PHM Consulting
Civil - Structural - Environmental

Firhouse Inn
Strategic Housing Development (SHD)
Firhouse Road, Dublin 24

WATER SERVICES REPORT

May 2022

Strategic Housing Development (SHD)
At
Firhouse Road, Dublin 24

WATER SERVICES REPORT

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1.0 INTRODUCTION

PHM Consulting have been appointed by Bluemont Developments (Firhouse) Limited to design infrastructural solutions particular to wastewater, surface water and potable water supply and discharge from a proposed development located within the administrative area South Dublin County Council.

This report has been prepared to outline the proposed strategy to provide water services for a proposed Mixed Use development located on lands on the north western corner of the junction of Firhouse Road with Mount Carmel Park. The proposed development is to comprise of the following:

Bluemont Developments (Firhouse) Limited intend to apply to An Bord Pleanála (the Board) for a Strategic Housing Development with a total site area of c.0.46 ha, on lands located at No. 2 Firhouse Road and the former 'Morton's The Firhouse Inn', Firhouse Road, Dublin 24.

The development will consist of the demolition of all existing structures on site (c. 1,326 sq m), including:

- Two storey building formally used as public house, ancillary off-licence and associated structures (c. 972 sq m);
- Two storey building comprising an existing barber shop and betting office (c. 260 sq m);
- Single storey cottage building and associated structures (c. 94 sq m); and
- Eastern boundary wall and gated entrance from Mount Carmel Park.

The development with a total gross floor area of c. 11,638 sq m, will also consist of 100 no. residential units arranged in 2 blocks (Blocks 01 and 02) ranging between 3 and 5 storeys in height, over lower ground floor and basement levels, comprising:

- 96 no. apartments (consisting of 2 no. studio units; 45 no. one bedroom units; 10 no. two bedroom (3 person) units; 34 no. two bedroom (4 person) units; and 5 no. three bedroom units), together with private (balconies and private terraces) and communal amenity open space provision at podium and roof levels; and
- 4 no. duplex apartments (consisting of 2 no. one bedroom units and 2 no. two bedroom units (4 person) located within Block B01, together with private balconies and terraces.

The development will also consist of non-residential uses (c. 355 sq m), including:

- 1 no. café (c. 58 sq m) and 1 no. office (c. 30 sq m) located at ground floor level of Block B01;
- 1 no. medical unit (c. 59 sq m) and 1 no. betting office (c. 66 sq m) located at ground floor level of Block B02;
- 1 no barber shop (c. 28 sq m) located at ground floor level between Blocks 01 and 02; and
- 1 no. crèche (c. 114 sq m) located at lower ground floor level of Block B01 and associated outdoor play area to the rear.

Vehicular access to the site will be from the existing access off Firhouse Road. The proposal includes minor alterations to the existing access, including the provision of new and enhanced pedestrian infrastructure.

The development will also consist of the provision of public open space and related play areas; hard and soft landscaping including internal roads, cycle and pedestrian routes, pathways and boundary treatments, street furniture, basement car parking (80 no. spaces in total, including accessible spaces); motorcycle parking; electric vehicle charging points; bicycle parking (long and short stay spaces including stands); ESB substations, piped infrastructural services and connections to existing public services, (including relocation of existing surface water sewer and water main from within the application site onto the public roads area along Firhouse Road and Mount Carmel Park); ducting; plant; waste management provision; SuDS measures; stormwater management and attenuation; sustainability measures; signage; changes in levels; public lighting; and all ancillary site development and excavation works above and below ground.

The proposed development will necessitate the demolition of two existing buildings situated on the site, namely the Firhouse Inn and ancillary accommodation along with the existing Barber and Betting Office.

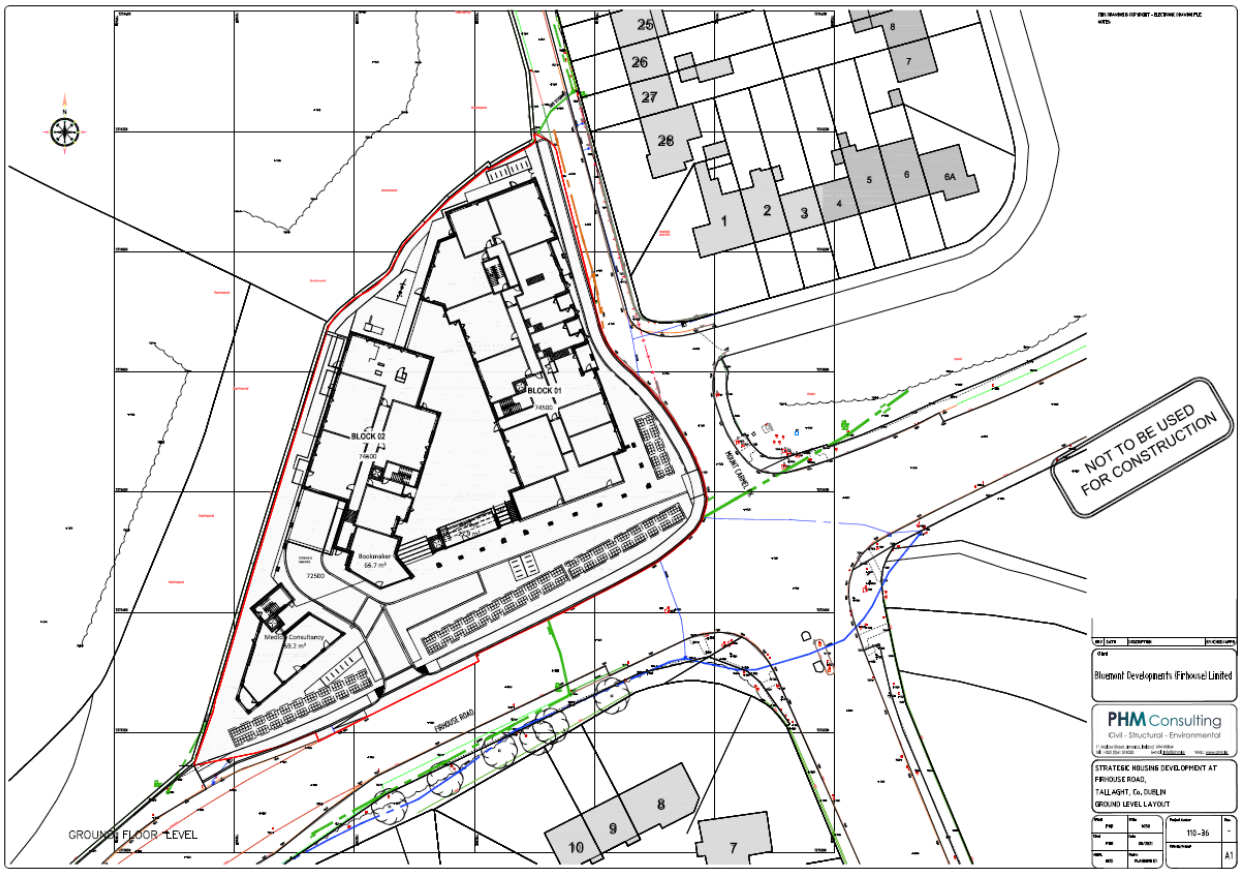


Fig 1.1 – Site Layout

This existing buildings currently benefit from all normal public water services.

2.0 TOPOGRAPHY

The site is currently accessed directly off the Firhouse Road. The site is triangular in nature and is bounded on the south and east be public roads and to the north by private third party lands.

A topographical survey of the site was carried out for the purpose of the preparation of the design of the roads and infrastructure of this proposed development. The site falls from South to North from a level of 73.5m AOD to 71.30m OD (Avg. Grad - 1:50).

3.0 SCOPE OF SERVICES REPORT

This report has been prepared taking into consideration available data from other sources such as:

- South Dublin County Council
- Irish Water
- Office of Public Works
- Design Team members

The proposed design for Foul, Surface water and Water Supply has been prepared taking account of the following guidance documents:

- Irish Water Code of Practice and Standard Details for Wastewater Infrastructure

- Irish Water Code of Practice and Standard Details for Water Infrastructure
- Greater Dublin Strategic Drainage Study (GDSDS) (2005)
- Greater Dublin Regional Code of Practice for Drainage Works (GDRCOP)
- South Dublin County Council – County Development Plan 2016-2022
- South Dublin County Council – DRAFT County Development Plan 2022-2028
- South Dublin County Council – Sustainable Drainage Explanatory Design & Evaluation Guide 2022
- Dublin City Council - Green and Blue Roof Guide 2021
- CIRIA P3084 - Guidance on the delivery of blue roof
- CIRIA C753 – The SuDS Manual V.6 2015
- Building Regulations – TGD Part H
- DoEHLG *'Recommendations for Site Development Works for Housing Areas'*
- DoHLGH Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas
- BS 8005: Part 1, 1987 *'Guide to New Sewerage Construction'*
- OPW – www.floodinfo.ie
- DECLG – www.myplan.ie
- EPA – www.gis.epa.ie/EPAMaps
- Geological Survey of Ireland – www.gsi.ie
- Architectural Drawing
- Landscape Drawings
- Topographical Survey information
- Utility Services GPR Survey information

4.0 FOUL WATER DRAINAGE

4.1 Foul Water Drainage

All foul water is to be managed in line with the required Irish Water Connection Agreement – to be entered into post planning and built in accordance with IW CoP and Standard Details.

