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CIVIL & STRUCTURAL
ENGINEERS

ENGINEERING DRAINAGE REPORT FOR PLANNING SUBMISSION

HOUSING DEVELOPMENT AT STOCKING LANE BALLYBODEN DUBLIN 16

Reference: 50-09
Date: 30 September 2021

ENGINEERS IRELAND

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1. INTRODUCTION

1.1 Background

OBA Consulting Civil and Structural (OBA) were commissioned to provide engineering services in support of a proposed residential development off Stocking Lane, Dublin 16.

This report will consider the essential civil engineering elements, inter alia:

- The development layout design and proposed levels;
- Surface water strategy and design incorporating SUDS;
- Foul sewer design;
- Water main design; and
- Road and access design.

1.2 Existing Site

This site currently comprises of greenfield site adjacent to Coolamber House in the north, with existing housing to the west and south, Stocking Lane and Waterworks to the east.
The greenfield total site area currently subject to this planning application is **2.41ha**.

The overall site rises 5m from north to south (93 – 98m).

An existing access point from the Stocking Lane is located at Coolamber House.

1.3 The Proposal

The proposed planning application is for 131 housing units, a shop and a crèche with associated access roads, footpaths and utilities.

1.4 Local Authority Consultation

The design has been developed through consultation with the South Dublin County Council, Environment, Water and Climate Change, Assistant Engineer, Ronan Toft. The format followed an initial submission (pre-planning) of the proposed drainage scheme. The overall scheme was positively accepted, with details thereof having been discussed and improved through a 'query, response' format email correspondence. A copy of the correspondence is attached in Appendix B for clarity. Previous Drainage related Queries of the Planning Authority have been addressed, please refer to Table of Queries and Responses in Appendix B for further details thereof.

1.5 Irish Water

The Confirmation of Feasibility (CDS19003311) was issued on the 30th May 2019 and Statement of Design Acceptance (CDS2003688) was issued on the 12th August 2020. There is no expiry date for either of these documents. Furthermore, there has been no significant additions to the permitted or constructed development within the area since the Statement of Design Acceptance was issued. There is consequently no material change in circumstances since the scheme was assessed by Irish Water.

2. SURFACE WATER DRAINAGE

2.1 Existing Surface Water

The overall topography of the subject site slopes from south to north. An existing 225mm diameter SW sewer is located on Stocking Lane, north of the site, gravitating northwards and an existing 225mm diameter SW sewer is located northwest of the site in adjacent Springvale Housing, gravitating westwards.

A 600mm diameter waterworks overflow traverses the site from east to west at an approximate depth of 5m (cover), over which a 10m development free area will be maintained.

Refer to drawing no. 50-09 C03 and 50-09-C04 for further clarity.

2.2 Surface Water Policy

The management of surface water for the proposed development will be designed in accordance with the policies and guidelines outlined in the Greater Dublin Strategic Drainage Study (GDSDS) and to the requirements of South Dublin County Council. The guidelines require the following measures to be catered for in the design:

- Sustainable Urban Drainage Systems (SUDS);
- Surface water attenuation by restricting the new surface water discharge to the permissible greenfield run-off rate (Q_{bar}) or 2 l/s (whichever is the greater);
- Surface water design to accommodate rainfall events up to 1:100 year return event; and
- Climate change allowance.

2.3 General Design

The surface water system has been designed in accordance with South Dublin County Council Guidelines, the Greater Dublin Strategic Drainage Study and Recommendations for Site Development Works for Housing Areas published by the Department of the Environment and Local Government.

SW sewers have been designed in accordance with BS8301:1985, using the modified rational method with allowance of 75mm/hr. for roofs and 50mm/hr. for roads (main sewer is less than 200m). The gradient has been designed to ensure velocities of between 0.75 and 3m/s when flowing half full, using pipe roughness of 0.6 for SW sewers. Refer to appendix B for Surface Water Drainage Calculations.

2.4 SUDS

In accordance with GDSDS it is proposed to use sustainable urban drainage systems (SUDS) to manage storm water run-off generated by the proposed development. The aim of the SUDS strategy for the site will be:

- Attenuate storm water run-off;
- Reduce storm water run-off;
- Reduce pollution impact; and
- Replicate the natural characteristics of rainfall run-off for the site.

The proposed layout of the drainage is shown on drawing no. 50-09 C03 and 50-09-C04.
It is proposed to provide two independent SW networks to connect to the afore-mentioned existing Council SW sewers.

The allowable discharge / run-off for the 'eastern' and 'western' networks has been calculated using the Q_{bar} formula and is limited to a maximum of 4.77 l/s and 2.9 l/s respectively, refer to Appendix A, HR Wallingford Greenfield run-off estimation, for details.

The SUDS elements to be incorporated within the proposed development include the following:

1. All parking bays are to be permeable paving, except those located above services to be taken in charge; and
2. All roof, road and footpath run-off from Catchment A will be directed through conventional road gullies and surface water sewers to a swale discharging to a wetland. Restricted flow from this discharges to the council sewer on Stocking Lane. Due to the limited area in which to provide the wetland and permanent pond, without encroaching on usable public open space, insufficient volume to cater for the 1:100 year (+20%) exists within the wetland and pond. An overflow to an underground Stormtech Arched Chamber type surface water attenuation tank is provided to cater for the deficit. In order to further diversify the SUDS train, it is proposed to provide private ug Wavin geocellular attenuation and restricted flow upstream of Catchment A, incorporating the apartment blocks (under private management company holding) as Catchment C.
3. All roof, road and footpath run-off from Catchment B will be directed through conventional road gullies and surface water sewers to underground Stormtech Arched Chamber type surface water attenuation tank, prior to flow restrictor and discharge to the public sewer in Springvale Housing.

2.5 Design Standards

All services have been designed in accordance with the Department of the Environment 'Recommendations for Site Development Works for Housing Areas'. The design outflow from the site is 7.67 l/s (4.77 + 2.9 l/s).

Surface water pipework has been sized using the rational method. A return period of 5 years has been used for pipe design (Table 3.1, Recommendations for Site Development Works for Housing Areas, DOE). Surface water sewers have been designed in accordance with IS EN 752 and the recommendations of the GSDS.

Surface water attenuation has been designed to accommodate the 1:100 year return storm with an additional allowance of 20% for climate change.

The minimum pipe diameter for public surface water sewers is 225mm.

Refer to drawing no. 50-09-C03 and 50-09-C04 for the Proposed Surface Water Layout Plan and drawing no. 50-09-C10-1 for Drainage Longitudinal Sections, Appendix B for Surface Water Drainage Calculations and Appendix C for Attenuation Design.

2.6 SUDS Health & Safety, Risk Assessment

There is a perception by some that SuDS features, especially ponds and wetlands, are unsafe. Specifically, there is a fear of drowning occurring. With careful thought these risks can be designed out. If ponds are properly designed, with shallow side slopes, shallow shelving edges and strategically placed vegetation, they will be as safe as the many watercourses, ponds and lakes that are unfenced in parks, country parks and similar locations throughout the country.
The total elimination of risk at open water sites is not usually possible. An appropriate risk control philosophy has been employed and the following risk reduction approaches are to be implemented:

1. All drainage systems designed for safe access for maintenance.
2. Designs must considered minimising the risk of falls. There are no specific residual risks for construction workers as the pond is a shallow earthworks operation. There are no areas where a person could fall more than 2 m, the provision of a fence does not need to be considered.
3. Access around the pond (safety bench) which is suitable for maintenance vehicles and pedestrians to be provided.

