Ruirside Developments Limited

# 42A Parkgate Street

# Drainage and Watermain Planning Report

PGATE-ARUP-ZZ-XX-RP-CD-0002

Issue 1 | 8 June 2021



Job number 265381-00

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| | | Name | Kieran Dowdall | Gregg Sim | John Flaherty |
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# Contents



## Appendices

# 1 Introduction

This report has been prepared to accompany drainage and watermain drawings as prepared by Arup and architectural drawings prepared by Reddy Architecture and Urbanism for the planning application of a mixed-use residential and commercial development at the former Hickey's site, 42A Parkgate Street, Dublin 8.

The existing development site area is 0.82 hectares which is approximately 95% existing roof and hardstanding areas and contains a number of low-rise buildings which will be demolished. Refer to the architect's layouts for the proposed redevelopment.

The site is located adjacent to the River Liffey fronting onto Parkgate Street to the north, Heuston Station to the south and Wolfe Tone Quay to the southeast. See Figure 1 below for site location.


**Figure 1** Map data © 2021 Google

## 1.1 Proposed Development

In the split decision made by An Board Pleanála (ABP Ref. 306569-20) in 2020, permission was granted at the site for 321 no. Build-to-Rent (BTR) residential units, ancillary residents' amenity facilities, commercial office space, retail space and café/restaurant accommodated in 5no. blocks ranging from 8 to 13 storeys over ancillary basement area, and all associated and ancillary conservation, landscaping and site development works.

Permission was refused for Block A, a 29-storey residential tower, accommodating 160 no. 'BTR' residential units, ancillary residents' internal

amenity areas and external roof gardens, 1 no. café/restaurant and ancillary plant / storage.

The planning application, for which this drainage and watermain report forms part of, seeks permission for a new 30-storey Block A tower design with an increase in 38 residential units to 198, providing an overall number of 519 units for the development.

The Block A building will rely on the permitted site works and shared amenities contained within the wider consented scheme. Therefore, the red line planning application boundary is drawn around the wider planning unit containing the consented scheme and Block A. The consented scheme and Block A is the area assessed as part of this drainage and watermain report and shall be referred to as ‘the development’.

# 2 Existing Drainage Systems

The existing drainage systems on the site are mainly separate with the surface water system discharging unrestricted into the River Liffey and the foul system into the existing sewerage network on Parkgate Street. There is an existing 450mm combined sewer on Parkgate Street discharging in an easterly direction into a 750mm combined sewer on Wolfe Tone Quay, which eventually discharges into the Municipal Wastewater Treatment Plant at Ringsend. Approximately 6% of the existing roof area of the site discharges to the existing sewer on Parkgate Street. Refer to Arup drawing PGATE-ARUP-ZZ-00-DR-CD-0001 in Appendix A and Appendix C for a copy of the existing drainage and sewerage systems in the vicinity.

# 3 Proposed Drainage

Drainage from the development will be drained on a completely separate system, with separate foul and surface water drains connecting to the receiving systems on Parkgate Street and the River Liffey respectively.

Sustainable drainage systems will be incorporated into the design with surface water run-off from the development discharging through a minimum of a two-stage treatment train process prior to discharge by gravity to the River Liffey.

Foul drainage from the development will discharge by gravity to the existing 450mm foul sewer on Parkgate Street.

The drainage systems shall be designed in accordance with Part H of the Building Regulations, EN 752: Drain and Sewer Systems outside Buildings, The Greater Dublin Regional Code of Practice for Drainage Works, Irish Water's Code of Practice for Water and Wastewater and to DCC Drainage Division and Irish Water requirements.

## 3.1 Proposed Foul Drainage

Foul drainage from the development shall be drained by a separate system to that of the surface water drainage system. Foul drainage from the new development shall drain by gravity and discharge to the existing 450mm sewer on the Parkgate Street. See Arup drainage drawings PGATE-ARUP-ZZ-00-DR-CD-0002 and PGATE-ARUP-ZZ-00-DR-CD-0003 in Appendix A, consented under An Board Pleanála ref. 306569-20.

Foul drainage from basement level within Blocks B and C (which is part of the consented scheme) shall drain by gravity to a central pumping chamber and be pumped via a rising main to an external foul manhole prior to discharge by gravity to the existing 450mm foul sewer on Parkgate Street. Incidental run-off from the basement car park will discharge through a Class 2 full retention petrol interceptor before discharge via a pump chamber and rising main to the external foul gravity drainage system. Foul outfall manholes will be constructed to Irish Water's Code of Practice.

The foul drainage system will be designed to take discharges from residential apartments, small office, retail, café/restaurants and gym. Drainage from kitchen/canteen facilities will discharge through a grease separator designed in accordance with IS EN 1825 Part 1 and Part 2 and / or to Irish Water requirements.

The existing structures which included warehousing had 10 number of employees equivalent to a total hydraulic loading of 0.75 $m^3$ per day of foul effluent equating to an average flow of 0.009 litres/second (over a 24-hour period) and a peak flow of 0.04 litres/second based on 4.5 x Dry Weather Flows (DWF). An average daily $BOD_5$ loading of 0.2 kg/day based on 20 grams of $BOD_5$/head/day for office usage.

The development will have an estimated total hydraulic loading of 242$m^3$ per day of foul effluent generated on completion of the development. This equates to an average flow of 2.80 litres/second (over a 24-hour period) and a peak flow of 9.5 litres/second. The final average daily $BOD_5$ loading from the new development

would be 94.6 kg/day. Refer to **Table 1** for a breakdown of foul loading calculations.

Three new foul connections will be required to the existing sewerage system on Parkgate Street in agreement with Irish Water. A Pre-connection Enquiry (PCE) application was submitted to Irish Water on 4 February 2019 to confirm capacity in the receiving network. Based upon details submitted as part of the PCE application, Irish Water confirmed that subject to a specific condition, a connection to the foul sewer network can be facilitated. Irish Water Confirmation of Feasibility Statement outlined the condition to construct a new surface water sewer on Parkgate Street to reduce the equivalent surface water peak flows from their network, to accommodate the proposed development.

Arup has carried out an equivalent surface water area catchment design and has agreed with Dublin City Council Drainage Division and Irish Water for the construction of a new surface water sewer on Parkgate Street to remove surface water run-off from Irish Water network. Refer to Arup drawing PGATE-ARUP-ZZ-00-DR-CD-0004 for a copy of the proposed sewer improvement works on Parkgate Street.

DCC drainage construction standards in accordance to the Greater Dublin Regional Code of Practice for Drainage Works shall be applied to all surface water infrastructure proposed in the public way. A pre-construction CCTV survey on the public surface water sewers affected by the development will be undertaken. See Arup drainage drawings PGATE-ARUP-ZZ-00-DR-CD-0002 and PGATE-ARUP-ZZ-00-DR-CD-0004 in Appendix A, consented under An Board Pleanála ref. 306569-20.

Refer to Appendix E for a copy of the Confirmation of Feasibility and Design Acceptance Statements from Irish Water and correspondence confirming the agreed number of 519 residential units to rectify the anomaly in Irish Water Tri-Partite letter to ABP, dated 1 February 2021.

**Table 1** Development foul loading

| Use type | Nett floor area ($m^2$) | Number of units | Occupancy level | Number of persons | Design flows (litres per person per day) | Peaking Factor | Daily foul loading (litres) |
|---|---|---|---|---|---|---|---|
| Commercial / offices | 3,422 | - | 1 person / 10$m^2$ | 342 | 75 | 6.0 | 25,650 |
| Commercial / Retail | 214 | - | 1 staff / 20$m^2$ | 11 | 50 | 6.0 | 550 |
| Amenity / Gym | 150 | - | 1 staff / 55$m^2$ | 3 | 45 | 6.0 | 135 |
| Visitors to gym | - | - | - | 400 | 10 | 6.0 | 4,000 |
| Residential | - | 519 | 2.7 persons / unit | 1,401 | 150 | 3.0 | 210,150 |
| Cafes | 459 | | | 140 | 12 | 6.0 | 1,680 |
| | | | | | | Total | 242,165 |

## 3.2 Proposed Surface Water Drainage

Surface water run-off from the development shall drain by gravity and discharge to the River Liffey. Sustainable drainage systems will be incorporated into the development and will include greenroofs, raingardens, filter strips, filter drains, rainwater harvesting for irrigation purposes and surface water treatment systems. Surface water run-off will go through a minimum of two-stage treatment prior to discharge by gravity to the River Liffey. The proposed SuDS measures will reduce the quantity and improve the quality of water discharging into the receiving system, see Section 3.3 below.

Run-off from roofs and paved areas will discharge unrestricted to the River Liffey above the 1 in 200-year tidal event plus 20% climate change of 3.82m OD. A non-return valve will be located at the outfall headwall in agreement with DCC Drainage Division.

## 3.3 Surface Water Management Plan

The proposed Surface Water Management Plan is in line with the key requirements of the Dublin City Council Drainage Division Planning & Development Control Section. The proposed surface water drainage system takes cognisance of the Dublin City Development Plan 2016 – 2022 with respect to Sustainable Drainage Systems (SuDS) Section 9.5.4. The proposed SuDS measures provide a minimum of two stage treatment train approach including interception and primary and secondary treatment of surface water run-off. This treatment approach is in line with The CIRIA SuDS Manual C753 and is outlined below.

### 3.3.1 Greenroof

The proposed greenroofs will be mainly sedum (extensive type) covering c. 60% of the roof areas and will provide interception of rainfall, filtration through the medium, storage within the voids facilitating evapotranspiration.

The greenroofs will intercept and absorb the first 5 – 10mm of rainfall thereby reducing the volume of run-off into the receiving systems. Rainfall run-off that is not absorbed by the greenroof will filtrate through substrate and geotextile filter fabric. A limited attenuation volume will be provided by the greenroof drainage layer system below the geotextile filter fabric, which will provide a time delay between the rainfall event and discharge into the system thereby reducing peak flow discharge rates. According to the leading greenroof supplier / manufacturer Bauder, up to 40% of the average annual rainfall can be absorbed and released back into the atmosphere by transpiration and evaporation.

Amenity areas at roof-top level account for c. 11% of roof space. These areas will drain onto or into adjacent extensive and intensive greenroofs providing a total of 60% roof area with 2-stage treatment. The remaining c. 40% of roof area will discharge into rainwater harvesting tanks for use as irrigation of planting in amenity rooftop areas. This measure will provide a single stage treatment and a second stage treatment through catchpits on the receiving drainage system.

Therefore, rainfall run-off from roof areas will go through a two-stage treatment train including interception and primary treatment in line with SuDS Manual C753 Table 26.7, replicated in Table 1 Section 4.

### 3.3.2 Raingarden

Raingardens proposed adjacent to Block B1 will allow surface water run-off from paved areas to pond temporarily before filtering through vegetation and underlaying soil before discharge into the system.

Paved areas at ground level will discharge into the proposed raingardens. The raingardens will serve as a bio-retention system providing interception as the water discharges through plants, shrubs and landscape medium. The planters will provide temporary retention for the 1 in 1-year event in the shallow depressions. Sand based material circa 750 – 850mm deep will be used to filter the water passing through. Further filtration will be provided by the geotextile filter membrane prior to discharge into the surface water system.

Therefore, rainfall run-off from approximately 11% of paved areas at ground level will go through a three-stage treatment train including interception, primary and secondary treatment in line with SuDS Manual C753 Table 26.7.

### 3.3.3 Filter Drains

Filter drains proposed in the Private Amenity landscaped area between Blocks B1 and C will reduce peak run-off rates prior to discharge into the surface water drainage system. The filter drains are linear excavations filled with suitable granular material with a minimum void porosity of 30% and wrapped in a geotextile filter

membrane. Catchpits will also be provided downstream of the infiltration trenches to provide primary treatment. The granular material and geotextile filter material will provide interception and act as a secondary treatment in preventing ingress of fine material from paved areas prior to discharge into surface water drainage system.

Therefore, rainfall run-off from approximately 14% of paved areas discharging into the filter drains / catchpits will go through a three-stage treatment train including interception, primary and secondary treatment in line with SuDS Manual C753 Table 26.7.

### 3.3.4 Filter Strips

Filter strips proposed in the Private Amenity landscaped area between Blocks B1 and C will provide interception from impermeable areas before discharging into the filter drains or surface water drainage system. This additional measure will promote sedimentation and filtration thereby providing primary treatment.

Therefore, rainfall run-off from paved areas discharging into the filter strips will go through treatment train including interception and primary treatment in line with SuDS Manual C753 Table 26.7.

