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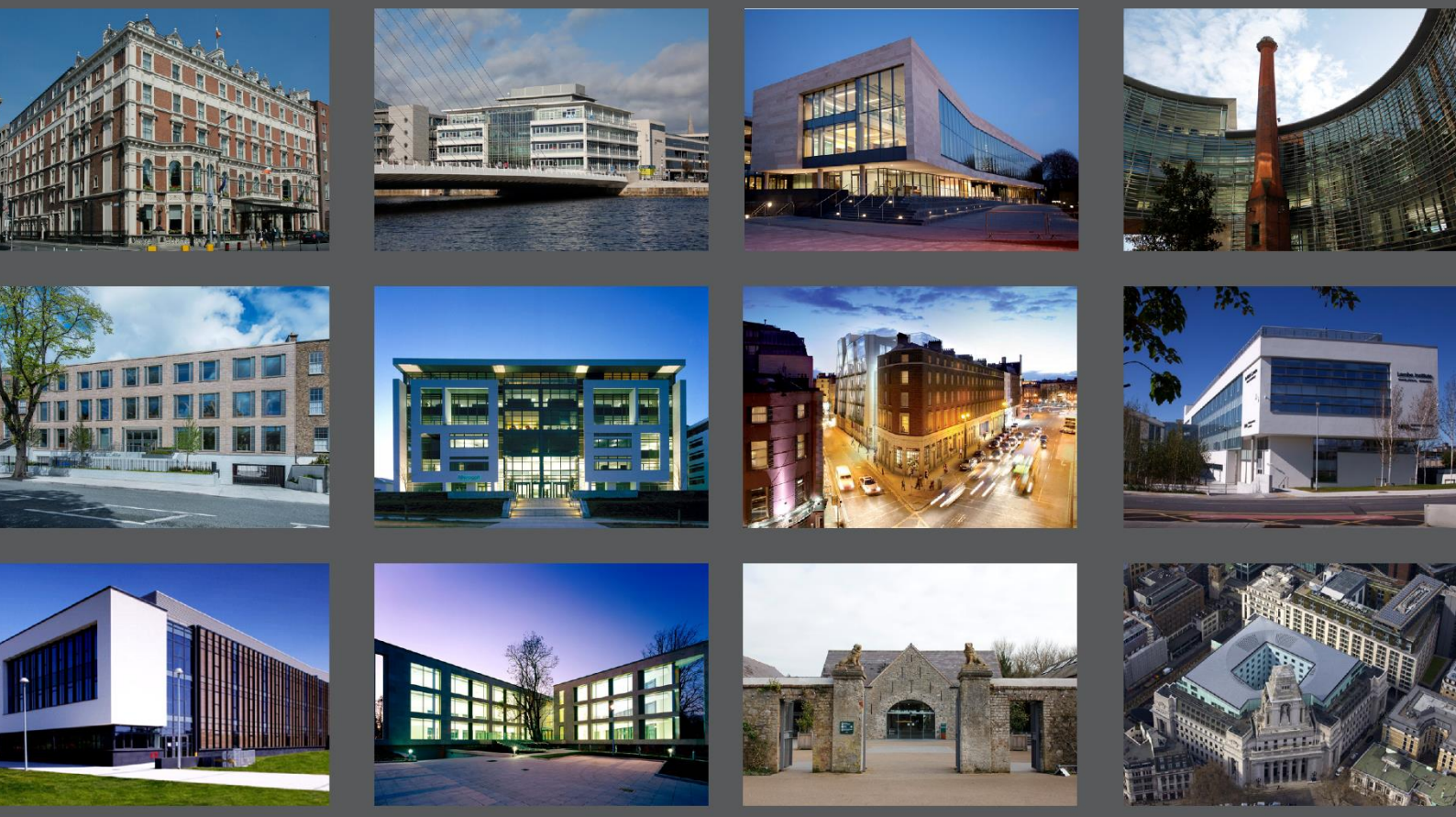

Proposed Strategic Housing Development on the Former Player Wills Site and Undeveloped Land Owned by Dublin City Council at South Circular Road, Dublin 8.

Civil Engineering Infrastructure Report for Planning

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PROJECT: **PROPOSED STRATEGIC HOUSING DEVELOPMENT ON THE FORMER PLAYER WILLS SITE AND UNDEVELOPED LAND OWNED BY DUBLIN CITY COUNCIL AT SOUTH CIRCULAR ROAD, DUBLIN 8.**

PROJECT NO. **19.117**

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Issue	Date	Description	Orig.	PE	PD	Issue Check
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PL5	06/11/2020	ISSUE FOR PLANNING	JMCM	COR	CK	COR
PL6	11/12/2020	ISSUE FOR PLANNING	JMCM	COR	CK	COR

CIVIL ENGINEERING INFRASTRUCTURE REPORT
FOR
PROPOSED PLAYER WILLS SHD
AT
SOUTH CIRCULAR ROAD,
DUBLIN 08

barrett mahony

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1.0 INTRODUCTION

1.1 GENERAL DESCRIPTION

DBTR-SCR1 Fund, a Sub-Fund of the CWTC Multi Family ICAV intend to apply to An Bord Pleanála for permission for a mixed-use Build to Rent Strategic Housing Development at the former 'Player Wills' site (2.39 hectares) and adjoining lands (0.67 hectares) under the control of Dublin City Council. A public park, public road and works to South Circular Road and to facilitate connections to municipal services at Donore Avenue are proposed on the Dublin City Council land. The former 'Player Wills' site incorporates Eircode's: D08 T6DC, D08 PW25, D08 X7F8 and D08 EK00 and has frontage onto South Circular Road, St. Catherine's Avenue and Donore Avenue, Dublin 8. The Dublin City Council undeveloped land adjoins the former 'Player Wills' site to the west and the former 'Bailey Gibson' site to the east. The total area of the proposed development site is 3.06 hectares.

The design rationale is to create and deliver a high quality, sustainable, residential led mixed use strategic housing development within this inner city brownfield site which respects its setting and maximises the site's natural attributes while achieving maximum efficiency of existing infrastructure. The Proposed Site Layout is illustrated on Drawing No. PL0003 contained within the architectural suite of drawings.

The development will consist of;

i. the demolition of all buildings (15,454 sq.m GFA), excluding the original fabric of the former Player Wills Factory, to provide for the development of a mixed use(residential, community, arts and culture, creche, food and beverage and retail) scheme comprising predominantly build to rent apartment dwellings (492 no.) together with a significantly lesser quantity of single occupancy shared accommodation private living areas (240 no.), with an average private living floor area of 24.6 sq.m (double the minimum private living space size required for single occupancy shared accommodation) and a arts/culture/community hub within the repurposed ground floor of the former factory building;

ii. change of use, refurbishment, modifications and alterations to the former Player Wills Factory building (PW1) to include the removal of 1 no. later addition storey (existing 4th storey) and the later addition rear (northern) extension, retention and modification of 3 no. existing storeys and addition of 2 no. storeys set back on the building's south, east and west elevations with an 8-storey projection (max. height 32.53m) on the north eastern corner, with a cumulative gross floor area of 17,630 sq.m including ancillary uses, comprising;

    a. at ground floor 852 sq.m of floor space dedicated to community, arts and cultural and exhibition space together with artist and photography studios (Class 1 and Class 10 Use), 503 sq.m of retail floor space (Class 1 Use), 994 sq.m of café/bar/restaurant floor space, 217 sq.m of co-working office floor space (Class 3 Use) and ancillary floor space for welfare facilities, waste management and storage;

    b. 240 no. single occupancy shared accommodation private living areas, distributed over levels 1-4, including 2 no. rooms of 30 sq.m, 49 no. rooms of 25 sq.m; 14 no. rooms of 23 sq.m, 58 no. rooms of 22.5 sq.m, 8 no. rooms of 20 sq.m, 104 no. rooms of 19 sq.m and 5 no. disabled access (Part M) rooms (3 no. 32 sq.m and 2 no. 26 sq.m); 21 no. kitchen/dining areas, and, 835 sq.m of dedicated shared accommodation services, amenities and facilities distributed across levels 1-4, to accommodate uses including lounge areas, entertainment (games) area, 2 no.

external terraces (Level 03 and 04), laundry facilities, welfare facilities and waste storage;

c. 47 no. build-to rent apartments distributed across levels 1-7 including 12 no. studio apartments; 23 no. 1 bed apartments, 8 no. 2 bed apartments: and, 4 no. 3-bed apartments;

d. 1,588 sq.m of shared (build to rent and shared accommodation) services, amenities and facilities including at ground floor reception/lobby area, parcel room, 2 no. lounges and administration facilities; at Level 01 entertainment area, TV rooms, entertainment (games room), library, meeting room, business centre; at Level 02 gym and storage and at Level 07, a lounge area.

e. Provision of communal amenity outdoor space as follows; PW1 - 450 sq.m in the form of roof terraces dedicated to shared accommodation and 285 sq.m roof terrace for the proposed apartments .

f. a basement (190 sq.m) underlying the proposed 8-storey projection to the northeast of PW1 to accommodate plant.

iii. the construction of 445 no. Build to Rent apartment units, with a cumulative gross floor area of 48,455 sq.m including ancillary uses distributed across 3 no. blocks (PW 2, 4 and 5) comprising;

a. PW2 (45,556 sq.m gross floor area including ancillary uses) - 415 no. apartments in a block ranging in height from 2-19 storeys (max. height 63.05m), incorporating 16 no. studio units; 268 no. 1 bed apartments, 93 no. 2 bed apartments and 38 no. 3-bed apartments. At ground floor, 2 no. retail unts (combined 198 sq.m) (Class 1 use), and a café/restaurant (142 sq.m). Tenant services, amenities and facilities (combined 673 sq.m) distributed across ground floor (lobby, mail room, co-working and lounge area), Level 06 (terrace access) and Level 17 (lounge). Provision of communal amenity open space including a courtyard of 1,123 sq.m and roof terraces of 1,535 sq.m

b. Double basement to accommodate car parking, cycle parking, waste storage, general storage and plant.

c. PW4 (1,395 sq.m gross floor area including ancillary uses) - 9 no. apartments in a part 2-3 storey block (max. height 10.125m) comprising, 2 no. 2-bed duplex apartment units and 7 no. 3-bed triplex apartment units. Provision of communal amenity open space in the form of a courtyard 111 sq.m

d. PW5 (1,504 sq.m gross floor area including ancillary uses) - 21 no. apartments in a 4 storey block (max. height 13.30m) comprising 12 no. studio apartments, 1 no. 1-bed apartment, 5 no. 2-bed apartments, and 3 no. 3-bed apartments. Provision of communal amenity space in the form of a courtyard 167sq.m. Provision of communal amenity open space in the form of a courtyard 167 sq.m

iv. the construction of a childcare facility (block PW4) with a gross floor area of 275 sq.m and associated external play area of 146 sq.m;

v. the provision of public open space with 2 no. permanent parks, 'Players Park' (3,960 sq.m) incorporating active and passive uses to the northwest of the former factory building on lands owned by Dublin City Council; 'St. Catherine's Park' (1,350 sq.m)a playground, to the north east of the Player Wills site adjacent to St. Catherine's National School. A temporary public park (1,158 sq.m) to the northeast of the site set aside for a future school extension. The existing courtyard (690 sq.m) in block PW1 (former factory building) to be retained and enhanced and a public plaza (320 sq.m) between proposed blocks PW and PW4.

vi. 903 no. long-stay bicycle parking spaces, with 861 no. spaces in the PW2 basement and 42 no. spaces at ground level in secure enclosures within blocks PW4 and PW5. 20 no. spaces reserved for non-residential uses and 110 no. short-stay visitor bicycle spaces provided at ground level.

vii. 4 no. dedicated pedestrian access points are proposed to maximise walking and cycling, 2 no. from South Circular Road, 1 no. from St. Catherine's Avenue and 1 no. from Donore Avenue.

viii. in the basement of PW2, 148 no. car parking spaces to serve the proposed build to rent apartments including 19 no. dedicated disabled parking spaces and 6 no. motorcycle spaces. 20 no. spaces for a car sharing club ('Go Car' or similar). 10% of parking spaces fitted with electric charging points.

ix. in the basement of PW2, use for 81 no. car parking spaces (1,293 sq.m net floor area) including 5 no. dedicated disabled parking spaces, 3 no. motorcycle spaces and 10% of parking spaces fitted with electric charging points to facilitate residential car parking associated with future development on neighbouring lands. The area will not be used for carparking without a separate grant of permission for that future development. In the alternative, use for additional storage (cage/container) for residents of the proposed development.

x. 37 no. surface level car parking spaces including 3 no. disabled access and 3 no. creche set down spaces and 10% fitted with electric charging points. 2 no. loading bays and 2 no. taxi set-down areas.

xi. development of internal street network including a link road (84m long x 4.8m wide) to the south of the proposed 'Players Park' on land owned by Dublin City Council that will provide connectivity between the former 'Bailey Gibson' site and the 'Player Wills' site.

xii. vehicular access will be provided via Donore Avenue with a one-way exit provided onto South Circular Road to the east of block PW1(the former factory building);

xiii. replacement and realignment of footpaths to provide for improved pedestrian conditions along sections of Donore Avenue and South Circular Road and realignment of centreline along sections of Donore Avenue with associated changes to road markings;

xiv. a contra-flow cycle lane is proposed at the one-way vehicular exit to the east of PW1 (former factory building) to allow 2-way cycle movements via this access point;

xv. decommissioning of existing 2 no. ESB substations and the construction of 2 no. ESB substations and associated switch rooms, 1 no. single ESB substation in PW 1 (43.5 sq.m) and 1 no. double ESB substation in PW2 (68 sq.m);

xvi. the construction of a waste and water storage building (combined 133 sq.m, height 4.35m) to the west of building PW1;

xvii. all ancillary site development works; drainage, rooftop solar photovoltaics (20 no. panels total), landscaping, boundary treatment and lighting.

Figure 1.1: Google Maps Screenshot – Player Wills Development Site

1.2 SCOPE OF THIS REPORT

This report describes the proposed civil engineering infrastructure for the development and how it connects to the public infrastructure serving the area. In particular, foul and surface water drainage, flood risk and water supply aspects are addressed. This report should be read in conjunction with the following drawings submitted with the planning application.

- C-1000 Site Location Plan
- C-1020 Proposed Lower Basement Foul and Surface Water Drainage
- C-1021 Proposed Foul and Surface Water Drainage Sheet 1
- C-1022 Proposed Foul and Surface Water Drainage Sheet 2
- C-1023 Proposed Masterplan Drainage Strategy Plan
- C-1024 Proposed Masterplan Drainage Phasing Plan
- C-1030 Proposed Watermain Layout Sheet 1
- C-1031 Proposed Watermain Layout Sheet 2
- C-1050 Proposed SuDS Strategy Plan
- C1060 Footing Systems
- C-1212 Typical Roads and Pavement Details
- C-1220 Standard Stormwater Drainage Details
- C-1250 Typical SuDS Details Sheet 1
- C-1251 Typical SuDS Details Sheet 2
- C-1252 Typical SuDS Details Sheet 3

1.3 PRE-PLANNING DISCUSSIONS

Extensive pre-planning consultation has occurred with Dublin City Council Drainage Planning Department in relation to stormwater management. Dedicated stormwater infrastructure pre-planning meetings were held in the office of Dublin City Council on the following dates and with the following DCC Drainage Planning Department representatives.

10.06.2019 – Ms. Maria Treacy and Mr. Gabriel Koncal

12.07.2019 – Mr. Gabriel Koncal.

26.07.2019 – Ms. Niamh Fitzgerald and Mr. Gabriel Koncal.

11.12.2019 – Ms. Maria Treacy and Mr. Gabriel Koncal

Pre-planning consultation was also undertaken in conjunction with the landscape architects with Dublin City Council Parks Department in relation to the design of the proposed SuDS tree pit locations, types and size. The most recent meetings were held via online meeting platforms, due to the current Covid19 movement restrictions, on the following dates and DCC representatives.

01.04.2020 – Ms Suzanne O'Connell and Mr. Gareth Toolan

24.04.2020 – Ms. Suzanne O'Connell and Mr. Peter Leonard

The Dublin City Council Drainage Planning Department issued a report based on a review of the SHD process Pre-Application documentation submission to An Bord Pleanála, which raised queries in relation to various elements of the stormwater management design. Subsequent discussions with Dublin City Council Executive Engineer, Ms. Maria Treacy, were held on 14.07.2020 and again on 14.09.2020 to ensure those queries were addressed to the satisfaction of the Drainage Planning Department prior to lodgement of the full planning application. The main issues discussed and the manner in which they have been addressed are presented in this report.

2.0 SURFACE WATER DRAINAGE SYSTEM

2.1 EXISTING SURFACE WATER INFRASTRUCTURE

2.1.1 Street Network

The Player Wills site is bounded by DCC owned lands and private residences to the west and north-west, private residences and St. Catherine's National School to the east, St. Theresa's Church and Donore Avenue to the north and The South Circular Road to the south. The proposed park, referenced in this report are Players Park, within DCC owned lands to the west of the Player Wills site, also forms part of this application and is bounded by the Bailey Gibson site to the west and further DCC owned land to the south and north. There is an existing 1050mm public surface water culvert located in Donore Avenue. This culvert enters Donore Avenue from the south at the junction with Merton Avenue and continues running northwards along Donore Avenue to the east of St. Catherine's Church where it changes to a 910mm culvert. There is a 300mm diameter vitrified clay combined sewer located within St. Catherine's Avenue to the east. There is also a 300mm vitrified clay combined sewer within Donore Avenue to the north-east of the site. Further north along Donore Avenue, to the east of the proposed site, this sewer changes to a 990mm brick combined sewer culvert. A 1040mm brick combined sewer culvert runs within the South Circular Road.

2.1.2 Internal to Masterplan Lands

2.1.2.1 450mm Diameter Stormwater Drain

The local authority map, contained in Appendix II, shows a 450mm diameter stormwater drain which runs parallel to the west boundary of the Player Wills site and DCC Lands. It enters the Players Wills site at the rear of the adjacent domestic residence to the south-west of the old Player Wills Factory and extends generally northwards. At the north-west corner of the Player Wills site, this drain is shown connecting to a 375mm stormwater drain which extends through the now demolished St. Theresa's Gardens flats complex and, subsequently, connects to the stormwater culvert in Donore Avenue. There is also a stormwater drain from the adjacent Coombe lands, which connects to the same 375mm stormwater drain within the zone of the demolished St. Theresa's flats. Dublin City Council's Maintenance Division carried out exploratory work in the general area around the St. Theresa's Gardens flats in early to mid-2019. They confirmed that the connection shown on the Local Authority map between the 450mm diameter drain and 375mm diameter drain is not present. It is understood that this connection was demolished as part of the demolition of the St. Theresa's Gardens Flats or at some earlier time.

DCC also noted that there was no indication of issues with flooding as a result of this lack of a downstream connection for the 450mm diameter pipe. Subsequent exploratory works and CCTV surveys carried out by the Applicant on the 450mm diameter pipe have proved it to be a very shallow pipe which is exposed to the ground surface in parts, has root ingress and is blocked in several locations. The final manhole which could be accessed on this drain is located at the intersection of the north-west corner of the Players Wills site and the adjacent DCC lands. This manhole was permanently flooded, with no flow observed. This correlates with advice from DCC Drainage Planning that the connection downstream from this drain was no longer present.

It has been established that there are live connections into the 450mm diameter pipe from at least one road gulley within the private estate directly to the west of the old Players Factory and that

this pipe has one incoming pipe feeding from the south side of the South Circular road which is not on the current Local Authority record maps.

2.1.2.2 1050mm Stormwater Culvert

A 1050mm concrete stormwater culvert is shown on the local authority map, contained in Appendix II, extending east to north-west across the masterplan. It enters the masterplan along the boundary separating the Player Wills site and the adjacent St. Theresa's Church site. This culvert extends north-west through the DCC lands and continues into the Coombe Hospital site. Exploratory works carried out by DCC Maintenance Division in early to mid-2019 confirmed that the 1030mm concrete culvert is obsolete/has been demolished between its intersection with the 450mm diameter pipe at the north-west corner of the Player Will site and the boundary with the Coombe hospital. It is also understood that works are planned for DCC to construct a manhole on this culvert where it crosses the boundary of the Coombe hospital site into the DCC Masterplan lands, as the section of culvert extending through the Coombe hospital site remains live.

The Flood Risk Assessment prepared by JJ Campbell & Associates Consulting Structural and Civil Engineers and Archaeological Desktop Report, prepared by Archaeology Plan, both of which were submitted as part of DCC planning reference 2475/18 for the development currently under construction along the north of the masterplan, indicate that the 1030mm culvert crossing the site was once a main culverted watercourse of the Abbey Stream, but that the Abbey Stream flow was diverted to the stormwater culvert in Donore Avenue many years ago, with only an overflow connection to the culvert crossing the masterplan remaining.

During pre-planning discussions with DCC Drainage Planning Department, it was agreed that the extent of the stormwater culvert crossing the northern boundary of the Player Wills site would be surveyed to establish flow rates within the culvert, its condition and also to confirm if any private connections to the culvert exist. This survey work was carried out between August and November 2019 and established the following:

- The starting point of this culvert at Donore Avenue does not have an access manhole. There is a 225mm diameter pipe at an elevation of approximately 700mm above the outfall invert in the adjacent manhole which enters the culvert. The main flow in the adjacent manhole, connects to the stormwater culvert within Donore Avenue. i.e. stormwater flow upstream of this point could only ever enter the culvert crossing the masterplan in the event that the culvert in Donore Avenue was surcharged to 700mm or higher.
- On opening the manhole which is located within the adjacent Church Grounds, standing water was present in the culvert to a height of approximately 750mm below surface level. There was no flow in the culvert. This indicates that there is no downstream outflow from the culvert and that the water within the culvert is a result of either ground water entering the culvert and finding its natural level, or surface water seeping into the culvert over time, or a combination of both. As part of the survey works, the culvert was pumped out, a significant amount of silt was removed to facilitate a CCTV survey.
- The CCTV survey discovered that a concrete wall is present in the culvert close to the north-west corner of the Player Wills site, within the adjacent Church property. The wall closes off this end of the culvert except for a 225mm diameter outfall pipe which connects to a manhole on the 450mm diameter line running south to north along the west boundary of the Player Wills site. As noted in 2.1.2.1, that manhole is permanently flooded, with no downstream connection due to the previous demolition of the downstream stormwater drains.

- A drainage survey was also carried out within the adjacent Church property. This survey confirmed that all the drainage lines within the Church property connect to a combined sewer within Donore Avenue and that there are no connections to the stormwater culvert.

In summary, it has been established that the extent of culvert shown on the Local Authority Maps which extends across the boundary between the Player Wills site and the adjacent Church site exists, but is permanently flooded, was heavily silted, has only one feed which is a 225mm diameter overflow from the main culvert in Donore Avenue and has no downstream connection to a stormwater network. Hence, while the culvert may once have acted as some form of storage in storm events, it now serves no drainage function.

2.1.2.3 Drainage Within Area of Demolished St. Theresa's Gardens Flats

As shown on the local authority map contained in Appendix II, there is a 300/375mm diameter stormwater pipe which extends from the boundary with the rear of the Coombe hospital, through the St. Theresa's Gardens flats site. It flows in a north-east direction and connects to the stormwater culvert in Donore Avenue. DCC have advised that while this line required removal of silt and some repair work during the exploratory works carried out in 2019, it remains a live sewer.

2.2 OTHER DEVELOPMENTS PLANNED AND UNDER CONSTRUCTION

The Player Wills SHD Site is located within the masterplan covering the Player Wills Site, Dublin City Council and Bailey Gibson Lands. A portion of the DCC lands, along the northern boundary of the masterplan, are currently being developed, with construction already underway – DCC Planning Ref 2475/18. Dublin City Council has prepared a masterplan which provides an integrated strategy for the development of the three individual sites. This masterplan includes an integrated road layout connecting each of the properties. It also includes proposals for site wide stormwater management and foul drainage layouts. A masterplan drainage layout is included with the submitted civil engineering drawings which details how this integrated approach will be achieved, while also allowing for separate development of each of the sites.

2.3 PROPOSED SURFACE WATER DRAINAGE SYSTEM

DCC Drainage Planning Department policy requires that consideration be given to stormwater management over the full masterplan, not only the individual sites. As outlined in 2.2, a masterplan drainage strategy has been developed in consultation with DCC and this strategy plan is provided as part of submitted civil engineering drawings. The three individual sites within the masterplan will be developed in different stages and as a result, the stormwater management and drainage strategy include provision to account for this staging.

2.3.1 Proposed Sewer Diversions

To facilitate development across the whole masterplan, various pipe diversions are necessary. Phasing of the development takes into consideration the stages at which diversions are required. Refer to drawing C1024 – Proposed Masterplan Drainage Phasing Plan, which has been submitted as part of this planning application.

As outlined in 2.1.2.1, there is a 450mm diameter public stormwater pipe which runs from south to north and is located along the boundary between the Players Wills site and DCC lands. This pipe is in very poor condition and while it has live connections from the south, it currently has no connection to the public surface water drains where it terminates at the north-west corner of the

Player Wills site. Given that live connections to this drain exist, this drain will be diverted as part of the development of the Masterplan to reinstate service to those connections. This diversion will be carried out as part of the Player Wills SHD construction works. The diversion, which will predominantly run within the Player Wills site, will also facilitate construction of one of the blocks on DCC's Land, which clashes with the existing sewer location. The diversion will include lowering the pipe to achieve sufficient cover beneath proposed new roads within the development. Details of the diversion and phasing for same are included on the accompanying drawings. The diverted pipe will be connected to the proposed new stormwater drainage beneath the new internal roads on the Player Wills site.