4. The aquatic bench is to be 1.5 m wide. Gradients in the pond beyond the aquatic bench, are to be designed at 1 in 3.
5. Gradients between the safety bench and the lower "aquatic bench" are to be 1 in 4 to reduce risks of the public slipping into the water and ensuring easy access from it.

Hazard	Who is at Risk?	Avoid	Reduce	Mitigate	Residual Risk
Sudden inflow of water	Public and maintenance staff.	Design to avoid sudden inflows so that warning of flooding is given.	Shallow banks so easy to get out.	Reed beds or brushes to act as barrier.	Very low
Drowning	Public and maintenance staff.		Shallow banks so easy to get out, shallow depth to discourage swimming.	Reed beds or brushes to act as barrier, shallow slopes, warning signs, life jackets for maintenance staff.	Very low
Falling from inlet/outlet structure	Public.	Design inlets/outlets with minimum use of vertical walls.	Provide barrier.	Education boards. Warning signs.	Very low
Entering inlet or outlet pipes	Public/pets/wildlife.	Use small pipes so entry not possible.	Provide grilles.	Education boards. Warning signs.	Very low
Contact with contaminated sediment	Maintenance workers.	Design vehicular access to sediment forebays so that excavation is possible using machines		Personal protective equipment for workers during de-silting.	Very low

Table 2.6 Risk Assessment for Integrated Constructed Wetland

6. FOUL DRAINAGE

6.1 General

It is proposed to provide a new gravity sewer system comprising of 150/225mm diameter concrete foul sewers and 100mm uPVC private foul collector drains at 1:60, all discharging to the existing 225mm diameter foul sewer located north west of the site in adjacent Springvale Housing.

It is estimated that the 131 dwellings, shop and creche provided in this development will add a total of 399 PE to the foul network, which is equivalent to an average foul discharge of 79.8 m^3/day (based on 600 l/unit/day).

6.2 Layout

It is proposed to lay 150/225mm diameter foul sewer following the access road, discharging to the existing foul sewer in adjacent Springvale Housing (MH Ex.F2).

All new foul drains and sewers are designed to discharge by gravity to the existing Springvale 225mm diameter sewer.

Refer to Drawing no. 50-09-C03 and 50-09-C04 for the Proposed Foul Sewer Layout Plan and drawing no. 50-09-C10 for Drainage Longitudinal Sections.

6.3 Design Calculations

Foul drains and sewers have been designed in accordance with the Building Regulations, Irish Water and specifically in accordance with the principles and methods set out in the DOE “Recommendations for Site Development Works for Housing Areas”, BS8301:1985, ISEN752, 2008, ISEN12056: Part 2, 2000 and the recommendations of the GDSDS.

Refer to Appendix A for Foul Sewer Drainage Calculations.

7. PROPOSED WATER SUPPLY

7.1 Distribution Layout for the Development

The water main distribution system for the development will connect to the existing 300mm diameter DI watermain on Stocking Lane.

The distribution system for the development will comprise a looped 100mm MDPE water main. Ductile iron is to be used on road crossings and beneath parking bays.

Refer to drawing no. 50-09-C05 and 50-09-C06 for the Watermain Layout Plan, including positions of isolation valves and hydrants.

Individual houses will have their own connections to the distribution main via service connections and boundary boxes. Individual service boundary boxes will be of the type to suit Irish Water and South Dublin County Council.

7.2 Watermain Standards and Details

It is proposed that at a post planning detailed design stage a comprehensive Mechanical and Electrical (M&E) building design would be submitted, as may be required, by the applicant for the buildings for approval by South Dublin County Council. Included in this detailed M&E building design would be the following:

- Full internal piping layout including all ancillaries;
- Boosting requirements and details;
- 24 hour water storage; and
- Other requirements specific to the proposed development.

The water supply network has been sized to ensure it conforms to fire-fighting requirements. Hydrants have been positioned to ensure that all buildings are within 45m of a fire hydrant.

7.3 Water Demand

Based on 600 l/unit/day, the total estimated water usage equates 133 units x 600 l = 79,800 l/day (79.8 m^3/day).

8. ACCESS AND ROADS

8.1 General

It is proposed to access the site from a proposed new access point onto Stocking Lane. Adequate kerb radii, entry treatment and pedestrian facilities are to be provided at the junction.

Road junction visibility requirements comply with the Design Manual for Urban Roads and Streets (DMURS). As per table 4.2 of DMURS, the required sightline at a setback of 2.4m is 45m.

Drawing no. 50-09-C01 and 50-09-C02, Proposed Road Layout, shows the layout of the access road / parking serving the development.

In accordance with DMURS, it is proposed to provide 'home zone' type road layout on short cul-de-sacs making use of shared surfaces.

A link has been provided into Springvale Housing estate, further information with regards to this should be taken from the traffic engineers documentation.

8.2 Design of Roads / Access

The main internal access road is designed in accordance with DMURS and the local authority requirements. Refer to drawing no. 50-09-C01 and 50-09-C02 for the Proposed Road Layout and drawing no. 50-09-C07 for sections and details indicating proposed construction. Refer to drawing no. 50-09-C08 for the longitudinal sections of all roads. The proposed pavement design is based on 5% CBR, which would need to be confirmed by a geotechnical investigation prior to detailed design stage.

APPENDIX A

Foul Drainage Calculations

0.75 to 3 m/s **Self cleansing velocity when flowing half full:**

0.6 for <420 Discharge Units (Intermittent Flow) **Pipe Roughness Co-efficient (K_s):**

1.5 for >420 Discharge Units (Constant Flow)

References:

Recommendations for Site Development Works, D.O.E. Nov. 1998

BS8301:1985, Table 4, 7.4.4.1

BS8301:1985, Table 4, 7.4.4.1

Pipe Run	Pipe Gradient	Pipe Diameter	Discharge Units for segment	Accumulative Discharge units	Actual		Full Bore		Proportional flow	Discharge Velocity	Proportional Depth
					Flow Q	Velocity v	Flow Q_p	Velocity v_p	Q/Q_p		
	1 in	mm	units	units	l/s	m/s	l/s	m/s	OK?	OK?	OK?
F1-F2	115	225	140	140	4.193	0.752	48.346	1.216	YES	YES	YES
F2-F3	115	225	56	196	4.596	0.772	48.346	1.216	YES	YES	YES
F3-F4A	120	225	262	458	6.031	0.750	41.595	1.046	YES	YES	YES
F4A-F4	120	225	0	458	6.031	0.750	41.595	1.046	YES	YES	YES
F4-F5	170	225	98	1746	10.769	0.776	34.909	0.878	YES	YES	YES
F5-F6	170	225	196	1942	11.385	0.787	34.909	0.878	YES	YES	YES
F6-F7	180	225	0	1942	11.385	0.771	33.919	0.853	YES	YES	YES
F7-F8	180	225	42	1984	11.515	0.773	33.919	0.853	YES	YES	YES
F8-EX.F2	20	225	42	2026	11.645	1.721	102.232	2.571	YES	YES	YES
F10-F11	30	225	364	364	5.568	1.319	95.205	2.394	YES	YES	YES
F11-F4	30	225	70	1190	8.922	1.379	83.428	2.098	YES	YES	YES
PRIVATE DRAIN:											
F11.1-F11.2	20	150	434	434	5.916	1.474	34.693	1.963	YES	YES	YES
F11.2-F11.3	100	225	14	448	5.983	0.799	45.587	1.147	YES	YES	YES
F11.3-F11.4	100	225	308	756	7.313	0.846	45.587	1.147	YES	YES	YES
F11.4-SADDLE	80	225	0	756	7.313	0.917	50.996	1.283	YES	YES	YES

* 14 Discharge units per dwelling unit

F1-F2: Allowance of 9 dwelling units for future adjacent development + 1 existing dwelling