As part of the development design process a Pre-connection Enquiry was submitted to Irish Water on the basis of a Strategic Housing Development (SHD) of 120 Units. A **Confirmation of Feasibility** (CoF) as issued on the 28th January 2021, along with a **Statement of Design Acceptance** (SoDA) as issued on the 13th May 2022 are enclosed in Appendix G.

All foul drainage is to be drained by gravity via a minimum 225mm sewer system and is to be connected to the existing Public Sewer. Currently, there is an existing 225 connection into the site which serves the existing buildings. The main sewer runs north along Mount Carmel Park. It is proposed to connect the proposed development via a replacement connection to this same public sewer.

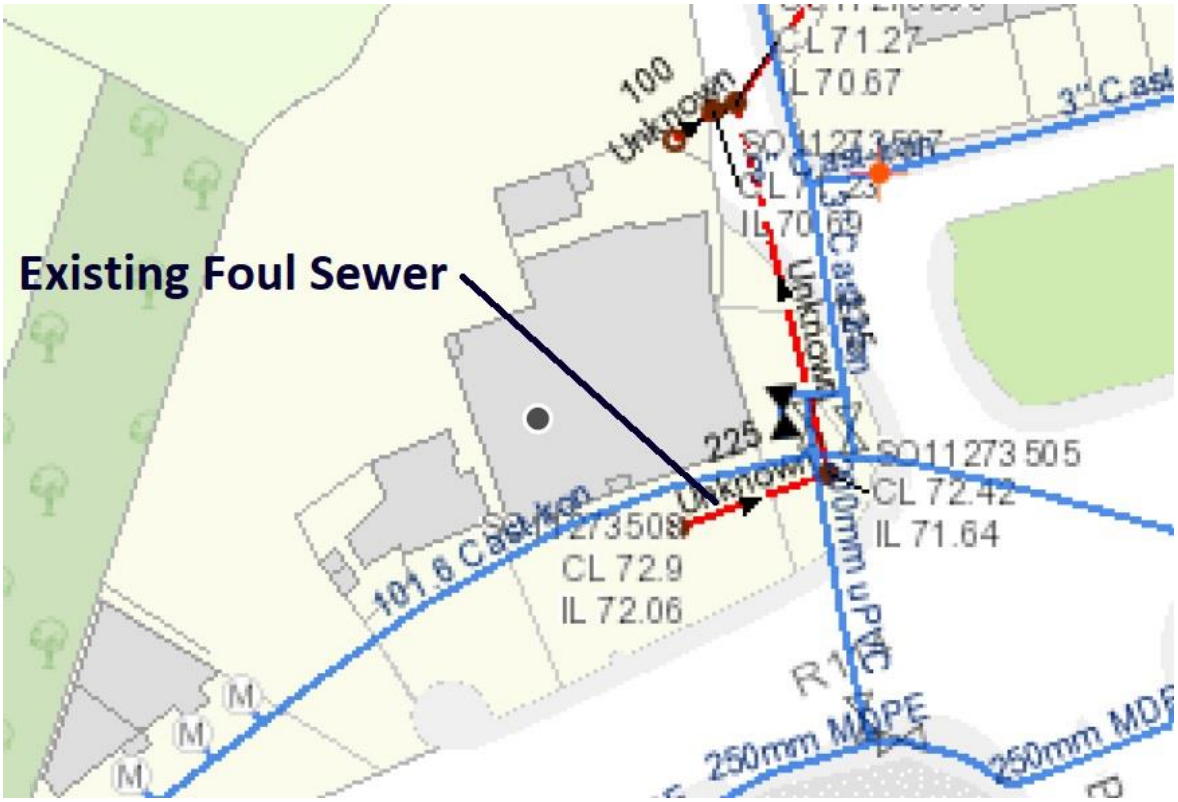


Fig 4.1 – Existing Foul Network from IW Record

4.2 Detailed Design

All foulwater is to be collected in a separate gravity collection system from each apartment/unit through internal and local drainage peripheral to the proposed building and discharged to the main collection network which will run parallel with the southern elevation and turn along the eastern elevation of the proposed building.

The foul collection system has been designed based on a peak flow of 6 DWF (Dry Weather Flow) assuming a discharge of 180 litres per person and an average of 2.3 persons per apartment/unit.

A minimum size of 225mmϕ pipe is used for all main foul sewers with a minimum gradient of 1:150. This gradient will ensure a velocity greater than the minimum velocity specified in the DoEHLG

'Recommendations for Site Development Works for Housing Areas', Section 3 of 0.7m/sec and a maximum of 3.0m/sec.

A minimum size of 100mm diameter is proposed for the private foul drains. All internal stacks connecting multiple units will be a minimum diameter of 150mm with a maximum of 8 units connected through a single stack. Each stack will be vented to the external environment through the building roof.

Capacity calculation of the main foul sewers are included in Appendix A at the rear of this report.

Refer to drawing 110-36-121 for proposed layout and drawings 110-36-130 & 131 for longitudinal sections and cross sections.

Construction and commissioning shall be to Irish Water Code of Practice and Standard Details.

5.0 STORM WATER DRAINAGE

5.1 Storm Water Drainage

This chapter outlines the way in which the storm water runoff from the proposed development is to be managed and discharged.

The proposed stormwater drainage strategy is to collect all run-off from roofs, upper level garden areas, ground level paved areas and trafficked areas and to discharge to the public sewer network located on Mount Carmel Park. Where possible all water will be conveyed via a gravity system.

All collected run-off will be treated for contaminate removal prior to discharge. In accordance with current best practice guidance it is proposed to incorporate sustainable drainage techniques where possible within the system in order to mitigate the impact of the development on receiving networks and waters. In accordance with the GDSDS all developments need to be designed in such a manner s to restrict the allowable discharge rate to that which presided prior to when the site was first developed, that a limited surface water run-off to no greater that the greenfield run-off rate. Account also need to be taken of extreme rainfall events up to a predicted 1 in 100 year rainfall event over a series of intensity durations. Furthermore, with respect to global climate changes it is necessary to accommodate within the design a factor of 20% increase on current rainfall intensities as per GDSDS.

In relation to this site and from investigation surveys carried out - Topo and GPR, it is understood that the current buildings and hardstanding areas discharge without restriction to the existing network of surface water drainage which is present on site and on the public road.

Currently, there is a 300mm surface water sewer which traverses diagonally across the rear of the site, falling from west to east out onto Mount Carmel Park.

It is proposed to divert this 300mm pipe out of the site and along the Firhouse Road and Mount Carmel Park, resulting in this public sewer being provided within the public space under the control of the local authority and not in private lands as it is currently.

This proposed diversion is identified on drawing 110-36-122 with longitudinal sections on drawing 110-36-130.

Capacity calculations are included in Appendix B.

5.2 Design

The main storm sewers serving the proposed development have be designed to cater for predicted 1 in 5 year rainfall intensities with minimum velocities of 1.0m/s and a maximum of 3.0 m/s.

Access for inspection and maintenance purposes has been allowed through standard D400 manhole covers.

The minimum storm sewer size specified to be 225mm diameter.

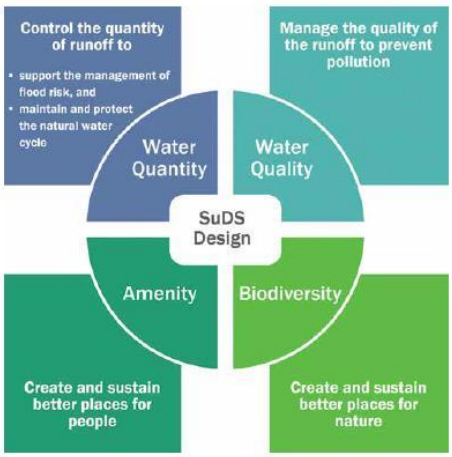
Given the provision of a basement to the proposed development, surface waters shall be prevented from entering the basement as far as is reasonably possible with the provision of channel collection at all ground level entry points. Surface water from the basement which will typically be as a consequence of being brought into the basement on accessing vehicles will be collected via an independent gravity system isolated to the basement and directed to a pump sump at the lowest point of the system located to the north east of the basement. Prior to entering the pump sump all surface water from the car park area in the basement will be treated for suspended solid and hydrocarbon removal through a Class 1 Bypass Separator before being pumped up into the main gravity foul system at ground level, from where it will run through the ground level gravity system as normal.