### 3.3.5 Proprietary Surface Water Treatment System

As a portion of the external pavement including some low-level roof terraces equivalent to 17% of the site area will receive a single stage treatment using catchpits, proprietary surface water treatment system like “First Defense or Downstream Defender” will be incorporated into the drainage system to ensure the run-off will receive a minimum of 2-stage treatment. This additional measure will improve the quality of surface water run-off discharging into the receiving system, in compliance with best drainage practice and SuDS requirements. The “First Defense or Downstream Defender” will provide removal efficiency rates of 50% for suspended solids and 80% for hydrocarbons. Refer to Appendix F for Hydro-International Guide to Surface Water Treatment System and their compliance with SuDS Manual C753. Third party testing has confirmed Mitigation Indices for proprietary surface water treatment systems similar to swales and ponds. All surface water run-off from the site will discharge by gravity through these treatment systems prior to discharge to the River Liffey.

### 3.3.6 Summary of SuDS Measures

The proposed comprehensive Surface Water Management Plan for the development, carried out in consultation with Mitchell & Associates Landscape Architects, is in line with the key requirements of the Dublin City Drainage Division and the Dublin City Development Plan 2016 – 2022 with respect to Sustainable Drainage Systems.

Rainfall run-off from the proposed site development will go through at least a two-stage treatment train prior to discharge into the River Liffey.

**Table 2** is a summary of the proposed SuDS measures for the development and the management train in line with The CIRIA SuDS Manual C753. The key SuDS measures for the proposed development include but are not limited to greenroofs, raingardens, filter drains, filter strips and rainwater harvesting for irrigation purposes.

**Table 2** SuDS Component and Treatment Train (Source CIRIA C753)

| SuDS Component | Interception | Close to source / primary treatment | Secondary treatment | Tertiary treatment |
|---|---|---|---|---|
| Greenroof | Yes | Yes | | |
| Bio-retention Raingarden / raised planters | Yes | Yes | Yes | |
| Filter drains | Yes | | Yes | |
| Rainwater harvesting | Yes | | | |
| Filter strip | Yes | Yes | | |
| Catchpits | | Yes | | |
| Proprietary treatment systems | | Yes (where design performance can be demonstrated) | Yes (where design performance can be demonstrated) | Yes (where design performance can be demonstrated) |

## 3.4 Flood Risk Assessment

Please see separate report for Flood Risk Assessment.

# 4 Watermains

The water supply connection to the proposed development will be from the existing 150mm public main adjacent to the site on Parkgate Street with a cross-connection to the 600mm public main running in parallel with the 150mm public main, as directed by Irish Water.

The proposed watermain system will be designed to supply water to the redevelopment with sluice valves and hydrants located in compliance with Part B of the Building Regulations and the local Fire Officers requirements. See Arup drawing PGATE-ARUP-ZZ-00-DR-CD-0002 for layout of the watermain and connection to the public network, consented under An Board Pleanála ref. 306569-20.

A Pre-connection Enquiry Application was submitted to Irish Water on 4 February 2019 to confirm capacity in the network. Based upon details submitted as part of the application, Irish Water confirmed that a water supply connection can be facilitated. Refer to Irish Water Confirmation of Feasibility Statement. A new water connection from the existing mains on Parkgate Street will be required in agreement with Irish Water.

We expect the peak flow demand for the proposed development to be in the region of 17.51 litres/second.

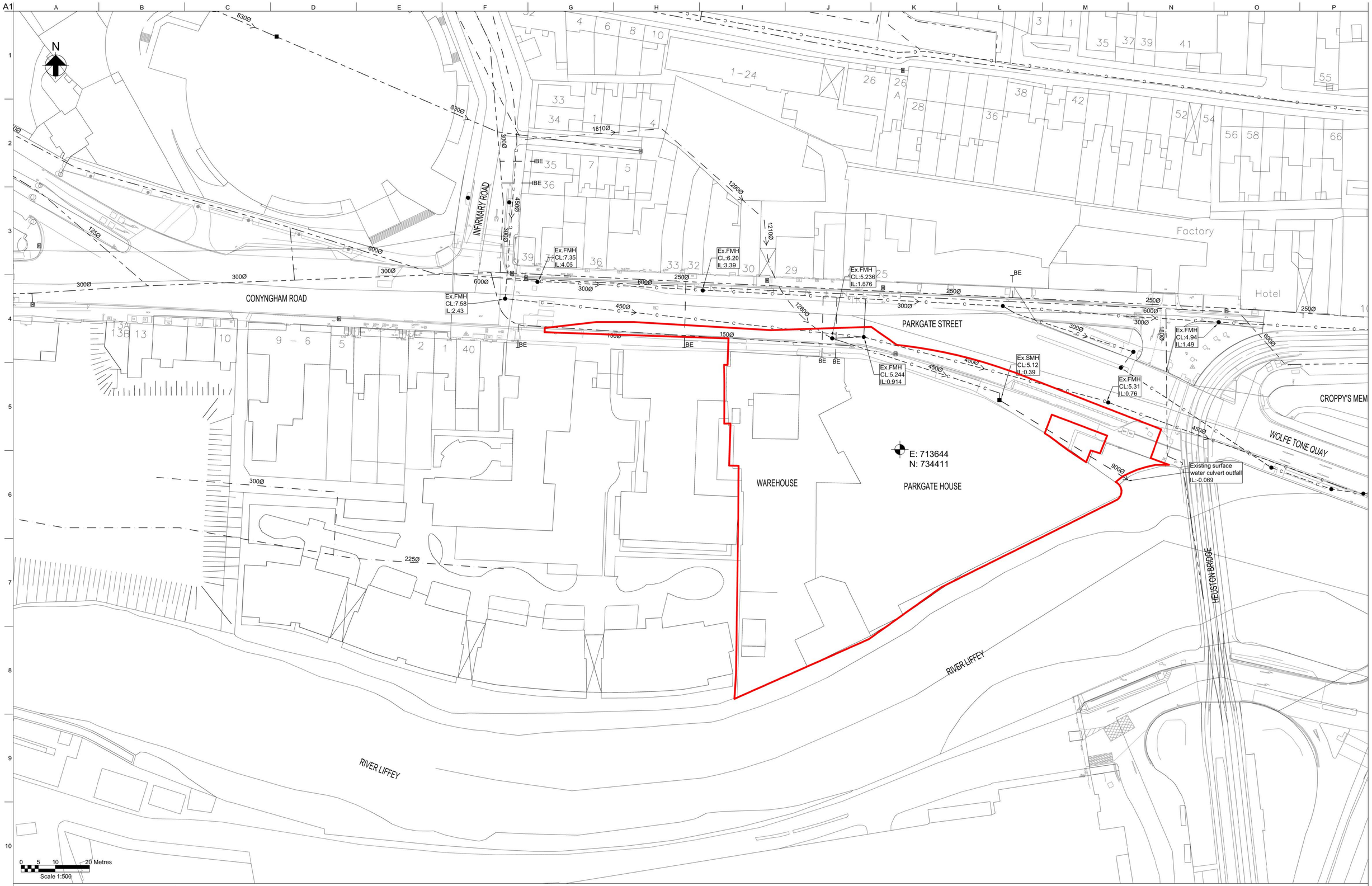
The installation of low flow fittings and a rainwater harvesting system for the development will reduce the demand on the existing water supply network.

Refer to Appendix E for a copy of the Confirmation of Feasibility and Design Acceptance Statements from Irish Water and correspondence confirming the agreed number of 519 residential units to rectify the anomaly in Irish Water Tri-Partite letter to ABP, dated 1 February 2021.

# Appendix A

Arup Drawings

A1




Legend

- Existing Watermain — Hydrant
- Existing Surface Sewer — Ex. SMH
- Existing Combined Sewer — Ex. FMH
- Site Boundary Line

| Rev | Date | By | Chkd | Appd |
|---|---|---|---|---|
| PL3 | 08/06/21 | SB | KD | GS |
| Issued for Planning (Status A2) | | | | |

| Rev | Date | By | Chkd | Appd |
|---|---|---|---|---|
| C01 | 10/02/21 | SB | GS | GS |
| Issued for Stage 1 Tender (Status A3) | | | | |
| PL2 | 11/12/20 | SB | KD | KD |
| Pre-app Submission | | | | |
| PL1 | 17/12/19 | MC | AB | KD |
| Planning Issue | | | | |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Client
Ruirside Developments Limited

Project Title
Parkgate Street Redevelopment

Drawing Title
Existing Drainage and Watermain Site Plan Layout

Scale at A1 1:500
Role Civil
Suitability A2 - Approved for Planning
Arup Job No 265381-00
Rev PL3
Name PGATE-ARUP-ZZ-00-DR-CD-0001

Do not scale


## GENERAL SURFACE WATER MANAGEMENT PLAN

Notes:

1. Proposed extensive and intensive greenroof equivalent to 60% of total roof area offering a two-stage treatment train including interception and primary treatment in line with CIRIA Manual C753 Table 26.7

   Run-off from the amenity area at roof level equivalent to 374m² or 11% of total roof area will discharge into the proposed greenroofs.

   Therefore a roof area equivalent to 60% of total roof area, will discharge into the proposed extensive and intensive greenroofs providing interception of rainfall, filtration through the medium, storage within the voids and evapotranspiration. The remaining 40% will collect roof run-off into the rainwater butts for re-use as irrigation of planting in the amenity roof gardens.

2. Run-off from pavement at ground level equivalent to 941m² or 13.8% of site area will discharge into the proposed filter drain, offering a three-stage treatment train including interception, primary and secondary treatment in line with CIRIA Manual C753 Table 26.7. The proposed filter drain will reduce peak run-off rates prior to discharge into raingardens or surface water drainage system.

3. Proposed filter strips will provide interception from impermeable areas before discharge into filter drains. This addcitional measure will promote sedimentation and filtration thereby providing 2 stage treatment.

4. Run-off from pavement at ground level equivalent to 707m² or 10.3% of site area will discharge into the proposed raingardens, (Bio-retention system) offering a three-stage treatment train including interception, primary and secondary treatment in line with CIRIA Manual C753 Table 26.7.
   The proposed raingardens will allow surface water run-off frcm paved areas to pond temporarily before filtering through vegetation and underlaying soils and discharge into the system.

5. Discharge to the River Liffey through a proposed surface water treatment system as shown.

Legend

- Existing Watermain
- Existing Surface Sewer
- Existing Combined Sewer
- Proposed Surface Water Drain (225Ø 1:72, SIC1, CP=Catch Pit)
- Proposed Foul Drain (225Ø 1:80, FMH1)
- Proposed Watermain (SV = Sluice valve, ScV = Scour valve, Hydrant, 100Ø)
- Proposed Water Meter (WM)
- Proposed Paving Gully (PG)
- Prposed Drainage Channel (DC, SLI)
- Proposed Filter drain (FD)
- Proposed Rain Garden
- Proposed Filter Strip
- Proposed Surface Water Treatment System (SWTS)
- Proposed Low Level Land Drain (100Ø)
- Site Bourdary Line

Note:

Refer to M&A drawings for Greenroof layouts .