Shop

Appliance	Number	Recurrence Intervals	Discharge Units per Appliance	Total Discharge Units
WC	1	1200	7	7
		600	14	0
		300	28	0
Washbasin	1	1200	1	1
		600	3	0
		300	6	0
Sink	1	1200	6	6
		600	14	0
		300	27	0
Bath	0	4500	7	0
		1800	18	0
Washing Machine	0	15000	4	0
Shower	0	-	-	0
Spray tap		-	-	0
Urinal		1200	0.3	0
	0	900	0.4	0
				14

Creche

Appliance	Number	Recurrence Intervals	Discharge Units per Appliance	Total Discharge Units
WC	4	1200	7	28
		600	14	0
		300	28	0
Washbasin	4	1200	1	4
		600	3	0
		300	6	0
Sink	1	1200	6	6
		600	14	0
		300	27	0
Bath	0	4500	7	0
		1800	18	0
Washing Machine	0	15000	4	0
Shower	0	-	-	0
Spray tap		-	-	0
Urinal		1200	0.3	0
	0	900	0.4	0
				38

APPENDIX B

Surface Water Drainage Calculations

Rainfall Intensity (i) roof =	**75**	**mm/hr**	***RSDW, DOE, 1998, 3.4***
Rainfall Intensity (i) paved =	**50**	**mm/hr**	***RSDW, DOE, 1998, 3.4***
Storm Return Period =	**5**	**years**	***RSDW, DOE, 1998, Table 3.1***
Self cleansing Velocity =	**0.75-3**	**m/s (when flowing half full)**	***RSDW, DOE, 1998, 3.4***
Roof Vol. run-off coeffiecient (Cv) =	**0.9**		
Paved Vol. run-off coeffiecient (Cv) =	**0.8**		
Pipe Roughness K_s =	**0.6**	**mm**	***BS8301:1985, 7.4.4.1 Hydraulic Roughness***

Design calculations: Q = A_P x i x Cr x Cv x 2.78

Where,
Impermeable Area A_P is in Ha
Routing coefficient (Cr) = 1.0

Qmax = 147.3 l/s

Total Roof Area = 5921.0 m^2
Total Paved Area = 3255.0 m^2

Pipe No.	Impermeable Area (A_p)		Gradient	Diameter	Actual Rate of Flow	Accumulative Rate of Flow	Discharge Velocity	Capacity Full bore flow	Full Bore Velocity	Proportional flow	Self cleansing velocity	Proportional Depth
	Roof (A_{p1})	Paved(A_{p2})			Q	Q_t	v	Q_p	v_p	Q/Q_p		
P	m^2	m^2	1 in	mm	l/s	l/s	m/s	l/s	m/s	OK?	OK?	OK?
S1-S2	0	425	250	300	4.7	38.1	1.008108178	69.805	0.988	YES	YES	YES
S2-S3	0	176	250	300	2.0	40.0	1.020011065	69.805	0.988	YES	YES	YES
S3-S4	0	173	300	375	1.9	73.9	1.101324015	114.702	1.039	YES	YES	YES
S4-HW1	0	0	300	375	0.0	73.9	1.101324015	114.702	1.039	YES	YES	YES
S11-S12	0	0	100	225	4.13	4.13	0.78712652	51.886	1.305	YES	YES	YES
S12-S12A	0	0	100	225	0.00	4.13	0.78712652	51.886	1.305	YES	YES	YES
S12A-S12B	0	0	100	225	0.00	4.13	0.78712652	51.886	1.305	YES	YES	YES
S12B-EX.S2	0	0	100	225	0.00	4.13	0.78712652	51.886	1.305	YES	YES	YES
S5-HW2	755	270	100	225	17.2	17.2	1.174816538	51.886	1.305	YES	YES	YES
S5A-HW3	0	256	80	225	2.8	2.8	0.763295095	58.077	1.461	YES	YES	YES
S6-S7	1195	240	40	225	25.1	25.1	1.824548209	82.372	2.072	YES	YES	YES
S7-S3	225	240	150	225	6.9	32.0	1.16487925	42.262	1.063	YES	YES	YES
S10-S9	1510	540	150	225	34.3	34.3	1.179748003	42.262	1.063	YES	YES	YES

Pipe No.	Impermeable Area (A_p)		Gradient	Diameter	Actual Rate of Flow	Accumulative Rate of Flow	Discharge Velocity	Capacity Full bore flow	Full Bore Velocity	Proportional flow	Self cleansing velocity	Proportional Depth
	Roof (A_{p1})	Paved(A_{p2})			Q	Q_t	v	Q_p	v_p	Q/Q_p		
P	m^2	m^2	1 in	mm	l/s	l/s	m/s	l/s	m/s	OK?	OK?	OK?
S8-S9	0	450	130	225	5.0	5.0	0.757595854	45.438	1.143	YES	YES	YES
S9-S13	150	0	150	300	2.8	42.2	1.25722698	90.406	1.279	YES	YES	YES
S13-S14	225	0	150	300	4.2	46.4	1.286908888	90.406	1.279	YES	YES	YES
S14-S15	85	485	150	300	7.0	53.4	1.330047843	90.406	1.279	YES	YES	YES
S15-TANK	0	0	150	300	0.0	53.4	1.330047843	90.406	1.279	YES	YES	YES
TANK-S16	0	0	35	225	2.9	2.9	1.027264942	88.099	2.216	YES	YES	YES
S16-EX.S4	0	0	35	225	0.0	2.9	1.027264942	88.099	2.216	YES	YES	YES
PRIVATE DRAIN:												
S2.1-S2.2	390	0	20	150	7.3	7.3	1.731260842	39.927	2.259	YES	YES	YES
S2.2-S1	0	0	48	225	0.0	33.3	1.841727937	75.523	1.899	YES	YES	YES
S2.4-S2.3	1128	0	100	225	21.2	21.2	1.240361483	51.886	1.305	YES	YES	YES
S2.3-S2.2	258	0	100	225	4.8	26.0	1.305678511	51.886	1.305	YES	YES	YES

* **LIMITED FLOW FROM HYDROBRAKE, CATCHMENT A = 4.13 L/S; CATCHMENT B =2.9 L/S**

Item	Comments	Applicant Response
Surface Water Report		
1	'The applicant is required to submit a drawing showing the inclusion of water butts in all proposed housing units as part of further SuDS (Sustainable Drainage System) measures for the development.'	Please refer to Matt Barnes Architect drawing numbers: 2183-151-A, 2183-142-A, 2183-141-A, 2183-152-A, 2183-153-A for water butts.
	'The applicant is required to submit a revised drainage layout drawing showing the relocation of the proposed surface water attenuation system for Catchment B such that it is located a minimum of 5m away from the 600mm waterworks overflow pipe traversing the site.'	Please refer to OBA drawing number 50-09-C04 Foul and SW drainage layout plan sheet 2 of 2 which shows a revised location for the proposed surface attenuation system for catchment B, a minimum of 5m away from the 600mm waterworks overflow pipe traversing the site.
Flood Risk Report		
2	'The Developer shall ensure that there is complete separation of the foul and surface water drainage systems within the site, both in respect of installation and use. All new precast surface water manholes shall have a minimum thickness surround of 150 mm concrete class B. All works for this development shall comply with the requirements of the GDRCPDW.'	There will be complete separation of the foul and surface water drainage systems within the site, both in respect of installation and use. Please refer to the engineering drawings by OBA Consulting Engineers. All new precast surface water manholes will have a minimum thickness surround of 150mm concrete class B. All works for this development will comply with the requirements of the GDRCPDW. Please refer to the infrastructure report by OBA Consulting engineers for further clarity.