The proposed surface water sump will be fitted with a dual pump duty/duty arrangement. An emergency float alarm with dial-out will be provided in the event of pump failure. In the event of power outage a stand-by generator will be provided at upper floor level. The proposed Bypass Separator will also be provided with a float alarm and dial-out system to indicate necessary servicing for oil/suspended exceedance.

Regular inspection and monitoring will be required by the development management company.

5.3 Sustainable urban Drainage Systems

All new developments are required incorporated into the surface water management design a range of mechanisms that will promote sustainable urban drainage. Sustainable urban drainage systems (SuDS) aim to maintain or restore a more natural hydrological regime, such that the impact of urbanisation on downstream flooding and water quality is minimised. Originally, SuDS were introduced primarily as single purpose facilities, however, this has now evolved into more integrated systems which serve a variety of purposes, including habitat and amenity enhancement.



SuDS involves a change in our way of managing urban run-off from solely looking at volume control to an integrated multi-disciplinary approach which addresses water quality, water quantity, amenity and habitat. SuDS minimise the impacts of urban runoff by capturing runoff as close to source as possible and then releasing it slowly. The use of SuDS to control runoff also provides the additional benefit of reducing pollutants in the surface water by settling out suspended solids, and in some cases providing biological treatment.

Some examples of SuDS include:

- Green Roofs, Blue Roofs,
- Pervious Pavements
- Bioretention systems
- Tree planting
- Swales, Detention basins, ponds and wetlands
- Soakaways and infiltration basins/trenches.