To facilitate pipe sizing, an estimate of the catchment for this pipe has been used to establish a conservative peak flow rate. Refer to figure 2.1 below. This catchment area has been included in the Microdrainage calculations in Appendix III to design the new pipe sizes. The existing peak flow rate, calculated for a 50mm/hr storm, is as follows:

$$= \text{Site area x } \frac{50}{1000} x \frac{1000}{60^2}$$

$$= 1169\text{m}^2 \text{ x } 0.0139$$

$$= 16.24 \text{ l/s}$$

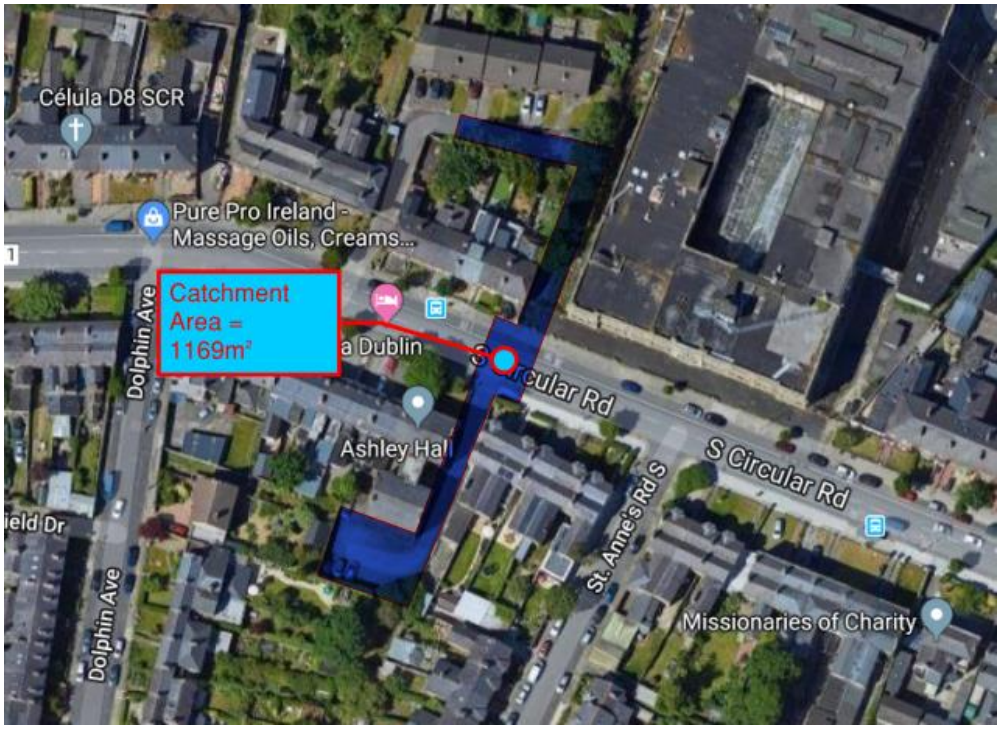


Figure 2.1: Existing 450mm Pipe Estimated Catchment

As outlined above, the attenuated outflow from Player Wills development will connect into the drainage infrastructure to be constructed as part of the Bailey Gibson development, just prior to the final discharge to the public stormwater culvert in Donore Avenue. Therefore, the peak flow in the final section of drain in the 100Year ARI (including 20% for climate change) event must cater for the combined peak flow from the Bailey Gibson and Player Wills sites and the diverted 450mm diameter pipe.

As outlined in 2.1.2.2, the 1050mm concrete culvert which extends across the northern boundary of the Player Wills site is now redundant. As part of the proposed Bailey Gibson development, for which planning permission has recently been granted, this culvert will be abandoned when the new

connection to the culvert in Donore Avenue is made. The culvert will be grubbed up and removed when the later stages of the masterplan are developed.

As outlined in 2.1.2.3, the 300/375mm diameter stormwater drain which extends through the old St. Theresa's Gardens flats area is still live. As part of the proposed development of this land, which will form part of a separate planning application, this drain will be diverted to connect to a new stormwater network to be constructed as part of that development.

2.3.2 Proposed New Surface Water System

2.3.2.1 Masterplan Drainage Strategy

A Masterplan Drainage Strategy has been developed with DCC Drainage Planning Department to provide an integrated approach to stormwater management across the three sites within the Masterplan. This planning application covers the Player Wills Development to the south-east and the proposed Players Park site to the south, between the Bailey Gibson and Player Wills sites. In accordance with the masterplan drainage strategy, stormwater from the Player Wills site will be managed within that site prior to discharge to the stormwater culvert in Donore Avenue close to the junction with Sandford Avenue. Once the masterplan has been fully developed, stormwater from all other areas of the masterplan (DDC Lands, including the Southern Park, and the Bailey Gibson site) shall discharge to the stormwater culvert in Donore Avenue close to the junction with Harman St., after passing through an attenuation tank located to the north of the proposed Municipal playing pitch. To facilitate phased construction of the masterplan, which will include construction of The Bailey Gibson, Players Park and Player Wills sites prior to construction of the remainder of DCC's Land, an interim approach to stormwater management from Bailey Gibson and the Players Park sites will be employed.

Construction of the Bailey Gibson site, that will form phase 1 of the masterplan, shall include construction of a stormwater sewer from the Bailey Gibson site, across DCC Land and the Player Wills site to connect to the existing public stormwater culvert in Donore Avenue, near the junction with Sandford Avenue. This connection shall serve as the point of discharge of stormwater from the Bailey Gibson site and the Players Park until the stormwater attenuation tank to the north of the Municipal playing pitch and connecting drainage infrastructure has been constructed. This connection shall also serve as the permanent outfall connection for the Player Will site.

When the DCC Lands are developed, stormwater from the Bailey Gibson and Players Park sites will be diverted into the stormwater infrastructure within DCC's lands at the north west corner of the Player Wills site and will be directed to the attenuation tank located to the north of the Municipal playing pitch.

The peak outflow rates from the Bailey Gibson development, summarised in table 2.1, which will be combined with the outflow from the Player Wills site on an interim basis, have been incorporated into the Microdrainage calculations for the Player Wills drainage network to facilitate pipe sizing for the final outfall drain from the point of connection of the stormwater drainage from each separate development, to the discharge location at Donore Avenue.

Table 2.1: Summary of Peak Outflow from Bailey Gibson Site (From Bailey Gibson SHD Infrastructure Report)

Storm Event	Flow (l/s)
1 Year ARI +20% for Climate change	1.1
30 Year ARI +20% for Climate change	10.8
100 Year ARI +20% for Climate change	21.7

2.3.2.2 Player Wills Development

This development comprises four individual building blocks, two park areas and a network of streets which are to be taken in charge by Dublin City Council.

The stormwater management for the site is as follows:

Each individual block shall incorporate green roofs throughout and all hard landscaping at grade within the private space of each block shall be discharged to tree pits or filter strips with overflows which shall finally discharge to an attenuation tank which will be individual to each block, located within the private land of that block and maintained by the developer. The attenuation tank, along with a proprietary flow control device, hydrobrake or similar, shall limit discharge from each block to 2l/s/ha subject to a 2l/s minimum rate due to practical minimum discharge limit. The outfall drain from each block shall connect to the new stormwater drainage network within the street. Microdrainage calculations for each individual block are included in Appendix IV.

In accordance with DCC policy for roads to be taken in charge, the road drainage has been designed to cater for the 5 Year ARI storm event including a 20% allowance for climate change with no attenuation of stormwater discharge from these areas. The full Microdrainage roads network model is included in Appendix IV. This network model includes discharge from each of the individual Player Wills blocks at 2l/s along with allowance for a discharge of 2l/s from the future DCC Block 4 located to the south of the Players Park between the Bailey Gibson and Player Wills sites and finally with allowance for flows from the existing 450mm diameter stormwater pipe which enters the site along the west side of the existing factory building and is to be diverted into the new road drainage network.

Both the proposed St. Catherine's Park to the east within the Player Wills site and the proposed Players Park located between the Bailey Gibson and Player Wills sites will have a significant area of soft landscaping throughout. Hard paved surfaces forming footpaths through the parks will all drain to filter strips located along the verge/kerbline of each footpath. From here, the stormwater will filter into the permeable hardcore build-up beneath the full area of the paved surface above. Essentially, this shall ensure that all stormwater in both parks shall be capable of discharging to ground over the full surface area of the park. Due to the poor permeability of the boulder clays which are present at this site, and to ensure the ongoing functionality of the parks in high intensity storm events, the filter strips will incorporate a land drain which will have an overflow connection to the main surface water network. The area covering the proposed Play Park is currently a fully hard paved surface with untreated and unattenuated discharge to the public combined sewer. The proposed drainage system for the Play Park shall provide a significant improvement from existing peak discharge rates.

2.3.2.3 Dublin City Council SDRA Lands

2.3.2.3.1 Part 8 DCC Housing Development Under Construction

A portion of the DCC lands, along the northern boundary of the masterplan, is currently being developed, with construction already underway – DCC Planning Ref 2475/18. The stormwater drainage system for that development, designed by others, is a standalone system, with stormwater attenuation and SuDS measures applicable to that site only. The new stormwater drainage for this development, serves the new road parallel to the northern boundary, along with the buildings themselves. The design and levels of that stormwater system mean there will be no significant interaction with the drainage network for the rest of the masterplan.

2.3.2.3.2 Remaining DCC Lands to centre, north and north east of the masterplan

A new stormwater drainage system is to be provided for these DCC lands. The primary drainage route shall follow the proposed road network, extending from the northern boundary of the Bailey Gibson site, around the northern side of the proposed new playing pitch, with a final connection to the stormwater culvert in Donore Avenue, near Harman St. As noted in Section 2.3.2.1, the stormwater discharge from the Bailey Gibson site and Players Park site, is to be redirected to connect to the stormwater drainage network within DCC lands and to achieve good practice SuDS initiatives for the overall masterplan, the required attenuation storage for both the DCC lands and Bailey Gibson site, will be provided within DCC lands. The location for this future diversion is outlined on the submitted Masterplan Drainage Strategy Plan and Masterplan Phasing Plan. The masterplan drainage strategy drawing includes provision for attenuation storage with capacity to cater for the both the DCC Lands and Bailey Gibson Lands, while the Player Wills site has its own standalone attenuation storage.

2.4 COMPLIANCE WITH THE PRINCIPLES OF SUSTAINABLE DRAINAGE SYSTEMS

The development is designed in accordance with the principles of Sustainable Drainage Systems (SuDS) as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS). The GDSDS addresses the issue of sustainability by requiring designs to comply with a set of drainage criteria which aim to minimize the impact of urbanization, by replicating the run-off characteristics of the greenfield site. The criteria provide a consistent approach to addressing the increase in both rate and volume of run-off, as well as ensuring the environment is protected from any pollution from roads and buildings. These drainage design criteria are as follows:

- Criterion 1 – River Water Quality Protection
- Criterion 2 – River Regime Protection
- Criterion 3 – Flood Risk Assessment
- Criterion 4 – River Flood Protection

2.4.1 Criterion 1 GDSDS – River Water Quality Protection

Run-off from natural greenfield areas contributes very little pollution and sediment to rivers and for most rainfall events direct run-off from greenfield sites to rivers does not take place as rainfall percolates into the ground. By contrast, urban run-off, when drained by pipe systems, results in run-off from virtually every rainfall event with high levels of pollution, particularly in the first phase of run-off, with little rainfall percolating to the ground. To prevent this happening, Criterion 1 requires that interception storage and/or treatment storage is provided, thereby replicating the run-off characteristics of the pre-development greenfield site.

2.4.1.1 Interception Storage

Interception storage where provided, should ensure that, at a minimum, the first 5mm and preferably the first 10mm of rainfall is intercepted on site and does not find its way to the receiving water.

In the context of the subject site, interception storage will be provided as follows:

(a) Roof Areas including Basement Roof/Podium Slab;

- **Intensive Green Roof** over all the podium slab area (basement roof) and roof terrace areas on the building. This will be achieved using a proprietary cellular drainage mat under the podium hard and soft landscaping finish to give the required retention capacity;
- **Extensive Green Roof (Sedum Blanket**) on upper roofs of the building, accessed only for maintenance;

(b) Paved Areas

The road and paved surfaces will be finished in impermeable surfacing, either flexible bituminous pavement, rigid bound paving, impermeable concrete paver or stone pavers. Typically, all streets are provided with trees and soft landscaping zones, interlinked with car parking on at least one side. The roads and footpaths will be drained by gullies and kerb cuts that connect to tree pits which are interlinked with perforated distribution pipes to provide infiltration trenches. The perforated pipes will allow discharge directly to the ground through the surrounding gravel bed. Due to the limited permeability which can be achieved through the sub-surface boulder clays, these pipes will also be connected to the surface water network via silt trap manholes. Notwithstanding the poor sub soil permeability, the gravel bed beneath the tree pits and surrounding the perforated pipes will provide good interception storage, which will retain, filter and attenuate run-off.

Table 2.2: Interception Storage: Required & Provided

Interception Storage Required	
Total Impermeable Area within Proposed Development Site	23,420m^2
Minimum required level of interception storage as per GDSDS Table 6.3	5mm
∴ Minimum Required Interception Storage = (0.005 x 23,420) = 117.10 m^3	
Minimum Required Interception Storage	**117.10 m^3**
Interception Storage Provided	
Intensive Green Roof on Podium Slab: Area = 2,392m^2 (e.g. Bauder DSE60 Board – Technical Data states up to 12 litres/m^2 storage)	28.70m^3
Sedum Roof on Building Roofs: Area = 2,856m^2 (e.g. Bauder DSE40 Board – Technical Data states up to 13.5 litres/m^2 storage)	38.56m^3
Soft landscaping: Area = 1,895m^2 (Footpath discharging into adjacent soft landscaping areas) 10mm/m^2	18.95m^3
Blue Roof on Building Roof Terrace slabs: Area = 1,250m^2 (e.g. Bauder DSE40 Board – Technical Data states up to 13.5 litres/m^2 storage)	16.88m^3
Tree Pit equivalent to 715m^2 (100mm deep of Granular fill 30% voids below outlet drainpipe)	21.45m^3
Interception Storage Provided	**124.54m^3**

2.4.2 Criterion 2 GDSDS – River Regime Protection

Regardless of the rainfall event, unchecked run-off from the developed site through traditional pipe networks will discharge into receiving waters at rates that are an order of magnitude greater than that prior to development. This can cause flash flow in the outfall river / stream that can cause scour and erosion. Attenuation storage is provided to prevent this occurring by limiting the rate of run-off to that which took place from the pre-development greenfield site. In practice, the rate of run-off needs to be appropriately low for the majority of rainfall events, and attenuation storage volumes should be provided for the 1 and 100 year storm event. The rate of outflow from such storage should be controlled so that it does not exceed the greenfield run-off rate of the greater of QBAR (which can be factored upwards by factors appropriate to the various return periods (given in the Flood Studies Report) if long term storage is provided) or 2l/s/ha.

Given that stormwater attenuation will be provided for each of the blocks individually, each of which is less than 1 hectare in total area, the stormwater discharge rate from each block will be limited to a peak outflow of 2l/s.

As noted in 2.3.2.2, the public parks shall predominantly act as a greenfield area, with all hard surfaces discharging to ground and land drains only acting as overflows to cater for high intensity storm events.

The remainder of the site consists of roads and pavements to be taken in charge. As noted in 2.3.2.2, in accordance with DCC policy for roads to be taken in charge, the road drainage has been designed to cater for the 5 Year ARI storm event including a 20% allowance for climate change and no attenuation is provided for stormwater discharge from these areas.

2.4.3 Criterion 3 GDSDS – Level of Service (Flooding) For the Site

The GDSDS requires that no flooding should occur on site for storms up to and including the 1 in 30 year event. The pipe network and the attenuation storage volumes should, therefore, be checked for such storms to ensure that no site flooding occurs although partial surcharging of the system is allowed as long as it does not threaten to flood.

For the 1 in 100 year event, the pipe network can fully surcharge and cause site flooding, but the top water level due to any such flooding must be at least 500mm below any vulnerable internal floor levels, and the flood waters should be contained within the site. In addition, the top water level in any attenuation device during the 100 year storm must be at least 500mm below any vulnerable internal floor levels.

Consideration should also be given to potential flooding of the receiving public system or watercourse outside the site during the 1 in 100 year event, and this is dealt with in more detail in Section 2.4.4 that follows and more globally in Section 3: Flood Risk Assessment.

Appendix IV gives MicroDrainage computer output for the pipe system during the 1 in 1, 1 in 30, and 1 in 100-year events for each of the individual building blocks. No flooding occurs during the storm events. The surcharge level of water in the manholes during the 1 in 100-year storm is always lower than 500mm below the nearest vulnerable internal ground floor levels.

In accordance with DCC policy for roads to be taken in charge, the road drainage has been designed to cater for the 5 Year ARI storm event including a 20% allowance for climate change

The basement car park is drained by a separate system that outfalls to a petrol interceptor followed by a sump buried below the basement slab. From there, the car park drainage is pumped to the

nearest foul manhole and is not at risk of any backflow from the surface water system during storm conditions. GDSDS Criterion 3 is therefore complied with.

2.4.4 Criterion 4 GDSDS – River Flood Protection

Criterion 4 is intended to prevent flooding of the receiving system / watercourse by either limiting the volume of run-off to the pre-development greenfield volume using 'long-term storage' (Option 1) or by limiting the rate of run-off for the 1 in 100 year storm to QBAR without applying growth factors using 'extended attenuation storage' (Option 2).

Significant long-term storage will be provided in the form of interception storage. This does not, however, equate to full long-term storage volumes and, given the low permeability of the subsoil, it is not feasible to provide additional storage areas elsewhere on site to achieve the required volume.

Option 2 has therefore been used to comply with Criterion 4 and an extended attenuation volume will be provided in the form of attenuation tanks across the Player Wills site to limit the rate of discharge in the 1 in 100 year storm event to the greater of QBAR without growth factors applied, or 2 l/s/ha from each of the individual buildings.

3.0 SITE FLOOD RISK ASSESSMENT

3.1 INTRODUCTION

This flood risk assessment is carried out in accordance with guidelines outlined in the OPW publication "*The Planning System and Flood Risk Assessment Guidelines for Planning Authorities*". The stages involved in the assessment of flood risk are listed in that publication as follows:

- Stage 1: Flood Risk Identification
- Stage 2: Initial Flood Risk Assessment
- Stage 3: Detailed Flood Risk Assessment

The OPW publication also outlines a Sequential Approach for determining whether a particular development is appropriate for a specified location in terms of flood risk. The categorization of the subject site in terms of the OPW's sequential approach is further outlined in Section 3.2 below.

This Flood Risk Assessment addresses the Player Wills and Players Park sites. Separate flood risk assessments will be required for adjacent developments within the Masterplan, as appropriate.

3.2 FLOOD RISK IDENTIFICATION

Stage 1 identifies whether there are any flooding or surface water management issues related to the site i.e. it identifies whether a flood risk assessment is required.

The first source considered is the OPW Flood Hazard Mapping service. The OPW map report for the Player Wills and Players Park sites shows no flood incidents have been recorded on the sites or the areas adjacent to the site.

All rain falling on the site, apart from roads to be taken in charge, will undergo two stage treatment, and all stormwater drains will be sized based on stormwater flows calculated using the simulation package Microdrainage. Therefore, the risk of pluvial flooding within the site is negligible.

The possibility of Fluvial or Tidal flooding on the site is considered utilizing the guidelines outlined in Chapter 3 of the OPW publication referenced in section 3.1 and with the Eastern CFRAMS (Catchment Flood Risk Assessment and Management) study, which is an overall study undertaken by the OPW.

As outlined in the OPW publication, new developments are divided into three categories which are as follows:

- Highly Vulnerable Development
- Less Vulnerable Development
- Water-compatible Development

The proposed development comes under the heading of Highly Vulnerable Development, as it is residential.

Geographical areas are similarly divided into three categories, based on their risk of river and tidal flooding. The three categories are as follows:

- Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding).

- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding).
- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding i.e. all areas which are not within zone A or B).

Good data is available on possible flooding of the surrounding area to the site in the Eastern CFRAM Study by the OPW. The study is a requirement of the EU 'Floods' Directive (2007/60/EC). The PFRA map is also available and considers flood risk arising from any major source of flooding, including natural sources such as river, sea, groundwater and rainfall as well as infrastructural sources such as urban drainage systems, reservoirs, water supply systems, ESB and Waterways Ireland Infrastructure.

Both the OPW Flood Hazard Mapping service and the Dublin City Development Plan 2016-2022 Strategic Flood Risk Assessment (SFRA) Composite Flood Map indicate that the Player Wills and Players Park sites are located in Zone C, where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B. These flood maps indicate that the DCC lands to the north of the masterplan are within Flood Zone A, with flooding indicated predominantly within the old St. Theresa's Gardens Flats area, to the north of and at a lower topography than the Player Wills site. OPW Flood Hazard mapping indicated that flood depths in the 1% Fluvial Flood event are limited to between 0-250mm above surface level.

The matrix shown in Figure 3.1, which is an extract from the OPW document, states whether a particular development is deemed 'Appropriate' for a geographical location.

Development Vulnerability	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Figure 3.1 – Matrix of vulnerability versus flood zone

In accordance with the flood zone definitions outlined above, the subject site is located in Flood Zone C. Hence, the proposed development is deemed 'Appropriate' in accordance with the guidelines of the OPW's publication.

3.3 INITIAL FLOOD RISK ASSESSMENT

The initial flood risk assessment should ensure that all relevant flood risk issues are assessed in relation to the decisions to be made and potential conflicts between flood risk and development are addressed. It should assess the adequacy of existing information and any flood defences.

The possible sources of flood water are assessed in the table below using the "Source – Pathway – Receptor Model".

Table3.1: The possible sources of flood water

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Tidal	Overtop Breach	People Property	Very Remote	Very high	Very Low
Fluvial	Overtop Breach	People Property	Remote	High	Low
Pluvial Surface water	Overflow / Blockage	People Property	Unlikely	High	Low
Groundwater	Rising groundwater levels	People Property	Unlikely	Low	Low

3.3.1 Appraisal of the availability and adequacy of existing information and flood zone maps

a) Tidal / Fluvial

Good data is available on possible tidal / fluvial flood risks. As discussed in detail in Section 3.2 previously, the predictive flood maps published by the OPW as part of the PRFA study provides detailed information on possible flooding of the site. These indicate that the proposed site is within Flood Zone C meaning 'Appropriate' for development. It is not considered necessary to carry out further studies.

b) Pluvial / Surface Water

The GDSDS includes extensive information on the storm and combined sewer network for this area. Performance Maps are available giving flooding prediction and cataloguing existing hydraulic deficiencies in the network in this area – see GDSDS map given in Appendix II of this document. An extract from the 2031 System Performance Assessment Maps is also shown in Figure 3.1 below.

The colour coding is as follows:

- Brown Line: Foul/Combined Sewer floods for 30year return period or less.
- Pink Line: Foul/Combined Sewer surcharges for 1 or 2year return period events
- Dark Green Line: Foul/Combined Sewer does not surcharge for 1 or 2year return period event and does not flood for a 30year return period event or below.
- Green Dot: Modelled Manhole does not flood for 5year Return Period Event
- Light Green Line: Stormwater Sewer does not surcharge for 1 or 2year return period event and does not flood for a 30year return period event or below.
- Light Blue Line: Stormwater Sewer surcharges for 1 or 2year return period events
- Dark Blue Line: Stormwater Sewer floods for the 30year return period or less.

The Player Wills site is bounded by:

1. The combined culvert on the South Circular Road. Although the Player wills site is located topographically lower than the combined culvert, it does not surcharge for the 1 or 2year return period event and does not flood for a 30year return period event or below.
2. A 300mm combined sewer in St. Catherine's Avenue which does not surcharge for the 1 or 2year return period event and does not flood for a 30year return period event or below.
3. A 300mm combined sewer in Donore Avenue which surcharges for the 1 or 2year return period events.

4. A 450mm diameter stormwater sewer in adjoining DCC lands parallel to the western boundary of the site, half of which does not surcharge for the 1 or 2year return period event and does not flood for a 30year return period event or below and the other half of which Floods for the 30year return period or less. This correlates with OPW Flood Hazard Mapping which indicates that resulting flooding does not extend into the Player Wills site and is limited in depth to between 0-250mm in the 1:1000 Fluvial Flood Event.
5. A 910-1210mm concrete culvert in Donore Avenue to the north east of the development which does not surcharge for the 1 or 2year return period event and does not flood for a 30year return period event or below.

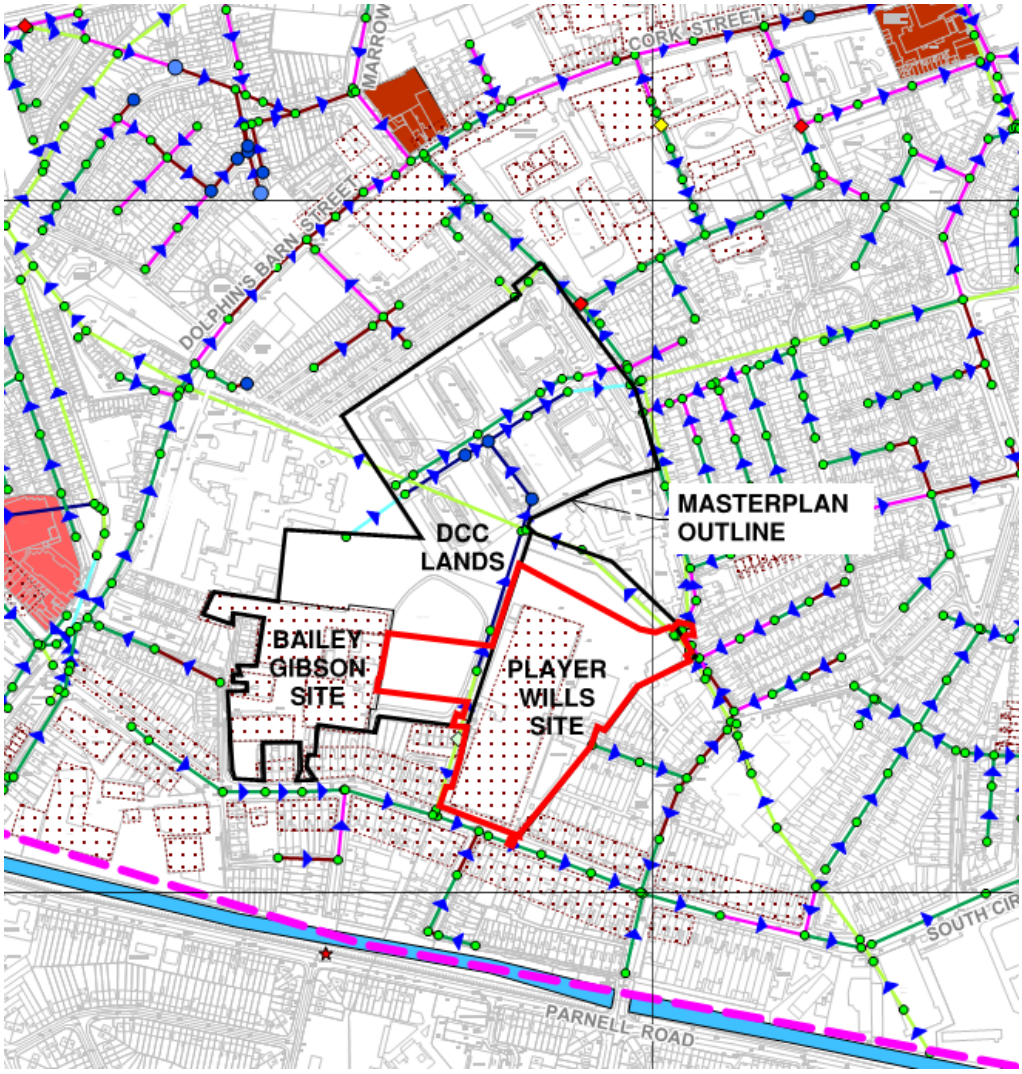


Figure 3.1 Extract from GDSDS Existing Hydraulic Performance Map 2031

3.3.2 Determination of what technical studies are appropriate

Given the comprehensive and detailed nature of the existing information available regarding flooding, it is not considered necessary to carry out any further analysis of the risk of tidal and fluvial flooding.

