHARGED	
S1.002	S8	0.000	0.10		5.9	SURCHARGED	
S4.000	S9	0.000	0.04		3.0	SURCHARGED	
S1.003	S10	0.000	0.18		6.2	SURCHARGED	