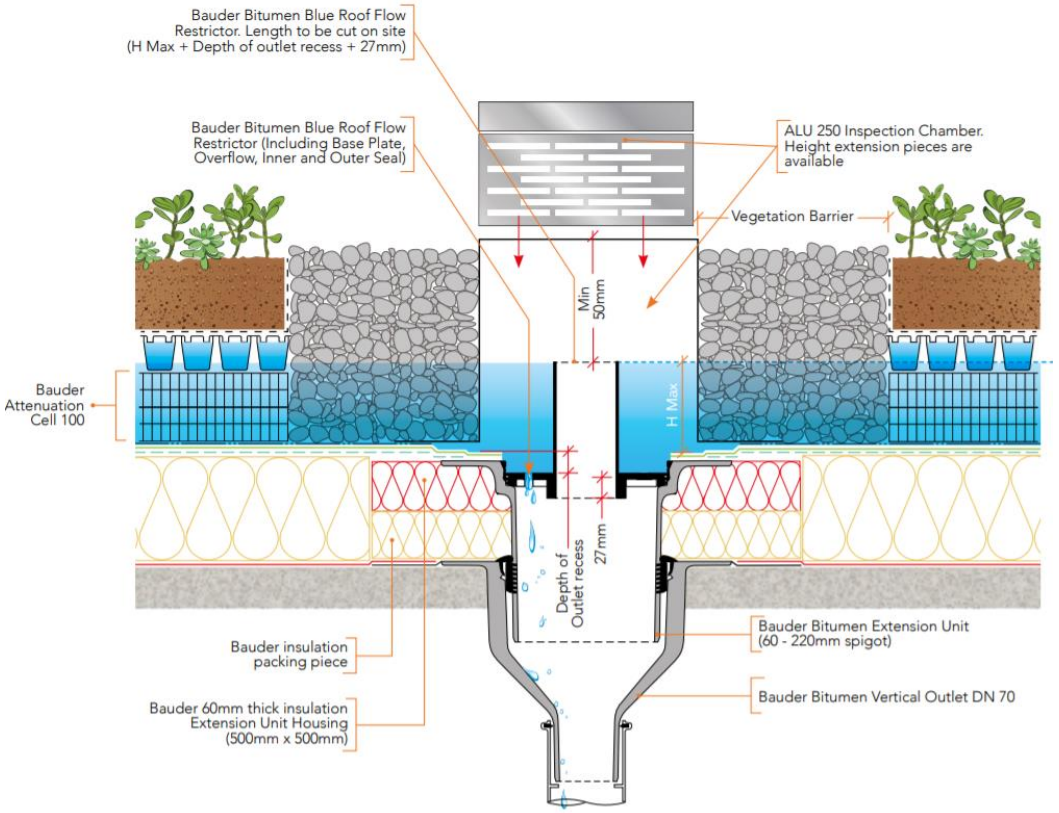


Fig 5.1 - Blue Roof Detail

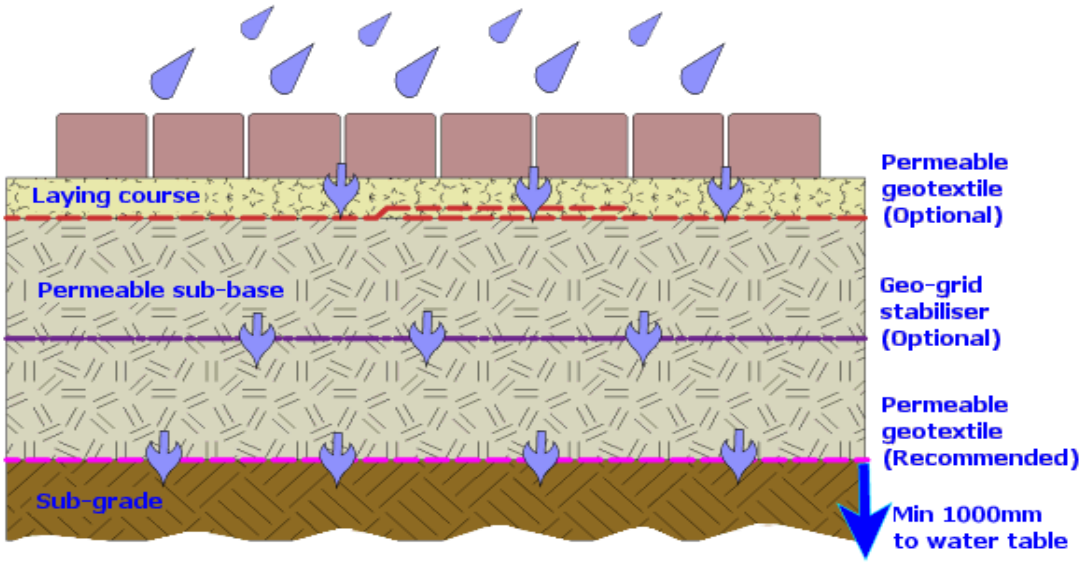


Fig 5.2 – Pervious Paving

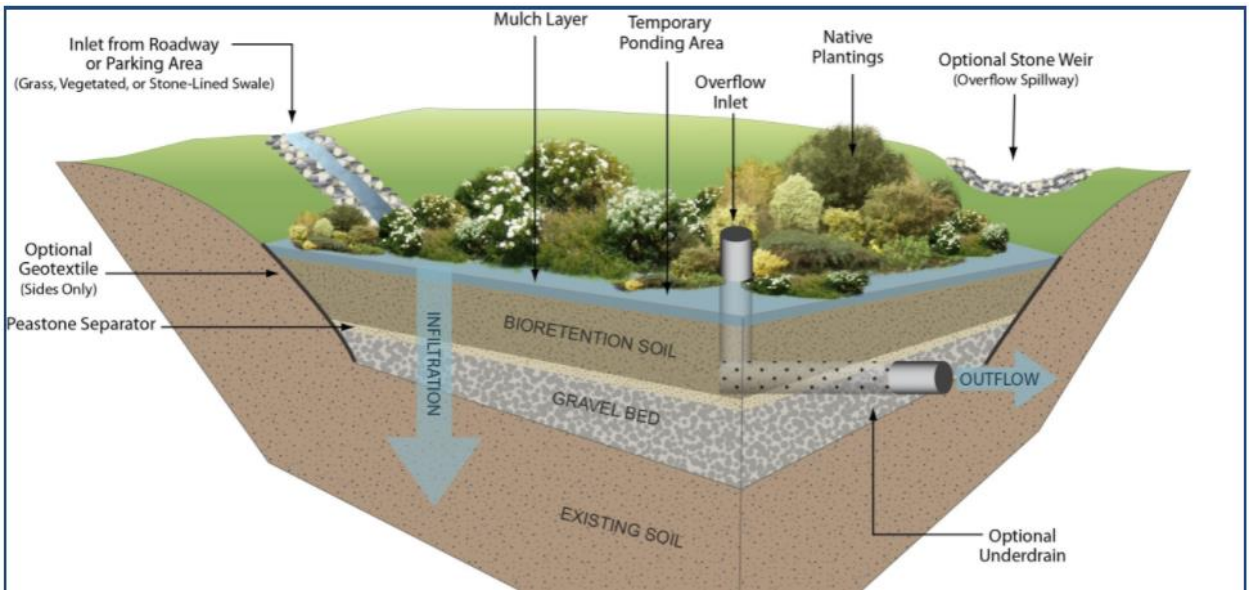


Fig 5.3 – Bio-retention System

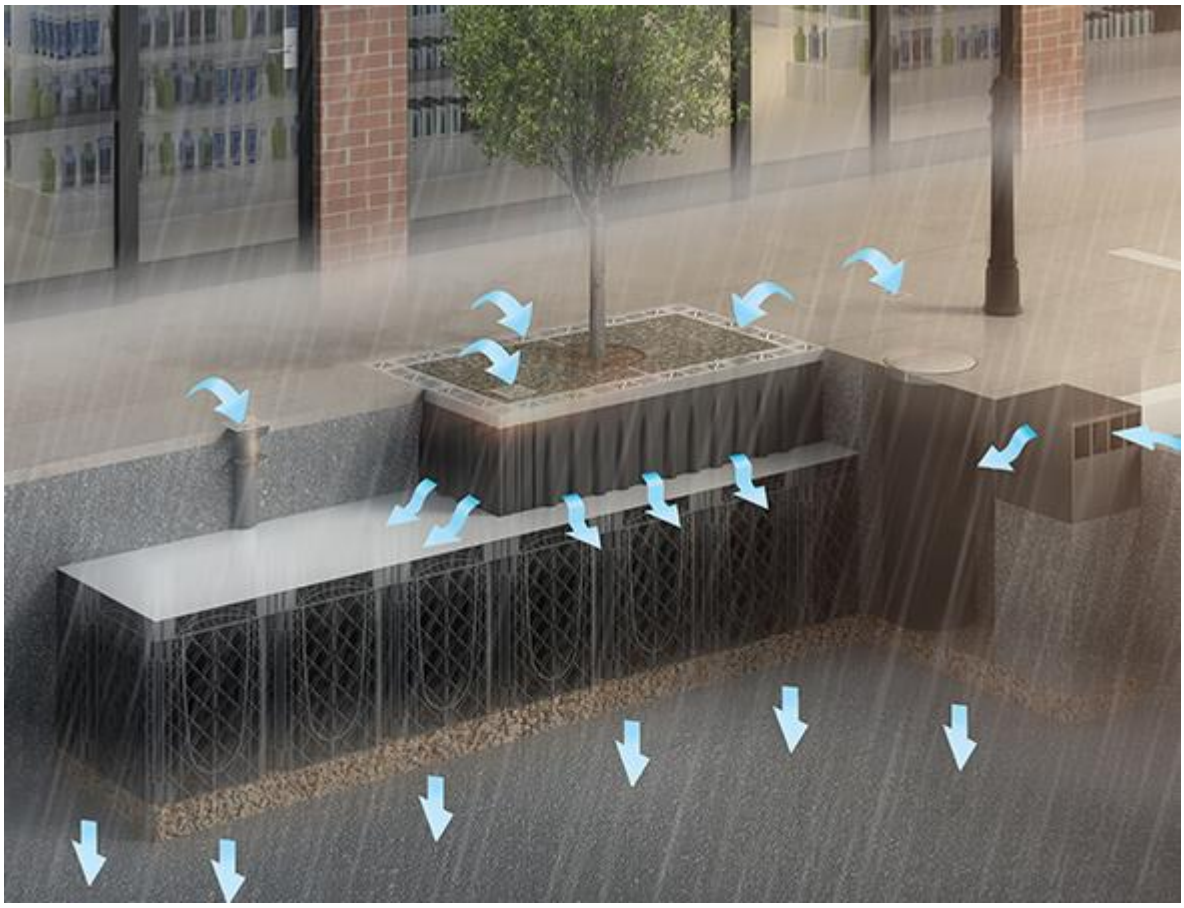


Fig 5.4 – Tree Pits

South Dublin County Council DRAFT Development Plan 2022-2028 requires the use of SuDS with the following Objectives:

GI4 Objective 1: To limit surface water run-off from new developments through the use of Sustainable Urban Drainage Systems (SuDS) using surface water and nature-based solutions and ensure that SuDS is integrated into all new development in the County and designed in accordance with South Dublin County Council's Sustainable Drainage Systems (SuDS) Explanatory, Design and Evaluation Guide.
GI4 Objective 2: To incorporate a SuDS management train during the design stage whereby surface water is managed locally in small sub-catchments rather than being conveyed to and managed in large systems further down the catchment.
GI4 Objective 3: To require multifunctional open space provision within new developments to include provision for ecology and sustainable water management.
GI4 Objective 4: To require that all SuDS measures are completed to a taking in charge standard.
GI4 Objective 5: To promote SuDS features as part of the greening of urban and rural streets to restrict or delay runoff from streets entering the storm drainage network.
GI4 Objective 6: To maintain and enhance existing surface water drainage systems in the County and promote and facilitate the development of Sustainable Urban Drainage Systems (SUDS), including integrated constructed wetlands, at a local, district and County level, to control surface water outfall and protect water quality.

5.4 Site Specific SuDS Strategy

The successful achievement of sustainable urban drainage does not solely rely on the use of engineered techniques to control and treat runoff. 'Good housekeeping' measures, such as safe storage and handling of oils and chemicals, street sweeping and control of sediment run-off from construction sites are an essential component of SuDS. Public awareness is also an important factor in ensuring the successful implementation of sustainable drainage practices.

The drainage strategy employed for dealing with storm water follows the principles of Sustainable Urban Drainage Systems (SuDS) as set out in CIRIA document C753 *'The SuDS Manual'.* Specifically, the Best Management Practices (BMP's) for the control of surface waters, as prepared by Dublin Corporation and as set out in their document *'Storm Water Management Policy for Developers 1999'*, have been used in the design of the surface water system.

The design has been evaluated in terms of the guidance provided by the South Dublin County Council Sustainable Drainage Explanatory Design & Evaluation Guide 2022 (SDEDEG).

The design of the surface water drainage network will take cognisance of the objectives and guidance contained in the Greater Dublin Strategic Drainage Study (GDSDS).

A key part of the design strategy is limiting the amount of post-development run-off below the Mean Annual Peak Flow (Q_{BAR}) associated with the lands in their pre-development state.

For the purposes of design it will be assumed that the site is a Greenfield and the natural storm water discharge from the site (Q_{BAR}) is calculated using the estimation method contained in the Institute of Hydrology Report No. 124:

Q_{BAR} (50 Ha) = $0.00108 \times (AREA)^{0.89} \times (SAAR)^{1.17} \times (SOIL)^{2.17}$

= $0.00108 \times (0.5)^{0.89} \times (817)^{1.17} \times (0.37)^{2.17}$

= $0.172\ m^3/s$ (172 l/s)

This equates to = 3.44 l/s/Ha

Therefore, for the subject catchment site area of 0.46 Ha the pre-development run-off is calculated as 1.57 litres per second. The catchment site area includes all areas up to the edge of the public footpath on the public road.

Limiting the post development flow to that of the pre-development run-off is to be achieved by means of a throttle in the form of a "Hydrobrake" flow control device on the outfall pipe. This is to be provided

within the manhole numbered S20. No direct connections are to be made to the outfall pipe between manholes S20 which is to be formed over the existing 300mm surface water sewer within the site.

The impact of limiting the run-off to that of the pre-development Q_{BAR} rate results in a requirement for the storage of the excess flows in storm events. This storage volume is a function of the return period of the rainfall event and the duration of the event.

The analysis has been carried out using available location specific record data as provided from Met Eireann which provides rainfall data over a series of durations and for a series of Annual Exceedance Probabilities – see Appendix D. In addition to the above, an allowance for predicted increase in rainfall intensities due to Climate Change has been factored into the rainfall records – **Climate Change allowance – 20%**. The resulting critical storm volumes will be retained and managed within the confines of the development site.

Urban Creep considers the potential impact on the drainage system from exempted development such as small extensions to houses and paving over front gardens to create driveways. Given the nature of the proposed development (Apartment development) and in line with the Section 8.4.7 of the SDEDEG 2022 an allowance of 0% has been adopted.