3.4 DETAILED FLOOD RISK ASSESSMENT

Stage 3 involves examining potential residual risks in detail and proposing measures to mitigate or eliminate same:

3.4.1 Check if Development Increases flood risk elsewhere

With regard to the potential for the proposed development increasing the flood risk elsewhere, the site is not subject to flooding in the 1 in 1000 year flood event. The site is currently entirely hardstand with sheet roofs and concrete/asphalt paving throughout. The introduction of SUDS measures as detailed in section 2.0 of this report, will reduce both the total outflow volume and peak outflow rate from the development and as a result will provide a reduction in peak flow contribution to the public stormwater network in a storm event.

3.4.2 Check Possibility of New Surface Water Network Flooding

As part of the surface water system design (Section 2.4.3), to comply with GDSDS Criterion 3 (Site Flooding), a 1year, 30year & 100year storm stimulation has been carried out on the proposed drainage system using the MicroDrainage software. The input & output data for this simulation are included in Appendix III. A 20% climate change factor has been applied. According to the Greater Dublin Strategic Drainage Study, flooding in a stormwater sewer should not occur up to the 30year event and the flood levels during a 100year event should not reach within 500mm of the finished floor levels of any building. From the simulation results it can be shown that there is no site flooding in any storm event and in all cases during the 1 in 100year storm event the top water level of surcharged manholes, is at least 500mm below the nearest vulnerable internal ground floor level.

3.5 CONCLUSION

The flood risk assessment has been carried out in accordance with the OPW publication “The Planning System and Flood Risk Assessment Guidelines for Planning Authorities”.

There is a no risk of flooding affecting the site from fluvial sources, so it is possible to develop the site within Flood Zone C. Any flood events do not cause flooding of the proposed development, and the development does not affect the flood storage volume or increase flood risk elsewhere.

4.0 FOUL DRAINAGE SYSTEM

4.1 EXISTING FOUL SEWER INFRASTRUCTURE

A 1060mm brick combined sewer is located within the South Circular Road with a flow direction of west to east, parallel to the southern boundary of the site. A 300mm diameter combined sewer is located within St Catherine's Avenue to the East of the site. A 300mm diameter combined sewer which becomes a 910mm diameter combined sewer culvert further downstream, is located within Donore Avenue, to the north east of the development site.

Refer to Appendix II(a) for existing sewer records.

4.2 PROPOSED FOUL SEWER SYSTEM

The local area gradually falls from south-west to north-east. The Bailey Gibson development will include construction of a foul sewer across both DCC's Land and the Player Wills site, which will connect to the existing 300mm combined sewer in Donore Avenue at the north-east corner of the Players Wills site. This sewer will be constructed as part of the first phase of the development of the masterplan and it has been designed with capacity to cater for the total flows from both the Bailey Gibson and Players Wills Developments. Refer to the calculations in Section 4.3 which are in accordance with the Irish Water Code of Practice for Wastewater.

The foul sewer calculations and proposed sewer layout provide provision for a future development of 23 units/townhouses on DCC's Land to the south of the Players Park and 400 units in a future development north of the Player Wills site.

A Pre-connection Enquiry was submitted to Irish Water on 11.04.2019 with details of the development proposals and foul flow calculations. A response to the Pre-Connection Enquiry was received on 29.10.2019 and confirms feasibility of a connection to the Irish Water network at the proposed location without a need for network upgrades. A copy of the Pre-Connection Enquiry and Irish Waters letter of feasibility is included in Appendix II.

Irish Water have also carried out the mandatory SHD design vetting on the proposed foul drainage design and issued a Statement of Design Acceptance for same. Refer to Appendix II(d).

4.3 FOUL FLOW CALCULATIONS

4.3.1 Residential Component:

Block No.	No. of Units	Population Equivalent Per Unit	Total Population	Daily Discharge Rate (L) @150l/p/day	Average Discharge Rate (Daily Discharge*1.1/24/60/60) l/s	Peak Discharge *
PW1	240 **	1	240	36000	0.458 l/s	2.748 l/s
	47	2.7	127	19050	0.243 l/s	1.458 l/s
PW2	415	2.7	1121	168150	2.141 l/s	6.423 l/s
PW4	9	2.7	25	3750	0.048 l/s	0.288 l/s
PW5	21	2.7	57	8550	0.109 l/s	0.654 l/s

Total			**1570**	**235500**	**3 l/s**	**9 l/s**

Table 4-1 Residential Foul Flow Calculation

*** Peak Demand Factor (Pf_{dom}) varies with total population.**

**** Shared Accommodation Units – Population Equivalent taken as 1 person per unit.**

4.3.2 Retail/Café/Bar/Community/Arts/Culture Component:

Block No.	Area (m^2)	Staff Daily Discharge 1 person per 19m^2 @90l/p/day	Patrons Daily Discharge @15l/p/day **	Total Average Discharge Rate (Daily Discharge*1.1/24/60/60) l/s	Peak Discharge (4.5*Ave Discharge)
PW1	2349	11127	12506	0.301 l/s	1.354 l/s
PW2	340	1610	2550	0.053 l/s	0.2385 l/s
Total	**1837**	**8701**	**13778**	**0.286 l/s**	**1.59 l/s**

Table 4-2 Non-Residential Foul Flow Calculation

*** * Retail/Café/Bar – 1 patron per 2m^2. Community/Arts/Culture – 1 patron per 10m^2**

4.3.3 Childcare Component:

Block No.	Area (m^2)	Population Equivalent 50 Children and 1 staff per 5 children	Daily Discharge (L) @50 l/p/day	Average Discharge Rate (Daily Discharge*1.1/24/60/69) l/s	Peak Discharge (4.5*Ave Discharge)
PW4	275	60	3000	0.038 l/s	0.172 l/s

Table 4-3 Creche Foul Flow Calculation

4.3.4 Total Foul Discharge

Block No.	Daily Discharge (L)	Average Discharge (l/s)	Peak Discharge (l/s)
PW1	59910	1.002 l/s	5.56 l/s
PW2	169770	2.194 l/s	6.661 l/s
PW4	7850	0.086 l/s	0.460 l/s
PW5	8550	0.109 l/s	0.654 l/s
Total	**246080**	**3.391 l/s**	**10.762 l/s**

Using Colebrook White Equation and Flow Charts for foul pipes with a roughness coefficient, ks = 1.5, a 225mm diameter pipe has a flow capacity of 34 l/s and velocity of 0.87 m/s at a gradient of 1:200. The Relative Velocity and Flow in Circular Pipe for any Depth of Flow chart confirms that for a peak discharge of 10.762 l/s, this gives a depth of flow of 0.375 and proportional velocity of 0.875. Actual velocity at peak flow = 0.87 * 0.875 = 0.761 l/s. Irish Water Code of Practice for Wastewater specifies a velocity of between 0.75 and 2.5m/s. Therefore, a 225mm diameter pipe at a gradient of 1:200 is adequate.

The peak discharge rate from the proposed Bailey Gibson Development, is 6.78 l/s.

In accordance with the masterplan for this area, there are potentially 423 additional residential units in future phasing giving a peak discharge rate of 423*2.7*150*1.1/24/60/60*3=6.54l/s

Therefore, the total peak discharge rate to the combined sewer in Donore Avenue will be 6.78 + 10.762 + 6.54l/s = 24.082 l/s

Again, using Colebrook White Equation and Flow Charts for foul pipes with a roughness coefficient, ks = 1.5, a 300mm diameter pipe has a flow capacity of 68 l/s and velocity of 0.99m/s at a gradient of 1:225. The Relative Velocity and Flow in Circular Pipe for any Depth of Flow chart confirms that for a peak discharge of 23.844l/s, this gives a depth of flow of 0.4 and proportional velocity of 0.9. Therefore, actual velocity at peak flow = 0.99 * 0.9 = 0.891 l/s. Irish Water Code of Practice for Wastewater specifies a velocity of between 0.75 and 2.5m/s. Therefore, a 300mm diameter pipe at a gradient of 1:225 is adequate.

4.4 PROPOSED BASEMENT CAR PARK DRAINAGE SYSTEM

The basement car park will be a concrete structure designed to withstand hydrostatic water pressures. The basement will have a series of gullies and drainage channels cast into the floor slab which will cater for the limited amount of run-off that enters the through ramps, service openings and from vehicles. These channels will connect to a buried gravity pipe network that will fall to a petrol interceptor. The outflow from the petrol interceptor will flow to a sump with duty and standby pumps from where it will be pumped through a rising main, to the nearest foul manhole on the main gravity system, via a standoff manhole.

Separate drainage lines will be provided within the basement which will collect run-off from the bin store wash down floor gulleys. These drains will be directed to a second pump chamber with duty and standby pumps from where the outflow will be pumped through a rising main, to the nearest foul manhole on the main gravity system, via a standoff manhole.

5.0 WATER SUPPLY

5.1 EXISTING WATER SUPPLY INFRASTRUCTURE

There is a total of three cast iron watermains located in the South Circular Road to the south of the site. These watermains are 4, 6, and 18inch respectively. There is a 9 inch cast iron watermain located in St Catherine's Avenue to the east of the site. There is also a 6 inch cast iron watermain located in Donore Avenue to the north-east of the site.

Refer to Appendix II(a) for existing watermain records

5.2 PROPOSED WATER SUPPLY SYSTEM

In accordance with Irish Water Code of Practice for Water Infrastructure, a new 200 mm diameter looped watermain is proposed to service the Player Wills development with a connection to the 18" cast iron watermain in the South Circular Road.

Hydrants will be provided on the watermain in accordance with Part B of the Building Regulations and the Fire Safety Certificate's Requirements. Sluice valves will be provided at appropriate locations to facilitate isolation and purging of the system.

Twenty-four-hour storage will be provided to cater for possible shut-downs in the system.

The water demand calculations in Section 5.3 and the proposed watermain layout include provision for a future development of 23 units/townhouses on DCC's Land to the south of the Players Park and 250 units in a future development to the northern end of the Player Wills site.

A Pre-connection Enquiry was submitted to Irish Water on 11.04.2019 with details of the development proposals and water demand calculations. A response to the Pre-Connection Enquiry was received on 29.10.2019 and confirms feasibility of a connection to the Irish Water network at the location shown on the submitted drawings with no network upgrades necessary to facilitate the development. A copy of the Pre-Connection Enquiry and Irish Waters letter of feasibility is included in Appendix II.

Irish Water have also carried out the mandatory SHD design vetting on the proposed watermain design and issued a Statement of Design Acceptance for same. Refer to Appendix II(d).

5.3 WATER DEMAND CALCULATIONS

5.3.1 Residential Component:

Block No.	No. of Units	Population Equivalent Per Unit	Total Population	Daily Demand (L) @150l/p/day	Average Day/ Peak Week Demand (Daily Discharge*1.25/24/60/60) l/s	Peak Discharge (5*Ave Day/Peak Week) l/s
PW1	240 *	1	240	36000	0.521 l/s	2.605 l/s
	47	2.7	127	19050	0.276 l/s	1.380 l/s
PW2	415	2.7	1121	168150	2.433 l/s	12.165 l/s
PW4	9	2.7	25	3750	0.054 l/s	0.270 l/s
PW5	21	2.7	57	8550	0.124 l/s	0.620 l/s

Total			**1570**	**235500**	**3.408 l/s**	**17.04 l/s**

*** Shared Accommodation Units – Population Equivalent taken as 1 person per unit (all units are single occupancy).**

5.3.2 Retail/Café/Bar/Community/Arts/Culture Component:

Block No.	Area (m^2)	Staff Daily Discharge 1 person per 19m^2 @90l/p/day	Patrons Daily Discharge @15l/p/day **	Average Day/ Peak Week Demand (Daily Discharge*1.25/24/60/60) l/s	Peak Discharge (5*Ave Day/Peak Week) l/s
PW1	2,349	11127	12506	0.342 l/s	1.71 l/s
PW2	340	1610	2550	0.06l/s	0.3 l/s
Total	**1837**	**8701**	**13778**	**0.325 l/s**	**2.01 l/s**

*** * Retail/Café/Bar – 1 patron per 2m^2. Community/Arts/Culture – 1 patron per 10m^2**

5.3.3 Childcare Component:

Block No.	Area (m^2)	Population Equivalent 50 Children and 1 staff per 5 children	Daily Discharge (L) @50 l/p/day	Average Day/ Peak Week Demand (Daily Discharge*1.25/24/60/60) l/s	Peak Discharge (5*Ave Day/Peak Week) l/s
PW4	275	60	3000	0.043l/s	0.217l/s

5.3.4 Total Water Demand

Block No.	Daily Demand (L)	Average Day/Peak Week Demand (l/s)	Peak Demand (l/s)
PW1	59910	1.139 l/s	5.695 l/s
PW2	169770	2.493 l/s	12.465 l/s
PW4	7850	0.097 l/s	0.487 l/s
PW5	8550	0.124 l/s	0.620 l/s
Total	**246080**	**3.853 l/s**	**19.267 l/s**

APPENDIX I

Flood Maps

(a) OPW Historic Flood Mapping

(b) GDSDS 2011 & 2031 Hydraulic Performance Maps

(c) PRFA Predictive Flood mapping

(d) Dublin City Development Plan (2016-2022) SFRA – Composite Flood Map

APPENDIX I(a)

OPW HISTORIC FLOOD MAPPING

OPW National Flood Hazard Mapping

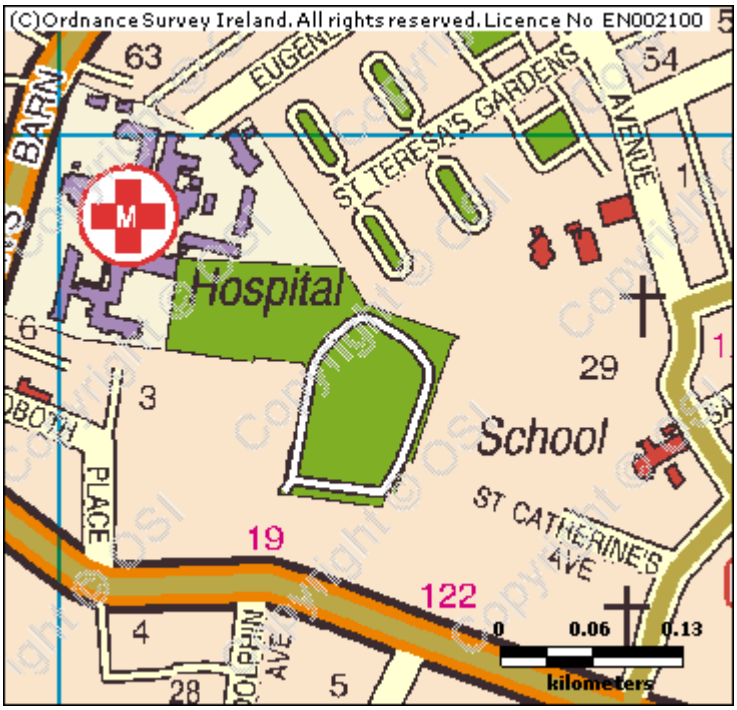
Summary Local Area Report

This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

The map centre is in:

County: Dublin

NGR: O 142 328



Map Scale 1:5,229

Map Legend	
	Flood Points
	Multiple / Recurring Flood Points
	Areas Flooded
	Hydrometric Stations
	Rivers
	Lakes
	River Catchment Areas
	Land Commission *
	Drainage Districts *
	Benefiting Lands *

* Important: These maps do not indicate flood hazard or flood extent. Thier purpose and scope is explained in the Glossary.

30 Results

1. Flooding at Lady's Lane, Kilmainham, Co. Dublin on 24th Oct 2011
County: Dublin
Start Date: 24/Oct/2011
Flood Quality Code:2
Additional Information: Reports (1) More Mapped Information

2. Flooding at Kearns Place, Kilmainham, Dublin 8 on 24th Oct 2011
County: Dublin
Start Date: 24/Oct/2011
Flood Quality Code:2
Additional Information: Reports (1) More Mapped Information

3. Flooding at Harold's Cross, Dublin City on 24th Oct 2011
County: Dublin
Start Date: 24/Oct/2011
Flood Quality Code:3
Additional Information: Reports (1) More Mapped Information

4. Flooding at Bow Lane, Kilmainham, Dublin 8 on 24th Oct 2011
County: Dublin
Start Date: 24/Oct/2011
Flood Quality Code:3
Additional Information: Reports (1) More Mapped Information

5. Flooding at Blarney Park, Crumlin, Dublin 12 on 24th Oct 2011
County: Dublin
Start Date: 24/Oct/2011
Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information

6. Dublin City Tidal Feb 2002 — Start Date: 01/Feb/2002

County: Dublin — Flood Quality Code: 1

Additional Information: Photos (32) Reports (10) Press Archive (27) More Mapped Information

---

7. Liffey Lower - Dec 1954 — Start Date: 08/Dec/1954

County: Kildare, Dublin — Flood Quality Code: 2

Additional Information: Reports (4) Press Archive (2) More Mapped Information

---

8. Flooding at Mount Argus Road and Kimmage Road Lower on 24th Oct 2011 — Start Date: 24/Oct/2011

County: Dublin — Flood Quality Code: 2

Additional Information: Reports (1) More Mapped Information

9. Poddle August 1986 — Start Date: 25/Aug/1986

County: Dublin — Flood Quality Code: 2

Additional Information: Reports (9) Press Archive (1) More Mapped Information

---

10. Camac August 1986 — Start Date: 25/Aug/1986

County: Dublin — Flood Quality Code: 2

Additional Information: Reports (3) More Mapped Information

11. Camac Turvey Ave Recurring — Start Date:

County: Dublin — Flood Quality Code: 3

Additional Information: Reports (1) More Mapped Information

12. Camac Bow Bridge Recurring — Start Date:

County: Dublin — Flood Quality Code: 3

Additional Information: Reports (1) More Mapped Information

13. Camac Carrickfoyle Terrace Recurring — Start Date:

County: Dublin — Flood Quality Code: 3

Additional Information: Reports (1) More Mapped Information

14. Camac Kearns Place Recurring — Start Date:

County: Dublin — Flood Quality Code: 3

Additional Information: Reports (1) More Mapped Information

15. Clanbrassil Street June 1963 — Start Date: 11/Jun/1963

County: Dublin — Flood Quality Code: 3

Additional Information: Reports (3) Press Archive (2) More Mapped Information

---

16. Rathmines Lower June 1963 — Start Date: 11/Jun/1963

County: Dublin — Flood Quality Code: 3

Additional Information: Reports (3) Press Archive (2) More Mapped Information

---

17. Kimmage June 1963 — Start Date: 11/Jun/1963

County: Dublin — Flood Quality Code: 3

Additional Information: Reports (3) Press Archive (2) More Mapped Information

---

18. Harold's Cross June 1963 — Start Date: 11/Jun/1963

County: Dublin — Flood Quality Code: 3

Additional Information: Reports (3) Press Archive (2) More Mapped Information

---

19. Mount Jerome Harold's Cross June 1963
County: Dublin
Start Date: 11/Jun/1963
Flood Quality Code:3
Additional Information: Reports (3) Press Archive (2) More Mapped Information

20. Kimmage Mount Argus June 1963
County: Dublin
Start Date: 11/Jun/1963
Flood Quality Code:3
Additional Information: Reports (3) Press Archive (2) More Mapped Information

21. Grafton Street June 1963
County: Dublin
Start Date: 11/Jun/1963
Flood Quality Code:3
Additional Information: Reports (3) Press Archive (2) More Mapped Information

22. Poddle Park Nov 2000
County: Dublin
Start Date: 05/Nov/2000
Flood Quality Code:3
Additional Information: Reports (1) More Mapped Information

23. Poddle Tributary Marrowbone Lane Jan 1941
County: Dublin
Start Date: 21/Jan/1941
Flood Quality Code:4
Additional Information: Reports (1) More Mapped Information

24. Poddle St Claires Ave Sept 1931
County: Dublin
Start Date: 03/Sep/1931
Flood Quality Code:3
Additional Information: Reports (1) More Mapped Information

25. Poddle Limekiln Lane Sept 1931
County: Dublin
Start Date: 03/Sep/1931
Flood Quality Code:3
Additional Information: Reports (1) More Mapped Information

26. Poddle Limekiln Lane Aug 1905
County: Dublin
Start Date: 24/Aug/1905
Flood Quality Code:3
Additional Information: Reports (1) More Mapped Information

27. Poddle Larkfield Mills Undated 1940s
County: Dublin
Start Date:
Flood Quality Code:4
Additional Information: Reports (1) More Mapped Information

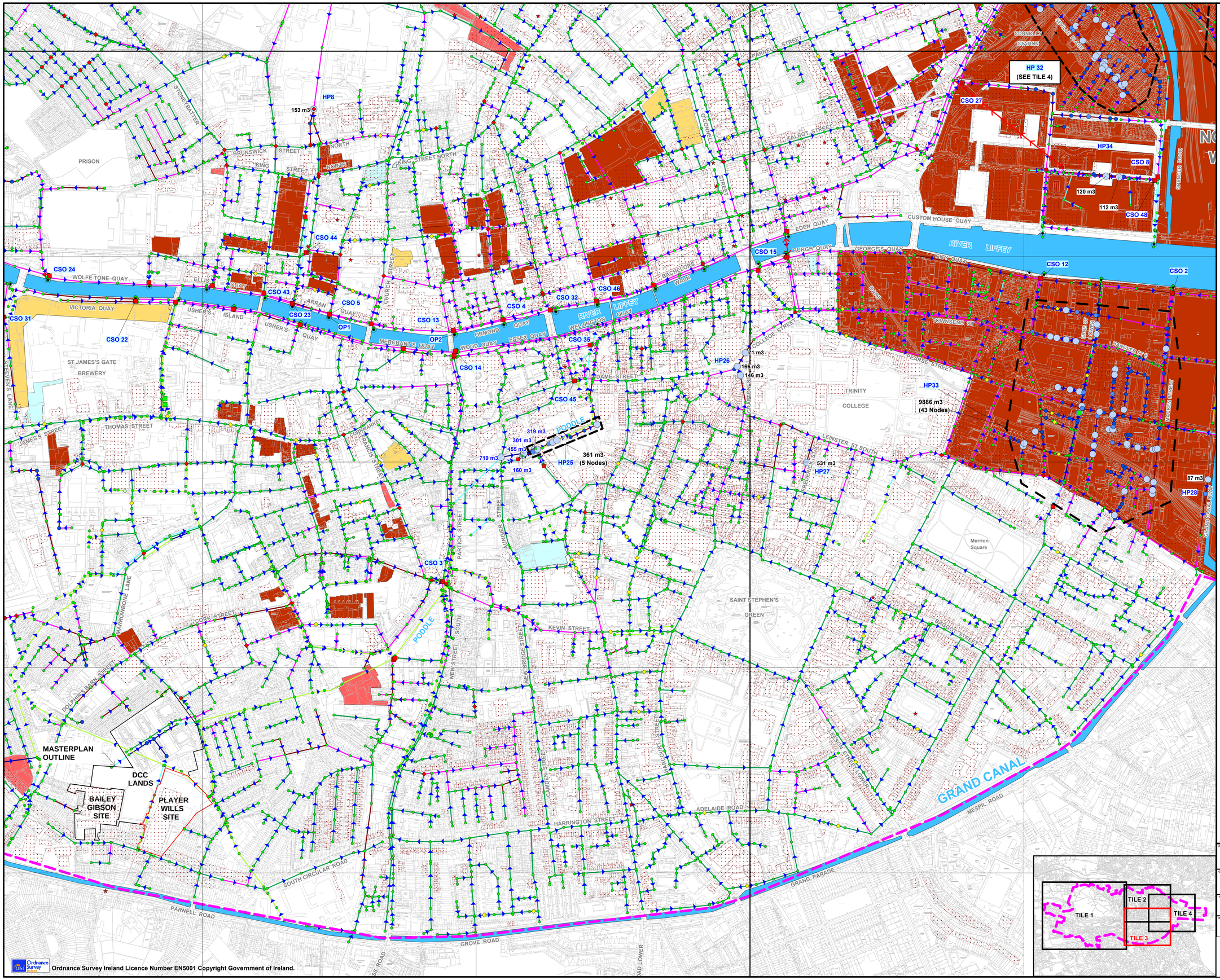
28. Poddle Harold's Cross undated 1940's
County: Dublin
Start Date:
Flood Quality Code:4
Additional Information: Reports (1) More Mapped Information

29. Flooding at Bridgewater Quay Apartments, Islandbridge, Dublin 8, on 24th Oct 2011
County: Dublin
Start Date: 24/Oct/2011
Flood Quality Code:2
Additional Information: Reports (1) More Mapped Information

30. Flooding at Ashling Hotel, Parkgate Street, Dublin 8 on 24th Oct 2011
County: Dublin
Start Date: 24/Oct/2011
Flood Quality Code:2
Additional Information: Reports (1) More Mapped Information

APPENDIX I(b)

GDSDS 2011 & 2031 HYDRAULIC PERFORMANCE MAPS



Ordnance Survey Ireland Licence Number EN5001 Copyright Government of Ireland.