APPENDIX C

SW Attenuation Design

Storm Water Attenuation Calculations

Total Site Area = 24069 m^2
Catchment Area A = 14180 m^2

Areas contributing to SW Run-off:

Description	Finish	Area (m^2)	Percentage run-off (%)	Equivalent run-off area (m^2)
Roof Areas	conc tile	3951	90	3555.9
Roads and Footpaths	macadm/paviors/conc	1780	80	1424
Permeable Paving	porous paviors	512.5	60	307.5
Public Open Space	lawn/landscaped	1970	10	197
Private Open Space	lawn/landscaped	5966.5	0	0
Equivalent impermeable area:				**5484.4**

Permissible outflow = **4.13 l/s**

100 year storm

Permissible Volume (l)= Actual Achievable Outflow (l/s) x time (s)

Actual Volume (l)= (Equivalent Impermeable Area x depth of rainfall)
+ 2 l/s x duration; from interception storage (Catchment C)

Storage capacity (l)= Actual - Permissible Volumes

Duration	Rainfall	Permissible	Actual	Store
min	mm	l	l	l
15	29.2	3717.00	160144.48	156427.48
30	37	7434.00	206522.80	199088.80
60	46.8	14868.00	263869.92	249001.92
120	59.3	29736.00	339624.92	309888.92
240	75	59472.00	440130.00	380658.00
360	86.2	89208.00	515955.28	426747.28
720	109.1	178416.00	684748.04	506332.04
1440	138.2	356832.00	930744.08	573912.08

Rainfall figures are site specific, see Met Eireann rainfall table attached.

From table above, required storage volume is 573.91 m^3
Allow 20% for climate change,
therefore storage required is 688.69 m^3

Hydrobrake discharge = 4.13 l/s

Type of surface	Runoff coefficient (φ)
Roof without storage	0.9
Concrete or asphalt, rock with large slopes	0.8
Cobbled stone with gravel joints	0.7
Gravel road	0.4
Rock with small slopes	0.3
Gravel paths	0.2
Park	0.1
Lawn, pasture, etc.	0-0.1
Forest, no slopes	0-0.1

User Inputs

Chamber Model	MC-4500
Outlet Control Structure	Yes (Outlet)
Project Name	Stocking Lane A
Project Location	Stocking Lane Dublin 24
Project Date	04/09/2020
Engineer	Alan Manthe
Measurement Type	Metric
Required Storage Volume	703 cubic meters
Stone Porosity	40%
Stone Above Chambers	305 mm.
Stone Foundation Depth	230 mm.
Average Cover Over Chambers	750 mm.
Design Constraint	Width
Design Constraint Dimension	17.5 meters

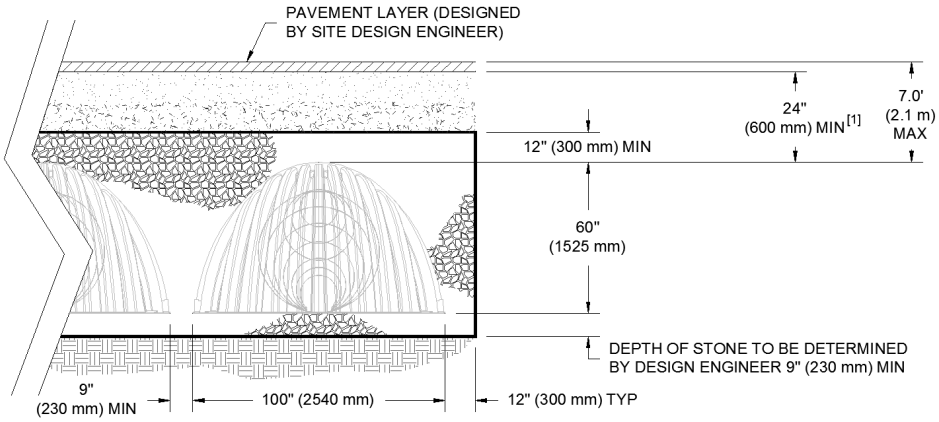
Results

System Volume and Bed Size

Installed Storage Volume	706 cubic meters
Storage Volume Per Chamber	4.6 cubic meters
Storage Volume Per End Cap	3.0 cubic meters
Number Of Chambers Required	138 each
Number Of End Caps Required	12 each
Rows/Chambers	6 row(s) of 23 chamber(s)
Maximum Length	32.67 meters
Maximum Width	17.18 meters
Approx. Bed Size Required	545 square meters

System Components

Amount Of Stone Required	693 cubic meters
Volume Of Excavation (Not Including Fill)	1122 cubic meters
Non-woven Filter Fabric Required	1295 square meters
Length Of Isolator Row	29.78 meters
Woven Isolator Row Fabric	206 square meters



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

StormTech MC-4500 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots thus maximizing land usage for commercial and municipal applications.

StormTech MC-4500 Chamber (not to scale)
Nominal Chamber Specifications

Size (L x W x H)	52" (1321 mm) x 100" (2540 mm) x 60" (1524 mm)
Chamber Storage	106.5 ft³ (3.01 m³)
Min. Installed Storage*	162.6 ft³ (4.60 m³)
Weight	120 lbs (54.4 kg)

* This assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below chambers, 9" (230 mm) of stone between chambers/end caps and 40% stone porosity.

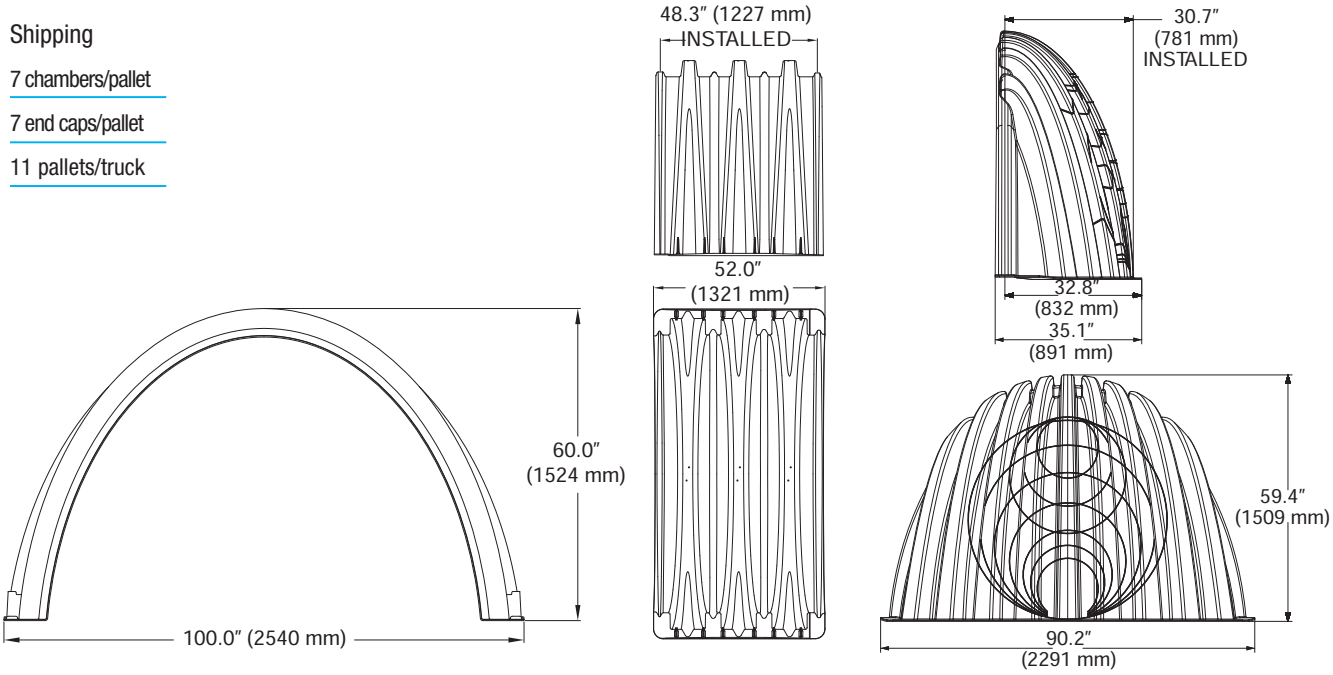
StormTech MC-4500 End Cap (not to scale)
Nominal End Cap Specifications