| Rev | Date | By | Chkd | Appd |
|---|---|---|---|---|
| PL3 | 08/06/21 | SB | KD | GS |
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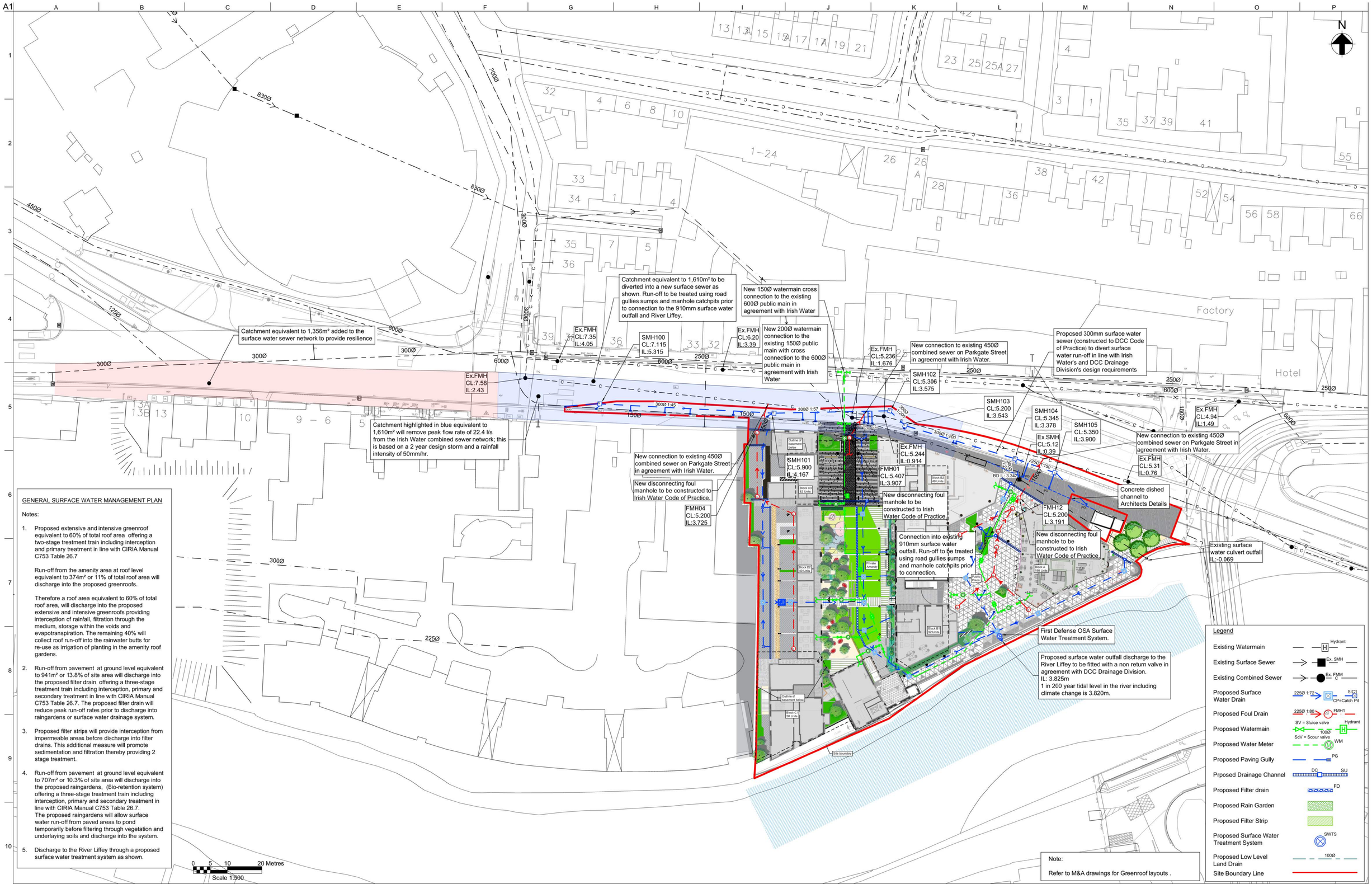
Client: Ruirside Developments Limited

Project Title: 42A Parkgate Street

Drawing Title: Proposed Drainage and Watermain Layout

Scale at A1: 1:250
Role: Civil
Suitability: A2 - Approved for Planning
Arup Job No: 265381-00
Rev: PL3
Name: PGATE-ARUP-ZZ-00-DR-CD-0002

A1

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2. Run-off from pavement at ground level equivalent to 941m² or 13.8% of site area will discharge into the proposed filter drain offering a three-stage treatment train including interception, primary and secondary treatment in line with CIRIA Manual C753 Table 26.7. The proposed filter drain will reduce peak run-off rates prior to discharge into raingardens or surface water drainage system.

3. Proposed filter strips will provide interception from impermeable areas before discharge into filter drains. This additional measure will promote sedimentation and filtration thereby providing 2 stage treatment.

4. Run-off from pavement at ground level equivalent to 707m² or 10.3% of site area will discharge into the proposed raingardens, (Bio-retention system) offering a three-stage treatment train including interception, primary and secondary treatment in line with CIRIA Manual C753 Table 26.7.
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- Proposed Filter drain (FD)
- Proposed Rain Garden
- Proposed Filter Strip
- Proposed Surface Water Treatment System (SWTS)
- Proposed Low Level Land Drain (100Ø)
- Site Boundary Line

Note:

Refer to M&A drawings for Greenroof layouts .

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Drawing Title: Proposed Drainage and Watermain Site Plan Layout

Scale at A1: 1:500

Role: Civil

Suitability: A2 - Approved for Planning

Arup Job No: 265381-00

Rev: PL3

Name: PGATE-ARUP-ZZ-00-DR-CD-0004

Do not scale

# Appendix B

Storm Water Attenuation Calculations

# Technical Note

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| Project title | Parkgate Street Redevelopment | Job number | 265381-00 |
| cc | Kieran Dowdall<br>Alan Fitzsimons<br>Sean Barrett | File reference | P01 |
| Prepared by | Alpha Barry | Date | 06 December 2019 |
| Subject | Proposed Surface Water Drainage Design | | |

# 1 Microdrainage Simulation Summary

The Parkgate Street Redevelopment proposed surface water drainage system is designed for a 2 year storm return period. The system is simulated and indicates no surface flooding at any part of the site for storms up to and including the 1:100 year return period plus 20% for climate change. Refer to Arup drawing C-0002 Proposed Drainage Layout for the surface water drainage layout.

# 2 Introduction

Microdrainage design software is based on the Wallingford procedure. It has the ability to model and analyse fully integrated drainage systems. The rainfall and runoff variables required are explained under the following headings.

# 3 Design Criteria and Loading

The Parkgate Street Redevelopment proposed surface water drainage system is designed in accordance with Part H of the Building Regulations, BS EN 752 Drain and Sewer System, the Greater Dublin Regional Code of Practice for Drainage Works.

The Flood Studies Report (FSR) rainfall methodology is used in the programme. Rainfall is calculated using Region, Return Period, M5-60, and Ratio R as explained further below.

The programme uses the M5-60 (60 minutes storm duration of 5 year return period) and ratio R (M5-60/M5-2 day) to calculate the intensity/duration/ frequency characteristics for any location in Ireland.

A rainfall depth of 16.300mm on 60 minutes storm duration of 5 year return period and a ratio of 0.278 was applied as design criteria on Microdrainage. Refer to this report for a copy of the Met Eireann Rainfall Statistics for the location.

## 4 Storm Network Details

The storm network is designed on Microdrainage using a 2 year return period. The pipe network and gradient are assigned using the Modified Rational Method where:

Q (l/s) = Cv*Cr*(2.78*I(mm/hr)*A (ha))

Cv= 0.75 and Cr= 1.3 (as recommended by the Wallingford Procedure)

Run-off from roofs will discharge via a suspended pipework into a surface water system at ground level. The roads and paving at grade level are drained by gravity via a system of road gullies, drainage channels and filter drains. The proposed surface water system at ground level is a series of drains and catchpits. The system discharges unrestricted into the River Liffey following a two-stage treatment train in line with SuDS Manual C753 Table 26.7. Therefore, there are no online control devices such as Hydrobrakes or orifices. The surface water system has no offline controls such as overflow pipes.

There are no attenuation systems in place as the proposed surface water system discharges unrestricted to the River Liffey above the 1 in 200-year tidal event plus 20% climate change of 3.82m OD. The proposed surface water system is simulated for the critical 1 in 100 year return including climate change. Refer to this Report for a copy of the simulation of the surface water system.

A non-return valve will be located at the outfall headwall in agreement with DCC Drainage Division.

## 5 Network Simulation

The level of service includes no surface flooding for return periods up to 1:100 year plus 20% for climate change. Detailed summary of critical results of the 2 year+20%, 30 year+20% and 100 year + 20% is included in this report.

**DOCUMENT CHECKING (not mandatory for File Note)**

| | Prepared by | Checked by | Approved by |
|---|---|---|---|
| Name | Alpha Barry | Kieran Dowdall | Kieran Dowdall |
| Signature | | | |

Microdrainage Simulation

## 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) | 2 | PIMP (%) | 100 |
| M5-60 (mm) | 16.300 | Add Flow / Climate Change (%) | 0 |
| Ratio R | 0.278 | Minimum Backdrop Height (m) | 0.200 |
| Maximum Rainfall (mm/hr) | 500 | Maximum Backdrop Height (m) | 1.500 |
| Maximum Time of Concentration (mins) | 300 | Min Design Depth for Optimisation (m) | 1.200 |
| 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

Design criteria and loading

## 2 year Return Period 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 Storage Structures | 0 |
| Number of Online Controls | 0 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | | FSR | Ratio R 0.278 |
| Region | Scotland and Ireland | Cv (Summer) | 0.750 |
| M5-60 (mm) | 16.300 | Cv (Winter) | 0.840 |

| | |
|---|---|
| Margin for Flood Risk Warning (mm) | 0.0 |
| Analysis Timestep | 2.5 Second Increment (Extended) |
| DTS Status | ON |
| 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) | 2, 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) |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | SCP1 | 360 Winter | 2 | +20% | 30/15 Summer | | | | 4.366 |
| S2.000 | SAJ13 | 15 Winter | 2 | +20% | | | | | 4.833 |
| S2.001 | SIC14 | 15 Winter | 2 | +20% | | | | | 4.616 |
| S2.002 | SIC15 | 15 Winter | 2 | +20% | | | | | 4.522 |
| S3.000 | SIC17 | 15 Summer | 2 | +20% | | | | | 4.579 |
| S2.003 | SCP16 | 15 Winter | 2 | +20% | 30/15 Summer | | | | 4.418 |
| S2.004 | SCP17 | 15 Winter | 2 | +20% | 30/15 Summer | | | | 4.339 |
| S1.001 | SCP3 | 15 Winter | 2 | +20% | 30/15 Summer | | | | 4.158 |
| S1.002 | SCP4 | 15 Winter | 2 | +20% | 30/15 Summer | | | | 4.143 |
| S1.003 | SCP5 | 15 Winter | 2 | +20% | 30/15 Summer | | | | 4.120 |
| S1.004 | SCP6 | 15 Winter | 2 | +20% | 30/15 Summer | | | | 4.083 |
| S4.000 | SCP7 | 15 Winter | 2 | +20% | 30/15 Summer | | | | 4.365 |
| S4.001 | SCP8 | 15 Winter | 2 | +20% | 30/15 Summer | | | | 4.156 |
| S5.000 | SCP10 | 15 Winter | 2 | +20% | 100/15 Summer | | | | 4.496 |
| S5.001 | SCP11 | 15 Winter | 2 | +20% | 100/15 Summer | | | | 4.154 |
| S1.005 | SCP9 | 15 Winter | 2 | +20% | 2/15 Winter | | | | 4.022 |

## 2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|
| S1.000 | SCP1 | -0.225 | 0.000 | 0.00 | | 0.0 | OK | |
| S2.000 | SAJ13 | -0.053 | 0.000 | 0.45 | | 2.7 | OK* | |
| S2.001 | SIC14 | -0.096 | 0.000 | 0.27 | | 4.3 | OK* | |
| S2.002 | SIC15 | -0.096 | 0.000 | 0.28 | | 4.4 | OK* | |
| S3.000 | SIC17 | -0.121 | 0.000 | 0.08 | | 1.9 | OK* | |
| S2.003 | SCP16 | -0.073 | 0.000 | 0.52 | | 7.5 | OK | |
| S2.004 | SCP17 | -0.076 | 0.000 | 0.48 | | 7.3 | OK | |
| S1.001 | SCP3 | -0.088 | 0.000 | 0.48 | | 24.9 | OK | |
| S1.002 | SCP4 | -0.070 | 0.000 | 0.91 | | 46.6 | OK | |
| S1.003 | SCP5 | -0.064 | 0.000 | 0.81 | | 45.6 | OK | |
| S1.004 | SCP6 | -0.053 | 0.000 | 0.71 | | 44.9 | OK | |
| S4.000 | SCP7 | -0.091 | 0.000 | 0.66 | | 25.7 | OK | |
| S4.001 | SCP8 | -0.130 | 0.000 | 0.60 | | 36.2 | OK | |
| S5.000 | SCP10 | -0.070 | 0.000 | 0.55 | | 9.4 | OK | |
| S5.001 | SCP11 | -0.148 | 0.000 | 0.25 | | 9.3 | OK | |
| S1.005 | SCP9 | 0.002 | 0.000 | 1.17 | | 95.0 | SURCHARGED | |