Legend

- Wastewater Treatment Works
- County Council Boundaries
- Catchment Boundary
- Rising Main (Coloured as sewer)
- Sewer not included in hydraulic model
- Direction of Flow (on sewer line)
- River/Watercourse
- Culverted River/Watercourse
- 1:1000 OS Grid Line Boundaries
- 1:5000 OS Grid Line Boundaries
- Combined Sewer Overflow
- Foul/Combined Pumping Station
- Foul/Combined Bifurcation
- Foul/Combined Apex Manhole
- Foul/Combined Flow Management Chamber
- Storm Water Overflow to Foul/Combined
- Storm Water Bifurcation
- Storm Water Apex Manhole

Flooding Performance Key

- Flooding greater than 50m3 Volume for 5yr Return Period Event (Volume m3)
- Flooding between 25m3 and 50m3 Volume for 5yr Return Period Event
- Flooding less than 25m3 Volume for 5yr Return Period Event
- Modelled Manhole does not flood for 5 year Return Period Event
- 75m3 — 1:5 year Foul/Combined flood volume
- 75m3 — 1:5 year Storm flood volume
- Historically Reported Flooding Incidents caused by Hydraulic Overloading
- Outfall

Foul/Combined Hydraulic Performance Key

- Foul/Combined Sewer floods for 30 year return period or less.
- Foul/Combined Sewer surcharges for 1 or 2 year return period events
- Foul/Combined Sewer does not surcharge for 1 or 2 year return period events and does not flood for a 30 year return period event or below. (eg 1,2,5,10,20)

Storm Hydraulic Performance Key

- Storm Sewer floods for 30 year return period or less.
- Storm Sewer surcharges for 1 or 2 year return period events
- Storm Sewer does not surcharge for 1 or 2 year return period events and does not flood for a 30 year return period event or below. (eg 1,2,5,10,20)
- Area Covered by EDS/DCC Asset Survey

Important Hydraulic Considerations

- Location of Known Basements
- Zoned Residential Land
- Zoned Science/Technology Parks/Land
- Zoned Industrial Land
- Zoned Commercial Land
- Zoned Land for Mixed Development
- Recently Completed Developments

Catchment Deficiency Reference Key

- HP 1 — Hydraulic Deficiency Reference No (Foul/Combined) (Not included for EDS/DCC Asset Survey area).
- CSO 1 — CSO Deficiency Reference No. (Hydraulic or Environmental)
- OP 1 — Operational Deficiency Reference No.

Notes

1. Results are based on assessment of sewer system under 1, 2, 5, 10, 20, 30, 50 and 100 year return period rainfall events.
2. For colour coding, flooding takes priority over surcharging.
3. Levels referenced in meters to Ordnance Survey Datum, which is Mean Sea Level at Malin Head, Co. Donegal (1970 Adjustment).

Project: GREATER DUBLIN STRATEGIC DRAINAGE STUDY

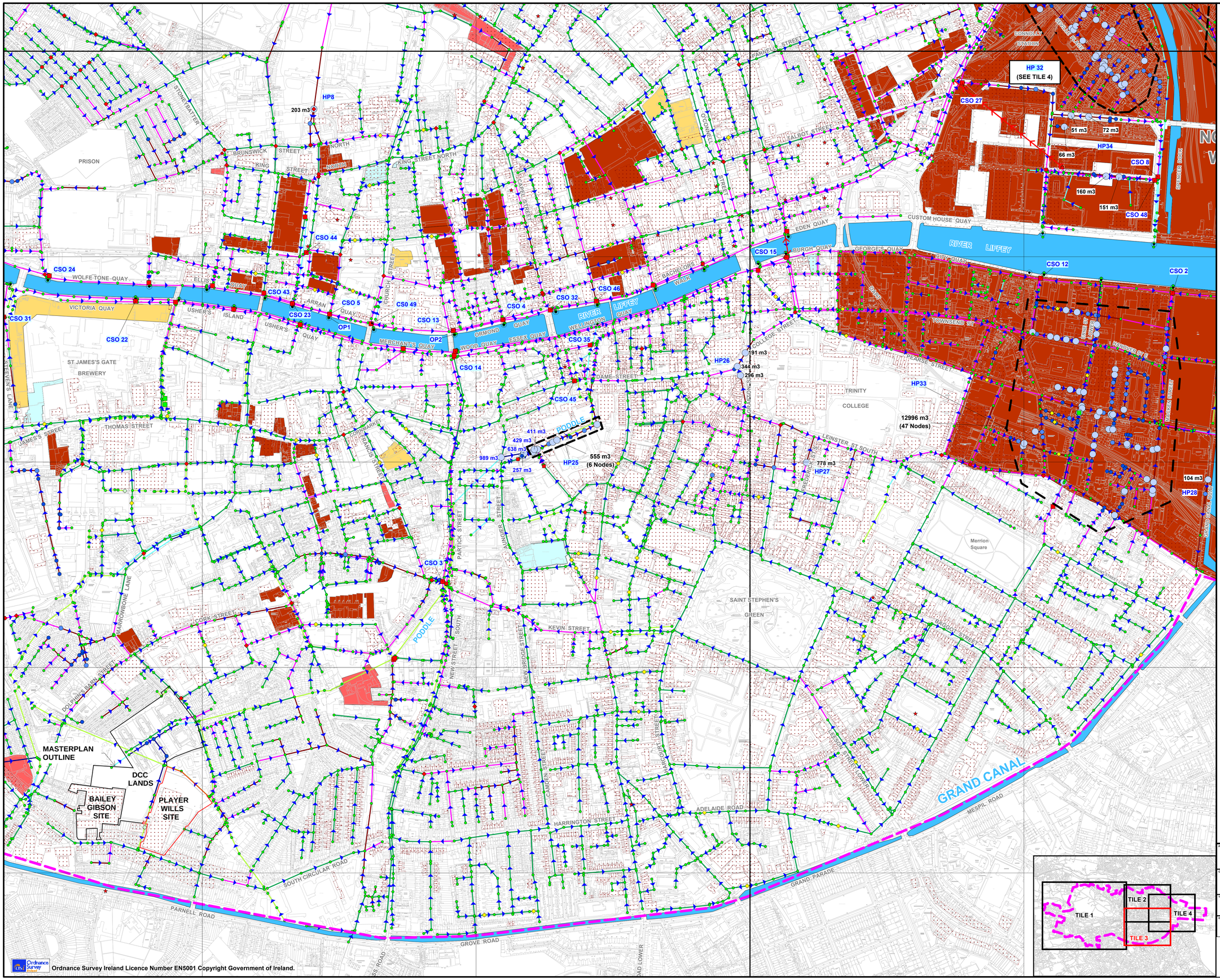
Catchment: CITY CENTRE/DOCKLANDS CATCHMENT

Title: PHASE 3 - 2011 System Performance Assessment

Drg. No.: GDSDS/MAR3079/F001/P3-002_Tile3

Dublin Drainage
A Strategic Study for Greater Dublin

Drawn	JGA	Chk'd	MCB
Approved	MCB		
Scale	N.T.S.	REVISION	A
Date	7/5/04		



Legend

- Wastewater Treatment Works
- County Council Boundaries
- Catchment Boundary
- Rising Main (Coloured as sewer)
- Sewer not included in hydraulic model
- Direction of Flow (on sewer line)
- River/Watercourse
- Culverted River/Watercourse
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- 1:5000 OS Grid Line Boundaries
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- Foul/Combined Pumping Station
- Foul/Combined Bifurcation
- Foul/Combined Apex Manhole
- Foul/Combined Flow Management Chamber
- Storm Water Overflow to Foul/Combined
- Storm Water Bifurcation
- Storm Water Apex Manhole

Flooding Performance Key

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- Flooding between 25m3 and 50m3 Volume for 5yr Return Period Event
- Flooding less than 25m3 Volume for 5yr Return Period Event
- Modelled Manhole does not flood for 5 year Return Period Event
- 75m3 1:5 year Foul/Combined flood volume
- 75m3 1:5 year Storm flood volume
- Historically Reported Flooding Incidents caused by Hydraulic Overloading
- Outfall

Foul/Combined Hydraulic Performance Key

- Foul/Combined Sewer floods for 30 year return period or less.
- Foul/Combined Sewer surcharges for 1 or 2 year return period events
- Foul/Combined Sewer does not surcharge for 1 or 2 year return period events and does not flood for a 30 year return period event or below. (eg 1,2,5,10,20)

Storm Hydraulic Performance Key

- Storm Sewer floods for 30 year return period or less.
- Storm Sewer surcharges for 1 or 2 year return period events
- Storm Sewer does not surcharge for 1 or 2 year return period events and does not flood for a 30 year return period event or below. (eg 1,2,5,10,20)
- Area Covered by EDS/DCC Asset Survey

Important Hydraulic Considerations

- Location of Known Basements
- Zoned Residential Land
- Zoned Science/Technology Parks/Land
- Zoned Industrial Land
- Zoned Commercial Land
- Zoned Land for Mixed Development
- Recently Completed Developments

Catchment Deficiency Reference Key

- HP 1 — Hydraulic Deficiency Reference No (Foul/Combined) (Not included for EDS/DCC Asset Survey area).
- CSO 1 — CSO Deficiency Reference No. (Hydraulic or Environmental)
- OP 1 — Operational Deficiency Reference No.

Notes

1. Results are based on assessment of sewer system under 1, 2, 5, 10, 20, 30, 50 and 100 year return period rainfall events.
2. For colour coding, flooding takes priority over surcharging.
3. Levels referenced in meters to Ordnance Survey Datum, which is Mean Sea Level at Malin Head, Co. Donegal (1970 Adjustment).

Project: GREATER DUBLIN STRATEGIC DRAINAGE STUDY

Catchment: CITY CENTRE/DOCKLANDS CATCHMENT

Title: PHASE 3 - 2031 System Performance Assessment

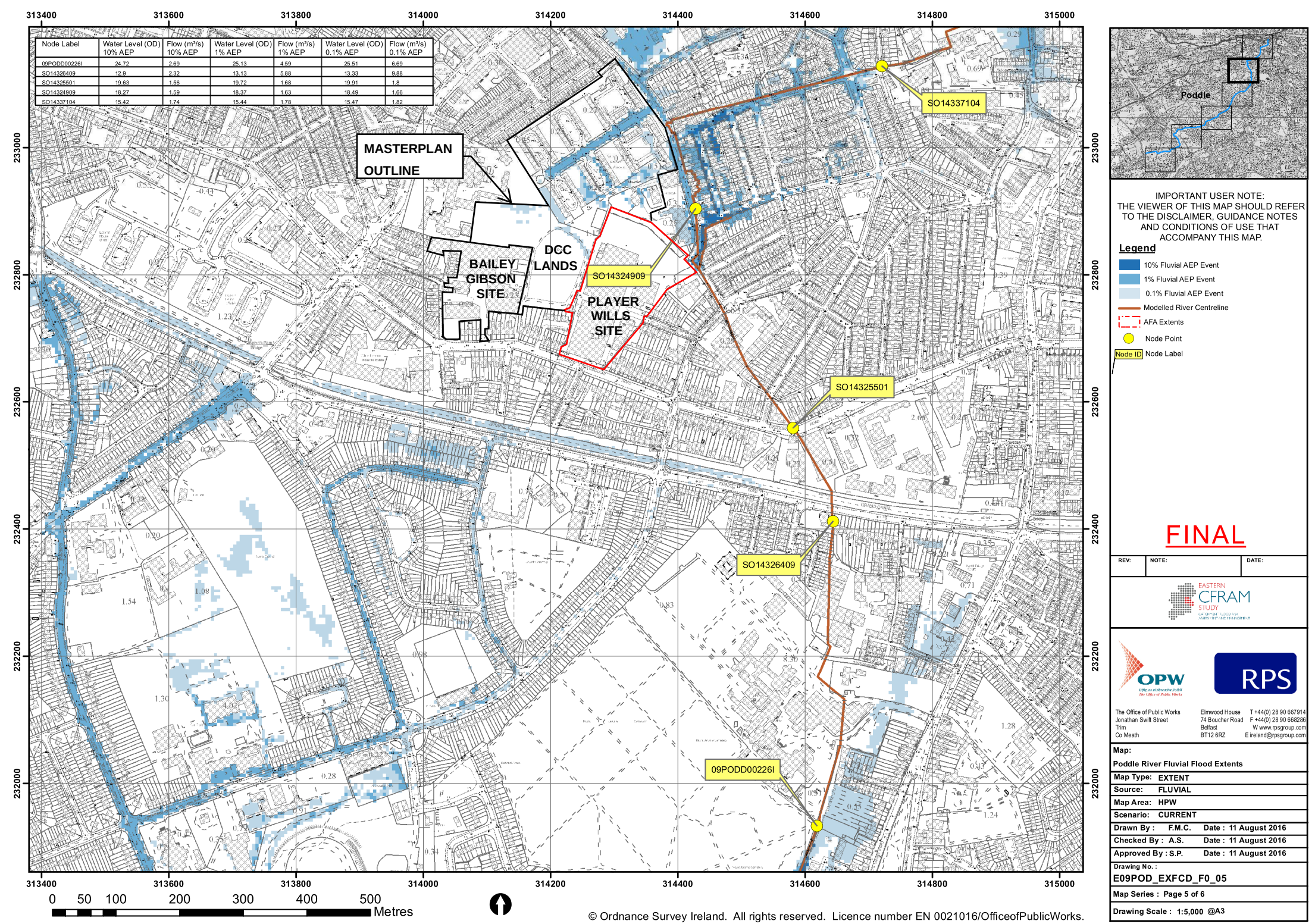
Dwg. No.: GDSDS/MAR3079/F001/P3-003_Tile3

Drawn	JGA	Chk'd	MCB
Approved	MCB		
Date	N.T.S.	REVISION	A
Date	7/5/04		

Dublin Drainage
A Strategic Study for Greater Dublin

APPENDIX I(c)

PRFA PREDICTIVE FLOOD MAPPING



Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
09PODD00226I	24.72	2.69	25.13	4.59	25.51	6.69
SO14326409	12.9	2.32	13.13	5.88	13.33	9.88
SO14325501	19.63	1.56	19.72	1.68	19.91	1.8
SO14324909	18.27	1.59	18.37	1.63	18.49	1.66
SO14337104	15.42	1.74	15.44	1.78	15.47	1.82

IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

Legend

- 10% Fluvial AEP Event
- 1% Fluvial AEP Event
- 0.1% Fluvial AEP Event
- Modelled River Centreline
- AFA Extents
- Node Point
- Node ID Node Label

FINAL

REV:	NOTE:	DATE:

EASTERN CFRAM STUDY

The Office of Public Works
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Co Meath

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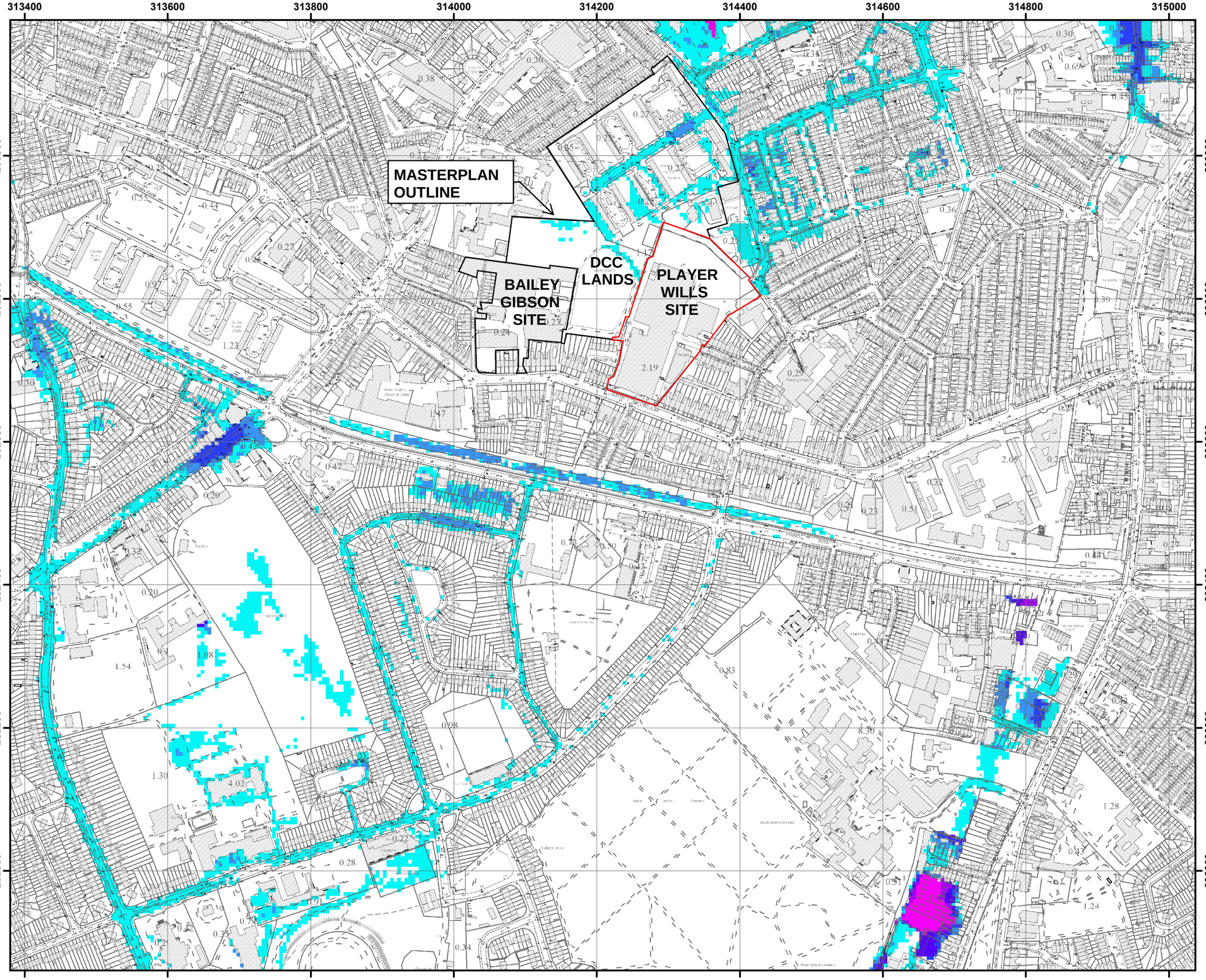
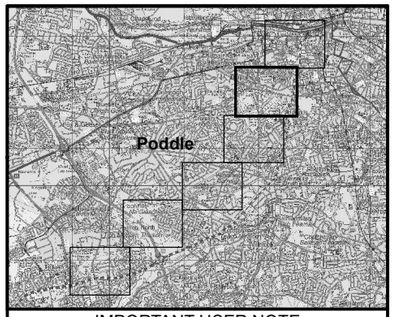
W www.rpsgroup.com
E ireland@rpsgroup.com

Map: Poddle River Fluvial Flood Extents

Map Type:	EXTENT
Source:	FLUVIAL
Map Area:	HPW
Scenario:	CURRENT
Drawn By : F.M.C.	Date : 11 August 2016
Checked By : A.S.	Date : 11 August 2016
Approved By : S.P.	Date : 11 August 2016
Drawing No. :	E09POD_EXFCD_F0_05
Map Series :	Page 5 of 6
Drawing Scale :	1:5,000 @A3





IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

Legend

0.1% Fluvial AEP Flood Depth

- 0 - 0.25m
- 0.25 - 0.5m
- 0.5 - 1m
- 1.0 - 1.5m
- 1.5 - 2m
- >2m
- Modelled River Centreline
- AFA Extents

FINAL

REV:	NOTE:	DATE:

EASTERN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

OPW
Oifig na nOibreacha Poiblí
The Office of Public Works

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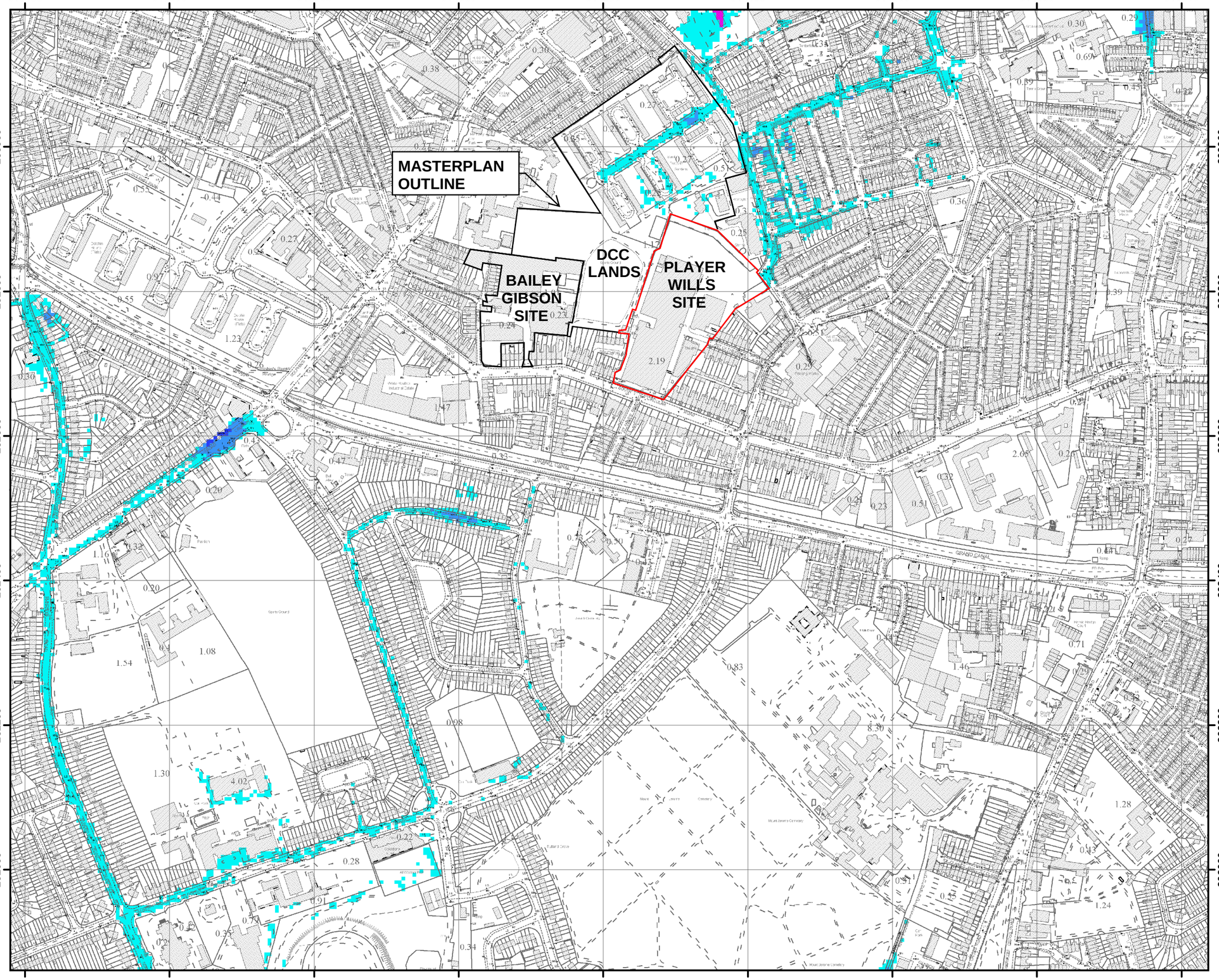
Map:
Poddle River Fluvial Flood Depths

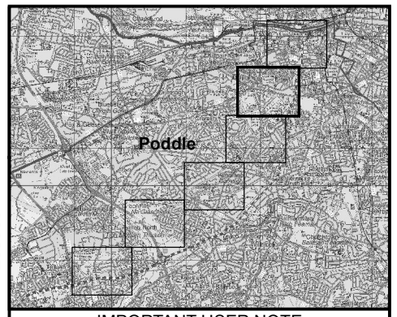
Map Type:	**DEPTH**	
Source:	**FLUVIAL**	
Map Area:	**HPW**	
Scenario:	**CURRENT**	
Drawn By :	**F.M.C.**	**Date : 20 October 2016**
Checked By :	**A.S.**	**Date : 20 October 2016**
Approved By :	**S.P.**	**Date : 20 October 2016**

Drawing No. :
E09POD_DPFCD001_F0_05

Map Series : Page 5 of 6

Drawing Scale : 1:5,000 @ A3





IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

Legend

1% Fluvial AEP Flood Depth

- 0 - 0.25m
- 0.25 - 0.5m
- 0.5 - 1m
- 1.0 - 1.5m
- 1.5 - 2m
- >2m
- Modelled River Centreline
- AFA Extents

FINAL

REV:	NOTE:	DATE:

EASTERN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

OPW
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W www.rpsgroup.com
E ireland@rpsgroup.com