The percentage of rainfall that occurs as runoff from a surface is called the **'coefficient of volumetric runoff' (Cv)**. In extreme rainfall conditions the losses anticipated from hard development surfaces such as roofs or paved areas are anticipated to be minimal. Runoff coefficients of 0.95 for roofs and 0.9 for paved areas would be considered acceptable by SDCC where no more detailed assessment is undertaken.

In this instance the following Cv's have been adopted irrespective of the proposed surface treatment:

Roofs: 0.95

Paved Areas: 0.9

5.5 SuDS Quantity Management

The proposed surface water management begins at the source where it is proposed to provide individual outlet controls on all flat roof and podium areas with a minimum 100mm deep attenuation capacity to each area. The limited flows (Q) area listed in the table below for each area. These flat roof areas will discharge at reduced rates to the landscaped open space area on the Firhouse Road and Mount Carmel Park side of the development where further source controls will be provided limited the flows to the final Site Control location and provide opportunity for evaporation, transpirations and percolation.

In collaboration with the Landscaping Design, the surface water run-off will be reduced through the use of a variety of elements provided throughout the development, including:

To be read in conjunction with drawing 110-36-122

Roof / Paving Areas contributing to SuDS:				Q	Vol Prov.
				l/s	m^3
Roof 3A	A(Imp) =	113	m^2	0.08	9.7
Roof 3B	A(Imp) =	298	m^2	0.24	22.6
Roof 2A	A(Imp) =	183	m^2	0.16	15.6
Roof 1A	A(Imp) =	52	m^2	0.08	4.4
Roof 1B	A(Imp) =	38	m^2	0.08	3.2
Grd Podium	A(Imp) =	468	m^2	0.56	40.0
Build 02 Pitched Roof =		784	m^2		0

Build 01 Pitched Roof =	378	m^2		0
Open Space Firhouse Rd	1061	m^2	0.96	168.8
Open Space Mt Carmel	235	m^2	0.48	26.1

The above provisions will provide circa 290.5m^3 of surface water storage. Water from the roofs and podium will be directed through the landscaped area close to the surface levels.

Each of the provided areas will have individual outlet controls to limit the discharge to that stated (Q) through the use of an area specific designed Bauder source control device. The Bauder device will limit the flows to that stated up to a maximum water depth of 100mm. At 100mm the storage capacity will be exceeded and the water will over top the device in the event of excessive storms >1:30 AEP or in the event of device blockage.

The SuDS Management train provides potential for 'interception losses' along its whole length, as well as through soakage into the ground, evaporation, and transpiration through the leaves of vegetation. It also reduces the rate at which runoff flows through the site and provides treatment of runoff as it passes through each SuDS component.

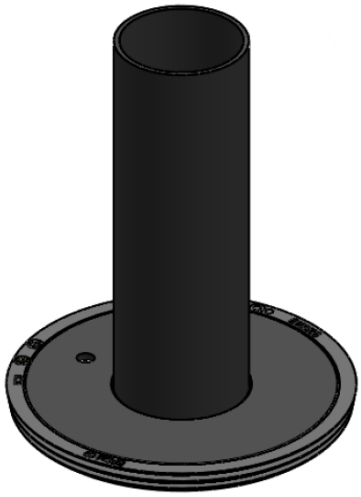
Particular to this development the sequence of rainfall flow is as follows:

➔ Blue Roofs → Blue Podium → Open Space → Landscaped Areas → Site Control → Discharge

Bauder Bitumen Blue Roof Flow Restrictor

The Bauder Bitumen Blue Roof Flow Restrictor is designed to be used in conjunction with a standard Bauder Bitumen Blue Roof Vertical Outlet DN70. The Bauder Blue Roof Bitumen Flow Restrictor is comprised of four parts; Baseplate, overflow pipe, Baseplate inner and Baseplate outer seal. The polyamide Baseplate fits within the 70mm vertical outlet, with the EPDM outer seal creating a watertight fit. The HDPE Overflow slots into the central hole of the Baseplate with an inner EPDM seal preventing any leaks.

Baseplate has a number (1-12) of 10mm restrictive flow holes bespoke to the project.



Presently, no firm information is available in terms of the natural permeability of the site to accept discharge to ground. From GSI Data the site is located within an area which is indicated as having a HIGH Subsoil Permeability capacity. As part of a full Site Investigation permeability testing in accordance with BRE365 will be carried out and the natural permeability will be utilised in order to reduce the run-off of surface water off the site. Given the extent of the required basement carparking the available area where discharge to ground is available is limited to the peripheral south and east public areas.

Until the natural Co-efficient of Permeability is established it will be assumed that all surface waters are to run off the site and shall be designed accordingly to take account of the worst case scenario.

When the run-off from the development exceeds the allowable peak discharge (Q_{BAR} – 1.57 l/s), the excess flow will be retained within the individual SuDS features provided storage.

In accordance with GDSDS it is necessary to analyse various storm durations (30 Minute to 48 Hour) and for 1 in 30 and 1 in 100 year storm events with provision for an additional 20% on rainfall intensities for predicted impact of Climate Change.

Each of the roof and open space areas have been subjected to the suite of storm intensities and durations from 30 minute to 24 hours for a 1 year return up to a 100 year return event.

The resulting storage requirements are presented in Appendix C. Each of the roof and open space areas will cater for their respective critical 1:30 year events without flooding given their specific allowable discharge rate.

5.6 SuDS Quality Management

A key aspect of SuDS is the requirement to treat all surface waters for the removal of contaminates prior to discharge to either Ground, Surface or Sewer and is dependent on the contributing surface types and nature of the development.

Given this particular development the majority of the development comprises of roofs or paved pedestrian areas with a limited portion available for vehicular traffic and no surface area available for parking. The resultant Pollution Hazard Risk is therefore Low to Very Low requiring Discharge to any SuDS component as outlined in section 7.4.7 of the SDEDEG 2022.

An evaluation has been carried out using the Susdrain Simple Index Approach as set out in the SuDS Manual to evaluate the sufficiency of the proposed SuDS components in mitigating water quality risks to the receiving waters and is presented in Appendix F.

Interception: For the majority of rainfall event during the year particular to greenfield site there is little or no discharge to receiving water. In such circumstances the rainfall is either absorbed to ground, taken up by vegetation or evaporated back into the atmosphere.

Interception of rainfall is aimed at replicating the conditions of the greenfield. The proposed scheme has been designed to facilitate retention of run-off with permeability of systems to ground and the provision of soil retention for vegetation growth in the form of rain gardens and tree pits.

It is advised that a least a volume equivalent to 5mm of rainfall be considered for interception. Based on the contributing development area of 0.46 Ha this equates to a volume of 23m^3. The proposed SuDS features aforementioned will provide in excess of this volume. The provided tree pits not accounting for other form of interception will provide 37m^3 of storage.

The removal of suspended solids and other pollutants is integral to the success of any sustainable urban drainage system. A number of stages of treatment have been incorporated into the design of the proposed system including prior to final discharge either to ground or surface water outfall:

All paved area and basement road gullys are to be trapped to retain grit and debris.

All ACO Channel collectors are to be provided with trapped sumps to retain grit and debris.

All Rainwater Downpipes are to discharge below ground via back inlet gully traps.

All pervious paving systems and bedding layers are to be laid over non-woven geotextile membranes to aid in the retention of debris in the upper pavement layers. The retention layer of open graded granular material with typical porosity of 40% is to be provided with a similar geotextile underlay to prevent upward migration of contaminates into the retention layer.

All collected surface waters will either flow through a sub-base granular layer or a soil filtration layer prior to reaching the site control point.

Prior to final outfall at manhole S20 all waters will pass through the proposed Class 1 Petrol Interceptor which will treat all waters for the removal of any remaining hydrocarbon and suspended contamination.

The particular Petrol Interceptor has been selected based on the area of the drainage catchment in order to minimise the frequency of maintenance and servicing that will be necessary for continued operation.

The proposed Hydrobrake manhole is to be provided with a sump of minimum 600mm depth below the outlet level in order to allow suspended solids settle out prior to passing forward.

5.7 Amenity and Biodiversity

Particular to the key aspects of amenity and biodiversity, this is covered under the landscape design and associated reports.

5.8 Surface Water Impact Assessment

Within the GDSDS documents there is guidance which sets out criteria which are to be considered in the design of new developments:

- **River Water Quality Protection**

  It is proposed that the surface water system that is to serve the proposed development, will contain a range of surface water treatment methods, as outlined above, which will improve the quality of the water prior to discharge through the removal of floating debris, suspended solids, hydrocarbons and other impurities at source.

- **River Regime Protection**

  Surface water discharge flow rate from the proposed development will be restricted to an equivalent greenfield run-off rate of 1.57 litres per second through the provision of a Hydrobrake contained within the system at the last manhole prior to discharge.