Simulation results for 2 year return period

## 30 year Return Period 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 Storage Structures | 0 |
| Number of Online Controls | 0 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | | FSR | Ratio R 0.278 |
| Region | Scotland and Ireland | Cv (Summer) | 0.750 |
| M5-60 (mm) | 16.300 | Cv (Winter) | 0.840 |

| | |
|---|---|
| Margin for Flood Risk Warning (mm) | 0.0 |
| Analysis Timestep | 2.5 Second Increment (Extended) |
| DTS Status | ON |
| 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) | 2, 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) |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | SCP1 | 15 Winter | 30 | +20% | 30/15 Summer | | | | 4.642 |
| S2.000 | SAJ13 | 15 Winter | 30 | +20% | | | | | 4.855 |
| S2.001 | SIC14 | 15 Winter | 30 | +20% | | | | | 4.712 |
| S2.002 | SIC15 | 15 Winter | 30 | +20% | | | | | 4.618 |
| S3.000 | SIC17 | 15 Winter | 30 | +20% | | | | | 4.700 |
| S2.003 | SCP16 | 15 Winter | 30 | +20% | 30/15 Summer | | | | 4.707 |
| S2.004 | SCP17 | 15 Winter | 30 | +20% | 30/15 Summer | | | | 4.672 |
| S1.001 | SCP3 | 15 Winter | 30 | +20% | 30/15 Summer | | | | 4.646 |
| S1.002 | SCP4 | 15 Winter | 30 | +20% | 30/15 Summer | | | | 4.576 |
| S1.003 | SCP5 | 15 Winter | 30 | +20% | 30/15 Summer | | | | 4.476 |
| S1.004 | SCP6 | 15 Winter | 30 | +20% | 30/15 Summer | | | | 4.377 |
| S4.000 | SCP7 | 15 Winter | 30 | +20% | 30/15 Summer | | | | 4.530 |
| S4.001 | SCP8 | 15 Winter | 30 | +20% | 30/15 Summer | | | | 4.298 |
| S5.000 | SCP10 | 15 Winter | 30 | +20% | 100/15 Summer | | | | 4.546 |
| S5.001 | SCP11 | 15 Winter | 30 | +20% | 100/15 Summer | | | | 4.225 |
| S1.005 | SCP9 | 15 Winter | 30 | +20% | 2/15 Winter | | | | 4.200 |

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|
| S1.000 | SCP1 | 0.051 | 0.000 | 0.04 | | 1.4 | SURCHARGED | |
| S2.000 | SAJ13 | -0.031 | 0.000 | 0.81 | | 4.9 | OK* | |
| S2.001 | SIC14 | 0.000 | 0.000 | 0.54 | | 8.5 | SURCHARGED* | |
| S2.002 | SIC15 | 0.000 | 0.000 | 0.46 | | 7.3 | SURCHARGED* | |
| S3.000 | SIC17 | 0.000 | 0.000 | 0.15 | | 3.3 | SURCHARGED* | |
| S2.003 | SCP16 | 0.217 | 0.000 | 0.84 | | 12.0 | SURCHARGED | |
| S2.004 | SCP17 | 0.257 | 0.000 | 0.87 | | 13.3 | SURCHARGED | |
| S1.001 | SCP3 | 0.400 | 0.000 | 0.69 | | 36.2 | SURCHARGED | |
| S1.002 | SCP4 | 0.362 | 0.000 | 1.55 | | 78.9 | SURCHARGED | |
| S1.003 | SCP5 | 0.291 | 0.000 | 1.38 | | 78.4 | SURCHARGED | |
| S1.004 | SCP6 | 0.241 | 0.000 | 1.23 | | 78.1 | SURCHARGED | |
| S4.000 | SCP7 | 0.074 | 0.000 | 1.14 | | 44.8 | SURCHARGED | |
| S4.001 | SCP8 | 0.011 | 0.000 | 1.12 | | 67.2 | SURCHARGED | |
| S5.000 | SCP10 | -0.020 | 0.000 | 0.99 | | 16.8 | OK | |
| S5.001 | SCP11 | -0.077 | 0.000 | 0.44 | | 16.1 | OK | |
| S1.005 | SCP9 | 0.179 | 0.000 | 2.16 | | 175.1 | SURCHARGED | |

Simulation results for 30 year return period

## 100 year Return Period 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 Storage Structures | 0 |
| Number of Online Controls | 0 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Ratio R | 0.278 |
| Region | Scotland and Ireland | Cv (Summer) | 0.750 |
| M5-60 (mm) | 16.300 | Cv (Winter) | 0.840 |

| | |
|---|---|
| Margin for Flood Risk Warning (mm) | 0.0 |
| Analysis Timestep | 2.5 Second Increment (Extended) |
| DTS Status | ON |
| 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) | 2, 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) |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | SCP1 | 15 Winter | 100 | +20% | 30/15 Summer | | | | 4.928 |
| S2.000 | SAJ13 | 15 Winter | 100 | +20% | | | | | 4.886 |
| S2.001 | SIC14 | 30 Winter | 100 | +20% | | | | | 4.712 |
| S2.002 | SIC15 | 30 Winter | 100 | +20% | | | | | 4.618 |
| S3.000 | SIC17 | 30 Winter | 100 | +20% | | | | | 4.700 |
| S2.003 | SCP16 | 15 Winter | 100 | +20% | 30/15 Summer | | | | 4.993 |
| S2.004 | SCP17 | 15 Winter | 100 | +20% | 30/15 Summer | | | | 4.954 |
| S1.001 | SCP3 | 15 Winter | 100 | +20% | 30/15 Summer | | | | 4.934 |
| S1.002 | SCP4 | 15 Winter | 100 | +20% | 30/15 Summer | | | | 4.867 |
| S1.003 | SCP5 | 15 Winter | 100 | +20% | 30/15 Summer | | | | 4.716 |
| S1.004 | SCP6 | 15 Winter | 100 | +20% | 30/15 Summer | | | | 4.568 |
| S4.000 | SCP7 | 15 Winter | 100 | +20% | 30/15 Summer | | | | 4.754 |
| S4.001 | SCP8 | 15 Winter | 100 | +20% | 30/15 Summer | | | | 4.435 |
| S5.000 | SCP10 | 15 Winter | 100 | +20% | 100/15 Summer | | | | 4.696 |
| S5.001 | SCP11 | 15 Winter | 100 | +20% | 100/15 Summer | | | | 4.359 |
| S1.005 | SCP9 | 15 Winter | 100 | +20% | 2/15 Winter | | | | 4.304 |

## 100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|
| S1.000 | SCP1 | 0.337 | 0.000 | 0.06 | | 2.5 | SURCHARGED | |
| S2.000 | SAJ13 | 0.000 | 0.000 | 0.94 | | 5.7 | SURCHARGED* | |
| S2.001 | SIC14 | 0.000 | 0.000 | 0.52 | | 8.2 | SURCHARGED* | |
| S2.002 | SIC15 | 0.000 | 0.000 | 0.53 | | 8.4 | SURCHARGED* | |
| S3.000 | SIC17 | 0.000 | 0.000 | 0.13 | | 3.0 | SURCHARGED* | |
| S2.003 | SCP16 | 0.503 | 0.000 | 1.04 | | 14.9 | SURCHARGED | |
| S2.004 | SCP17 | 0.538 | 0.000 | 1.09 | | 16.6 | SURCHARGED | |
| S1.001 | SCP3 | 0.688 | 0.000 | 0.84 | | 44.3 | SURCHARGED | |
| S1.002 | SCP4 | 0.654 | 0.000 | 1.90 | | 96.5 | SURCHARGED | |
| S1.003 | SCP5 | 0.532 | 0.000 | 1.69 | | 95.5 | SURCHARGED | |
| S1.004 | SCP6 | 0.432 | 0.000 | 1.51 | | 95.5 | SURCHARGED | |
| S4.000 | SCP7 | 0.298 | 0.000 | 1.39 | | 54.2 | SURCHARGED | |
| S4.001 | SCP8 | 0.148 | 0.000 | 1.35 | | 81.5 | SURCHARGED | |
| S5.000 | SCP10 | 0.130 | 0.000 | 1.16 | | 19.7 | SURCHARGED | |
| S5.001 | SCP11 | 0.057 | 0.000 | 0.55 | | 20.2 | SURCHARGED | |
| S1.005 | SCP9 | 0.284 | 0.000 | 2.64 | | 214.6 | SURCHARGED | |

Simulation results for 100 year return period

# Rainfall Statistics

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 313712, Northing: 234384,

| | Interval | | Years | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DURATION | 6months, | 1year, | 2, | 3, | 4, | 5, | 10, | 20, | 30, | 50, | 75, | 100, | 150, | 200, | 250, | 500, |
| 5 mins | 2.4, | 3.5, | 4.1, | 5.0, | 5.6, | 6.1, | 7.7, | 9.5, | 10.7, | 12.4, | 14.0, | 15.2, | 17.1, | 18.6, | 19.8, | N/A , |
| 10 mins | 3.4, | 4.9, | 5.7, | 7.0, | 7.8, | 8.5, | 10.7, | 13.2, | 14.9, | 17.3, | 19.5, | 21.2, | 23.8, | 25.9, | 27.6, | N/A , |
| 15 mins | 4.0, | 5.7, | 6.7, | 8.2, | 9.2, | 10.0, | 12.6, | 15.6, | 17.6, | 20.4, | 22.9, | 24.9, | 28.0, | 30.4, | 32.4, | N/A , |
| 30 mins | 5.3, | 7.5, | 8.7, | 10.5, | 11.8, | 12.7, | 15.9, | 19.6, | 22.0, | 25.4, | 28.5, | 30.8, | 34.5, | 37.4, | 39.7, | N/A , |
| 1 hours | 7.0, | 9.8, | 11.3, | 13.6, | 15.1, | 16.3, | 20.2, | 24.6, | 27.5, | 31.6, | 35.3, | 38.1, | 42.5, | 45.8, | 48.6, | N/A , |
| 2 hours | 9.2, | 12.7, | 14.6, | 17.5, | 19.4, | 20.8, | 25.6, | 31.0, | 34.5, | 39.4, | 43.8, | 47.1, | 52.3, | 56.3, | 59.6, | N/A , |
| 3 hours | 10.8, | 14.9, | 17.0, | 20.2, | 22.4, | 24.0, | 29.4, | 35.4, | 39.3, | 44.8, | 49.6, | 53.3, | 59.0, | 63.4, | 67.1, | N/A , |
| 4 hours | 12.1, | 16.6, | 19.0, | 22.5, | 24.8, | 26.6, | 32.5, | 38.9, | 43.2, | 49.1, | 54.3, | 58.2, | 64.4, | 69.1, | 72.9, | N/A , |
| 6 hours | 14.3, | 19.4, | 22.1, | 26.1, | 28.7, | 30.7, | 37.3, | 44.5, | 49.2, | 55.8, | 61.5, | 65.9, | 72.7, | 77.9, | 82.1, | N/A , |
| 9 hours | 16.8, | 22.7, | 25.7, | 30.2, | 33.2, | 35.5, | 42.8, | 50.9, | 56.2, | 63.4, | 69.8, | 74.7, | 82.1, | 87.8, | 92.5, | N/A , |
| 12 hours | 18.9, | 25.3, | 28.7, | 33.6, | 36.8, | 39.3, | 47.3, | 56.0, | 61.7, | 69.5, | 76.3, | 81.5, | 89.5, | 95.6, | 100.6, | N/A , |
| 18 hours | 22.2, | 29.6, | 33.4, | 38.9, | 42.6, | 45.4, | 54.3, | 64.0, | 70.3, | 79.0, | 86.5, | 92.3, | 101.0, | 107.7, | 113.2, | N/A , |
| 24 hours | 25.0, | 33.0, | 37.2, | 43.2, | 47.2, | 50.2, | 59.9, | 70.4, | 77.2, | 86.5, | 94.6, | 100.8, | 110.2, | 117.3, | 123.1, | 143.2, |
| 2 days | 30.7, | 39.8, | 44.4, | 51.0, | 55.4, | 58.7, | 69.1, | 80.4, | 87.6, | 97.3, | 105.8, | 112.2, | 121.8, | 129.1, | 135.1, | 155.5, |
| 3 days | 35.2, | 45.2, | 50.2, | 57.4, | 62.0, | 65.6, | 76.7, | 88.6, | 96.1, | 106.3, | 115.1, | 121.8, | 131.8, | 139.3, | 145.5, | 166.4, |
| 4 days | 39.3, | 49.9, | 55.3, | 62.9, | 67.8, | 71.6, | 83.2, | 95.7, | 103.6, | 114.2, | 123.3, | 130.2, | 140.5, | 148.3, | 154.7, | 176.1, |
| 6 days | 46.3, | 58.1, | 64.1, | 72.4, | 77.9, | 81.9, | 94.6, | 108.1, | 116.5, | 127.9, | 137.6, | 144.9, | 155.8, | 164.0, | 170.7, | 193.2, |
| 8 days | 52.4, | 65.4, | 71.8, | 80.8, | 86.6, | 91.0, | 104.6, | 118.9, | 127.8, | 139.8, | 150.0, | 157.7, | 169.1, | 177.7, | 184.7, | 208.1, |
| 10 days | 58.1, | 72.0, | 78.8, | 88.4, | 94.6, | 99.2, | 113.6, | 128.6, | 138.0, | 150.6, | 161.3, | 169.3, | 181.2, | 190.1, | 197.3, | 221.5, |
| 12 days | 63.3, | 78.1, | 85.3, | 95.5, | 102.0, | 106.8, | 121.9, | 137.6, | 147.4, | 160.5, | 171.6, | 179.9, | 192.2, | 201.5, | 209.0, | 233.9, |
| 16 days | 73.1, | 89.3, | 97.3, | 108.4, | 115.4, | 120.7, | 137.0, | 154.0, | 164.5, | 178.5, | 190.4, | 199.3, | 212.4, | 222.2, | 230.1, | 256.5, |
| 20 days | 82.0, | 99.7, | 108.2, | 120.2, | 127.8, | 133.5, | 150.9, | 168.9, | 180.0, | 194.9, | 207.4, | 216.8, | 230.6, | 240.9, | 249.2, | 276.8, |
| 25 days | 92.5, | 111.7, | 120.9, | 133.9, | 142.0, | 148.1, | 166.8, | 186.1, | 197.9, | 213.7, | 227.0, | 236.9, | 251.5, | 262.3, | 271.1, | 300.1, |