Size (L x W x H)	35.1" (891 mm) x 90.2" (2291 mm) x 59.4" (1509 mm)
End Cap Storage	35.7 ft³ (1.01 m³)
Min. Installed Storage*	108.7 ft³ (3.08 m³)
Weight	120 lbs (54.4 kg)

*This assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below, 12" (300 mm) of stone perimeter, 9" (230 mm) of stone between chambers/end caps and 40% stone porosity.

Shipping

7 chambers/pallet
7 end caps/pallet
11 pallets/truck



StormTech MC-4500 Chamber

Storage Volume Per Chamber/End Cap ft³ (m³)

	Bare Unit Storage ft³ (m³)	Chamber/End Cap and Stone Unit Volume — Stone Foundation Storage Depth in. (mm)			
		9 (230)	12 (300)	15 (375)	18 (450)
MC-4500 Chamber	106.5 (3.02)	162.6 (4.60)	166.3 (4.71)	169.9 (4.81)	173.6 (4.91)
MC-4500 End Cap	35.7 (1.0)	108.7 (3.08)	111.9 (3.17)	115.2 (3.26)	118.4 (3.35)

NOTE: Assumes 9" (230 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume. End cap volume assumes 12" (300 mm) stone perimeter.

Amount of Stone Per Chamber

ENGLISH tons (yd³)	Stone Foundation Depth			
	9"	12"	15"	18"
MC-4500	7.4 (5.2)	7.8 (5.5)	8.3 (5.9)	8.8 (6.2)
End Cap	9.6 (6.8)	10.0 (7.1)	10.4 (7.4)	10.9 (7.7)
METRIC kg (m³)	230 mm	300 mm	375 mm	450 mm
MC-4500	6681 (4.0)	7117 (4.2)	7552 (4.5)	7987 (4.7)
End Cap	8691 (5.2)	9075 (5.4)	9460 (5.6)	9845 (5.9)

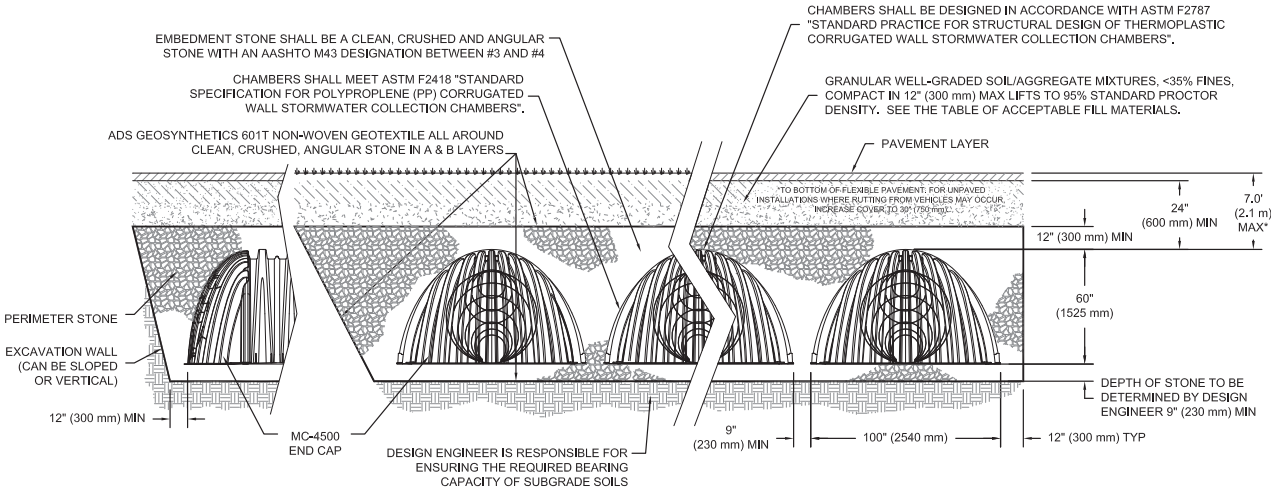
NOTE: Assumes 12" (300 mm) of stone above, 9" (230 mm) row spacing, and 12" (300 mm) of perimeter stone in front of end caps.

Volume of Excavation Per Chamber/End Cap in yd³ (m³)

	Stone Foundation Depth			
	9" (230 mm)	12" (300 mm)	15" (375 mm)	18" (450 mm)
MC-3500	10.5 (8.0)	10.8 (8.3)	11.2 (8.5)	11.5 (8.8)
End Cap	9.3 (7.1)	9.6 (7.3)	9.9 (7.6)	10.2 (7.8)

NOTE: Assumes 9" (230 mm) of separation between chamber rows, 12" (300 mm) of perimeter in front of end caps, and 24" (600 mm) of cover. The volume of excavation will vary as the depth of cover increases.

General Cross Section



*FOR COVER DEPTHS GREATER THAN 7.0' (2.1 mm) PLEASE CONTACT STORMTECH

THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS, WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Alan Manthe
Site name:	Stocking Lane
Site location:	Catchment A

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.27734° N
Longitude:	6.30082° W
Reference:	496000786
Date:	Jul 20 2020 21:05

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1.418

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1046	1046
Hydrological region:	12	12
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.13	2.13
Growth curve factor 100 years:	2.61	2.61
Growth curve factor 200 years:	2.86	2.86

Notes

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

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

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

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	4.13	4.13
1 in 1 year (l/s):	3.51	3.51
1 in 30 years (l/s):	8.81	8.81
1 in 100 year (l/s):	10.79	10.79
1 in 200 years (l/s):	11.82	11.82