  This will be a significant reduction on the current discharge rate from the site which will have a reducing effect on the receiving waters of the Dodder River.

- **Level of Service (Flooding) Site**

  The GDSDS set out the required level of service required for new developments:

  - No Flooding of properties on site (30 year rainfall event)

    The proposed system has been designed to accommodate generated rainfall from the critical 1 in 30 year event with an allowance of 20% for Climate Change.

  - No Flooding of properties on site (100 year rainfall event)

    The proposed system has been designed to accommodate generated rainfall from the critical 1 in 100 year event with an allowance of 20% for Climate Change.

  - No Flooding of properties on site (100 year river event and critical rainfall event)

    The proposed system has been designed to accommodate generated rainfall from the critical 1 in 100 year event with an allowance of 20% for Climate Change.

  - No Flood routing off site (100 year rainfall event)

    The proposed system has been designed to accommodate within the site generated rainfall from the critical 1 in 100 year event with an allowance of 20% for Climate Change.

    A risk assessment has been completed in relation to potential flood impacts on the development as is outlined in section 7.0 below.

- **River Flood Protection**

  Surface water discharge flow rate from the proposed development will be restricted to an equivalent greenfield run-off rate of 1.57 litres per second through the provision of a Hydrobrake contained within the system at the last manhole prior to discharge.

  This will be a significant reduction on the current discharge rate from the site and have a reducing effect on the receiving waters of the Dodder River.

6.0 WATERMAINS

6.1 General

This chapter of the Report outlines the way in which potable water will be supplied to the proposed development.

A pre-connection enquiry has been submitted to Irish Water and a

Confirmation of Feasibility (CoF) dated 28th January 2021 received along with a

Statement of Design Acceptance (SoDA) dated 13th May 2022 was received and is included in Appendix G.

6.2 Existing System and Diversions

Within the planned works area of the development including the public area on the Firhouse Road and Mount Carmel Park there are a number of existing watermains traversing the area which are historic to the original route of the Firhouse Road.

As part of this development it is proposed to rationalise the current arrangement through the provision of new watermains to be located on the Firhouse Road in order to simplify the current arrangement.

A diversion application has been registered with the diversions team within the Connections and Developer Services department of Irish Water and assigned reference **DIV21131**.

A **Diversion Agreement** ready for signing by the relevant parties, Irish Water and Bluemont Developments (Firhouse) Limited, has been issued by Irish Water as of the 11th May 2022 (taking account of the revised development) for the proposed diversion works, and is included in Appendix G.

Refer to drawing 110-36-140 for proposed layout arrangement.

6.3 Proposed System and Connection Point

The existing buildings are provided with existing connections off the public main on the Firhouse Road. These connections are to be terminated in lieu of a new 100mm PE connection off the existing 250mm MDPE Watermain located on the south side of the Firhouse Road.

Within the public area at the entrance to the development a bulk watermeter (Kent Magmaster) is to be provided with an above ground kiosk for accessible reading of the meter. This meter will be battery powered (minimum 10 years). A 100mm diameter network will distribute supply to the two buildings. Each apartment will be services with individual supplies from centralised location in the basement and have individual internal meters. Refer to OCS Utilities Report.

In relation to Hydrants for the purpose of fire-fighting. An assessment of the existing hydrants on Firhouse Road and Mount Carmel Park has been carried out. It is proposed to provide additional

hydrants on Firhouse Road and Mount Carmel Park in order to ensure that no part of the building is a distance in excess of 46m from an operational hydrant. Fire-fighting provisions internally shall be confirmed through the process of Fire Certificate Application with the Building Control Authority.

Expected water demand is calculated as follows:

No. of Apartments: 110

Average PE: 2.7

Average usage: 150 l/p

Day Peak factor: 1.25

Daily Demand = 110 x 2.7 x 150 = 44,550 l/d

Day Peak = 0.64 l/s

Peak Demand for Design = 5 x 0.51 = 2.58 l/s.

7.0 FLOOD RISK ASSESSMENT

7.1 Flood Information

The current relevant Flood Risk Assessment guidance appropriate for the assessment of flood risk is to be found in the 'Guidelines for Planning Authorities' titled 'The Planning System and Flood Risk Management' published in Nov. 2009 by the OPW and the DoEHLG.

These Guidelines outline the methodology and core objectives to be adopted when consideration is being given for new developments. In order to satisfy the aims and objectives of the Guidelines the following key principles are applied to new developments:

- Avoid the risk, where possible;
- Substitute less vulnerable uses;
- Justification of the development particular to Strategic proper planning reasons;
- Mitigate and manage the identified risks to an acceptable reduced level.

In terms of the subject site and the proposed development which is considered to be in the Highly Vulnerable Category of development given the habitable type of development, the site has been researched in terms of flood risk.

Given the classification of the proposed development, under the Guidelines this development is only considered 'Appropriate' if located within an area classed as Flood Zone C.

The primary source of such information is the OPW flood info mapping and the South Dublin SFRA for the SDCC Development Plan 2022-2028.

The OPW CFRAMS – Dodder Catchment Flood Risk Assessment and Management Study was also consulted.

The objectives of the CFRAMS are to:

- Produce detailed flood mapping that identifies and maps out the existing and potential future flood risk within the Dodder RBD.
- Build up the information base we need to make informed and effective decisions in relation to managing flood risk.

- Identify measures and options for managing flood risks, both in local high-risk areas and across the whole study area.
- Prepare a Flood Risk Management Plan for each Unit of Management that sets out how OPW, local authorities and stakeholders should work together to create sustainable and cost-effective ways of dealing with flood risk now and into the future.

Given the location of the subject site and having consulted the CFRAMS data maps it was noted that the site of the proposed development is located within the modelled area of the River Dodder catchment.

The River Dodder being located circa 180m to the north of the site.

Fig 7.1 – Site Location

7.2 Site Background

The site is located at E311298, N227542 ING. Existing ground levels range from 71.00 to 73.75m above ordnance datum (AOD) Malin. The site falls from South to North from a level of 73.5m AOD to 71.30m AOD (Avg. Grad - 1:50).

The site is triangular in shape and is bounded to the south be the Firhouse Road, to the east by the Mount Carmel Park road and to the north by open recreations lands.

The Firhouse Road falls in a west to east direction from 73.5m – 72.8m with a low point at the junction with the Mount Carmel Park. The Mount Carmel road falls in a south to north direction from 72.8m - 70.9m across the site frontage, and continues to fall in elevation in the northern direction.

The proposed lowest habitable ground floor level of the development is 74.20m AOD. Basement Carparking is proposed with parking levels at 71.20m and 68.05m AOD.

A review of current available information was undertaken in terms of the location of the site and the potential of flooding in the locality of the site. Refer to Section 7.3.

7.3 Scope of the FRA

Flood risk assessments can be undertaken at a range of scales relevant to the planning process. The key scales of FRA are:

- Regional (for regional planning guidelines);
- Strategic (for city or county development plans or local area plans); and
- Site Specific (for master plans and individual site planning applications).

General principles of flood risk assessment

Flood risk assessments should (be):

- Proportionate to the risk scale, nature and location of the development;
- Undertaken by competent people, such as a suitably qualified hydrologist, flood risk management professional or specialist water engineer;
- Undertaken as early as possible in the particular planning process;
- Supported by appropriate data and information, including historical information on previous events, but focusing more on predictive assessment of less frequent or more extreme events, taking the likely impacts of climate change into account;
- Clearly state the risk to people and development and how that will be managed over the lifetime of the development;
- Focused on addressing the impact of a change in land use or development on flood risk elsewhere, ensuring that any such change or development must not add to and should, where practicable, reduce flood risk;
- Consider the vulnerability of those that could occupy the development, including arrangements for safe access and egress; and
- Consider the modification to flood risk that infrastructure such as raised defences, flow channels, flood-storage areas and other artificial features provide, together with the consequences of their failure.

7.4 Source-Pathway-Receptor Model

- The assessment of flood risk requires a thorough understanding of the sources of flood water (e.g. high sea levels, intense or prolonged rainfall leading to runoff and increased flow in rivers and sewers), the people and assets affected by flooding (known as the receptors) and the pathways by which the flood water reaches those receptors (e.g. river channels, river and coastal floodplains, drains, sewers and overland flow).
- The Source-Pathway-Receptor (S-P-R) Model has become widely used to assess and inform the management of environmental risks. This is illustrated in Fig. 2.