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

$M_5$60 = 16.3mm
$M_5$ 2days = 58.7mm
Ratio = 0.278

# Appendix C

Irish Water Drainage &
Watermain Records


UISCE ÉIREANN : IRISH WATER

## Legend

- Unknown Meter ; Other Meter
- Sluice Valve Open
- Sluice Valve Closed
- Sluice Valve Closed

### Water Hydrants

**Hydrant Function**

- Fire Hydrant
- Telemetry Kiosk
- Cap
- Other Fittings

### Water Distribution Mains

**Owned By**

- Irish Water
- Private
- Irish Water

### Sewer Manholes

**Manhole Type**

- Standard

### Sewer Discharge Points

**Discharge Type**

- Other; Unknown

### Sewer Inlets

**Inlet Type**

- Catchpit
- Gravity - Combined
- Gravity - Foul
- Gravity - Overflow

### Storm Manholes

**Manhole Type**

- Standard

### Storm Discharge Points

**Discharge Type**

- Outfall
- Surface Gravity Mains

a3 - Scale **1:1,000**

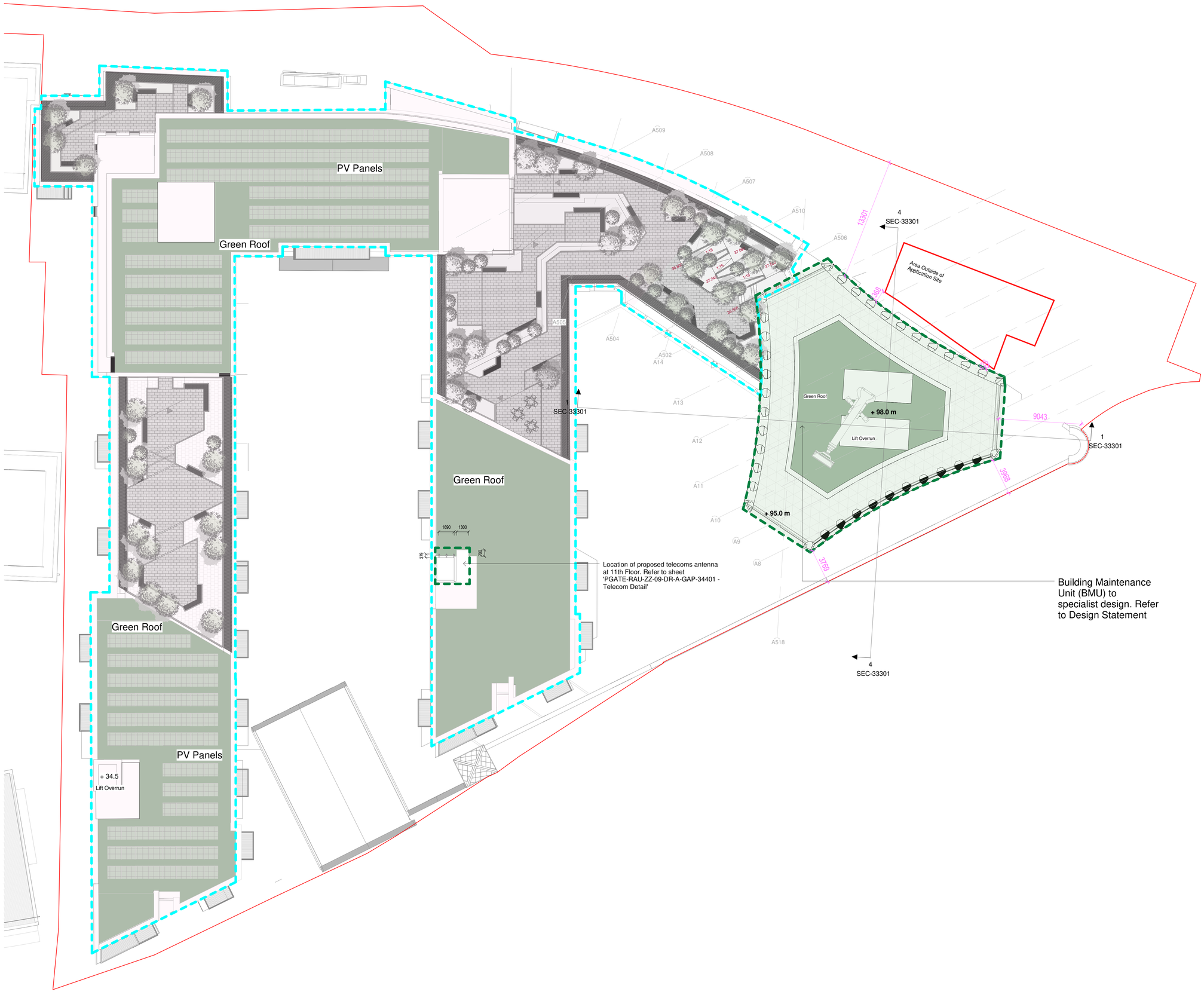
Date: 21/05/2019

Meters

0 12.5 25

# Appendix D

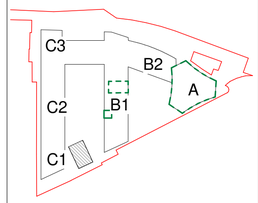
Greenroof Layout




**R01**
1 : 200

Notes:
DO NOT SCALE FROM THIS DRAWING. USE FIGURED DIMENSIONS IN ALL CASES. VERIFY DIMENSIONS ON SITE AND REPORT ANY DISCREPANCIES TO THE ARCHITECTS IMMEDIATELY. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE ARCHITECTS SPECIFICATION. © THIS DRAWING IS COPYRIGHT AND MAY ONLY BE REPRODUCED WITH THE ARCHITECTS PERMISSION.

**OSi License Number -** AR 0052219
**Projection / Spatial Reference:**
Projection= IRENET95_Irish_Transverse_Mercator
**Centre Point Coordinates:**
X,Y= 713657.3699,734403.2446
**Reference Index:**
Map Series | Map Sheets
1:1,000 | 3263-02
1:1,000 | 3263-08
1:1,000 | 3263-07
1:1,000 | 3263-03
**Vertical Datum:**
MALIN HEAD




**Planning Application Legend**

| Description | Symbol |
|---|---|
| SITE BOUNDARY LINE | |
| EXTENT OF PROPOSED DEVELOPMENT / WORKS | |
| OUTLINE OF REFUSED BLOCK A | |
| RESIDENTIAL | |
| CONSENTED BUILDINGS UNDER APPLICATION REF: ABP-306569-20 | |
| CAFE / RESTAURANT | |
| OFFICE | |
| CRITICAL DIMENSIONS TO SITE BOUNDARY OR ADJACENT STRUCTURES | 1500 |

| Rev | Date | DRN | Description |
|---|---|---|---|
| P02 | 07/04/21 | JB | Planning Issue |
| P01 | 02/12/20 | DZ | Pre-Planning Issue |

reddy architecture +urbanism
Dartry Mills,
Dartry Road
Dublin 6, D06 Y0E3
T: +353 (0)1 4987000
W: www.reddyarchitecture.com
E: info@reddyarchitecture.com

IN ASSOCIATION WITH

Glenn Howells Architects
Birmingham London glennhowells.co.uk
Glenn Howells Architects
321 Bartford Street
Birmingham B5 6ET
T: +44 (0)121 666 7640
W: www.glenhowells.co.uk
E: mail@glennhowells.co.uk

Client Details:
Ruirside Developments Ltd.

Project Details:
PGATE
42A Parkgate Street, Dublin 8

Drawing Title:
Proposed Roof Plan

| Job No | Date | Scale@A1 |
|---|---|---|
| P18-107D | 07/04/21 | 1:200 |
| Status: Planning | | Drawn By: M.McGuire |
| Purpose: Planning Permission | | Checked By: E.O'Brien |

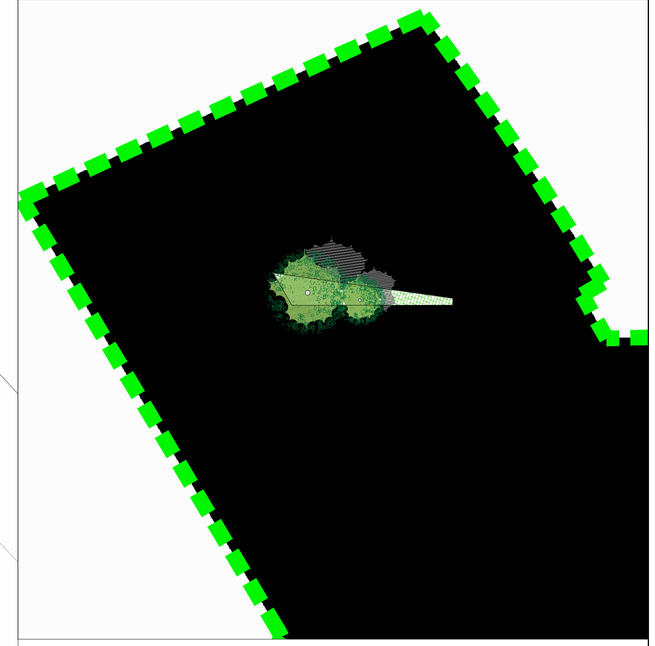
| Drawing Number | Revision |
|---|---|
| PGATE-RAU-ZZ-29-DR-A-GAP-31111 | P02 |

A1 Landscape


| BOTANIC NAME | COMMON NAME | SIZE |
|---|---|---|
| cmg = centimeter girth, rb = rootballed, cg = container grown, pf = pollinator, N = native | | |
| **PODIUM , COUTYARD AND ROOF LEVEL TREES** | | |
| Acer griseum | "Paperbark Maple" | 16-18cmg |
| Acer palmatum | "Japanese Maple" | 16-18cmg |
| Amelanchier x lamarckii | "Snowy Mespilus" | 2.5m ht, cg, pf |
| Arbutus unedo | "Strawberry Tree" | 1m ht, pf, N |
| Betula utilis var. jacquemonti | "Himalayan Birch" | 14-16cmg |
| Corylus avellana | "Common Hazel" | 2.5m ht, cg, pf, N |
| Sorbus aucuparia | "Rowan" | 14-16cmg, pf, N |
| **FORMAL HEDGE PLANTING** | | |
| Prunus lusitanica | "Portuguese laurel" | 60-80cm ht/100-120cm ht |
| Buxus sempervirens | "Common box" | 60-80cm ht |
| **SHRUB HERBACIOUS AND GROUNDCOVER PLANTING** | | |
| Anemone 'Honorine Jobert' | "Japanese Anemone" | 2Lt, pf |
| Berberis darwinii | "Darwin's Barberry" | 2Lt, pf |
| Choisya ternata | "Mexican orange" | 5Lt, pf |
| Dryopteris erythrosora | "Japanese Shield Fern" | 2Lt |
| Escalonia 'Apple Blossom' | "Apple Blossom Escallonia" | 2Lt, pf |
| Hydrangea quercifolia | "Oakleaf Hydrangea" | 5Lt, pf |
| Hydrangea quercifolia | "Red hot Poker" | 2Lt, pf |
| Liriope muscari | "Blue Lilu Turf" | 2Lt, pf |
| Luzula nivea | " White wood-rush" | 2Lt |
| Mischantus sinenis 'Gracilimus' | "Chinese Silver Grass" | 2Lt, pf |
| Pachysandra terminalis | "Japanese Pachysandra" | 2Lt |
| Pennisetum alopecuroides | "Chinese Fountain Grass" | 3Lt |
| Salvia officinalis | "Sage" | 2Lt, pf |
| Sarcococca hookeriana | "Sweet Box" | 5Lt, pf |
| Verbena bonariensis | "Purpletop vervain" | 2Lt,pf |
| Vinca minor 'Gertrude Jeckyll' | "Small White Periwinkle" | 2Lt |
| Viburnum opulus | "Guelder Rose" | 60-90cm, pf, N |
| Hypericum calycinum | "Aaron Beard" | 2Lt |
| **CLIMBERS** | | |
| Hydrangea anomala ssp petiolaris | "Climbing Hydrangea" | 5Lt, pf |
| Trachylospermum jasminoides | "Star Jasmine" | 5Lt, pf |
| Clematis montana 'Rosea' | "Himalayan clematis" | 5Lt, pf |