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 313397, Northing: 226559,

	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.7,	3.9,	4.6,	5.6,	6.4,	6.9,	8.8,	11.0,	12.4,	14.5,	16.4,	17.8,	20.1,	21.9,	23.4,	N/A ,
10 mins	3.7,	5.5,	6.4,	7.9,	8.9,	9.6,	12.2,	15.3,	17.3,	20.2,	22.8,	24.9,	28.0,	30.5,	32.6,	N/A ,
15 mins	4.4,	6.4,	7.5,	9.2,	10.4,	11.3,	14.4,	18.0,	20.4,	23.8,	26.8,	29.2,	33.0,	35.9,	38.4,	N/A ,
30 mins	5.8,	8.4,	9.8,	12.0,	13.5,	14.7,	18.5,	23.0,	26.0,	30.2,	34.0,	37.0,	41.6,	45.3,	48.3,	N/A ,
1 hours	7.6,	11.0,	12.8,	15.6,	17.5,	18.9,	23.8,	29.4,	33.1,	38.4,	43.1,	46.8,	52.6,	57.0,	60.7,	N/A ,
2 hours	10.1,	14.4,	16.7,	20.2,	22.6,	24.5,	30.6,	37.6,	42.3,	48.8,	54.7,	59.3,	66.3,	71.8,	76.4,	N/A ,
3 hours	11.9,	16.9,	19.5,	23.6,	26.3,	28.5,	35.5,	43.5,	48.8,	56.2,	62.9,	68.0,	76.0,	82.2,	87.4,	N/A ,
4 hours	13.3,	18.9,	21.8,	26.3,	29.3,	31.7,	39.4,	48.2,	54.0,	62.1,	69.4,	75.0,	83.8,	90.5,	96.2,	N/A ,
6 hours	15.7,	22.1,	25.5,	30.7,	34.1,	36.8,	45.7,	55.6,	62.2,	71.5,	79.8,	86.2,	96.0,	103.7,	110.0,	N/A ,
9 hours	18.5,	25.9,	29.8,	35.7,	39.7,	42.8,	52.9,	64.3,	71.8,	82.3,	91.7,	98.9,	110.1,	118.7,	125.9,	N/A ,
12 hours	20.8,	28.9,	33.3,	39.8,	44.2,	47.7,	58.8,	71.3,	79.5,	91.0,	101.2,	109.1,	121.3,	130.7,	138.5,	N/A ,
18 hours	24.4,	33.9,	38.9,	46.4,	51.5,	55.4,	68.1,	82.3,	91.7,	104.8,	116.4,	125.3,	139.0,	149.7,	158.4,	N/A ,
24 hours	27.4,	37.9,	43.5,	51.8,	57.4,	61.7,	75.6,	91.3,	101.5,	115.8,	128.5,	138.2,	153.2,	164.8,	174.3,	207.7,
2 days	34.5,	46.6,	52.8,	62.1,	68.2,	72.9,	88.1,	104.8,	115.6,	130.6,	143.8,	153.8,	169.2,	180.9,	190.6,	224.1,
3 days	40.2,	53.5,	60.4,	70.4,	77.0,	82.1,	98.2,	115.9,	127.2,	142.9,	156.6,	167.0,	182.8,	194.9,	204.8,	238.9,
4 days	45.3,	59.6,	67.0,	77.6,	84.7,	90.0,	107.0,	125.5,	137.4,	153.7,	167.8,	178.6,	194.8,	207.2,	217.4,	252.2,
6 days	54.1,	70.2,	78.4,	90.2,	97.9,	103.8,	122.3,	142.3,	155.0,	172.3,	187.3,	198.7,	215.8,	228.8,	239.4,	275.6,
8 days	62.0,	79.6,	88.5,	101.3,	109.6,	115.9,	135.6,	156.8,	170.3,	188.6,	204.3,	216.2,	234.1,	247.6,	258.6,	296.1,
10 days	69.2,	88.2,	97.7,	111.3,	120.1,	126.8,	147.7,	170.0,	184.1,	203.2,	219.6,	232.0,	250.5,	264.6,	276.0,	314.6,
12 days	75.9,	96.1,	106.2,	120.6,	129.9,	137.0,	158.9,	182.2,	196.9,	216.7,	233.8,	246.6,	265.7,	280.2,	291.9,	331.6,
16 days	88.5,	110.9,	122.0,	137.8,	147.9,	155.6,	179.3,	204.4,	220.2,	241.4,	259.5,	273.0,	293.3,	308.6,	321.0,	362.6,
20 days	100.1,	124.5,	136.5,	153.5,	164.4,	172.6,	198.0,	224.6,	241.3,	263.7,	282.7,	297.0,	318.3,	334.2,	347.2,	390.5,
25 days	113.8,	140.4,	153.4,	171.8,	183.5,	192.3,	219.5,	247.9,	265.6,	289.3,	309.4,	324.5,	346.9,	363.6,	377.1,	422.4,

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

Storm Water Attenuation Calculations

Total Site Area = 24069 m^2
Catchment Area B = 9889 m^2

Areas contributing to SW Run-off:

Description	Finish	Area (m^2)	Percentage run-off (%)	Equivalent run-off area (m^2)
Roof Areas	conc tile	1970	90	1773
Roads and Footpaths	macadm/paviors/conc	1475	80	1180
Permeable Paving	porous paviors	587.5	60	352.5
Public Open Space	lawn/landscaped	630	10	63
Private Open Space	lawn/landscaped	5226.5	0	0
Equivalent impermeable area:				**3368.5**

Permissible outflow = **2.90 l/s**

100 year storm

Permissible Volume (l)= Actual Achievable Outflow (l/s) x time (s)

Actual Volume (l)= (Equivalent Impermeable Area x depth of rainfall)

Storage capacity (l)= Actual - Permissible Volumes

Duration	Rainfall	Permissible	Actual	Store
min	mm	l	l	l
15	29.2	2610.00	98360.20	95750.20
30	37	5220.00	124634.50	119414.50
60	46.8	10440.00	157645.80	147205.80
120	59.3	20880.00	199752.05	178872.05
240	75	41760.00	252637.50	210877.50
360	86.2	62640.00	290364.70	227724.70
720	109.1	125280.00	367503.35	242223.35
1440	138.2	250560.00	465526.70	214966.70

Rainfall figures are site specific, see Met Eireann rainfall table attached.

From table above, required storage volume is 242.22 m^3
Allow 20% for climate change,
therefore storage required is 290.67 m^3

Hydrobrake discharge = 2.9 l/s

Type of surface	Runoff coefficient (φ)
Roof without storage	0.9
Concrete or asphalt, rock with large slopes	0.8
Cobbled stone with gravel joints	0.7
Gravel road	0.4
Rock with small slopes	0.3
Gravel paths	0.2
Park	0.1
Lawn, pasture, etc.	0-0.1
Forest, no slopes	0-0.1

User Inputs

Chamber Model	MC-4500
Outlet Control Structure	Yes (Outlet)
Project Name	Stocking Lane B
Project Location	Stocking Lane Dublin 24
Project Date	04/09/2020
Engineer	Alan Manthe
Measurement Type	Metric
Required Storage Volume	334 cubic meters
Stone Porosity	40%
Stone Above Chambers	305 mm.
Stone Foundation Depth	230 mm.
Average Cover Over Chambers	610 mm.
Design Constraint	Length
Design Constraint Dimension	19 meters

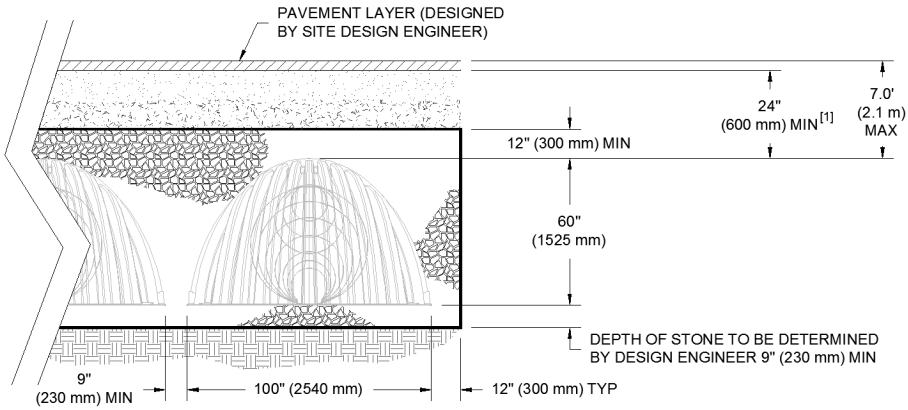
Results

System Volume and Bed Size

Installed Storage Volume	335 cubic meters
Storage Volume Per Chamber	4.6 cubic meters
Storage Volume Per End Cap	3.0 cubic meters
Number Of Chambers Required	61 each
Number Of End Caps Required	10 each
Rows/Chambers	4 row(s) of 13 chamber(s)
Leftover Rows/Chambers	1 row(s) of 9 chamber(s)
Maximum Length	19.22 meters
Maximum Width	14.41 meters
Approx. Bed Size Required	266 square meters

System Components

Amount Of Stone Required	353 cubic meters
Volume Of Excavation (Not Including Fill)	547 cubic meters
Non-woven Filter Fabric Required	665 square meters
Length Of Isolator Row	17.51 meters
Woven Isolator Row Fabric	114 square meters



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

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Alan Manthe
Site name:	Stocking Lane
Site location:	Catchment B

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.27734° N
Longitude:	6.30082° W
Reference:	951037705
Date:	Jul 20 2020 20:56

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.9889

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1046	1046
Hydrological region:	12	12
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.13	2.13
Growth curve factor 100 years:	2.61	2.61
Growth curve factor 200 years:	2.86	2.86

Notes

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

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

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

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	2.88	2.88
1 in 1 year (l/s):	2.45	2.45
1 in 30 years (l/s):	6.14	6.14
1 in 100 year (l/s):	7.53	7.53
1 in 200 years (l/s):	8.25	8.25

APPENDIX D

Existing Services

Irish Water Webmap

March 22, 2017

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.