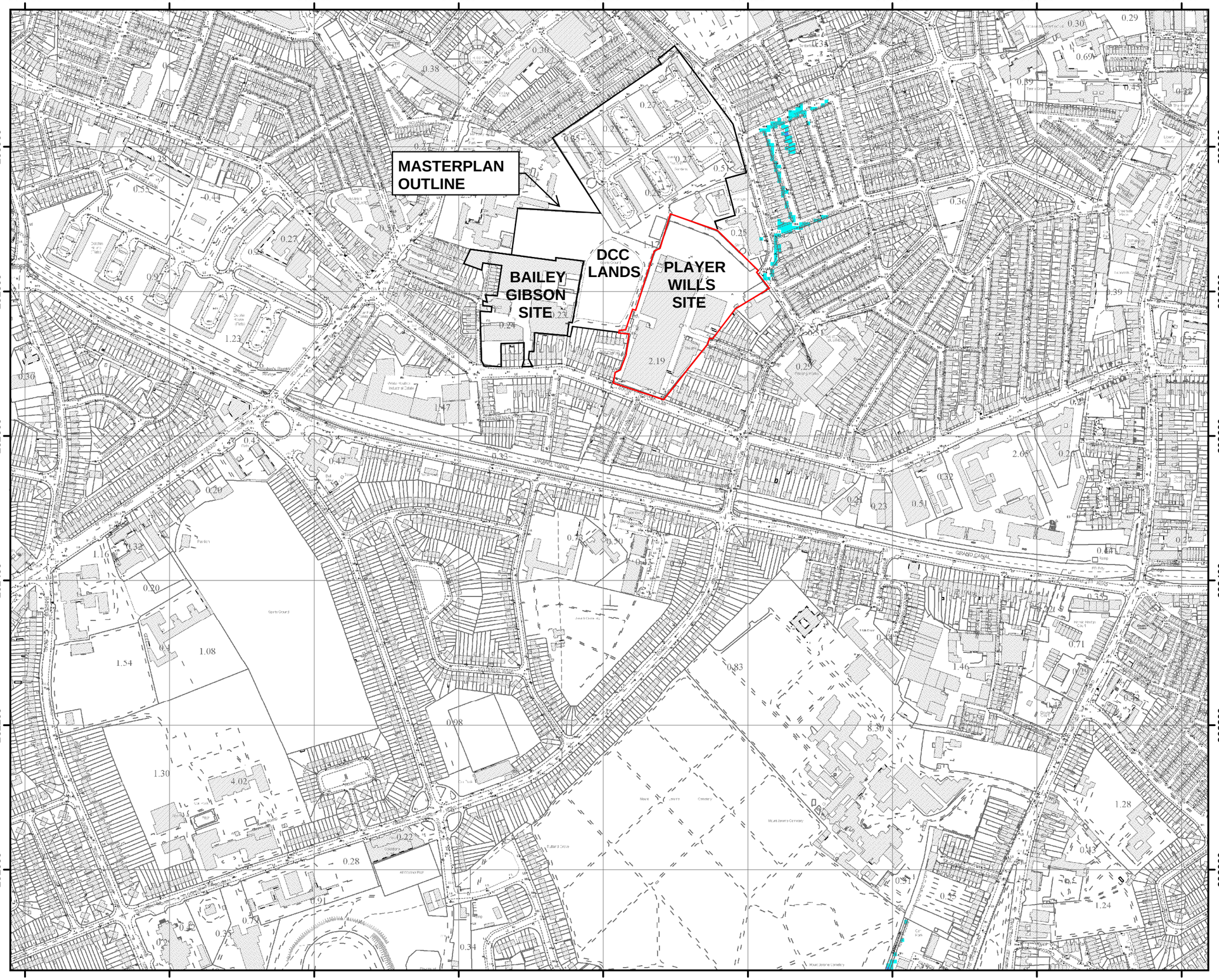
Map:
Poddle River Fluvial Flood Depths

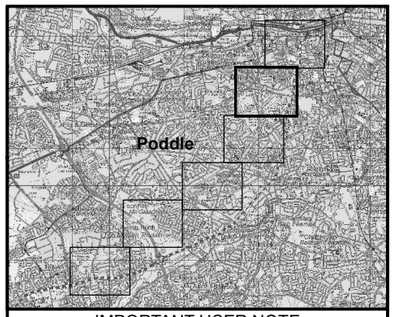
Map Type:	**DEPTH**	
Source:	**FLUVIAL**	
Map Area:	**HPW**	
Scenario:	**CURRENT**	
Drawn By :	**F.M.C.**	**Date : 20 October 2016**
Checked By :	**A.S.**	**Date : 20 October 2016**
Approved By :	**S.P.**	**Date : 20 October 2016**

Drawing No. :
E09POD_DPFCD010_F0_05

Map Series : Page 5 of 6

Drawing Scale : 1:5,000 @ A3





IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

Legend

10% Fluvial AEP Flood Depth

- 0 - 0.25m
- 0.25 - 0.5m
- 0.5 - 1m
- 1.0 - 1.5m
- 1.5 - 2m
- >2m
- Modelled River Centreline
- AFA Extents

FINAL

REV:	NOTE:	DATE:

EASTERN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

OPW
Oifig na nOibreacha Poiblí
The Office of Public Works

RPS

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W www.rpsgroup.com
E ireland@rpsgroup.com

Map:
Poddle River Fluvial Flood Depths

Map Type:	**DEPTH**	
Source:	**FLUVIAL**	
Map Area:	**HPW**	
Scenario:	**CURRENT**	
Drawn By :	**F.M.C.**	**Date : 20 October 2016**
Checked By :	**A.S.**	**Date : 20 October 2016**
Approved By :	**S.P.**	**Date : 20 October 2016**

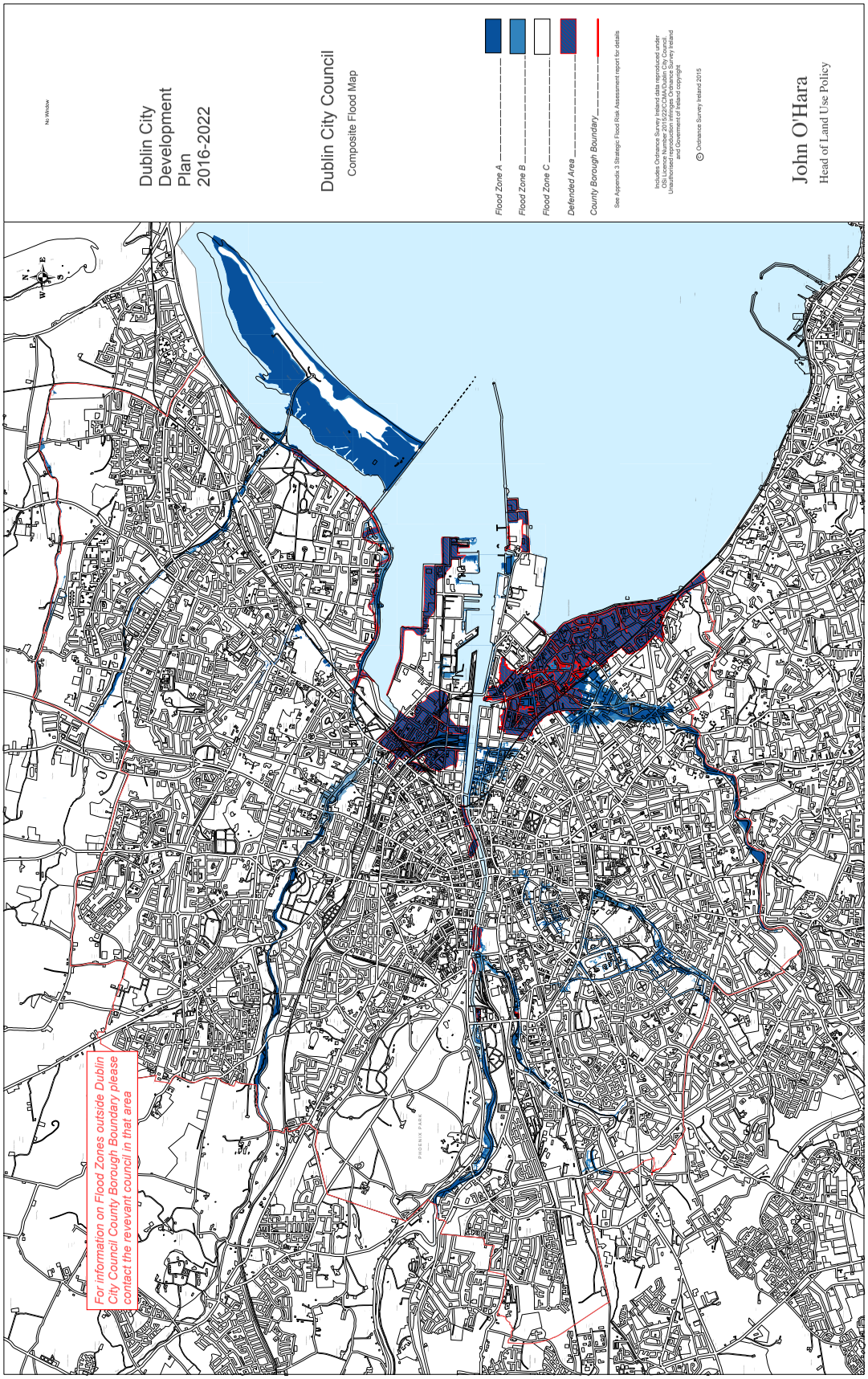
Drawing No. :
E09POD_DPFCD100_F0_05

Map Series : Page 5 of 6

Drawing Scale : 1:5,000 @ A3

APPENDIX I(d)

DUBLIN CITY DEVELOPMENT PLAN (2016-2022) SFRA – COMPOSITE FLOOD MAP


Dublin City Development Plan 2016-2022
Dublin City Council
Composite Flood Map
Flood Zone A
Flood Zone B
Flood Zone C
Defended Area
County Borough Boundary
See Appendix 3 Strategic Flood Risk Assessment report for details
John O'Hara
Head of Land Use Policy
For information on Flood Zones outside Dublin City Council County Borough Boundary please contact the revevant council in that area

APPENDIX II

Foul Drainage and Watermain Design

(a) Public Record Map of Receiving Sewers

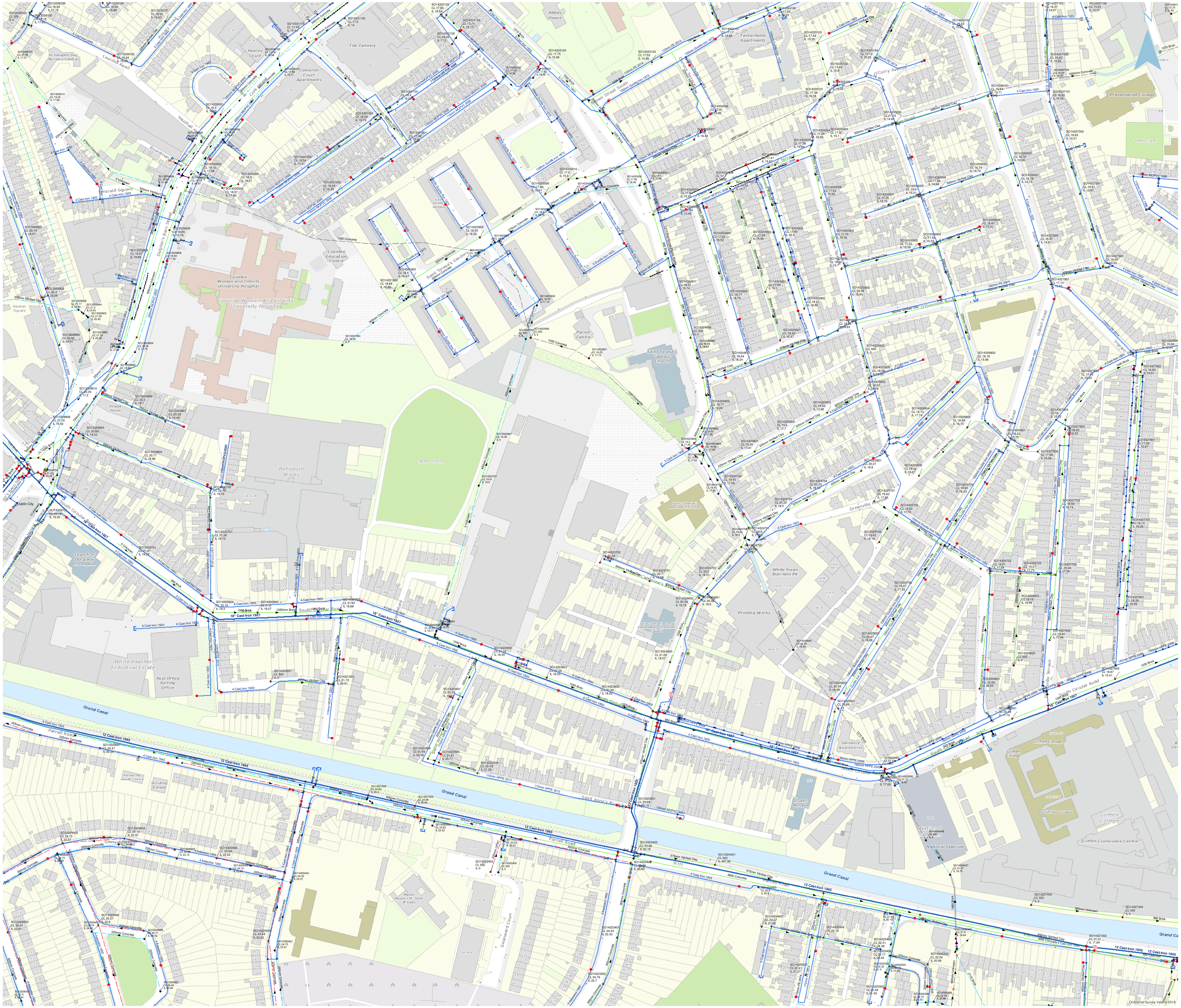
(b) Irish Water Pre-Connection Enquiry Application and Irish Water Letter of Feasibility

(c) Irish Water Letter of Feasibility

(d) Irish Water Statement of Design Acceptance

APPENDIX II(a)

PUBLIC RECORD MAP OF RECEIVING SEWERS



UISCE ÉIREANN : IRISH WATER

Legend

- Boundary Meter
- Check Meter
- Unknown Meter ; Other Meter
- Non-Return
- Sluice Valve Open
- Sluice Valve Closed
- Butterfly Valve Open
- Sluice Valve Open
- Sluice Valve Closed

Water Hydrants

Hydrant Function

- Fire Hydrant
- Pump Stations
- Telemetry Kiosk
- Cap
- Other Fittings

Water Distribution Mains

Owned By

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

Sewer Manholes

Manhole Type

- Standard
- Lamphole
- Other; Unknown

Sewer Discharge Points

Discharge Type

- Other; Unknown
- Gravity - Combined
- Gravity - Foul
- Gravity - Overflow

Storm Manholes

Manhole Type

- Standard
- Other; Unknown

Storm Discharge Points

Discharge Type

- Outfall
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Storm Inlets

Inlet Type

- Standard

Surface Fittings

Fitting Type

- Other; Unknown

1:1,000 at A0

Last edited: 04/02/2019

Metres

0 25 50 100

1. No part of this drawing may be reproduced or transmitted in any form or stored in any retrieval system of any nature without the written permission of Irish Water as copyright holder except as agreed for use on the project for which the document was originally issued.

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

APPENDIX II(b)

PLAYER WILLS IRISH WATER PRE-CONNECTION ENQUIRY APPLICATION

Pre-connection enquiry form

Large industrial and commercial developments, mixed use developments, housing developments, business developments.

This form is to be filled out by applicants enquiring about the feasibility of a water and/or wastewater connection to Irish Water infrastructure. If completing this form by hand, please use BLOCK CAPITALS and black ink.

Please refer to the **Guide to completing the pre-connection enquiry form** on page 12 of this document when completing the form.

Section A | Applicant details

1 WPRN number (where available):

2 Applicant details:

Registered company name (if applicable): CWTC Multi Family ICAV acting solely in respect of its sub fund DBTR SCR1 Fund

Trading name (if applicable):

Company registration number (if applicable):

If you are not a registered company/business, please provide the applicant's name:

Contact name: MALCOLM McCABE

Postal address:

70 SIR JOHN ROGERSONS QUAY

DUBLIN 2

Eircode:

Telephone: 01 7999900

Mobile:

Email: MALCOLM.MCCABE@HINES.COM

3 Agent details (if applicable):

Contact name: CIARÁN O'RAFFERTY

Company name (if applicable): BARRETT MAHONY

Postal address: SANDWITH HOUSE

52-54 SANDWITH ST LOWER

DUBLIN 2

Eircode:

Telephone: 0167732 00

Email: CORAFFERTY@BMCE.IE

4 **Please indicate whether it is the applicant or agent who should receive future correspondence in relation to the enquiry:**

Applicant ☐ Agent ☑

Section B | Site details

5 **Site address:** 27-289 SOUTH CIRCULAR ROAD, DUBLIN D08T6DC

6 **Irish Grid co-ordinates of site:** E(X) 314299 N(Y) 232801

Eg. co-ordinates of GPO, O'Connell St., Dublin: E(X) 315,878 N(Y) 234,619

7 **Local Authority:**

Local Authority that granted planning permission (if applicable):

8 **Has full planning permission been granted?** Yes ☐ No ☑

If 'Yes', please provide the current or previous planning reference number:

9 **Previous use of this site (if applicable):** DISUSED FACTORY

10 **Date that previous development was last occupied (if applicable):** ☐☐/☐☐/☐☐☐☐

11 **Are there poor ground conditions on site?** Yes ☐ No ☑

If 'Yes', please include site investigation report and a detailed site-specific report on the approach being taken to deal with ground conditions specifically with regard to pipe support and trenching.

12 **Are there potential contaminated land issues?** Yes ☐ No ☑

If 'Yes', please include a detailed site-specific report on the approach being taken to deal with contaminated land and the measures being taken to mitigate the impact on infrastructure.

13 **Is the development compliant with the local area development plan?** Yes ☑ No ☐

Section C | Water connection and demand details

14 **Is there an existing connection to public water mains at the site?** Yes ☑ No ☐

15 **Is this enquiry for an additional connection to the one already installed?** Yes ☐ No ☑

16 **Is this enquiry to increase the size of an existing water connection?** Yes ☐ No ☑

17 **Is this enquiry for a new water connection?** Yes ☑ No ☐

18 **Approximate date water connection is required:** 10 / 10 / 2020

19 **Please indicate pre-development water demand (if applicable):**

Pre-development peak hour water demand	0	**l/s**
Pre-development average hour water demand	0	**l/s**

Pre-development refers to brownfield sites only. Please include calculations on the attached sheet provided.

20 **Please indicate the domestic water demand (housing developments only):**

Post-development peak hour water demand	26.35	**l/s**
Post-development average hour water demand	5.27	**l/s**

Please include calculations on the attached sheet provided.

21 **Please indicate the business water demand (shops, offices, schools, hotels, restaurants, etc.):**

Post-development peak hour water demand	1.15	**l/s**
Post-development average hour water demand	0.23	**l/s**

Please include calculations on the attached sheet provided. Where there will be a daily/weekly/seasonal variation in the water demand profile, please provide all such details.

22 **Please indicate the industrial water demand (industry-specific water requirements):**

Post-development peak hour water demand	0	**l/s**
Post-development average hour water demand	0	**l/s**

Please include calculations on the attached sheet provided. Where there will be a daily/weekly/seasonal variation in the water demand profile, please provide all such details.

23 **What is the existing ground level at the property boundary at connection point (if known) above Malin Head Ordnance Datum?**

21.0 m

24 **What is the highest finished floor level of the proposed development above Malin Head Ordnance Datum?**

78.0 m

25 **Is on-site water storage being provided?** Yes ☑ No ☐

Please include calculations on the attached sheet provided.

26 **Are there fire flow requirements?** Yes ☐ No ☑

Additional fire flow requirements over and above those identified in Q20, Q21 and Q22 above		**l/s**

Please include calculations on the attached sheet provided, and include confirmation of requirements from the Fire Authority.

27 **Do you propose to supplement your potable water supply from other sources?** Yes ☐ No ☑

If 'Yes', please indicate how you propose to supplement your potable water supply from other sources (see **Guide to completing the application form** on page 12 of this document for further details):

Section D | Wastewater connection and discharge details

28 **Is there an existing connection to a public sewer at the site?** Yes ☑ No ☐

29 **Is this enquiry for an additional connection to one already installed?** Yes ☐ No ☑

30 **Is this enquiry to increase the size of an existing connection?** Yes ☐ No ☑

31 **Is this enquiry for a new wastewater connection?** Yes ☑ No ☐

32 **Approximate date that wastewater connection is required:** 10 / 10 / 2020

33 **Please indicate pre-development wastewater discharge (if applicable):**

Pre-development peak discharge	0	**l/s**
Pre-development average discharge	0	**l/s**

Pre-development refers to brownfield sites only. Please include calculations on the attached sheet provided.

34 **Please indicate the domestic wastewater hydraulic load (housing developments only):**

Post-development peak discharge	13.92	**l/s**
Post-development average discharge	4.64	**l/s**

Please include calculations on the attached sheet provided.

35 **Please indicate the commercial wastewater hydraulic load (shops, offices, schools, hotels, restaurants, etc.):**

Post-development peak discharge	1.2	**l/s**
Post-development average discharge	0.2	**l/s**

Please include calculations on the attached sheet provided.

36 Please indicate the industrial wastewater hydraulic load (industry-specific discharge requirements):

Post-development peak discharge	0	**l/s**
Post-development average discharge	0	**l/s**

Please include calculations on the attached sheet provided.

37 Wastewater organic load:

Characteristic	Max concentration (mg/l)	Average concentration (mg/l)	Maximum daily load (kg/day)
Biochemical oxygen demand (BOD)		150-500	
Chemical oxygen demand (COD)		300-1000	
Suspended solids (SS)		200-700	
Total nitrogen (N)			
Total phosphorus (P)		5-20	
Other		NIA 22-80 Coliforms 10^3	

Temperature range	
pH range	

38 Storm water run-off will only be accepted from brownfield sites that already have a storm/surface water connection to a combined sewer. In the case of such brownfield sites, please indicate if the development intends discharging surface water to the combined wastewater collection system:

Yes ☐ No ☑

If 'Yes', please give reason for discharge and comment on adequacy of SUDS/attenuation measures proposed.

39 Do you propose to pump the wastewater? Yes ☐ No ☑

If 'Yes', please include justification for your pumped solution with this application.

40 What is the existing ground level at the property boundary at connection point (if known) above Malin Head Ordnance Datum?

19.3 m

41 What is the lowest finished floor level on site above Malin Head Ordnance Datum? 19.8 m

Section E | Development details

42 Please outline the domestic and/or industry/business use proposed:

Property type	Total number of units for this application
Domestic	900
Office	
Residential care home	
Hotel	
Factory	
School	
Institution	
Retail unit	4500M2
Industrial unit	
Other (please specify)	

43 Approximate start date of proposed development: 1 / 6 / 2020

44 Is the development multi-phased? Yes ☐ No ☑

If 'Yes', application must include a master-plan identifying the development phases and the current phase number.

If 'Yes', please provide details of variations in water demand volumes and wastewater discharge loads due to phasing requirements.

Section F | Supporting documentation

Please provide the following additional information:

> Site location map: A site location map to a scale of 1:1000, which clearly identifies the land or structure to which the enquiry relates. The map shall include the following details:

a) The scale shall be clearly indicated on the map.

b) The boundaries shall be delineated in red.

c) The site co-ordinates shall be marked on the site location map.

> Details of planning and development exemptions (if applicable).

> Calculations (calculation sheets provided below).

> Site layout map to a scale of 1:500 showing layout of proposed development, water network and wastewater network layouts, additional water/wastewater infrastructure if proposed, connection points to Irish Water infrastructure (if known).

> Any other information that might help Irish Water assess this pre-connection enquiry.

Section G | Declaration

I/We hereby make this application to Irish Water for a water and/or wastewater connection as detailed on this form.

I/We understand that any alterations made to this application must be declared to Irish Water.

The details that I/we have given with this application are accurate.

I/We have enclosed all the necessary supporting documentation.

Signature: 

Date: 1 0 / 0 4 / 2 0 1 9

Your full name (in BLOCK CAPITALS):

C I A R Á N O ' R A F F E R T Y

Irish Water will carry out a formal assessment based on the information provided on this form.
Any future connection offer made by Irish Water will be based on the information that has been provided here.

Please submit the completed form to **newconnections@water.ie** or alternatively, post to:

Irish Water
PO Box 860
South City Delivery Office
Cork City

For office use only:

Input customer number:

Calculations

Water demand

```
Commercial/Retail:
Area - 4500m2
Commercial Demand 60l/person/day
Occupancy = 1 per 17ms
Equivalent number of persons = 265

Daily Demand = 265*60 = 15900l/day

Average Demand = 15900*1.25/24/60/60 = 0.23l/s

Peak Demand = 0.23*5 = 1.15l/s

Residential:
Number of Units = 900
Doemstic Demand = 150 l/person/day
Occupancy = 2.7 persons/unit
No. of persons = 2430

Daily Demand = 2430*150 = 364500 l/day

Average Demand = 364500*1.25/24/60/60 = 5.27l/s

Peak Demand = 5.27*5 = 26.35 l/s


Total Average demand = 0.23 + 5.27 = 5.5l/s
Total Peak Demand = 1.15 + 26.35 = 27.5 l/s
```

On-site storage

Fire flow requirements

Commercial/Retail:
Area - 4500m2
Commercial Discharge 60l/person/day
Occupancy = 1 per 17m2
Equivalent number of persons = 265

Daily Discharge = 265*60*1.1 = 17490/day

Average Discharge = 17490/24/60/60 = 0.2l/s

Peak Discharge = 0.2*6 = 1.2l/s

Residential:
Number of Units = 900
Doemstic Discharge = 150 l/person/day
Occupancy = 2.7 persons/unit
No. of persons = 2430

Daily Discharge = 2430*150*1.1 = 400950 l/day

Average Discharge = 400950/24/60/60 = 4.64l/s

Peak Discharge = 4.64*3 = 13.92 l/s

Total Average Discharge = 0.2 + 4.64 = 4.84l/s
Total Peak Discharge = 1.2 + 13.92 = 15.12 l/s

Guide to completing the pre-connection enquiry form

This form should be completed by applicants enquiring about the feasibility of a water and/or wastewater connection to Irish Water infrastructure.

The Irish Water Codes of Practice are available at **www.water.ie** for reference.

Section A | Applicant Details

Question 1: 'Water Point Reference Number (WPRN)' is a unique number assigned to every single water services connection in the country. The WPRN is prominently displayed on correspondence received from Irish Water, and can be found on water bills, previous connection offers, or previous enquiries in relation to the site. Existing customers and brownfield sites should have a WPRN. New customers are not required to answer this question.