## LEGEND

- NEW SMALL TO MEDIUM TREE PLANTING
- SHRUB PLANTING IN PLANTER
- NATURAL FLAG PAVING
- SEDUM
- HEDGE
- SEATING ELEMENT
- GLAZED STRUCTURE
- PART V BOUNDARY LINE
- BLOCK A AMENDMENT



DETAIL PLAN - BLOCK A AMENDMENT 1/100 @ A1

| REV | DESCRIPTION | ISSUED BY | DATE |
|---|---|---|---|
| | | | |


**MITCHELL** + ASSOCIATES
LANDSCAPE ARCHITECTURE URBAN DESIGN
Unit 5, Woodpark, The Rise, Glasnevin, Dublin 9, Ireland t: + 353 1 454 5066 e:info@mitchellassoc.net


**PROJECT**
Parkgate Street

**CLIENT**
Ruirside Developments Limited

**JOB NO.**
LPAR010

**DRAWING**
Roof Garden Plan

**DRAWING NO.**
201

| DRAWN BY | CHECKED | DATE |
|---|---|---|
| Tijana Cavara Petrovic | FMcG | 26.05.2021 |
| **STATUS:** PLANNING-RFI | **SCALE** >1:200 @ A1< | **REVISION** 0 |

NOTES:
All dimensions are in millimeters unless otherwise stated and shall be checked and confirmed by the contractor on site. Any discrepancies shall be immediately reported to the landscape architects. Work to figured dimensions only - Do not scale from drawing. Do Not Scale. Use Figured Dimensions Only. Not for Construction Purposes unless Specifically Marked.



NORTH

>1:200 @ A1<

# Appendix E

Irish Water Correspondence

# Confirmation of Feasibility

Kieran Dowdall
50 Ringsend Road
Dublin 4

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

14 October 2020

Dear Kieran Dowdall,

**Re: Connection Reference No CDS19000532 pre-connection enquiry - Subject to contract | Contract denied**

**Connection for Mixed Use Development of 519 units at Former Hickey & Co LTD, Parkgate Street, Dublin 8.**

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Former Hickey & Co LTD, Parkgate Street, Dublin 8.

Based upon the details that you have provided with your pre-connection enquiry and on the capacity currently available in the network(s), as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place, your proposed connection to the Irish Water network(s) can be facilitated subject to following:

**Water:**

- New connection to the water network should be 150mm ID taken from the existing 6'' cast iron watermain on opposite side of Parkgate Street.
- The connection should be cross-connected back into the existing 24'' cast iron main running in parallel with the 6'' main in Parkgate Street.

**Wastewater:**

- Surface water inflow from Parkgate Street should be removed from the combined network. Minimum reduction should be equivalent to the proposed 22.4 l/s peak foul water discharge from the Development. At connection application stage you should provide evidence of the successful delivery of the Project in agreement with Dublin City Council.

**Housing Development Strategic**

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

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

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

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

If you have any further questions, please contact Marina Zivanovic Byrne from the design team on 01 89 25991 or email mzbyrne@water.ie. For further information, visit **www.water.ie/connections.**

Yours sincerely,

**Maria O'Dwyer**

**Connections and Developer Services**

**From:** Marina Zivanovic Byrne <mzbyrne@water.ie>
**Sent:** Wednesday 26 May 2021 14:50
**To:** Kieran Dowdall
**Cc:** Kieran O'Regan; Ali Robinson; Cloragh Byrne; jmosullivan; Fergal Broderick; Dermot Phelan
**Subject:** RE: CDS19000532 Former Hickey & Co LTD, Parkgate Street, Dublin 8.



Hi Kieran,

Thank you for the email.
I can confirm that IW issued a confirmation of feasibility (COF) letter for 519 units ref. CDS19000532 PCE application.
The COF is still valid.
Please note that the COF conditions are applicable for any phase of the Development:
*Surface water inflow from Parkgate Street should be removed from the combined network. Minimum reduction should be equivalent to the proposed 22.4 l/s peak foul water discharge from the Development. At connection application stage you should provide evidence of the successful delivery of the Project in agreement with Dublin City Council.*

As per our conversation this morning, could you please provide details and DCC agreement ref. the surface water removal project to Irish Water for review.

Thank you and Kind Regards,

Marina

---

**From:** Kieran Dowdall <Kieran.Dowdall@arup.com>
**Sent:** Wednesday 26 May 2021 11:55
**To:** Marina Zivanovic Byrne <mzbyrne@water.ie>
**Cc:** Kieran O'Regan <koregan@water.ie>; Ali Robinson <arobinson@water.ie>; Cloragh Byrne <Cloragh.Byrne@arup.com>; jmosullivan <jmosullivan@lafferty.ie>
**Subject:** RE: CDS19000532 Former Hickey & Co LTD, Parkgate Street, Dublin 8.

## Connection Reference No CDS19000532

Hi Marina

Further to our telecom this morning we would appreciate if Irish Water can please provide confirmation that the correct number of units proposed for the Parkgate Street development is 519 units.

This is to correct the record in relation to the Irish Water Tri-Partite response to ABP, copy attached, stating an increase in 198 units in addition to the COF_1 approved 519 number of units.

As discussed this is incorrect and the total number of units proposed remains at 519 for the proposed development.

Kind regards
Kieran

Original Confirmation of Feasibility
(Superceded)

Kieran Dowdall
50 Ringsend Road
Dublin 4

4 July 2019

Uisce Éireann
Bosca OP 6000
Baile Átha Cliath 1
Éire

Irish Water
PO Box 6000
Dublin 1
Ireland

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

Dear Kieran Dowdall,

**Re: Connection Reference No CDS19000532 pre-connection enquiry - Subject to contract | Contract denied**

**Connection for Mixed Use Development of 584 units at Former Hickey & Co LTD, Parkgate Street, Dublin 8.**

Irish Water has reviewed your pre-connection enquiry in relation to a water connection at Former Hickey & Co LTD, Parkgate Street, Dublin 8.

Based upon the details that you have provided with your pre-connection enquiry and on the capacity currently available in the network(s), as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place, your proposed connection to the Irish Water network(s) can be facilitated subject to following conditions:

**Water:**

New connection to the water network should be 150mm ID taken from the existing 6'' cast iron watermain on opposite side of Parkgate Street. Also the connection should be cross-connected back into the existing 24'' cast iron main running in parallel with the 6'' main in Parkgate Street.

**Wastewater:**

It will be necessary to carry out further detailed study and investigations to confirm the available capacity and to determine the full extent of any upgrades which may be required to be completed to Irish Water Infrastructure, prior to agreeing to the proposed connection. Should you wish to have such studies and investigations progressed by Irish Water, you will be required to enter into Project Works Service Agreement.

**Strategic Housing Development**

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

A. In advance of submitting your full application to An Bord Pleanala for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services.

B. You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed and appropriate connection fee paid at a later date.

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

D. In advance of submitting this development to An Bord Pleanala for full assessment, the Developer is required to have entered into a Project Works Services Agreement to deliver infrastructure upgrades to facilitate the connection of the development to Irish Water infrastructure.

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

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

If you have any further questions, please contact Marina Zivanovic Byrne from the design team on 01 89 25991 or email mzbyrne@water.ie. For further information, visit **www.water.ie/connections.**

Yours sincerely,

**Maria O'Dwyer**

**Connections and Developer Services**

# Statement of Design Acceptance

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

Kieran Dowdall
50 Ringsend Road
Dublin 4

13 December 2019

**Re: Design Submission for Former Hickey & Co LTD, Parkgate Street, Dublin 8 (the "Development")**
**(the "Design Submission") / Connection Reference No: CDS19000532**

Dear Kieran Dowdall,

Many thanks for your recent Design Submission.

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

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

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

If you have any further questions, please contact your Irish Water representative:
Name: Marina Zivanovic Byrne
Phone: 01 89 25991
Email: mzbyrne@water.ie

Yours sincerely,

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

**Appendix A**

**Document Title & Revision**

- [Proposed Drainage & Watermain Layout] 265381-C-002-P05
- [Watermain Cross-section Near Structures] 265381-SK-C-005-P01

**Standard Details/Code of Practice Exemption:**

1. *Irish Water notes that longitudinal sections of the on-site foul sewer network, as required under Section 1.8.14 of the Wastewater Code of Practice, will not be produced until detailed design stage. Before Connection Application, these must be produced and agreed upon with Irish Water, after which a new Statement of Design Acceptance will be issued, to include agreed longitudinal sections..*
2. *Reduced separation distance between (south of) Block B1 and Watermain, and between the Watermain loop and the basement foundation.*

*For further information, visit **www.water.ie/connections***

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

**Subject:** 265381-00_Parkgate Street Re-development Connection Reference No CDS19000532

**From:** Marina Zivanovic Byrne <mzbyrne@water.ie>
**Sent:** Wednesday 7 April 2021 15:04
**To:** Kieran Dowdall <Kieran.Dowdall@arup.com>
**Cc:** Cloragh Byrne <Cloragh.Byrne@arup.com>; Gregg Sim <Gregg.Sim@arup.com>; Stephen Burke <stephen.burke@arup.com>
**Subject:** [External] RE: 265381-00_Parkgate Street Re-development Connection Reference No CDS19000532

Hi Kieran,

That is correct, in that case the issued SDA is valid,

Kind Regards,

Marina

**From:** Kieran Dowdall <Kieran.Dowdall@arup.com>
**Sent:** Tuesday 6 April 2021 17:36
**To:** Marina Zivanovic Byrne <mzbyrne@water.ie>
**Cc:** Cloragh Byrne <Cloragh.Byrne@arup.com>; Gregg Sim <Gregg.Sim@arup.com>; Stephen Burke <stephen.burke@arup.com>
**Subject:** RE: 265381-00_Parkgate Street Re-development Connection Reference No CDS19000532

Hi Marina

Just following on from our previous correspondence of the 14 October 2020, copy attached, and your extracted statement below, we confirm that the water and wastewater infrastructure design for the proposed Parkgate Street development has not changed since the previously granted planning application ABP-306569-20.

"If you are changing the water and wastewater infrastructure design you have to apply again for a Statement of Design Acceptance"

Based on the above statement we understand that an application for a new Statement of Design Acceptance is not required? A copy of the previous SDA is also attached.

We would appreciate if you could provide final clarity on this issue.

Kind regards
Kieran

**From:** CDS Design QA <cdsdesignqa@water.ie>
**Sent:** Friday 13 December 2019 15:15
**To:** Alpha Barry <Alpha.Barry@arup.com>
**Subject:** [External] RE: 265381-00_Parkgate Street Redevelopment_Connection Reference No CDS19000532

Dear Alpha,

**Subject:** FW: CDS19000532 Former Hickey & Co LTD, Parkgate Street, Dublin 8.
**Attachments:** CDS19000532 COF_1.pdf; CDS19000532 COF.pdf

**From:** Marina Zivanovic Byrne <mzbyrne@water.ie>
**Sent:** Wednesday 14 October 2020 10:36
**To:** Kieran Dowdall <Kieran.Dowdall@arup.com>
**Subject:** [External] RE: CDS19000532 Former Hickey & Co LTD, Parkgate Street, Dublin 8.

Hi Kieran,

I updated the COF for the Development of 519 units (please see attached)
If you are changing the water and wastewater infrastructure design you have to apply again for a Statement of Design Acceptance,

Kind Regards,

Marina

**From:** Kieran Dowdall <Kieran.Dowdall@arup.com>
**Sent:** Friday 9 October 2020 17:21
**To:** Marina Zivanovic Byrne <mzbyrne@water.ie>
**Cc:** Dermot Phelan <dphelan@water.ie>; Cloragh Byrne <Cloragh.Byrne@arup.com>; Sean Barrett <Sean.Barrett@arup.com>; John Flaherty <John.Flaherty@arup.com>
**Subject:** CDS19000532 Former Hickey & Co LTD, Parkgate Street, Dublin 8.

Hi Marina

Hope you are keeping well.

Please see attached, Confirmation of Feasibility letter CDS19000532, for the proposed mixed use development at Parkgate Street, Dublin 8, which received a split decision from ABP-306569-20. The entire development received approval except for Block A (the residential tower and ground floor retail). Out Client is now submitting a new planning application for Block A only.