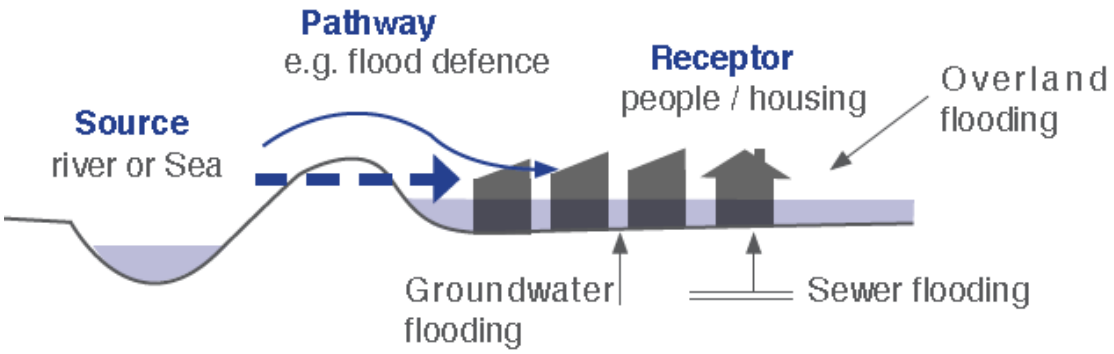


Fig 7.2 - Source-Pathway-Receptors of Flooding

Flood risk assessments require identification and assessment of all three components:

- The probability and magnitude of the source(s) (e.g. high river levels, sea levels and wave heights);
- The performance and response of pathways and barriers to pathways such as floodplain areas and flood defence systems; and
- The consequences to receptors such as people, properties and the environment.

The ultimate aim of a flood risk assessment is to combine these components and map or describe the risks on a spatial scale, so that the consequences can then be analysed. FRAs need to consider the situation both as it is now and also how it might change in the future. Such consideration should include changes in climate (which impact largely on sources), the construction of flood protection or drainage schemes within the locality by others, the deterioration of existing and proposed defences; the operational performance of screens and pumps over time both locally and provided by development (which all modify the pathways) and the introduction, through development, of receptors into areas at risk of flooding.

Given the proposed development a Site-specific Flood Risk Assessment is required which aims to assess all types of flood risk for the new development. The FRA is to identify the sources of flood risk, the effects of climate change on this, the impact of the development, the effectiveness of flood mitigation and management measures and the residual risks that remain after those measures are put in place.

7.5 Stages in the assessment of flood risk

The stages of assessment are:

Stage 1 Flood risk identification – to identify whether there may be any flooding or surface water management issues related to the proposed development site that may warrant further investigation;

Stage 2 Initial flood risk assessment – to confirm sources of flooding that may affect the proposed development site, to appraise the adequacy of existing information and to determine what surveys and modelling approach is appropriate to match the spatial resolution required and complexity of the flood risk issues. The extent of the risk of flooding should be assessed which may involve preparing indicative flood zone maps. Where existing river or coastal models exist, these should be used broadly to assess the extent of the risk of flooding and potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures; and

Stage 3 Detailed risk assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to the proposed development, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

A Stage 1, 2 and 3 Flood Risk Assessment has been carried out and the results presented in this report in order that there is sufficient information available about the site such that an informed decision can be made on the flood risk of the site.

7.6 Flood Risk Zones

The guidelines give guidance on flood risk, its identification, assessment and management in areas of potential development. The guidelines recommend a precautionary approach when considering flood risk management in the planning system. The core principle of the guidelines is to adopt a risk based sequential approach to managing flood risk and to identification of flood zones for rivers and coastal flooding.

Flood Zones:

Flood zones are geographical areas within which the likelihood of flooding is in a particular range and they are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning. There are three types of flood zones defined for the purpose of these Guidelines:

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

Development in Flood Zone A should be avoided and/or only considered in exceptional circumstances such as in cities or towns or in the case of essential infrastructure.

Flood Zone B - where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1:1000 year and 1% or 1:100 year for river flooding or 0.1% or 1:1000 year and 0.5% or 1:200 year for coastal flooding);

Development in Flood Zone B should be limited to developments of a less vulnerable nature such as retail, commercial and industrial uses. Developments such as hospitals, care homes, residential, emergency services and infrastructure provisions should not be located within this zone without satisfying the requirements of the Justification Test.

Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1:1000 year for both river and coastal flooding)

Development in this zone is generally appropriate from a flood risk perspective.

7.7 STAGE 1

Potential Sources

Stage 1 requires the identification of potential sources of flooding to be established through the desktop review of available information and the on-site assessment.

Possible sources of information can include:

- OPW Preliminary Flood Risk Assessment indicative fluvial flood maps;
- National Coastal Protection Strategy Study flood and coastal erosion risk maps;
- Predictive and historic flood maps, and Benefiting Lands Maps, such as those at www.floodmaps.ie;
- Predictive flood maps produced under the CFRAM Studies;
- River Basin Management Plans and reports;
- Indicative assessment of existing flood risk under Preliminary Flood Risk Assessment;
- Previous Strategic Flood Risk Assessments;

- Expert advice from OPW who may be able to provide reports containing the results of detailed modelling and flood-mapping studies, including critical drainage areas, and information on historic flood events, including flooding from all sources;
- Consultation with Local Authorities who may be able to provide knowledge on historic flood events and local studies etc.
- Topographical maps, in particular digital elevation models produced by aerial survey or ground survey techniques;
- Information on flood defence condition and performance;

The gathered information particular to the local area of Firhouse is presented as follows:

Fluvial Flooding occurs when a river or channel overtops its banks due to an exceedance of its capacity or a blockage as a consequence of excessive rainfall in its catchment area. The closest watercourse to the proposed site is the Dodder River to the north. There are no water channels within/around the site.

Mapping:

A location map – refer to Fig 1

A Plan that shows the proposed site and existing developments - see below

Fig 7.3 – Existing Site – Ordnance Survey Map

Site Topography:

Refer to section 7.2 above and enclosed Site Survey Drawing 110-36-101

Ordnance Survey Ireland:

Historic Ordnance Survey mapping do not identify the area of the proposed development as being 'Liable to Flooding'.

Office of Public Works:

From OPW records the location of the site has been reviewed in terms of historic flood events within a 2.5km radius. Refer to Appendix H for summary report.

The summary includes a report from the ESB referring to flooding in the location of Mount Carmel Park – Parkland. No flooding of the subject site was noted. Report is included in Appendix H.

An isolated flood event occurred in 2011 at Homeville, Knocklyon circa 150m to the southeast of the subject site. The source of the flood waters was the overtopping of the Ballycullen Stream, which is in the Dodder Catchment. Water level rose at culvert inlet under wall/shed. Residents reported that the trash screen was significantly blinded. (Trash screen witnessed by report writer to be over 50% blinded with old debris on 7/12/2011) Water entered the Homeville Estate through a railing fence and flooded 2 properties. River is open channel through the garden of 2 and 3 Homeville. Full report is included in Appendix H.

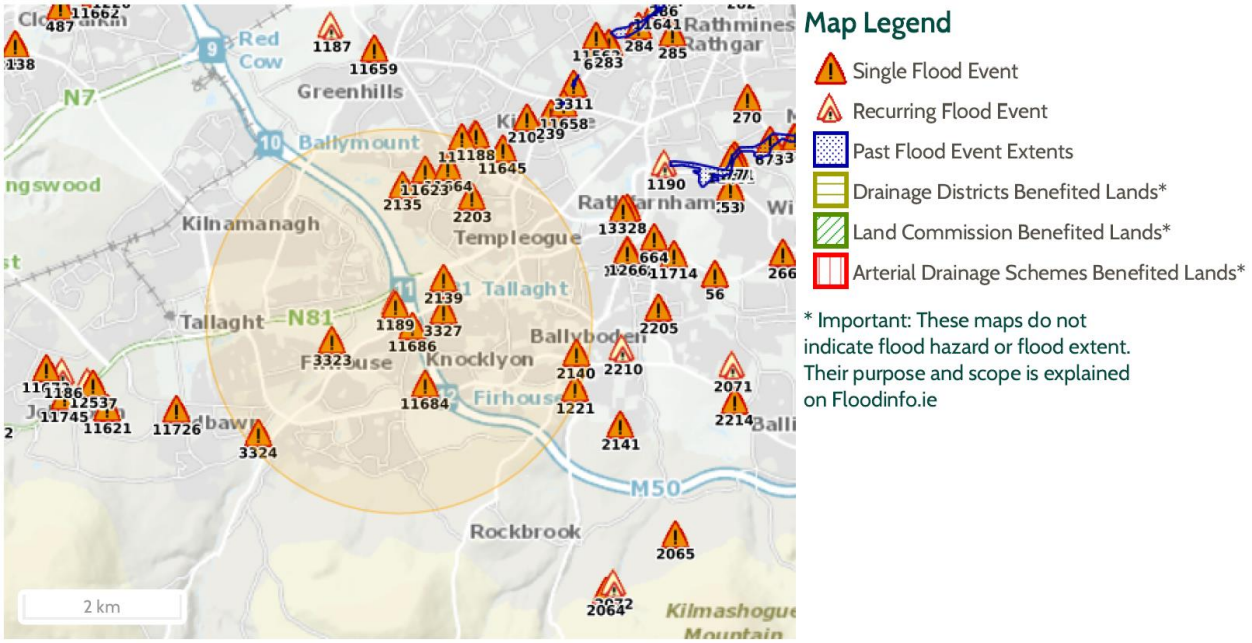


Fig 7.4 – OPW Flood Record

Eastern CFRAMS:

The development site falls inside the modelled catchment of the River Dodder.