Question 2: This question requires the applicant or company enquiring about the feasibility of a connection to identify themselves, their postal address, and to provide their contact details.

Question 3: If the applicant has employed a consulting engineer or an agent to manage the enquiry on their behalf, the agent's address and contact details should be recorded here.

Question 4: Please indicate whether it is the applicant or the agent who should receive future correspondence in relation to the enquiry.

Section B | Site details

Question 5: This is the address of the site requiring the water/wastewater service connection and for which this enquiry is being made.

Question 6: Please provide the Irish Grid co-ordinates of the proposed site. Irish grid positions on maps are expressed in two dimensions as Eastings (E or X) and Northings (N or Y) relative to an origin. You will find these coordinates on your Ordnance Survey map which is required to be submitted with an application.

Question 7: Please identify the Local Authority that is or will be dealing with your planning application, for example Cork City Council.

Question 8: Please indicate if planning permission has been granted for this application, and if so, please provide the planning permission reference number.

Question 9: Please specify the previous use of the site that is proposed to be developed, for example if greenfield, please state 'Agricultural'.

Question 10: Please specify the date that the development site was last occupied. Your answer will help us to determine the previous water usage/wastewater load of the development. If the site was previously greenfield, then this question does not need to be completed.

Question 11: Please provide details in relation to the ground conditions on the site if they are known to be poor, for example soil with a low bearing capacity, high water table, presence of peat, silt, etc. If a site investigation report is available, please include it with your enquiry.

Question 12: Please provide details in relation to contaminated land on your site (if any); this will determine what pipe material will be appropriate in the vicinity of the contaminated ground.

Question 13: Please indicate if the development is compliant with the local area development plan. You should contact your Local Authority in this regard and confirm same by ticking the appropriate box.

Section C | Water connection and demand details

Question 14: Please indicate if a water connection already exists for this site.

Question 15: Please indicate if this enquiry concerns an additional connection to one already installed on the site.

Question 16: Please indicate if you are proposing to upgrade the water connection to facilitate an increase in water demand. Irish Water will determine what impact this will have on our infrastructure.

Question 17: Please indicate if this enquiry concerns a new water connection for this site.

Question 18: Please indicate the approximate date that the proposed connection to the water infrastructure will be required.

Question 19: If the site was previously in use, please provide details of the pre-development peak hour and average hour water demand.

Question 20: Please provide calculations for domestic water demand and include your calculations on the calculation sheet provided. Demand rates (peak and average) are site specific. Average demand is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). For design purposes, please refer to the Irish Water Codes of Practice for Water Infrastructure.

Question 21: If this connection enquiry concerns a business premises, please provide calculations for the water demand and include your calculations on the calculation sheet provided. Business premises include shops, offices, hotels, schools, etc. Demand rates (peak and average) are site specific. Average demand is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). For design purposes, please refer to the Irish Water Codes of Practice for Water Infrastructure.

Question 22: If this connection enquiry is for an industrial premises, please calculate the water demand and include your calculations on the calculation sheet provided. Demand rates (peak and average) are site specific. Average demand is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). The peak demand for sizing of the pipe network will be as per the specific business production requirements. For design purposes, please refer to the Irish Water Codes of Practice for Water Infrastructure.

Question 23: Please specify the ground level at the location where connection to the public water mains will be made. This is required in order to determine if there is sufficient pressure in the existing water infrastructure to serve your proposed development. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 24: Please specify the highest finished floor level on site. This is required in order to determine if there is sufficient pressure in the existing water infrastructure to serve your proposed development. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 25: If storage is required, water storage capacity of 24-hour water demand must usually be provided at the proposed site. In some cases, 24-hour storage capacity may not be required, for example 24-hour storage for a domestic house would be provided in an attic storage tank. Please calculate the 24-hour water storage requirements and include your calculations on the attached sheet provided. Please also confirm that on-site storage is being provided by ticking the appropriate box.

Question 26: The water supply system shall be designed and constructed to reliably convey the water flows that are required of the development including fire flow requirements by the Fire Authority. The Fire Authority will provide the requirement for fire flow rates that the water supply system will have to carry. Please note that while flows in excess of your required demand may be achieved in the Irish Water network and could be utilised in the event of a fire, Irish Water cannot guarantee a flow rate to meet your fire flow requirement. To guarantee a flow to meet the Fire Authority requirements, you should provide adequate fire storage capacity within your development. Please include your calculations on the attached sheet provided, and further provide confirmation of the Fire Authority requirements.

Question 27: Please identify proposed additional water supply sources, that is, do you intend to connect to the public water mains or the public mains and supplement from other sources? If supplementing public water supply with a supply from another source, please provide details as to how the potable water supply is to be protected from cross contamination at the premises.

Section D | Wastewater connection and discharge details

Question 28: Please indicate if a wastewater connection to a public sewer already exists for this site.

Question 29: Please indicate if this enquiry relates to an additional wastewater connection to one already installed.

Question 30: Please indicate if you are proposing to upgrade the wastewater connection to facilitate an increased discharge. Irish Water will determine what impact this will have on our infrastructure.

Question 31: Please indicate if this enquiry relates to a new wastewater connection for this site.

Question 32: Please specify the approximate date that the proposed connection to the wastewater infrastructure will be required.

Question 33: If the site was previously in use, please provide details of the pre-development peak and average wastewater discharge.

Question 34: Please provide calculations for domestic wastewater discharge and include your calculations on the attached sheet provided. Discharge rates (peak and average) are site specific. Average discharge is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). For design purposes, please refer to the Irish Water Codes of Practice for Wastewater Infrastructure.

Question 35: If this enquiry relates to a business premises, please provide calculations for the wastewater discharge and include your calculations on the attached sheet provided. Business premises include shops, offices, hotels, schools, etc. Discharge rates (peak and average) are site specific. Average discharge is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). For design purposes, please refer to the Irish Water Codes of Practice for Wastewater Infrastructure.

Question 36: If this enquiry relates to an industrial premises, please provide calculations for the wastewater discharge and include your calculations on the calculation sheet provided. Discharge rates (peak and average) are site specific. Average discharge is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). The peak discharge for sizing of the pipe network will be as per the specific business production requirements. For design purposes, please refer to the Irish Water Codes of Practice for Wastewater Infrastructure.

Question 37: Please specify the maximum and average concentrations and the maximum daily load of each of the wastewater characteristics listed in the wastewater organic load table (if not domestic effluent), and also specify if any other significant concentrations are expected in the effluent. Please complete the table and provide additional supporting documentation if relevant. Note that the concentration shall be in mg/l and the load shall be in kg/day. Note that for business premises (shops, offices, schools, hotels, etc.) for which only domestic effluent will be discharged (excluding discharge from canteens/ restaurants which would require a Trade Effluent Discharge licence), there is no need to complete this question.

Question 38: In exceptional circumstances, such as brownfield sites, where the only practical outlet for storm/ surface water is to a combined sewer, Irish Water will consider permitting a restricted attenuated flow to the combined sewer. Storm/surface water will only be accepted from brownfield sites that already have a storm/surface water connection to a combined sewer and the applicant must demonstrate how the storm/surface water flow from the proposed site is minimised using sustainable urban drainage system (SUDS). This type of connection will only be considered on a case by case basis. Please advise if the proposed development intends discharging surface water to the combined wastewater collection system.

Question 39: Please specify if the development needs to pump its wastewater discharge to gain access to Irish Water infrastructure.

Question 40: Please specify the ground level at the location where connection to the public sewer will be made. This is required to determine if the development can be connected to the public sewer via gravity discharge. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 41: Please specify the lowest floor level of the proposed development. This is required in order to determine if the development can be connected to the public sewer via gravity discharge. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Section E | Development details

Question 42: Please specify the number of different property/premises types by filling in the table provided.

Question 43: Please indicate the approximate commencement date of works on the development.

Question 44: Please indicate if a phased building approach is to be adopted when developing the site. If so, please provide details of the phase master-plan and the proposed variation in water demand/wastewater discharge as a result of the phasing of the development.

Section F | Supporting documentation

Please provide additional information as listed.

Section G | Declaration

Please review the declaration, sign, and return the completed application form to Irish Water by email or by post using the contact details provided in Section G.

Notes

Notes

APPENDIX II(c)

IRISH WATER LETTER OF FEASIBILITY

Malcolm McCabe
70 Sir John Rogersons Quay
Dublin
Co. Dublin

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

29 October 2019

Dear Malcolm McCabe,

Re: Connection Reference No CDS19002980 pre-connection enquiry - Subject to contract | Contract denied

Connection for Mixed Use Development of 901 units at 275-289 South Circular Road, Dublin, Co. Dublin.

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at 275-289 South Circular Road, Dublin, Co. Dublin.

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

Water

- New connection to the existing network is feasible without upgrade.
- The connection should be from 18'' main in South Circular Road

Wastewater

- Separate storm and foul water connection services should be provided for the Development.
- The surface and storm water from the site must be discharged only into the existing storm water network or associated alternative to a combined drainage discharge. The connection arrangement should be agreed with Dublin City County Council Drainage Division.
- At the connection application stage, the applicant is required to provided additional evidence (by way of CCTV survey inclusive of dye testing and calculations) to prove that the current surface area contributing to the combined sewer in Donore Avenue is minimum 1860 m^2 and when removed from the combined sewer the overall proposed discharge (from the Development CDS19002980 of 901 units and another Development CDS19002978 in the area of 500 units proposed to be connected via the Development) will be less than the current discharge into the combined sewer.

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:

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

- 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.

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

APPENDIX II(d)

IRISH WATER STATEMENT OF DESIGN ACCEPTANCE

Malcolm McCabe
70 Sir John Rogersons Quay
Dublin
Co. Dublin

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

8 April 2020

Re: Design Submission for 275-289 South Circular Road, Dublin, Co. Dublin (the "Development")
(the "Design Submission") / Connection Reference No: CDS19002980

Dear Malcolm McCabe,

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: Alvaro Garcia
Phone: 01 89 25991
Email: agarcia@water.ie

Yours sincerely,

Maria O'Dwyer
Connections and Developer Services

Appendix A

Document Title & Revision

- PW-BMD-ZZ-XX-DR-C-1000 - Site Location Plan
- PW-BMD-ZZ-XX-DR-C-1001 - Roads and Surfaces Plan
- PW-BMD-ZZ-XX-DR-C-1021 - Proposed Foul and Surface Water Drainage Sheet 1
- PW-BMD-ZZ-XX-DR-C-1022 - Proposed Foul and Surface Water Drainage Sheet 2
- PW-BMD-ZZ-XX-DR-C-1030 - Proposed Watermain Layout Sheet 1
- PW-BMD-ZZ-XX-DR-C-1031 - Proposed Watermain Layout Sheet 2
- PW-BMD-ZZ-XX-DR-C-1120 - Proposed Foul Drainage Long Section
- PW-BMD-ZZ-XX-DR-C-1130 - Proposed Watermain Long Sections

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

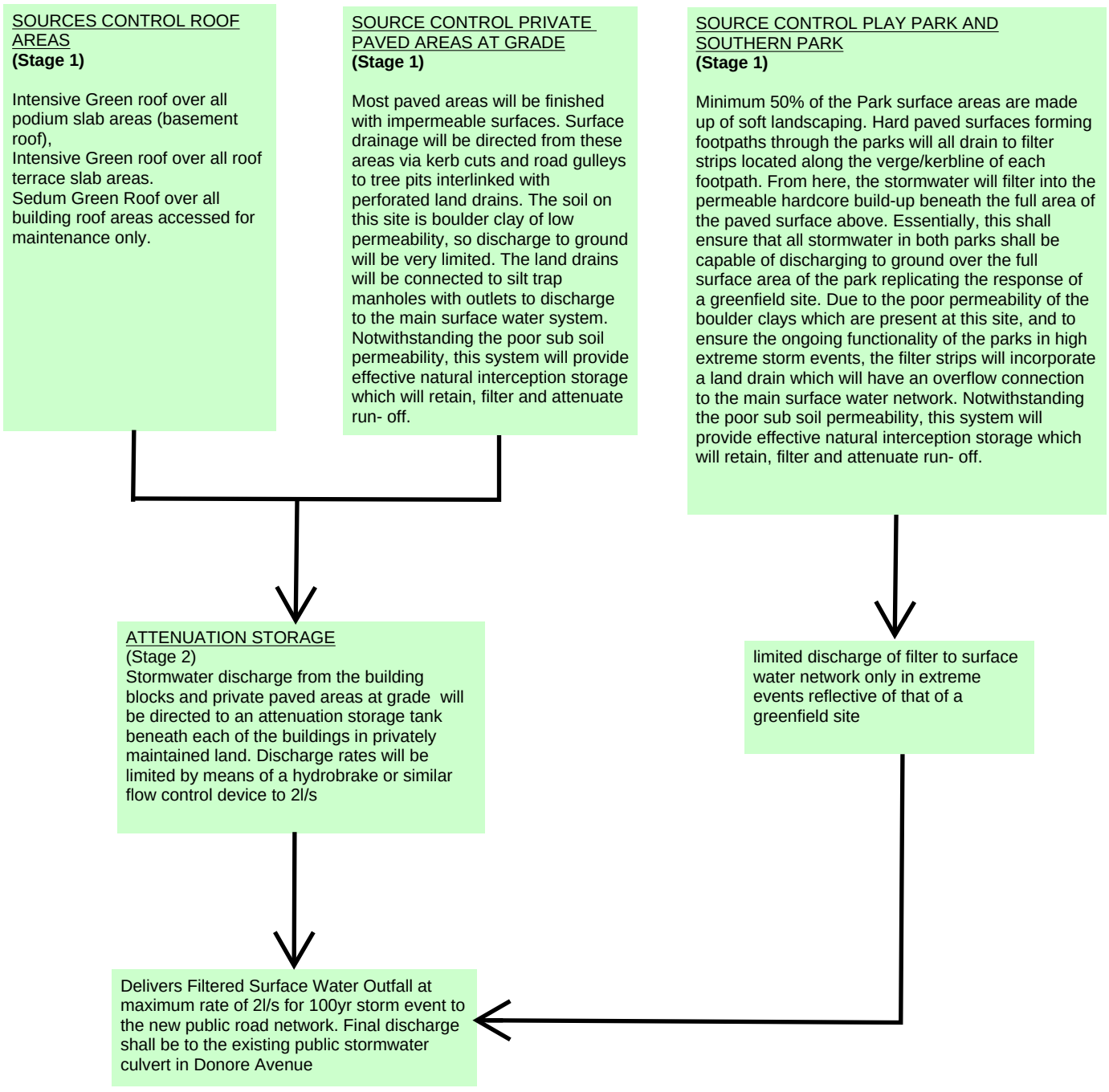
Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Irish Water will not, in any way, render Irish Water liable for any elements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

APPENDIX III

SUDS MANAGEMENT TRAIN FLOW CHART

SuDS MANAGEMENT TRAIN FLOW CHART

(Stage management of surface water run-off to replicate response of green field site)



APPENDIX IV

COMPUTER OUTPUT FOR FULL SURFACE WATER NETWORK SIMULATION FOR THE 1,20 AND 100 YEAR STORMS

Microdrainage Simulation
Part 1 : Storage Design

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	19.377	0.677	1.8	126.3	O K
120 min Winter	19.535	0.835	1.8	155.8	O K
180 min Winter	19.628	0.928	1.8	173.2	O K
240 min Winter	19.693	0.993	1.8	185.3	O K
360 min Winter	19.777	1.077	1.9	201.0	O K
480 min Winter	19.828	1.128	1.9	210.6	O K
600 min Winter	19.860	1.160	2.0	216.6	O K
720 min Winter	19.880	1.180	2.0	220.2	O K
960 min Winter	19.896	1.196	2.0	223.2	O K
1440 min Winter	19.890	1.190	2.0	222.1	O K
2160 min Winter	19.859	1.159	2.0	216.3	O K
2880 min Winter	19.810	1.110	1.9	207.1	O K
4320 min Winter	19.695	0.995	1.8	185.7	O K
5760 min Winter	19.576	0.876	1.8	163.6	O K
7200 min Winter	19.459	0.759	1.8	141.7	O K
8640 min Winter	19.336	0.636	1.8	118.7	O K
10080 min Winter	19.167	0.467	1.8	87.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	38.681	0.0	130.8	72
120 min Winter	24.415	0.0	165.1	130
180 min Winter	18.492	0.0	187.5	188
240 min Winter	15.157	0.0	204.8	244
360 min Winter	11.417	0.0	231.1	360
480 min Winter	9.325	0.0	251.0	474
600 min Winter	7.966	0.0	266.8	588
720 min Winter	7.002	0.0	278.6	698
960 min Winter	5.710	0.0	285.4	914
1440 min Winter	4.282	0.0	279.9	1150
2160 min Winter	3.209	0.0	392.3	1616
2880 min Winter	2.613	0.0	425.7	2084
4320 min Winter	1.953	0.0	475.0	2988
5760 min Winter	1.587	0.0	518.2	3864
7200 min Winter	1.351	0.0	551.4	4752
8640 min Winter	1.184	0.0	579.9	5624
10080 min Winter	1.060	0.0	604.9	6248

Note the required volume of attenuation is 223.2m3 for the critical 1 in 100 year storm event plus 20% for climate change at a restricted discharge of 2.0 l/s.

Model Details

Storage is Online Cover Level (m) 20.400

Tank or Pond Structure

Invert Level (m) 18.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	186.7	1.201	0.0	2.800	0.0	4.200	0.0
0.200	186.7	1.600	0.0	3.000	0.0	4.400	0.0
0.400	186.7	1.800	0.0	3.200	0.0	4.600	0.0
0.600	186.7	2.000	0.0	3.400	0.0	4.800	0.0
0.800	186.7	2.200	0.0	3.600	0.0	5.000	0.0
1.000	186.7	2.400	0.0	3.800	0.0		
1.200	186.7	2.600	0.0	4.000	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	18.700
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0
Flush-Flo™	0.282	1.8
Kick-Flo®	0.573	1.4
Mean Flow over Head Range	-	1.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

Note the tank capacity is 224m3 greater than the required volume of attenuation of 223.2 m3 for the critical 1 in 100 year storm event plus 20% for climate change at a restricted discharge of 2.0 l/s.

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	18.806	1.006	1.5	165.6	O K
120 min Winter	19.050	1.250	1.6	205.6	O K
180 min Winter	19.199	1.399	1.7	230.0	O K
240 min Winter	19.306	1.506	1.8	247.8	O K
360 min Winter	19.455	1.655	1.8	272.2	O K
480 min Winter	19.555	1.755	1.9	288.6	O K
600 min Winter	19.626	1.826	1.9	300.3	O K
720 min Winter	19.678	1.878	1.9	308.9	O K
960 min Winter	19.745	1.945	2.0	319.9	O K
1440 min Winter	19.796	1.996	2.0	328.4	O K
2160 min Winter	19.799	1.999	2.0	328.7	O K
2880 min Winter	19.775	1.975	2.0	324.9	O K
4320 min Winter	19.680	1.880	1.9	309.2	O K
5760 min Winter	19.570	1.770	1.9	291.1	O K
7200 min Winter	19.458	1.658	1.8	272.7	O K
8640 min Winter	19.348	1.548	1.8	254.7	O K
10080 min Winter	19.243	1.443	1.7	237.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	38.681	0.0	168.9	74
120 min Winter	24.415	0.0	211.4	130
180 min Winter	18.492	0.0	230.8	188
240 min Winter	15.157	0.0	236.6	246
360 min Winter	11.417	0.0	244.1	362
480 min Winter	9.325	0.0	251.2	478
600 min Winter	7.966	0.0	258.8	594
720 min Winter	7.002	0.0	264.7	708
960 min Winter	5.710	0.0	272.4	932
1440 min Winter	4.282	0.0	277.9	1360
2160 min Winter	3.209	0.0	501.4	1704
2880 min Winter	2.613	0.0	505.7	2172
4320 min Winter	1.953	0.0	499.5	3108
5760 min Winter	1.587	0.0	670.5	3984
7200 min Winter	1.351	0.0	713.3	4896
8640 min Winter	1.184	0.0	750.0	5712
10080 min Winter	1.060	0.0	781.4	6560

Note the required volume of attenuation is 328.7m3 for the critical 1 in 100 year storm event plus 20% for climate change at a restricted discharge of 2.0 l/s

Model Details

Storage is Online Cover Level (m) 20.300

Tank or Pond Structure

Invert Level (m) 17.800

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	164.5	1.400	164.5	2.800	0.0	4.200	0.0
0.200	164.5	1.600	164.5	3.000	0.0	4.400	0.0
0.400	164.5	1.800	164.5	3.200	0.0	4.600	0.0
0.600	164.5	2.000	164.5	3.400	0.0	4.800	0.0
0.800	164.5	2.001	0.0	3.600	0.0	5.000	0.0
1.000	164.5	2.400	0.0	3.800	0.0		
1.200	164.5	2.600	0.0	4.000	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0057-2000-2000-2000
Design Head (m)	2.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	57
Invert Level (m)	17.800
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	2.0
Flush-Flo™	0.247	1.3
Kick-Flo®	0.506	1.1
Mean Flow over Head Range	-	1.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	1.200	1.6	3.000	2.4	7.000	3.6
0.200	1.3	1.400	1.7	3.500	2.6	7.500	3.7
0.300	1.3	1.600	1.8	4.000	2.7	8.000	3.8
0.400	1.3	1.800	1.9	4.500	2.9	8.500	3.9
0.500	1.1	2.000	2.0	5.000	3.0	9.000	4.0
0.600	1.2	2.200	2.1	5.500	3.2	9.500	4.1
0.800	1.3	2.400	2.2	6.000	3.3		
1.000	1.5	2.600	2.3	6.500	3.4		

Note the tank capacity is 329m3 greater than the required volume of attenuation of 328.7m3 for the critical 1 in 100 year storm event plus 20% for climate change at a restricted discharge of 2.0 l/s.

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	19.197	0.847	2.0	24.9	O K
120 min Winter	19.287	0.937	2.0	27.6	O K
180 min Winter	19.292	0.942	2.0	27.8	O K
240 min Winter	19.282	0.932	2.0	27.4	O K
360 min Winter	19.232	0.882	2.0	26.0	O K
480 min Winter	19.168	0.818	2.0	24.1	O K
600 min Winter	19.099	0.749	2.0	22.1	O K
720 min Winter	19.025	0.675	2.0	19.9	O K
960 min Winter	18.835	0.485	2.0	14.3	O K
1440 min Winter	18.597	0.247	2.0	7.3	O K
2160 min Winter	18.462	0.112	1.7	3.3	O K
2880 min Winter	18.430	0.080	1.5	2.4	O K
4320 min Winter	18.410	0.060	1.1	1.8	O K
5760 min Winter	18.402	0.052	0.9	1.5	O K
7200 min Winter	18.396	0.046	0.8	1.4	O K
8640 min Winter	18.393	0.043	0.7	1.3	O K
10080 min Winter	18.390	0.040	0.6	1.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	38.681	0.0	30.9	66
120 min Winter	24.415	0.0	39.0	118
180 min Winter	18.492	0.0	44.3	152
240 min Winter	15.157	0.0	48.4	190
360 min Winter	11.417	0.0	54.7	268
480 min Winter	9.325	0.0	59.5	346
600 min Winter	7.966	0.0	63.6	420
720 min Winter	7.002	0.0	67.0	494
960 min Winter	5.710	0.0	72.9	618
1440 min Winter	4.282	0.0	82.0	832
2160 min Winter	3.209	0.0	92.2	1148
2880 min Winter	2.613	0.0	100.1	1476
4320 min Winter	1.953	0.0	112.2	2204
5760 min Winter	1.587	0.0	121.6	2928
7200 min Winter	1.351	0.0	129.4	3672
8640 min Winter	1.184	0.0	136.1	4344
10080 min Winter	1.060	0.0	142.0	4952

Note the required volume of attenuation is 27.8m3 for the critical 1 in 100 year storm event plus 20% for climate change at a restricted discharge of 2.0 l/s

Model Details

Storage is Online Cover Level (m) 19.800

Tank or Pond Structure

Invert Level (m) 18.350

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	29.5	0.700	29.5	1.400	0.0	2.100	0.0
0.100	29.5	0.800	29.5	1.500	0.0	2.200	0.0
0.200	29.5	0.900	29.5	1.600	0.0	2.300	0.0
0.300	29.5	0.950	29.5	1.700	0.0	2.400	0.0
0.400	29.5	0.951	0.0	1.800	0.0	2.500	0.0
0.500	29.5	1.200	0.0	1.900	0.0		
0.600	29.5	1.300	0.0	2.000	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0068-2000-0950-2000
Design Head (m)	0.950
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	68
Invert Level (m)	18.350
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.950	2.0
Flush-Flo™	0.292	2.0
Kick-Flo®	0.596	1.6
Mean Flow over Head Range	-	1.8

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.7	1.200	2.2	3.000	3.4	7.000	5.0
0.200	2.0	1.400	2.4	3.500	3.6	7.500	5.2
0.300	2.0	1.600	2.5	4.000	3.9	8.000	5.4
0.400	2.0	1.800	2.7	4.500	4.1	8.500	5.5
0.500	1.9	2.000	2.8	5.000	4.3	9.000	5.7
0.600	1.6	2.200	2.9	5.500	4.5	9.500	5.8
0.800	1.8	2.400	3.1	6.000	4.7		
1.000	2.0	2.600	3.2	6.500	4.9		

Note the tank capacity is 28m3 greater than the required volume of attenuation of 27.8m3 for the critical 1 in 100 year storm event plus 20% for climate change at a restricted discharge of 2.0 l/s.