UISCE EIREANN : IRISH WATER

Legend

Stormwater Gravity Mains (Irish Water Owned)
- Surface

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

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

Storm Inlets
- Gully
- Standard
- Other; Unknown

Storm Fittings
- Vent/Col
- Other; Unknown

Storm Discharge Points
- Outfall
- Overflow
- Soakaway
- Other; Unknown
- Storm Culverts
- Storm Clean Outs

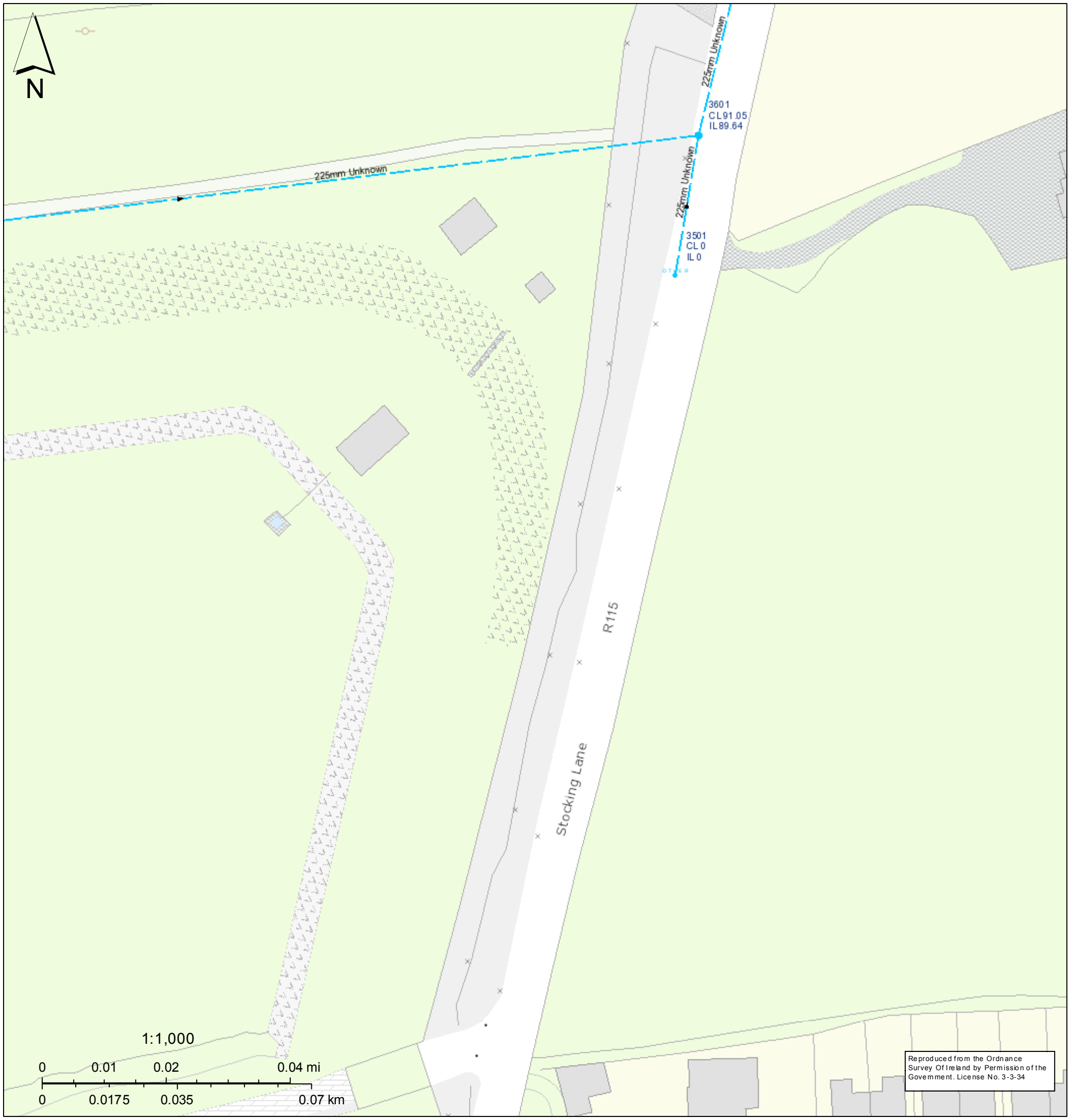
Sewer Gravity Mains (Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

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

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

"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."

Irish Water Webmap



March 22, 2017

Legend

Stormwater Gravity Mains (Irish Water Owned)
- Surface

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

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

Storm Inlets
- Gully
- Standard
- Other; Unknown

Storm Fittings
- Vent/Col
- Other; Unknown

Storm Discharge Points
- Outfall
- Overflow
- Soakaway
- Other; Unknown
- Storm Culverts
- Storm Clean Outs