This application will be a full SHD process, therefore we require a new COF letter prior to a Pre-app submission to ABP and thereafter a Statement of Design Acceptance prior to a planning submission to ABP, although there will be no change to the water / wastewater design strategy previously agreed with yourselves, see attached original statement received from IW.

The number of residential units for Block A is increasing from the original application of 160 units to 198 units, an increase of 38 units. The original application submitted to ABP for the full development was for 481 units.

The Confirmation of Feasibility Statement (CDS19000532), was based on our PCE Application for 584 units. The revised total number of units for the development will now be 519 units which is less than the previously approved number by Irish Water.

We would appreciate if Irish Water can provide a new COF statement for the Block A development, as soon as possible, so our Client can proceed with the Pre-app consultation with ABP.

If you require any further information or have any further queries on the above please do not hesitate to contact us.

Kind regards
Kieran

Kieran Dowdall
Associate

Arup
50 Ringsend Road Dublin 4 D04 T6X0 Ireland
d +353 1 233 4455 | t +353 1 233 4455
www.arup.com

Connect with Arup on LinkedIn
Follow @ArupGroup

---

**From:** newconnections <newconnections@water.ie>
**Sent:** Tuesday 15 October 2019 15:26
**To:** Kieran Dowdall <Kieran.Dowdall@arup.com>
**Cc:** Alan Fitzsimons <Alan.Fitzsimons@arup.com>
**Subject:** [External] CDS19000532 Former Hickey & Co LTD, Parkgate Street, Dublin 8 EMAIL:0161266

**Subject:** Pre-Connection Enquiry – CDS19000532 Former Hickey & Co LTD, Parkgate Street, Dublin 8

With regard to the pre-connection enquiry submitted for the above named address, please find Confirmation of Feasibility letter attached.
If you have any queries please feel free to contact the Connections and Developer Services Design Engineer (see contact details in the attached letter).

Regards,

Connections and Developer Services

**Uisce Éireann**
Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, Éire
**Irish Water**
Colvill House, 24-26 Talbot Street, Dublin 1, Ireland

***Please do not respond to this email.***

# Appendix F

Hydro International Guide to Surface Water Treatment Systems

**TABLE 26.7** **Indicative suitability of SuDS components within the Management Train**

| SuDS component | Interception[1] | Close to source/ primary treatment | Secondary treatment | Tertiary treatment |
|---|---|---|---|---|
| Rainwater harvesting | Y | | | |
| Filter strip | Y | Y | | |
| Swale | Y | Y | Y | |
| Filter drain | Y | | Y | |
| Permeable pavement | Y | Y | | |
| Bioretention | Y | Y | Y | |
| Green roof | Y | Y | | |
| Detention basin | Y | Y | Y | |
| Pond | [3] | Y[2] | Y | Y |
| Wetland | [3] | Y[2] | Y | Y |
| Infiltration system (soakaways/ trenches/ blankets/basins) | Y | Y | Y | Y |
| Attenuation storage tanks | Y[4] | | | |
| Catchpits and gullies | | Y | | |
| Proprietary treatment systems | | Y[5] | Y[5] | Y[5] |

**Notes**

1 Interception components are also normally also a treatment component (excluding rainwater harvesting which only removes runoff from the system)

2 for roof runoff only

3 Interception design may be possible in certain scenarios, but would require detailed justification

4 If unlined and design performance can be demonstrated (noting the need to protect groundwater)

5 where design performance can be demonstrated

# A Guide to The SuDS Manual (C753) Simple Index Approach

Author: Mark Goodger, Regional Technical Manager
Hydro International

# The SuDS Manual (C753) Simple Index Approach

## Introduction

In Table 26.1 of The SuDS Manual (C753) four risk based approaches for water quality management are specified:

1. Simple Index Approach
2. Risk Screening (generally used to determine if Simple Index Approach is appropriate)
3. Detailed Risk Assessment
4. Process-Based Treatment Modelling

With the intention that the simpler approaches are applied in lower risk scenarios, with more sophisticated assessments only used when appropriate to the risk.

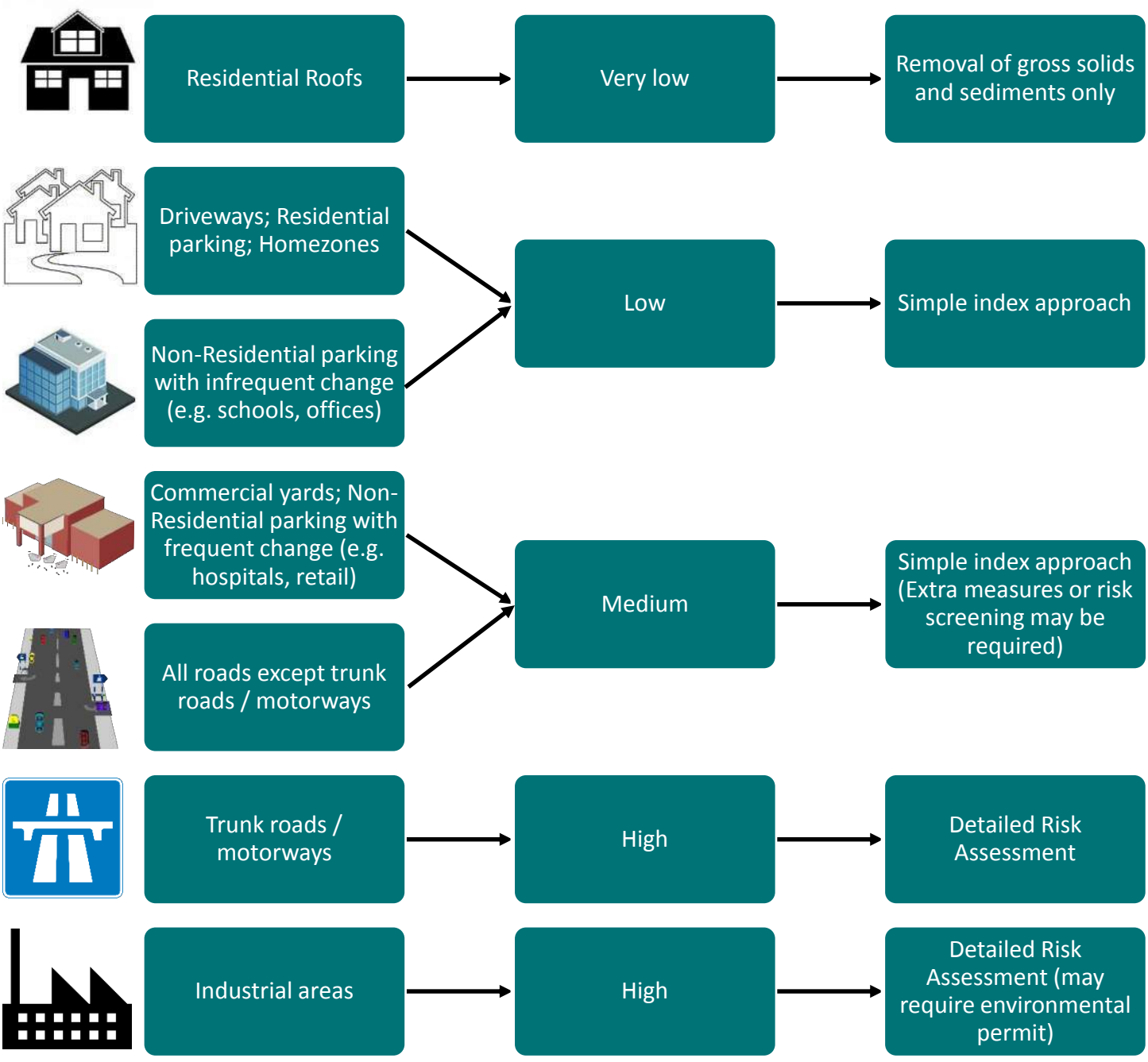



**Figure 1: Applying the Risk Based Water Quality Management Approaches (Source: After Table 4.3 of the SuDS Manual)**

# Applying the Simple Index Approach (SIA)

The Simple Index Approach (SIA) recommended in Section 26.7.1 of The SuDS Manual (C753) was developed from that set out by Middlesex University (as outlined in Annex 5 of Chapter 26 of The SuDS Manual) and follows a three step approach:

**Step 1** – Allocate suitable pollution hazard indices for the proposed land use categories

**Step 2** – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index

**Step 3** – Where the discharge is to protected[1] surface waters or groundwater, consider the need for a more precautionary approach.

Note:

1 Designated as those protected for the supply of drinking water (see SuDS Manual Table 4.3).

## Step 1: Define pollution hazard indices

Pollution hazad indices are presented in Table 26.2 of The SuDS Manual and reproduced here for simplicity. The indices range from 0 (no pollution of this type) to 1 (high pollution hazard for this contaminant type).

**Table 1: Pollution hazard indices for different land use classes (Source: Reproduced from The SuDS Manual Table 26.2)**

| Land Use | Pollution Hazard Level | Total Suspended Solids (TSS) | Metals | Liquid Hydrocarbons (free floating oils) |
|---|---|---|---|---|
| **Residential Roofs** | Very low | 0.2 | 0.2 | 0.05 |
| **Other Roofs** (typically commercial / industrial roofs) | Low | 0.3 | 0.2 (up to 0.8 where there is potential for metals to leach from the roof) | 0.05 |
| **Individual property driveways, residential car parks, low traffic roads** (e.g. cul de sacs, homezones and general access roads) **and non-residential car parks with infrequent change** (e.g. schools, offices) – i.e. <300 traffic movements / day | Low | 0.5 | 0.4 | 0.4 |
| **Commercial yard and delivery areas, non-residential parking with frequent change** (e.g. hospitals, retail)**; all roads except low traffic roads and trunk roads / motorways**[1] | Medium | 0.7 | 0.6 | 0.7 |
| **Sites with heavy pollution** (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites)**; sites where chemicals and fuels** (other than domestic fuel oil) **are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways**[1] | High | 0.8[2] | 0.8[2] | 0.9[2] |

**Notes:**

1. Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009)
2. These should only be used if considered appropriate as part of a detailed risk assessment – required for all these land use types (see also The SuDS Manual Table 4.3). When dealing with high hazard sites, the environmental regulator should first be consulted for pre-permitting advice. This will help to determine the most appropriate treatment approach to the development of a design solution. **Also consider spill protection – contact Hydro International to find out more about our specialist treatment and containment options for high pollultion hazard sites.**

Where a site land use falls outside of these categories, the indices should be adapted (and agreed with the drainage approving / adopting body) or else a more detailed risk assessment should be carried out.
Equivalent indices should be developed for other contaminants of interest of any given site. **For assistance with development of indices or detailed site analysis, contact Hydro International.**

## Step 2: Determine SuDS Pollution Mitigation Indices

To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for that contaminant type):

**Total SuDS Mitigation Index (for each contaminant) ≥ Pollution hazard index (for each contaminant)**

If the mitigation index of an individual component is insufficient, two components (or more) in series will be required, with a factor of 0.5 used to account for the reduced performance of secondary or tertiary components, in line with the following equation:

$$\text{Total SuDS Mitigation Index} = \text{Mitigation Index}_1 + 0.5\,(\text{Mitigation Index}_2)$$

Where *Mitigation Index$_n$ = Mitigation Index for Component n.*

If the only runoff destination is to surface water (i.e. there is no infiltration from the SuDS to groundwater), the surface water mitigation indices should be used.

Where the principal destination of the runoff is to groundwater, then the groundwater indices should be used. This will be the case, even for infiltration systems that are designed to discharge to surface waters once the infiltration capacity is exceeded – In this scenario, the overflow will often not need to be treated prior to discharge to surface waters as the risk will be low (highly contaminated flows will have been treated prior to infiltration) and dilution will be high.

In England and Wales, if the principal runoff destination is intended to be to surface water, but some infiltration (even in small amounts) may occur through unlined components, then the groundwater indices should be used for the proportion of runoff that discharges to groundwater and the surface water indices used for the proportion of runoff that discharges to surface waters. In Scotland & Northern Ireland, groundwater risk management is not a requirement for this scenario.