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	20.085	0.685	2.0	17.3	O K
120 min Winter	20.124	0.724	2.0	18.3	O K
180 min Winter	20.112	0.712	2.0	18.0	O K
240 min Winter	20.084	0.684	2.0	17.3	O K
360 min Winter	20.009	0.609	2.0	15.4	O K
480 min Winter	19.923	0.523	2.0	13.3	O K
600 min Winter	19.811	0.411	2.0	10.4	O K
720 min Winter	19.721	0.321	2.0	8.1	O K
960 min Winter	19.594	0.194	2.0	4.9	O K
1440 min Winter	19.493	0.093	1.8	2.3	O K
2160 min Winter	19.469	0.069	1.3	1.7	O K
2880 min Winter	19.458	0.058	1.1	1.5	O K
4320 min Winter	19.447	0.047	0.8	1.2	O K
5760 min Winter	19.442	0.042	0.7	1.1	O K
7200 min Winter	19.438	0.038	0.6	1.0	O K
8640 min Winter	19.435	0.035	0.5	0.9	O K
10080 min Winter	19.433	0.033	0.5	0.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	38.681	0.0	23.1	64
120 min Winter	24.415	0.0	29.1	106
180 min Winter	18.492	0.0	33.1	144
240 min Winter	15.157	0.0	36.1	182
360 min Winter	11.417	0.0	40.8	258
480 min Winter	9.325	0.0	44.5	332
600 min Winter	7.966	0.0	47.5	394
720 min Winter	7.002	0.0	50.1	450
960 min Winter	5.710	0.0	54.5	556
1440 min Winter	4.282	0.0	61.3	750
2160 min Winter	3.209	0.0	68.9	1104
2880 min Winter	2.613	0.0	74.8	1468
4320 min Winter	1.953	0.0	83.9	2204
5760 min Winter	1.587	0.0	90.9	2936
7200 min Winter	1.351	0.0	96.7	3656
8640 min Winter	1.184	0.0	101.7	4368
10080 min Winter	1.060	0.0	106.1	5008

Note the required volume of attenuation is 18.3m3 for the critical 1 in 100 year storm event plus 20% for climate change at a restricted discharge of 2.0 l/s

Model Details

Storage is Online Cover Level (m) 20.650

Tank or Pond Structure

Invert Level (m) 19.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	25.3	1.400	0.0	2.800	0.0	4.200	0.0
0.200	25.3	1.600	0.0	3.000	0.0	4.400	0.0
0.400	25.3	1.800	0.0	3.200	0.0	4.600	0.0
0.600	25.3	2.000	0.0	3.400	0.0	4.800	0.0
0.750	25.3	2.200	0.0	3.600	0.0	5.000	0.0
0.751	0.0	2.400	0.0	3.800	0.0		
1.200	0.0	2.600	0.0	4.000	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0071-2000-0750-2000
Design Head (m)	0.750
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	71
Invert Level (m)	19.400
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.750	2.0
Flush-Flo™	0.225	2.0
Kick-Flo®	0.480	1.6
Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.8	1.200	2.5	3.000	3.8	7.000	5.6
0.200	2.0	1.400	2.7	3.500	4.1	7.500	5.8
0.300	2.0	1.600	2.8	4.000	4.3	8.000	6.0
0.400	1.9	1.800	3.0	4.500	4.6	8.500	6.2
0.500	1.7	2.000	3.1	5.000	4.8	9.000	6.4
0.600	1.8	2.200	3.3	5.500	5.0	9.500	6.5
0.800	2.1	2.400	3.4	6.000	5.2		
1.000	2.3	2.600	3.5	6.500	5.4		

Note the tank capacity is 18.975m3 greater than the required volume of attenuation of 18.3m3 for the critical 1 in 100 year storm event plus 20% for climate change at a restricted discharge of 2.0 l/s.

Microdrainage Simulation
Part 2 : DCC Road Storm Network Design

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)	5	PIMP (%)	100
M5-60 (mm)	16.700	Add Flow / Climate Change (%)	0
Ratio R	0.280	Minimum Backdrop Height (m)	0.750
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

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S7.000	57.708	0.790	73.0	0.130	10.00	0.0	0.600	o	225	Pipe/Conduit	
S7.001	5.386	0.034	159.8	0.012	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.002	61.798	0.309	200.0	0.089	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.000	31.869	0.319	100.0	0.160	10.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	20.530	0.444	46.2	0.112	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.003	31.680	0.158	200.0	0.074	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.004	42.142	0.131	320.5	0.371	0.00	0.0	0.600	o	375	Pipe/Conduit	
S9.000	7.239	0.118	61.2	0.060	10.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.000	45.74	10.63	20.360	0.130	0.0	0.0	0.0	1.53	60.9	16.1
S7.001	45.56	10.71	19.570	0.142	0.0	0.0	0.0	1.03	41.0	17.5
S7.002	43.74	11.64	19.461	0.231	0.0	0.0	0.0	1.11	78.3	27.3
S8.000	46.21	10.41	19.990	0.160	0.0	0.0	0.0	1.31	52.0	20.0
S8.001	45.83	10.58	19.671	0.272	0.0	0.0	0.0	1.93	76.7	33.7
S7.003	42.88	12.12	19.152	0.577	0.0	0.0	0.0	1.11	78.3	67.0
S7.004	41.69	12.82	18.919	0.948	0.0	0.0	0.0	1.01	111.2	107.0
S9.000	46.94	10.07	19.056	0.060	0.0	0.0	0.0	1.68	66.6	7.6

Note storm network designed for the 1 in 5 year return period

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S7.005	10.947	0.055	200.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.006	6.194	0.113	54.7	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S10.000	23.819	0.238	100.0	0.090	10.00	0.0	0.600	o	225	Pipe/Conduit	
S10.001	32.352	0.192	168.4	0.053	0.00	0.0	0.600	o	225	Pipe/Conduit	
S10.002	6.080	0.030	200.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S11.000	35.512	0.178	200.0	0.310	10.00	0.0	0.600	o	300	Pipe/Conduit	
S11.001	16.126	0.081	200.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.002	7.312	0.321	22.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S10.003	32.673	0.101	322.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.007	53.715	0.143	376.7	0.041	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.008	18.478	0.049	376.7	0.034	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.009	46.304	0.128	361.8	0.066	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.010	48.164	0.133	361.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.011	48.436	0.134	361.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.012	46.422	0.128	361.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.013	66.117	0.183	361.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.014	2.040	0.006	361.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.015	84.894	0.244	347.5	0.297	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.005	41.48	12.95	18.712	1.008	0.0	0.0	0.0	1.43	228.1	113.2
S7.006	41.42	12.98	18.658	1.008	0.0	0.0	0.0	2.75	438.0	113.2
S10.000	46.43	10.30	19.406	0.090	0.0	0.0	0.0	1.31	52.0	11.3
S10.001	45.31	10.84	19.093	0.143	0.0	0.0	0.0	1.00	39.9	17.5
S10.002	45.16	10.91	18.751	0.143	0.0	0.0	0.0	1.43	228.1	17.5
S11.000	45.94	10.53	19.375	0.310	0.0	0.0	0.0	1.11	78.3	38.6
S11.001	45.44	10.78	19.197	0.310	0.0	0.0	0.0	1.11	78.3	38.6
S11.002	45.36	10.81	19.117	0.310	0.0	0.0	0.0	3.31	233.9	38.6
S10.003	44.22	11.39	18.721	0.453	0.0	0.0	0.0	1.13	179.2	54.3
S7.007	40.08	13.84	18.544	1.502	0.0	0.0	0.0	1.04	165.6	163.0
S7.008	39.64	14.14	18.402	1.536	0.0	0.0	0.0	1.04	165.6	164.9
S7.009	38.62	14.86	18.353	1.602	0.0	0.0	0.0	1.06	169.0	167.6
S7.010	37.63	15.62	18.225	1.602	0.0	0.0	0.0	1.06	169.0	167.6
S7.011	36.69	16.38	18.092	1.602	0.0	0.0	0.0	1.06	169.0	167.6
S7.012	35.84	17.11	17.958	1.602	0.0	0.0	0.0	1.06	169.0	167.6
S7.013	34.72	18.14	17.830	1.602	0.0	0.0	0.0	1.06	169.0	167.6
S7.014	34.68	18.18	17.647	1.602	0.0	0.0	0.0	1.06	169.0	167.6
S7.015	33.39	19.48	17.641	1.899	0.0	0.0	0.0	1.08	172.5	171.7

Note the proposed Bailey Gibson storm network is added upstream of pipe S7.011

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S12.000	10.823	0.300	36.1	0.011	10.00	2.0	0.600	o	225	Pipe/Conduit	
S13.000	79.129	0.800	98.9	0.087	10.00	0.0	0.600	o	225	Pipe/Conduit	
S12.001	5.332	0.028	193.0	0.009	0.00	0.0	0.600	o	300	Pipe/Conduit	
S14.000	16.139	0.478	33.8	0.000	10.00	2.0	0.600	o	225	Pipe/Conduit	
S12.002	4.308	0.196	22.0	0.028	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.000	56.626	0.339	167.2	0.039	10.00	0.0	0.600	o	225	Pipe/Conduit	
S15.001	28.979	0.173	167.2	0.000	0.00	2.0	0.600	o	225	Pipe/Conduit	
S15.002	75.086	0.375	200.0	0.190	0.00	0.0	0.600	o	450	Pipe/Conduit	
S12.003	30.630	0.117	262.0	0.047	0.00	0.0	0.600	o	450	Pipe/Conduit	
S12.004	34.382	0.085	404.3	0.033	0.00	2.0	0.600	o	450	Pipe/Conduit	
S12.005	26.183	0.065	404.3	0.039	0.00	0.0	0.600	o	450	Pipe/Conduit	
S12.006	9.318	0.299	31.2	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.016	28.858	0.059	490.6	0.041	0.00	2.0	0.600	o	600	Pipe/Conduit	
S7.017	17.810	0.036	490.6	0.042	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S12.000	46.91	10.08	18.975	0.011	2.0	0.0	0.0	2.19	86.9	3.4
S13.000	44.98	11.00	19.475	0.087	0.0	0.0	0.0	1.31	52.3	10.6
S12.001	44.82	11.08	18.600	0.107	2.0	0.0	0.0	1.13	79.8	15.0
S14.000	46.83	10.12	19.125	0.000	2.0	0.0	0.0	2.26	89.8	2.0
S12.002	44.78	11.10	18.572	0.136	4.0	0.0	0.0	3.37	238.0	20.4
S15.000	45.11	10.94	19.075	0.039	0.0	0.0	0.0	1.01	40.1	4.7
S15.001	44.18	11.42	18.736	0.039	2.0	0.0	0.0	1.01	40.1	6.6
S15.002	42.59	12.29	18.338	0.229	2.0	0.0	0.0	1.43	228.1	28.4
S12.003	41.89	12.70	17.963	0.411	6.0	0.0	0.0	1.25	199.0	52.6
S12.004	40.97	13.27	17.846	0.444	8.0	0.0	0.0	1.00	159.8	57.3
S12.005	40.30	13.70	17.761	0.483	8.0	0.0	0.0	1.00	159.8	60.7
S12.006	40.23	13.74	17.696	0.483	8.0	0.0	0.0	3.65	580.9	60.7
S7.016	32.98	19.92	17.247	2.423	10.0	0.0	0.0	1.09	308.9	226.4
S7.017	32.73	20.19	17.188	2.465	10.0	0.0	0.0	1.09	308.9	228.5

Note the proposed catchment equivalent to 0.117ha is added upstream to pipe S15.002. Restricted discharge rates of 2.0 l/s for Blocks PW1, PW2, PW4, PW5 and DCC4 are added as base flows as highlighted in table above.

Microdrainage Simulation
Part 3 : Storm Network Simulation

5 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	0.280
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	16.700	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)	5, 30
Climate Change (%)	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)
S7.000	S1.0	30 Winter	5	+20%					20.446
S7.001	S1.1	15 Winter	5	+20%	30/15 Summer				19.706
S7.002	S1.2	30 Winter	5	+20%	30/15 Summer				19.620
S8.000	S2.0	30 Winter	5	+20%	30/15 Summer				20.098
S8.001	S2.1	15 Winter	5	+20%	30/15 Summer				19.797
S7.003	S1.3	30 Winter	5	+20%	5/15 Summer				19.574
S7.004	S1.4	30 Winter	5	+20%	5/15 Summer				19.431
S9.000	S5.0	30 Winter	5	+20%	5/15 Winter				19.300
S7.005	S1.6	30 Winter	5	+20%	5/15 Summer				19.294
S7.006	S1.7	30 Winter	5	+20%	5/15 Summer				19.197
S10.000	S3.0	30 Winter	5	+20%	30/15 Winter				19.485
S10.001	S3.1	30 Winter	5	+20%	30/15 Summer				19.239
S10.002	S3.2	30 Winter	5	+20%	30/15 Summer				19.201
S11.000	S4.1	30 Winter	5	+20%	30/15 Summer				19.545
S11.001	S4.2	15 Winter	5	+20%	30/15 Summer				19.376
S11.002	S4.3	15 Winter	5	+20%	30/15 Summer				19.231

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S7.000	S1.0	-0.139	0.000	0.31		18.4	OK	
S7.001	S1.1	-0.089	0.000	0.67		20.1	OK	
S7.002	S1.2	-0.141	0.000	0.43		32.0	OK	
S8.000	S2.0	-0.117	0.000	0.46		22.6	OK	
S8.001	S2.1	-0.100	0.000	0.59		40.7	OK	
S7.003	S1.3	0.122	0.000	1.06		76.1	SURCHARGED	
S7.004	S1.4	0.137	0.000	1.21		122.9	SURCHARGED	
S9.000	S5.0	0.020	0.000	0.18		8.5	SURCHARGED	
S7.005	S1.6	0.131	0.000	0.72		116.6	SURCHARGED	
S7.006	S1.7	0.089	0.000	0.62		116.8	SURCHARGED	
S10.000	S3.0	-0.146	0.000	0.27		12.7	OK	
S10.001	S3.1	-0.079	0.000	0.54		20.4	OK	
S10.002	S3.2	0.000	0.000	0.15		20.5	OK	
S11.000	S4.1	-0.130	0.000	0.61		43.8	OK	
S11.001	S4.2	-0.121	0.000	0.66		43.9	OK	
S11.002	S4.3	-0.186	0.000	0.31		43.9	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S10.003	S3.3	30 Winter	5	+20%	5/30 Winter				19.178
S7.007	S1.8	30 Winter	5	+20%	5/15 Summer				19.086
S7.008	S1.9	30 Winter	5	+20%	5/15 Summer				18.925
S7.009	S1.10	30 Winter	5	+20%	5/15 Winter				18.847
S7.010	S1.11	30 Winter	5	+20%	5/15 Winter				18.700
S7.011	SEx.1.10	30 Winter	5	+20%	5/30 Winter				18.550
S7.012	SEx.1.11	30 Winter	5	+20%	5/30 Winter				18.413
S7.013	SEx1.12	30 Winter	5	+20%	30/15 Summer				18.277
S7.014	S1.10	15 Winter	5	+20%	5/15 Winter				18.100
S7.015	S1.11	60 Winter	5	+20%	30/15 Summer				18.012
S12.000	S3.4	30 Winter	5	+20%					19.007
S13.000	S1.0	30 Winter	5	+20%					19.550
S12.001	S1.1	15 Winter	5	+20%					18.716
S14.000	S6.2	360 Winter	5	+20%					19.149
S12.002	S1.2	15 Winter	5	+20%					18.665
S15.000	S2.0	30 Winter	5	+20%					19.131
S15.001	S2.1	15 Winter	5	+20%					18.804
S15.002	S2.2	15 Winter	5	+20%					18.469
S12.003	S1.3	15 Winter	5	+20%					18.167
S12.004	S1.4	15 Winter	5	+20%					18.088
S12.005	S1.5	15 Winter	5	+20%					18.006
S12.006	S1.5	15 Winter	5	+20%					17.848
S7.016	S1.6	60 Winter	5	+20%	30/30 Summer				17.794
S7.017	S1.13	60 Winter	5	+20%	30/30 Summer				17.726
S7.018	S1.14	60 Winter	5	+20%					17.598

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S10.003	S3.3	0.008	0.000	0.38		59.8	SURCHARGED	
S7.007	S1.8	0.092	0.000	1.12		169.5	SURCHARGED	
S7.008	S1.9	0.073	0.000	1.28		168.1	SURCHARGED	
S7.009	S1.10	0.044	0.000	1.12		171.0	SURCHARGED	
S7.010	S1.11	0.025	0.000	1.10		167.8	SURCHARGED	
S7.011	SEx.1.10	0.008	0.000	1.07		163.9	SURCHARGED	
S7.012	SEx.1.11	0.005	0.000	1.02		156.1	SURCHARGED	
S7.013	SEx1.12	-0.003	0.000	0.98		154.2	OK	
S7.014	S1.10	0.003	0.000	1.13		144.9	SURCHARGED	
S7.015	S1.11	-0.079	0.000	0.94		153.2	OK	
S12.000	S3.4	-0.193	0.000	0.05		3.5	OK	
S13.000	S1.0	-0.150	0.000	0.24		12.2	OK	
S12.001	S1.1	-0.184	0.000	0.32		17.0	OK	
S14.000	S6.2	-0.201	0.000	0.03		2.0	OK	
S12.002	S1.2	-0.207	0.000	0.21		23.1	OK	
S15.000	S2.0	-0.169	0.000	0.14		5.4	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S15.001	S2.1	-0.157	0.000	0.20		7.4	OK	
S15.002	S2.2	-0.319	0.000	0.18		38.2	OK	
S12.003	S1.3	-0.245	0.000	0.39		67.5	OK	
S12.004	S1.4	-0.208	0.000	0.52		72.8	OK	
S12.005	S1.5	-0.205	0.000	0.57		77.3	OK	
S12.006	S1.5	-0.298	0.000	0.25		77.0	OK	
S7.016	S1.6	-0.053	0.000	0.78		194.9	OK	
S7.017	S1.13	-0.062	0.000	1.00		193.4	OK	
S7.018	S1.14	-0.153	0.000	0.91		194.1	OK	

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	0.280
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	16.700	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)	5, 30
Climate Change (%)	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)
S7.000	S1.0	30 Winter	30	+20%					20.583
S7.001	S1.1	30 Winter	30	+20%	30/15 Summer				20.449
S7.002	S1.2	30 Winter	30	+20%	30/15 Summer				20.387
S8.000	S2.0	30 Winter	30	+20%	30/15 Summer				20.590
S8.001	S2.1	30 Winter	30	+20%	30/15 Summer				20.467
S7.003	S1.3	30 Winter	30	+20%	5/15 Summer				20.292
S7.004	S1.4	30 Winter	30	+20%	5/15 Summer				20.075
S9.000	S5.0	30 Winter	30	+20%	5/15 Winter				19.968
S7.005	S1.6	30 Winter	30	+20%	5/15 Summer				19.964
S7.006	S1.7	30 Winter	30	+20%	5/15 Summer				19.874
S10.000	S3.0	30 Winter	30	+20%	30/15 Winter				19.905
S10.001	S3.1	30 Winter	30	+20%	30/15 Summer				19.884
S10.002	S3.2	30 Winter	30	+20%	30/15 Summer				19.852
S11.000	S4.1	30 Winter	30	+20%	30/15 Summer				20.162
S11.001	S4.2	30 Winter	30	+20%	30/15 Summer				20.056
S11.002	S4.3	30 Winter	30	+20%	30/15 Summer				19.964

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
S7.000	S1.0	-0.002	0.000	0.46		26.8	OK	
S7.001	S1.1	0.654	0.000	0.86		25.6	SURCHARGED	
S7.002	S1.2	0.625	0.000	0.47		34.7	SURCHARGED	
S8.000	S2.0	0.375	0.000	0.63		30.9	SURCHARGED	
S8.001	S2.1	0.570	0.000	0.67		46.9	SURCHARGED	
S7.003	S1.3	0.840	0.000	1.24		88.8	SURCHARGED	
S7.004	S1.4	0.781	0.000	1.56		158.6	SURCHARGED	
S9.000	S5.0	0.687	0.000	0.20		9.8	SURCHARGED	
S7.005	S1.6	0.801	0.000	1.00		162.8	SURCHARGED	
S7.006	S1.7	0.766	0.000	0.84		159.7	SURCHARGED	
S10.000	S3.0	0.274	0.000	0.38		18.3	SURCHARGED	
S10.001	S3.1	0.566	0.000	0.74		27.6	SURCHARGED	
S10.002	S3.2	0.651	0.000	0.15		21.1	SURCHARGED	
S11.000	S4.1	0.487	0.000	0.85		61.2	SURCHARGED	
S11.001	S4.2	0.559	0.000	0.81		54.0	SURCHARGED	
S11.002	S4.3	0.547	0.000	0.34		48.6	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S10.003	S3.3	30 Winter	30	+20%	5/30 Winter				19.850
S7.007	S1.8	30 Winter	30	+20%	5/15 Summer				19.766
S7.008	S1.9	30 Winter	30	+20%	5/15 Summer				19.595
S7.009	S1.10	30 Winter	30	+20%	5/15 Winter				19.492
S7.010	S1.11	30 Winter	30	+20%	5/15 Winter				19.302
S7.011	SEx.1.10	30 Winter	30	+20%	5/30 Winter				19.108
S7.012	SEx.1.11	30 Winter	30	+20%	5/30 Winter				18.902
S7.013	SEx1.12	30 Winter	30	+20%	30/15 Summer				18.691
S7.014	S1.10	30 Winter	30	+20%	5/15 Winter				18.404
S7.015	S1.11	30 Winter	30	+20%	30/15 Summer				18.281
S12.000	S3.4	30 Winter	30	+20%					19.010
S13.000	S1.0	30 Winter	30	+20%					19.568
S12.001	S1.1	30 Winter	30	+20%					18.741
S14.000	S6.2	360 Winter	30	+20%					19.149
S12.002	S1.2	15 Winter	30	+20%					18.685
S15.000	S2.0	30 Winter	30	+20%					19.145
S15.001	S2.1	30 Winter	30	+20%					18.815
S15.002	S2.2	15 Winter	30	+20%					18.515
S12.003	S1.3	15 Winter	30	+20%					18.244
S12.004	S1.4	15 Winter	30	+20%					18.172
S12.005	S1.5	15 Winter	30	+20%					18.092
S12.006	S1.5	60 Winter	30	+20%					17.893
S7.016	S1.6	60 Winter	30	+20%	30/30 Summer				17.872
S7.017	S1.13	60 Winter	30	+20%	30/30 Summer				17.804
S7.018	S1.14	30 Summer	30	+20%					17.752

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S10.003	S3.3	0.679	0.000	0.43		66.4	SURCHARGED	
S7.007	S1.8	0.771	0.000	1.41		213.0	SURCHARGED	
S7.008	S1.9	0.743	0.000	1.65		216.0	SURCHARGED	
S7.009	S1.10	0.689	0.000	1.45		221.2	SURCHARGED	
S7.010	S1.11	0.627	0.000	1.42		217.0	SURCHARGED	
S7.011	SEx.1.10	0.567	0.000	1.37		210.6	SURCHARGED	
S7.012	SEx.1.11	0.494	0.000	1.34		204.2	SURCHARGED	
S7.013	SEx1.12	0.412	0.000	1.26		198.0	SURCHARGED	
S7.014	S1.10	0.307	0.000	1.55		197.9	SURCHARGED	
S7.015	S1.11	0.190	0.000	1.27		207.3	SURCHARGED	
S12.000	S3.4	-0.190	0.000	0.06		4.3	OK	
S13.000	S1.0	-0.132	0.000	0.36		18.1	OK	
S12.001	S1.1	-0.159	0.000	0.45		24.0	OK	
S14.000	S6.2	-0.201	0.000	0.03		2.0	OK	
S12.002	S1.2	-0.188	0.000	0.29		32.6	OK	
S15.000	S2.0	-0.155	0.000	0.21		8.0	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S15.001	S2.1	-0.146	0.000	0.27		10.0	OK	
S15.002	S2.2	-0.273	0.000	0.31		65.7	OK	
S12.003	S1.3	-0.169	0.000	0.62		106.8	OK	
S12.004	S1.4	-0.124	0.000	0.81		113.0	OK	
S12.005	S1.5	-0.119	0.000	0.88		118.9	OK	
S12.006	S1.5	-0.253	0.000	0.28		85.9	OK	
S7.016	S1.6	0.025	0.000	1.07		268.6	SURCHARGED	
S7.017	S1.13	0.016	0.000	1.40		271.3	SURCHARGED	
S7.018	S1.14	0.000	0.000	1.10		235.2	OK	

APPENDIX V

SITE INVESTIGATION REPORT

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Ground Investigations Ireland

Player Wills – Additional Work

Ground Investigation Report

DOCUMENT CONTROL SHEET

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A	Final	J Duggan	F McNamara	F McNamara	Dublin	09 October 2019

GROUND INVESTIGATIONS IRELAND

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CONTENTS

APPENDICES

1.0 Preamble

On the instructions of Downes Associates Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between June and July 2019 at the Player Wills Site in Dublin City.

2.0 Overview

2.1. Background

It is proposed to construct a new residential development with associated services, access roads and car parking at the proposed site. The site is currently occupied by industrial buildings and is situated on Donore Avenue in Dublin 8.

2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 8 No. Trial Pits to a maximum depth of 3.6m BGL
- Carry out 3 No. Rotary Core Boreholes to a maximum depth of 9.7m BGL
- Installation of 3 No. Groundwater monitoring wells
- Factual report

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.
The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.2. Trial Pits

The trial pits were excavated using a JCB 3CX at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services,

inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of this Report.

3.3. Rotary Boreholes

The rotary coring was carried out by a track mounted T44 Beretta rig at the locations shown on the location plan in Appendix 1. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring.

The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the “overshoot” recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit, and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 3 of this Report.

3.4. Groundwater Monitoring Installations

Groundwater Monitoring Installations were installed upon the completion of the boreholes to enable sampling and the determination of the equilibrium groundwater level. The typical groundwater monitoring installation consists of a 50mm HDPE slotted pipe with a pea gravel response zone and bentonite seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and are generally comprised;

- Surfacing
- Made Ground
- Granular Deposits
- Cohesive Deposits

SURFACING: Tarmac surfacing was present typically to a depth of 0.10m BGL in all the exploratory holes.

MADE GROUND: Made Ground deposits were encountered beneath the Surfacing and was present to a relatively consistent depth of between 1.1m and 1.8m BGL. These deposits were described generally as *dark grey/brown sandy gravelly Clay with fragments of red brick and clay pipe.*

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Made Ground and were described typically as *firm to stiff brown/grey sandy slightly gravelly CLAY*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. These deposits had some, occasional or frequent cobble and boulder content where noted on the exploratory hole logs.