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

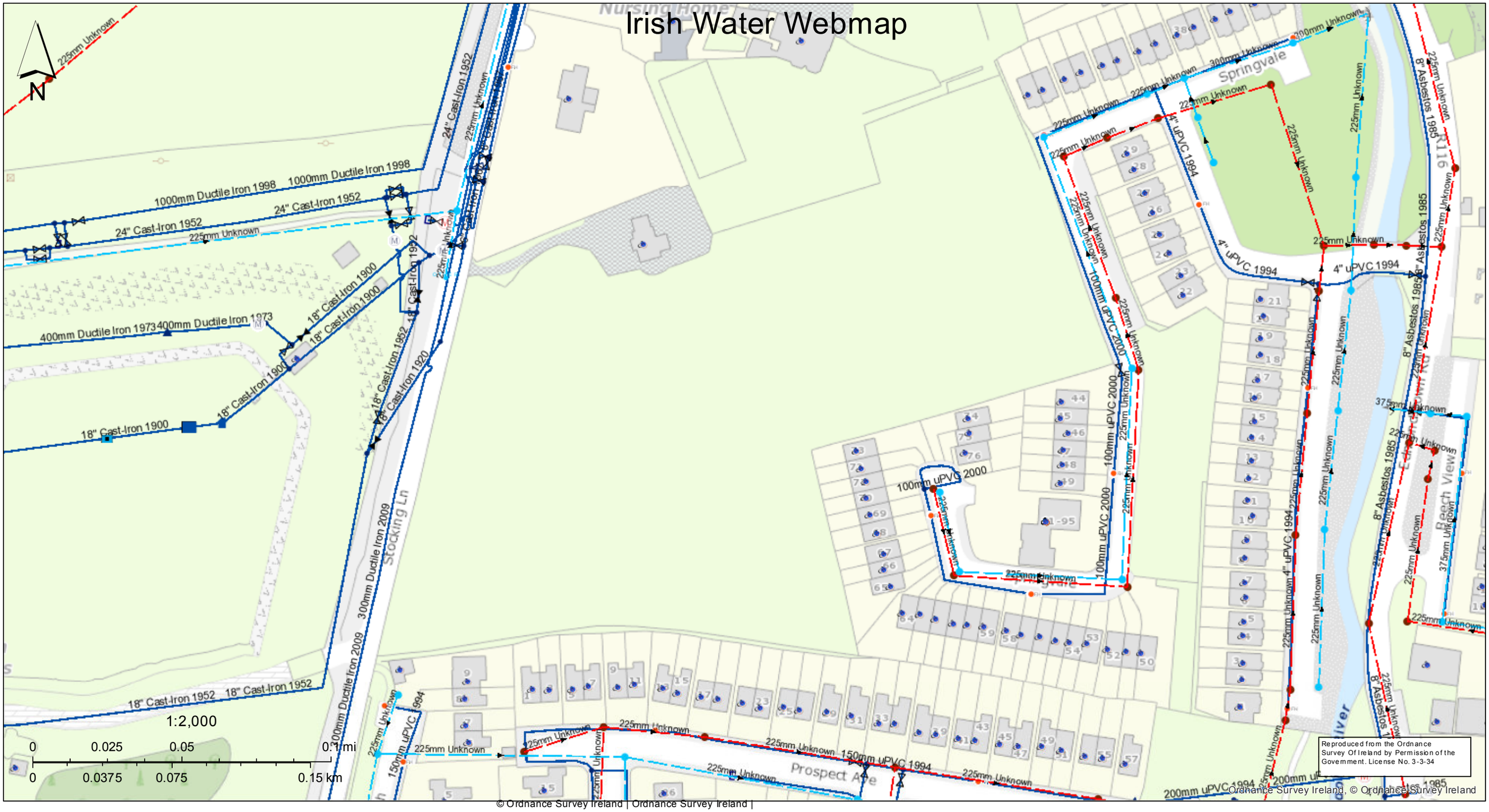
Sewer Gravity Mains (Non-Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Sewer Manholes
- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other; 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."

Irish Water Webmap



March 22, 2017

Legend

Stormwater Gravity Mains (Irish Water Owned)
- Surface

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

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

Storm Inlets
- Gully
- Standard
- Other; Unknown

Storm Fittings
- Vent/Col
- Other; Unknown

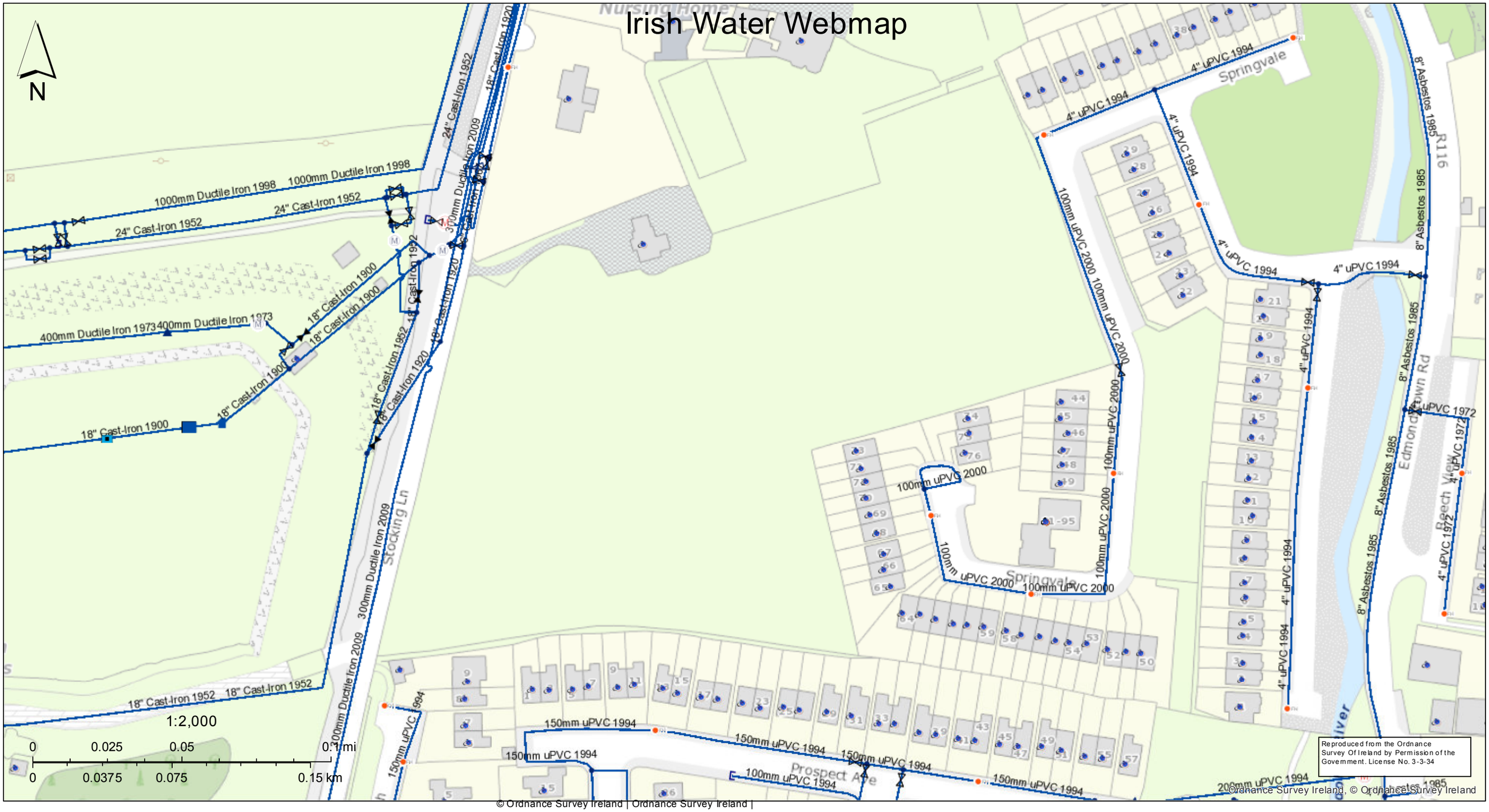
Storm Discharge Points
- Outfall
- Overflow
- Soakaway
- Other; Unknown
- Storm Culverts
- Storm Clean Outs

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

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

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

Irish Water Webmap



March 22, 2017

Legend

Flow Control Valves
- Non-return
- Hydro
- Orifice Plate
- PRV
- PSV
- Other

Boundary Valves
- Open
- Closed
- Part Closed

Non Boundary Valves
- Open
- Closed
- Part Closed
- Air Control Valves
- Water Stop Valves

Non Boundary Meter
- Meter
- Group Scheme
- Source

Boundary Meter
- District (Boundary Meter)

Water Hydrants
- Fire Hydrant
- Fire Hydrant/Washout
- Washout
- Treatment Plant

Reservoir
- Potable
- Raw Water
- Pump Stations
- Water Network Structures
- Abstraction Point
- Kisok
- Water Service Connections

Water Fittings
- Cap
- Other Fitting
- Water Distribution Chambers
- Pressure Monitoring Point

Water Mains(Irish Water Owned)
- Untreated
- Potable Water

Water Mains(Non Irish Water Owned)
- Untreated
- Potable Water

Water Lateral Lines
- Irish Water
- Non IW
- Water Abandoned Lines

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. © Irish Water

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