**Table 2: SuDS mitigation indices for discharges to surface waters (Source: Extended and reproduced from The SuDS Manual Table 26.3)**

| Type of SuDS Component | Mitigation Indices[1] | | |
|---|---|---|---|
| | TSS | Metals | Liquid Hydrocarbons |
| Filter Strip | 0.4 | 0.4 | 0.5 |
| Filter Drain | 0.4[2] | 0.4 | 0.4 |
| Swale | 0.5 | 0.6 | 0.6 |
| Bioretention System | 0.8 | 0.8 | 0.8 |
| Permeable Pavement | 0.7 | 0.6 | 0.7 |
| Detention Basin | 0.5 | 0.5 | 0.6 |
| Pond[3] | 0.7[2] | 0.7 | 0.5 |
| Wetland[3] | 0.8[2] | 0.8 | 0.8 |
| **First Defense® Vortex Separator** | 0.5[a] | 0.33[c] | 0.4[d] |
| **Downstream Defender® Advanced Vortex Separator** | 0.5[a] | 0.4[c] | 0.8[a] |
| **Up-Flo™ Filter** | 0.8[a] | 0.69[c, e] | 0.4[d] |
| **Hydro-BioCell™ Bioretention System** | 0.8[b] | 0.8[b] | 0.8[d] |

**Notes:**

1) SuDS components only deliver these indices if they are designed and constructed in accordance with the relevant technical chapters of the SuDS Manual. Designers and installers of SuDS components should be able to demonstrate competence in their respective areas.
2) Filter drains, ponds and wetlands are not recommended for removal of coarse sediments as their use for this purpose will have significant maintenance implications. Sediment (TSS) should be removed upstream where possible.
3) Where a wetland is not specifically designed to provide significantly enhanced treatment performance, it should be considered as having the same mitigation indices as a pond.

a) Derived from 3rd party testing and / or verification programmes. Test reports available on request.
b) Derived from testing and / or monitoring. Test reports available on request.
c) Derived from partitioning of sediment bound and dissolved contaminants and associated testing. Evidence available on request.
d) Based on typical values for components of this type.
e) Dependant on filter media used.

**Table 3: SuDS mitigation indices for discharges to groundwater (Source: Extended and reproduced from The SuDS Manual Table 26.4)**

| Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates[1] | Mitigation Indices | | |
|---|---|---|---|
| | TSS | Metals | Liquid Hydrocarbons |
| A layer of dense vegetation underlain by soil with good contaminant attenuation potential[2] of at least 300mm in depth[3] | 0.6[4] | 0.5 | 0.6 |
| A soil with good contaminant attenuation potential[2] of at least 300mm in depth[3] | 0.4[4] | 0.3 | 0.3 |
| Infiltration trench (where a suitable depth of filtration material is included that provides treatment) underlain by soil with good contaminant attenuation potential[2] of at least 300mm in depth[3] | 0.4[4] | 0.4 | 0.4 |
| Constructed permeable pavement (where a suitable filtration layer is included that provides treatment and including a geotextile at the base separating the foundation from the subgrade) underlain by soil with good contaminant attenuation potential[2] of at least 300mm in depth[3] | 0.7[4] | 0.6 | 0.7 |
| Bioretention underlain by soil with good contaminant attenuation potential[2] of at least 300mm in depth[3] | 0.8[4] | 0.8 | 0.8 |
| **Flow through Proprietary Treatment System prior to infiltration SuDS** | **TSS** | **Metals** | **Liquid Hydrocarbons** |
| **First Defense® Vortex Separator** | 0.5[a] | 0.33[c] | 0.4[d] |
| **Downstream Defender® Advanced Vortex Separator** | 0.5[a] | 0.4[c] | 0.8[a] |
| **Up-Flo™ Filter** | 0.8[a] | 0.69[c,e] | 0.4[d] |
| **Hydro-BioCell™ Bioretention System** | 0.8[b] | 0.8[b] | 0.8[d] |

**Notes:**

SuDS components only deliver these indices if they are designed and constructed in accordance with the relevant technical chapters of the SuDS Manual. Designers and installers of SuDS components should be able to demonstrate competence in their respective areas.

1) All designs must include a minimum of 1m unsaturated depth of aquifer material between the infiltration surface and the maximum likely groundwater level (as required by infiltration design – see The SuDS Manual Chapter 25).
2) For example as recommended in Sniffer (2008a and 2008b), Scott Wilson (2010) or other appropriate guidance.
3) Alternative depths may be considered where it can be demonstrated that the combination of the proposed depth and soil characteristics will provide equivalent protection to the underlying groundwater – see note 1.
4) If significant amounts of sediment are allowed to enter an infiltration system, there will be a high risk of rapid clogging and subsequent system failure. It is recommended to remove sediment prior to the infiltration system as far as reasonably practical.

a) Derived from 3rd party testing and / or verification programmes. Test reports available on request.
b) Derived from testing and / or monitoring. Test reports available on request.
c) Derived from partitioning of sediment bound and dissolved contaminants and associated testing. Evidence available on request.
d) Based on typical values for components of this type.
e) Dependant on filter media used.

**IMPORTANT NOTES:**

- Where the indices are not considered representative by the designer, a more detailed risk assessment can be undertaken.
- Components should always be designed for treatment, as described in the relevant technical guidance set out in the individual component chapters of The SuDS Manual. **If they are incorrectly designed, constructed or inadequately maintained, their treatment performance could be significanty adversely affected.**
- Where the infiltration component itself does not provide sufficient pollution mitigation, the design should include upstream SuDS components that are lined to prevent infiltration from occurring until sufficient treatment has taken place.

## Step 3: Consider the need for a precautionary approach where discharges are to protected waters

Reference should be made to local standards, planning requirements and guidance, particularly with reference to discharges to protected waters where more detailed risk assessments or enhanced treatment may be required.

## Case Studies:

### Small is Beautiful

A First Defense® provided a much-needed small footprint solution to meeting regulatory requirements on a confined site for a new commercial office development in Perkins Township, Ohio.
TSS was the main pollutant of concern and although the Simple Index Approach was not in use in Ohio at the time of installation, retrospectively considering this approach would give:

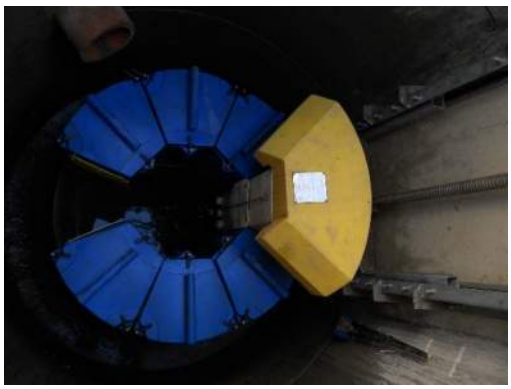
**TSS Hazard Index (Office Development) = 0.5**
**First Defense® TSS Mitigation Index = 0.5**

**Mitigation Index ≥ Hazard Index**

### Pollution Protection in Whisky Country

Poor drainage, flooding and freezing weather led to a landslip and extreme surface degradation along a section of the narrow A95 near Elgin. Although it pre-dated the new SuDS Manual risk based approach, treatment was vital as the surface water runoff destination was to an area world-renowned for the production of single malt whiskey and an important salmon fishery.
A Downstream Defender® advanced hydrodynamic vortex separator minimises the risk of sediment and hydrocarbon pollution reaching the sensitive watercourse.

**Downstream Defender® Mitigation Indices:**
**TSS = 0.5**
**Heavy Metals = 0.4**
**Liquid Hydrocarbons = 0.8**



### Fine Filtration enables Mixed-Use Development

Environment Agency planning conditions for a new commercial access road to retail and light commercial units as part of a mixed-use development in Faversham, Kent, required treatment prior to infiltration.
A bypass separator provides important spill protection for liquid hydrocarbons, prior to an Up-Flo™ Filter that ensures fine filtration of sediments and associated contaminants, such as Polycyclic Aromatic Hydrocarbons (PAHs). Although the installation pre-dates the Simple Index Approach, retrospective consideration of the approach gives:

| Contaminant | TSS | Metals | PAHs |
|---|---|---|---|
| **Hazard Indices (Commercial Access)** | **0.7** | **0.6** | **0.7** |
| **Up-Flo™ Filter Mitigation Indices** | **0.8** | **0.69** | **0.72** |

### Stringent Quality Control, Naturally

Hydro BioCell™ have brought attractive landscaping and stringent surface water quality control to a sensitive location in Barry, South Wales.
3 units were retrofitted to the Business Support Centre car park as part of a wide urban regeneration scheme, effectively removing pollutants prior to discharge into the adjacent, rejuvenated harbourside.

| Contaminant | TSS | Metals | Hydro-carbons |
|---|---|---|---|
| **Hazard Indices (Commercial / Retail Parking)** | **0.7** | **0.6** | **0.7** |
| **Hydro BioCell™ Mitigation Indices** | **0.8** | **0.8** | **0.8** |

# Simple Index Approach (SIA) Tool

A SIA spreadsheet tool has been developed by HR Wallingford on behalf of the Scottish Environment Protection Agency (SEPA) to support the implementation of the Simple Index Approach. The tool is freely available to download at www.susdrain.org/resources/SuDS_Manual.html.
The spreadsheet tool works through the Simple Index Approach Design Steps:

## Step 1: Define pollution hazard indices

| | | | | Pollution Hazard Indices | | |
|---|---|---|---|---|---|---|
| | *Runoff Area Land Use Description* | | *Hazard Level* | Suspended Solids | Metals | Hydrocarbons |
| Select land use type from the drop down list (or 'Other' if none applicable): → | Residential parking | | Low | 0.5 | 0.4 | 0.4 |
| If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row: | | | | | | |
| | **Landuse Pollution Hazard Index** | | **Low** | **0.5** | **0.4** | **0.4** |

## Step 2: Determine SuDS Pollution Mitigation Indices

| | | | Pollution Mitigation Indices | | |
|---|---|---|---|---|---|
| | *SuDS Component Description* | | Suspended Solids | Metals | Hydrocarbons |
| Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: → | Proprietary treatment system | Enter User Defined Indices in row below | | | |
| Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: → | None | | | | |
| Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: → | None | | | | |
| If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows: | Hydro BioCell | SuDS Component 1 | 0.8 | 0.8 | 0.8 |
| | | | | | |
| | | | | | |

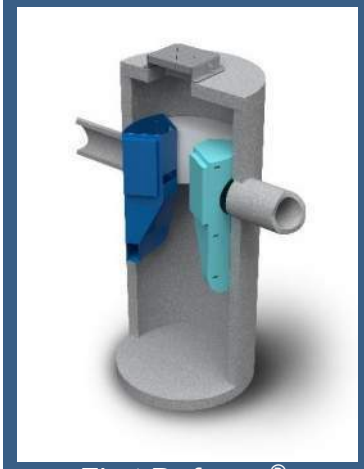
## Calculation of Total SuDS Mitigation Indices and Results

| | Combined Pollution Mitigation Indices | | |
|---|---|---|---|
| | Suspended Solids | Metals | Hydrocarbons |
| **Total Pollution Mitigation Indices for the Runoff Area** | **0.8** | **0.8** | **0.8** |

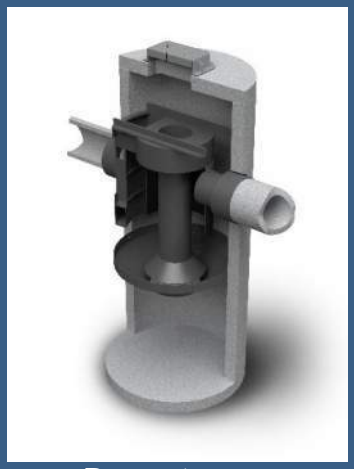
| | Sufficiency of Pollution Mitigation Indices | | |
|---|---|---|---|
| | Suspended Solids | Metals | Hydrocarbons |
| | Sufficient | Sufficient | Sufficient |

## The Hydro StormTrain® Series of Surface Water Treatment Devices

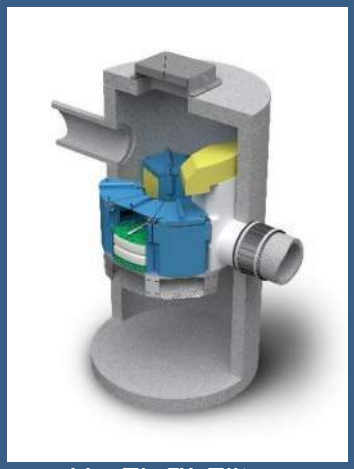
Each Hydro StormTrain® device delivers proven, measurable and repeatable surface water treatment performance. Each can be used independently to meet the specific treatment needs of a site; or can combined with one another or in conjunction with other SuDS components to form a mangament train; or can be used to protect and enhance SuDS features less suited to providing the first stage of treatment or more prone to failure due to sedimentation or shock loads associated with spills.



First Defense®
Vortex Separator



Downstream Defender®
Advanced Hydrodyanmic Vortex Separator



Up-Flo™ Filter
Fluidised Bed Up Flow Filtration System

Hydro BioCell™
Bioretention System

# Learn more…

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