BEDROCK: The rotary core boreholes recovered medium strong to strong light grey fine grained LIMESTONE interbedded with extremely weak to weak dark grey fine grained MUDSTONE. This is typical of the Calp Formation, which is noted on the geological mapping of the area.
The depth to rock varies from 5.1m BGL in MW01 to a maximum of 6.1m BGL in MW03. The total core recovery is good, typically 100% with some of the uppermost runs dropping to 80 or 90%. The SCR and RQD both are relatively poor in the upper weathered zone, often recovered as non-intact, however both indices show an increase with depth in each of the boreholes.

4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred and where possible drilling was suspended for twenty minutes to allow the subsequent rise in groundwater to be recorded. We would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the tide, time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in MW01, MW02 and MW03 to allow the equilibrium groundwater level to be determined.

APPENDIX 1 - Site Location Plan

O' Callaghan Moran & Associates.
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Model Farm Road, Cork, Ireland.
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environmental management for business

CLIENT
Hines

TITLE
OCM Trial Pit Layout Rev B

FIGURE No.
FIG

SCALE
SCALE

APPENDIX 2 – Trial Pit Records

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Site Player Wills Additional Work			**Trial Pit Number** TP16
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** L x W x D 3.60 x 0.90 x 3.00m	**Ground Level (mOD)**	**Client**	**Job Number** 8803-06-19
	Location	**Dates** 17/06/2019	**Engineer** Barrett Mahony	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	TARMACADAM		
						MADE GROUND: Brown sandy fine to coarse angular Gravel		
					(0.60) 0.70	MADE GROUND: Grey sandy gravelly Clay		
			Slow trickle(1) at 0.90m.					▽1
					(1.10)			
					1.80	Firm to stiff brown/grey sandy slightly gravelly CLAY		
2.50	B				(1.20)			
					3.00	Complete at 3.00m		

Plan

Remarks

Trial pit spalling
Groundwater encountered at 0.90mBGL as a slow trickle
Trial Pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	S. Connolly	8803-06-19.TP16

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Site Player Wills Additional Work			**Trial Pit Number** TP17
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** L x W x D 3.00 x 1.20 x 3.60m	**Ground Level (mOD)**	**Client**	**Job Number** 8803-06-19
	Location	**Dates** 17/06/2019	**Engineer** Barrett Mahony	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	TARMACADAM		
					(0.30) 0.40	MADE GROUND: Brown mottled dark brown slightly clayey sandy fine to coarse angular Gravel		
					(0.30) 0.70	MADE GROUND: Grey slightly clayey sandy fine to coarse Gravel with fragments of brick		
					(1.00) 1.70	MADE GROUND: Dark grey slightly sandy gravelly Clay with fragments of brick		
					(0.20) 1.90	Soft to firm light grey slightly sandy silty Clay with fragments of shell		
1.90	B		Slow flow(1) at 2.40m.		(1.30) 3.20	Firm brown/grey slightly sandy slightly gravelly silty CLAY		▽1
					(0.40) 3.60	Stiff dark grey/black slightly sandy gravelly CLAY with occasional cobbles		
						Complete at 3.60m		

Plan

Remarks

Trial pit stable
Groundwater encountered at 2.40mBGL as a slow flow
Trial Pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	S. Connolly	8803-06-19.TP17

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Site Player Wills Additional Work			**Trial Pit Number** TP18
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** L x W x D 3.50 x 1.00 x 3.00m	**Ground Level (mOD)**	**Client**	**Job Number** 8803-06-19
	Location	**Dates** 17/06/2019	**Engineer** Barrett Mahony	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	TARMACADAM		
					(0.10) 0.20	MADE GROUND: Dark grey fine to coarse angular Gravel Fill		
					(0.30) 0.50	MADE GROUND: Brown sandy gravelly Clay with fragments of brick		
					(1.20) 1.70	MADE GROUND: Dark grey/brown slightly sandy slightly gravelly Clay with fragments of brick and ceramic		
2.00	B		Slow trickle(1) at 1.70m.		(1.30) 3.00	Medium dense brown/grey clayey gravelly fine to coarse SAND with occasional cobbles		▽1
						Complete at 3.00m		

Plan

Remarks
Excavating from 0.00m.
Trial pit sidewall collapse below 1.70mBGL
Groundwater encountered at 1.70mBGL as a slow trickle
Trial Pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	S. Connolly	8803-06-19.TP18

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Site Player Wills Additional Work			**Trial Pit Number** TP19
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** L x W x D 3.60 x 1.50 x 2.30m	**Ground Level (mOD)**	**Client**	**Job Number** 8803-06-19
	Location	**Dates** 18/06/2019	**Engineer** Barrett Mahony	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	TARMACADAM		
					(0.30) 0.40	MADE GROUND: Dark grey fine to coarse angular Gravel Fill with frequent cobbles		
					(0.50) 0.90	MADE GROUND: Brown slightly clayey sandy fine to coarse angular Gravel with fragments of brick and wood		
					(0.50) 1.40	MADE GROUND: Dark brown sandy gravelly Clay with fragments of brick		
2.00	B		Rapid flow(1) at 1.70m.		(0.90) 2.30	Firm to stiff light brown/grey slightly sandy slightly gravelly CLAY with occasional cobbles		▽1
						Complete at 2.30m		

Plan

Remarks

Trial pit terminated due to influx of groundwater from old draining channel
Groundwater encountered at 1.70mBGL as rapid flow
Trial Pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	S. Connolly	8803-06-19.TP19

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Site Player Wills Additional Work			**Trial Pit Number** TP20
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** L x W x D 3.60 x 1.50 x 3.30m	**Ground Level (mOD)**	**Client**	**Job Number** 8803-06-19
	Location	**Dates** 18/06/2019	**Engineer** Barrett Mahony	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	TARMACADAM		
					(0.30)	MADE GROUND: Dark grey fine to coarse angular Gravel Fill		
					0.40	MADE GROUND: Dark brown slightly clayey fine to coarse angular Gravel with fragments of brick		
					(1.30)			
					1.70	Firm to stiff brown/grey slightly sandy gravelly CLAY with occasional cobbles		
					(1.60)			
3.00	B							
			Slow seepage(1) at 3.30m.		3.30	Complete at 3.30m		▽1

Plan

Remarks

Trial pit sidewall collapse below 2.50mBGL
Groundwater encountered at 3.30mBGL as slow seepage
Trial Pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	S. Connolly	8803-06-19.TP20

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Site Player Wills Additional Work			**Trial Pit Number** TP22
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** L x W x D 4.00 x 1.60 x 3.40m	**Ground Level (mOD)**	**Client**	**Job Number** 8803-06-19
	Location	**Dates** 17/06/2019	**Engineer** Barrett Mahony	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	TARMACADAM		
					(0.60)	MADE GROUND: Dark grey fine to coarse angular Gravel Fill with occasional cobbles		
					0.70			
					(0.60)	MADE GROUND: Dark brown/grey slightly sandy gravelly Clay with fragments of brick and concrete		
			Slow trickle(1) at 1.20m.		1.30			▽1
2.00	B				(0.90)	Firm to stiff brown/grey slightly sandy gravelly CLAY with occasional cobbles		
					2.20			
3.00	B				(1.20)	Stiff dark brown/grey sandy gravelly CLAY with occasional cobbles		
					3.40	Complete at 3.40m		

Plan

Remarks

Trial pit stable
Groundwater encountered at 1.20mBGL as a slow trickle
Trial Pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	S. Connolly	8803-06-19.TP22

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Site Player Wills Additional Work			**Trial Pit Number** TP23
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** L x W x D 3.50 x 2.00 x 2.80m	**Ground Level (mOD)**	**Client**	**Job Number** 8803-06-19
	Location	**Dates** 18/06/2019	**Engineer** Barrett Mahony	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	TARMACADAM		
					(0.10) 0.20	MADE GROUND: Dark grey fine to coarse angular Gravel Fill with frequent cobbles and occasional boulders		
					(0.40) 0.60	MADE GROUND: Dark grey/black slightly sandy gravelly Clay with fragments of brick		
					(0.50) 1.10	MADE GROUND: Brown/grey slightly sandy gravelly Clay with fragments of brick		
1.50	B				(0.80) 1.90	Soft to firm brown slightly sandy gravelly CLAY with occasional cobbles		
2.50	B				(0.90) 2.80	Stiff dark grey sandy gravelly CLAY with occasional cobbles		
						Complete at 2.80m		

Plan

Remarks

Trial pit terminated due to very stiff ground
No groundwater encountered
Trial Pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	S. Connolly	8803-06-19.TP23

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Site Player Wills Additional Work			**Trial Pit Number** TP25
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** L x W x D 2.60 x 0.70 x 2.30m	**Ground Level (mOD)**	**Client**	**Job Number** 8803-06-19
	Location	**Dates** 17/06/2019	**Engineer** Barrett Mahony	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	TARMACADAM		
						MADE GROUND: Dark frey fine to coarse angular Gravel FILL		
					(0.60) 0.70			
						MADE GROUND: Dark brown slightly sandy gravelly Clay with fragments of brick and plastic		
					(0.50) 1.20			
					(0.15) 1.35	MADE GROUND: Dark grey sandy gravelly Clay with fragments of brick and clay pipe		
						MADE GROUND: Red/brown sany gravelly Clay with fragments of brick		
			Rapid flow(1) at 1.90m.		(0.55) 1.90			▽1
						Firm grey sandy gravelly CLAY with rare cobbles		
					(0.40) 2.30			
						Complete at 2.30m		

Plan

Remarks

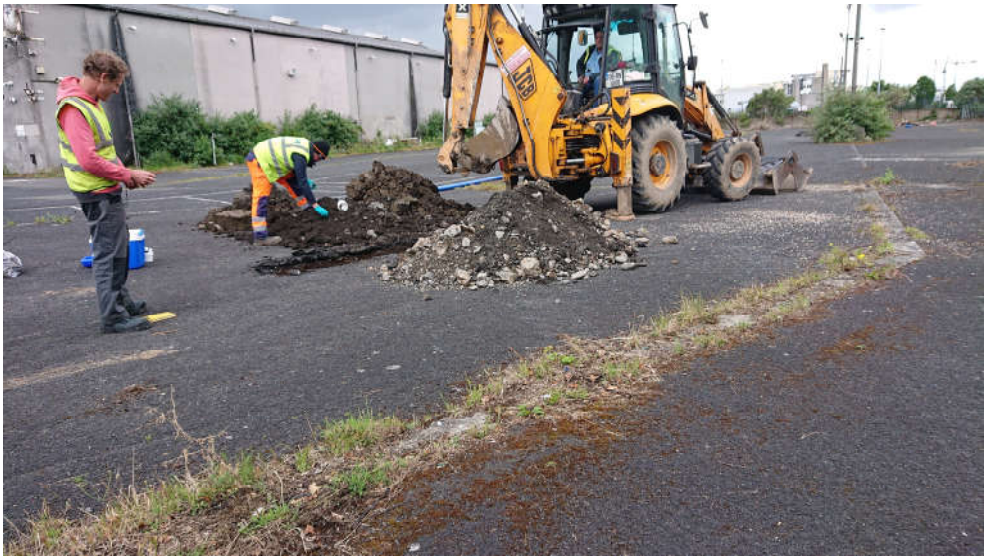
Trial Pit terminated at 2.30mBGL due to groundwater
Groundwater encountered at 1.90mBGL as a rapid flow
Trial Pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	S. Connolly	8803-06-19.TP25

Player Wills Additional Work – Trial Pit Photos

TP16

TP17



TP18

TP22

TP23

TP19

TP20

TP25

APPENDIX 3 – Borehole Records

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Site Player Wills Additional Work			**Borehole Number** MW01
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Cored	**Casing Diameter** 100mm cased to 8.60m	**Ground Level (mOD)**	**Client**	**Job Number** 8803-06-19
	Location	**Dates** 25/07/2019-01/08/2019	**Engineer** Barrett Mahony	**Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00											
	15						(2.00)	Poor recovery. Recovery consists of concrete fragments. Driller notes: MADE GROUND: Brown Clay fill with many concrete fragments			
2.00 2.00-2.45	10				2,3/3,5,4,6 SPT(C) N=18		2.00 (1.50)	Poor recovery. Recovery consists of brown very sandy gravelly Clay. Driller notes: Brown/dark brown CLAY			
3.50 3.50-3.88	66				6,7/12,14,13,11 SPT(C) 50/225		3.50 (1.60)	Poor recovery. Recovery consists of subangular to subrounded coarse Gravel and Cobbles fragments. Driller notes Black boulder CLAY			
5.00 5.00-5.16 5.10	84	34	11	46	17/50 SPT(C) 50/10		5.10 (0.90)	Extremely weak to weak dark grey fine grained MUDSTONE distinctly weathered 5.10m - 6.00m: 1 fracture set. Subhorizontal to 10 degrees, very closely spced, planar, smooth, closed with black clay smearing.			
6.00				9			6.00 (0.90)	Medium strong to strong thinly bedded light grey fine grained LIMESTONE interbedded with weak dark grey fine grained MUDSTONE partially weathered 6.00m - 6.90m: 1 fracture set. Subhorizontal to 10 degrees, medium spaced, planar, smooth, closed.			
6.50 6.90	84	46	38	28			6.90 (0.50)	Extremely weak to weak dark grey fine grained MUDSONE distinctly weathered 6.90m - 7.40m: 1 fracture set. Subhorizontal to 10 degrees, closely spaced, planar, smooth, closed with grey clay smearing.			
7.40				4			7.40 (0.30)				
7.70 8.00				NI			7.70 (0.90)	Medium strong light thinly bedded light grey fine grained LIMESTONE partially weathered with occasional calcite and pyrite veins 7.40m - 7.70m: 1 fracture set. Subhorizontal to 10 degrees, widely spaced, undulating, rough, open.			
8.30	98	25	0	20			8.60	Extremely weak to weak dark grey fine grained MUDSTONE distinctly weathered to destructured 7.70m - 8.30m: Mostly non-intact. 8.30m - 8.60m: 1 fracture set. Subhorizontal to 10 degrees, closely spaced, planar, smooth, closed with grey thin clay infill			
8.60								Complete at 8.60m			

Remarks
Standpipe installed on completion - Slotted pipe from 8.60m-5.60mBGL with gravel surround. Plain pipe installed from 5.60mBGL to GL with bentonite seal and flush cover

Scale (approx)	Logged By
1:50	JD

Figure No. 8803-06-19.MW01

Ground Investigations Ireland Ltd
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Site Player Wills Additional Work			**Borehole Number** MW02
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Cored	**Casing Diameter** 100mm cased to 9.70m	**Ground Level (mOD)**	**Client**	**Job Number** 8803-06-19
	Location	**Dates** 31/07/2019	**Engineer** Barrett Mahony	**Sheet** 1/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00							0.10	TARMACADAM			
	22							Poor recovery. Recovery consists of grey cobbles and concrete fragments. Driller notes: Clay with cobbles and hydrocarbon odour			
2.00-2.45					2,2/3,4,5,5 SPT(C) N=17		(3.10)				
2.40	20										
							3.20	Poor recovery. Recovery consists of grey cobbles and some finer material. Driller notes: Boulder CLAY			
3.70 3.70-4.15	33				6,7/8,11,12,12 SPT(C) N=43		(2.70)				
5.20 5.20-5.43					8,8/9,14,16,11 SPT(C) 50/75						
5.90	60	36	29	9			5.90	Medium strong thinly bedded fine grained grey LIMESTONE with occasional calcite veins partially weathered. 1 Fracture set - F1: Subhorizontal to 10 degrees widely spaced planar smooth closed			
6.70							(1.20)				
7.10	96	53	42	13			7.10	Extremely weak to weak very thinly laminated fine grained dark grey MUDSTONE distinctly weathered to destructured 1 Fracture set - F1: Subhorizontal to 10 degrees very closely spaced planar smooth closed with clay infill			
7.60				5			(0.50) 7.60				
8.20	100	39	0	45			(0.60) 8.20	Medium strong thinly bedded fine grained grey LIMESTONE partially weathered. 1 Fracture set - F1: Subhorizontal to 10 degrees medium spaced planar smooth closed			
							(0.50) 8.70	Extremely weak to weak very thinly laminated fine grained dark grey MUDSTONE distinctly weathered to destructured 1 Fracture set - F1: Subhorizontal to 10 degrees very closely spaced planar smooth closed with clay infill			
9.70							(1.00)	Medium strong thinly bedded fine grained grey LIMESTONE interbedded with MUDSTONE partially weathered 1 Fracture set - F1: Subhorizontal to 10			

Remarks
Standpipe installed on completion - Slotted pipe installed from 9.70m-6.70mBGL with gravel surround. Plain pipe installed from 6.70mBGL to GL with bentonite seal and flush cover

Scale (approx)	Logged By
1:50	JD

Figure No. 8803-06-19.MW02

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Site Player Wills Additional Work			**Borehole Number** MW02
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Cored	**Casing Diameter** 100mm cased to 9.70m	**Ground Level (mOD)**	**Client**	**Job Number** 8803-06-19
	Location	**Dates** 31/07/2019	**Engineer** Barrett Mahony	**Sheet** 2/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							9.70	degrees closely spaced planar smooth closed with clay infill Complete at 9.70m			

Remarks

Scale (approx)	Logged By
1:50	JD

Figure No. 8803-06-19.MW02

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Site Player Wills Additional Work			**Borehole Number** MW03
Machine : T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Cored	**Casing Diameter** 100mm cased to 9.50m	**Ground Level (mOD)**	**Client**	**Job Number** 8803-06-19
	Location	**Dates** 26/07/2019	**Engineer** Barrett Mahony	**Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00											
	7						(2.00)	Poor recovery. Recovery consists of tar and cobbles fragments. Driller notes: MADE GROUND: Brown Clay fill			
2.00							2.00				
2.00-2.45	10				2,2/2,3,5,6 SPT(C) N=16			Poor recovery. Recovery consists of grey subangular to subrounded cobbles. Driller notes: Brown boulder CLAY			
3.50							(4.10)				
3.50-3.95	20				6,5/8,10,11,11 SPT(C) N=40						
5.00											
5.00-5.45	40	16	12		7,9/11,9,12,15 SPT(C) N=47						
6.10							6.10				
6.50	100	45	20	12			(3.40)	Medium strong thinly laminated fine grained light grey LIMESTONE interbedded with weak dark grey thinly laminated fine grained MUDSTONE partially weathered with large quartz vein from 7.7m - 8.0m 2 Fracture sets. F1: Subhorizontal to 10 degrees close to medium spaced planar smooth closed. F2: 80 to 90 degrees, widely spaced, planar, rough, open with quartz and calcite infill			
8.00	100	72	62								
9.50							9.50	Complete at 9.50m			

Remarks
Standpipe installed on completion - Slotted pipe installed from 9.50m-6.50mBGL with gravel surround. Plain pipe installed from 6.50mBGL to GL with bentonite seal and flush cover

Scale (approx)	Logged By
1:50	JD

Figure No. 8803-06-19.MW03

Player Wills –
Monitoring Well Photos

MW01

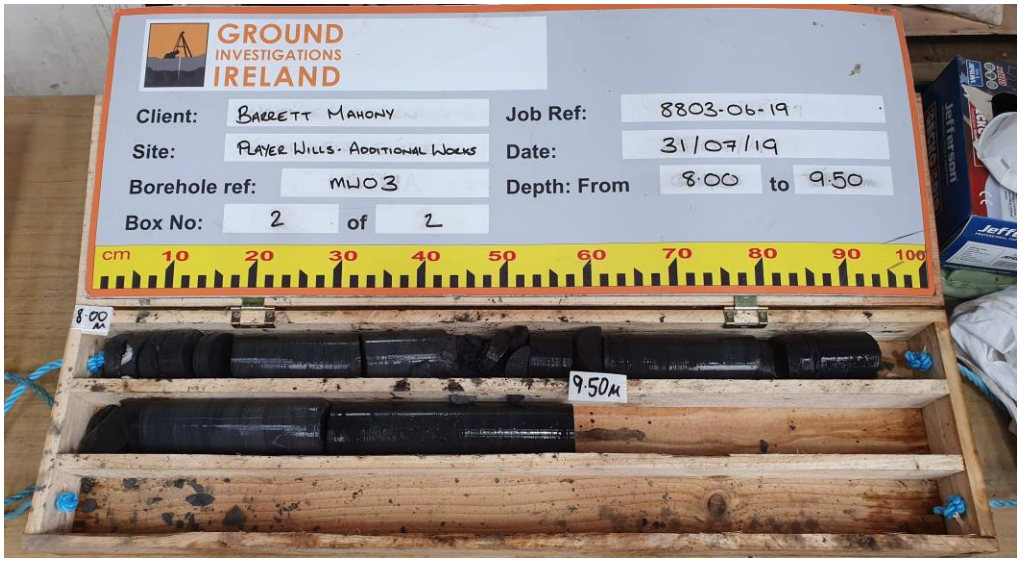
MW02

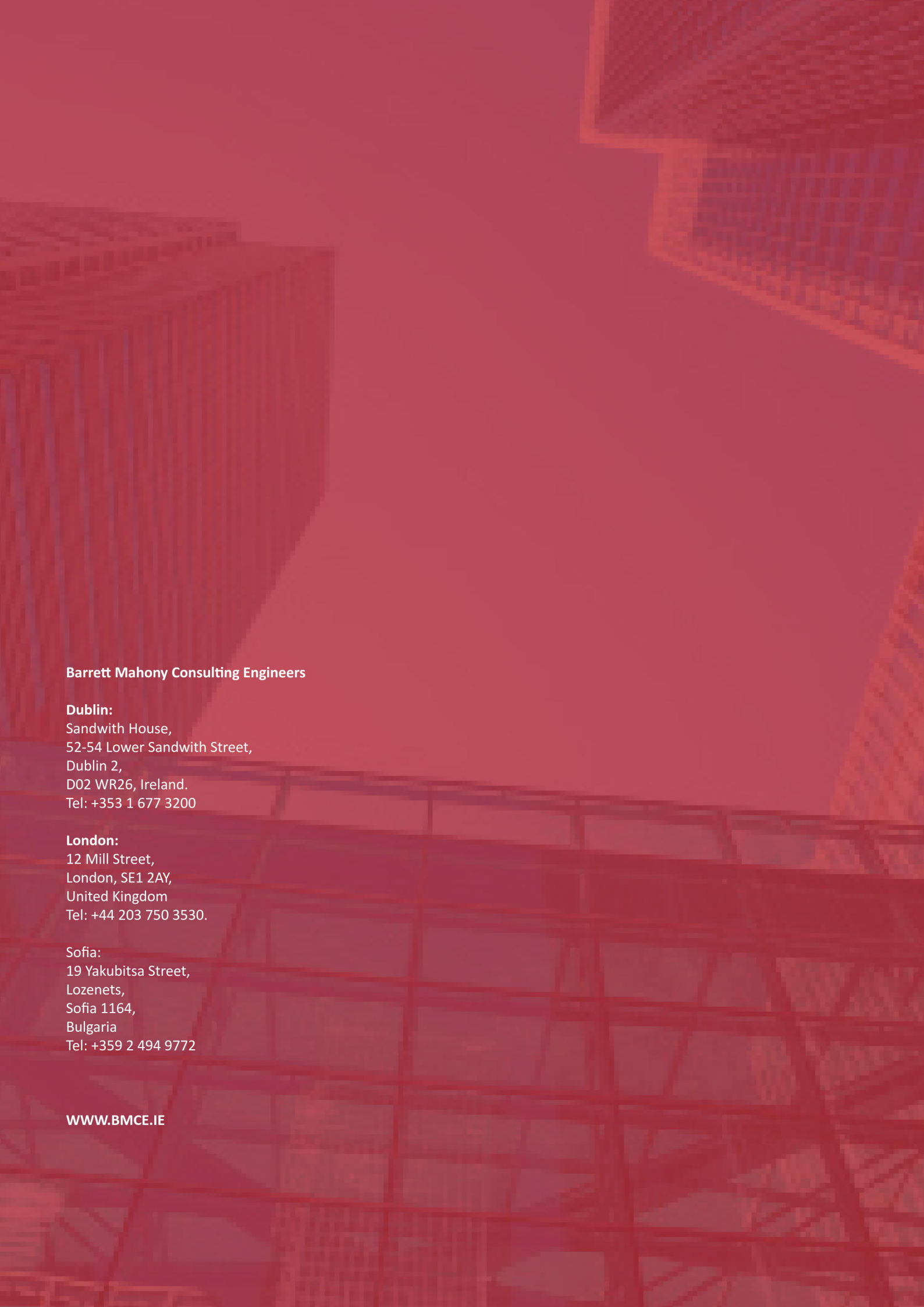

IRELAND
Client: Barrett Mahony
Site: Player Wills - Additional Works
Borehole ref: MW02
Box No: 1 of 2
Job Ref: 8803-06-19
Date: 31/07/19
Depth: From 0.00 to 7.15
cm 10 20 30 40 50 60 70 80 90 100
2.20
3.70
5.20
6.70


GROUND INVESTIGATIONS IRELAND
Client: Barrett Mahony
Site: Player Wills - Additional Works
Borehole ref: MW02
Box No: 2 of 2
Job Ref: 8803-06-19
Date: 31/07/19
Depth: From 7.15 to 9.70
cm 10 20 30 40 50 60 70 80 90 100
8.20
9.70

MW03


GROUND
INVESTIGATIONS
IRELAND
Client: Barrett Mahony
Site: Player Wills - Additional Works
Borehole ref: MW03
Box No: 1 of 2
Job Ref: 8803-06-19
Date: 31/07/19
Depth: From 0.00 to 8.00
cm 10 20 30 40 50 60 70 80 90 100
0.00m
2.00m
3.50m
5.00m
6.50m
8.00m


GROUND
INVESTIGATIONS
IRELAND
Client: Barrett Mahony
Site: Player Wills - Additional Works
Borehole ref: MW03
Box No: 2 of 2
Job Ref: 8803-06-19
Date: 31/07/19
Depth: From 8.00 to 9.50
cm 10 20 30 40 50 60 70 80 90 100
8.00m
9.50m



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