From the aforementioned: Predicted Flood Levels of the River Dodder from RPS/OPW Mapping of Nov. 2010 indicate the following flood water levels at Node DR-7050:

Water Levels (mOD) per AEP:

10% = 70.24m

1% = 70.58m

0.1% = 71.02m

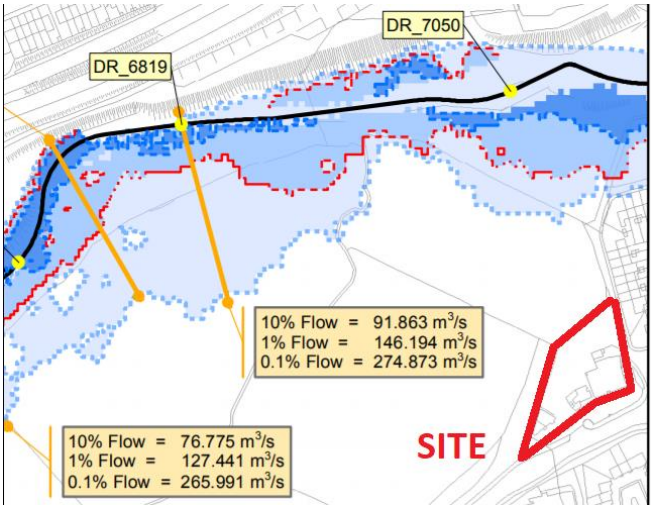


Fig 7.5 – CFRAMS Map

The current lowest ground level within the site is 71.20m OD.

The proposed lowest accommodation floor level is 71.20m OD on Ground Floor. No accommodation area is proposed in the lower levels of the proposed development.

There is no record of flooding of the subject site.

Fig 7.5 above from the OPW floodinfo with all Mid-Range and High-End Future Scenario layers active shows the site to be outside the predicted flood impact area of the Dodder River.

Fig 7.6 – Flood Map from www.floodinfo.ie

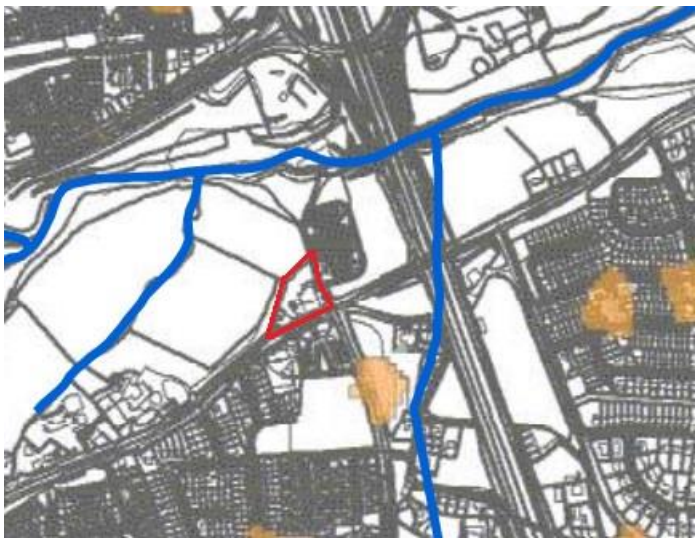
Fig 7.6 – Extract from Strategic Flood Risk Assessment for South Dublin County Council Development Plan 2022-2028, SFRA Flood Zone Mapping Sheet 16 of 26 – Fluvial Flooding.

The site is identified as being outside the Fluvial flood zone of the Dodder River.

Coastal flooding: The site is located >9kms from the eastern coastline and 6.5km south of the tidal River Liffey. There is no predicted Coastal Flooding impact in the Firhouse area and is therefore not considered a risk.

Fig 7.7 – Flood Map from SDCC Draft Development 2022-2028

Pluvial Flooding occurs when overland flow, resulting from rainfall events, cannot infiltrate into the ground, when drainage systems exceed their capacity or are blocked and when the water cannot discharge due to a high water level in the receiving watercourses.



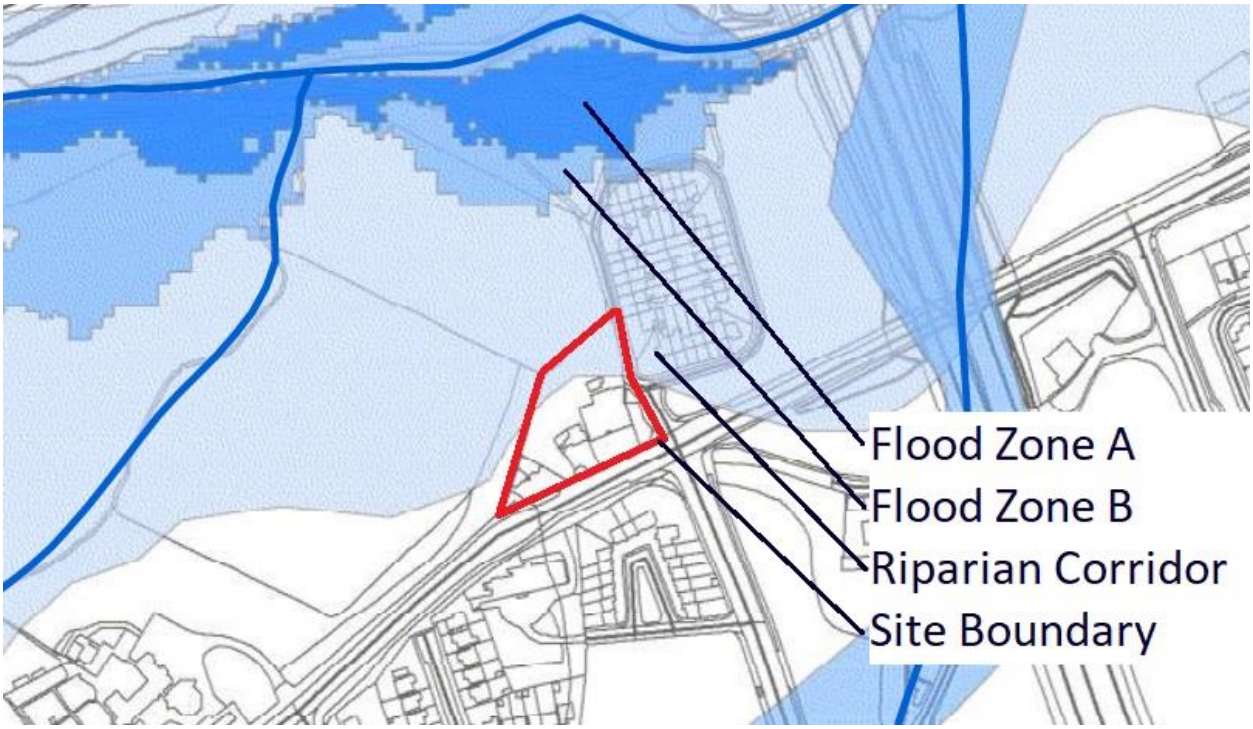
The SFRA for SDCC Development Plan 2022-2028 has provided draft Flood mapping for predicted flooding for the 1% AEP flood event.

No Pluvial Flooding indicated within or adjacent the proposed development site.

The site and surrounding road levels range from 70.90 at northeast corner to 73.70 at the southwest corner. The proposed development has been designed with the ground floor level of the habitable buildings at 74.20m – 0.5m above the highest level of the site.

Fig 7.8 – Extract from Strategic Flood Risk Assessment for South Dublin County Council Development Plan 2016-2022 – Pluvial Flooding.

The roads are at a constant fall from the west end to the north end and continue to fall through the



Mount Carmel Park towards the Dodder River.

Pluvial flooding is not deemed a risk to this development.

Groundwater Flooding: Occurs when the natural water table of the lands rises above the land surface due to inadequate self-drainage, usually occurring due to periods of prolonged rainfall.

From www.gsi.ie data available particular to groundwater flood event is presented in Fig 7.9 below.

The proposed development is located in 3.7 kms from the nearest recorded event at Ballymount Park.

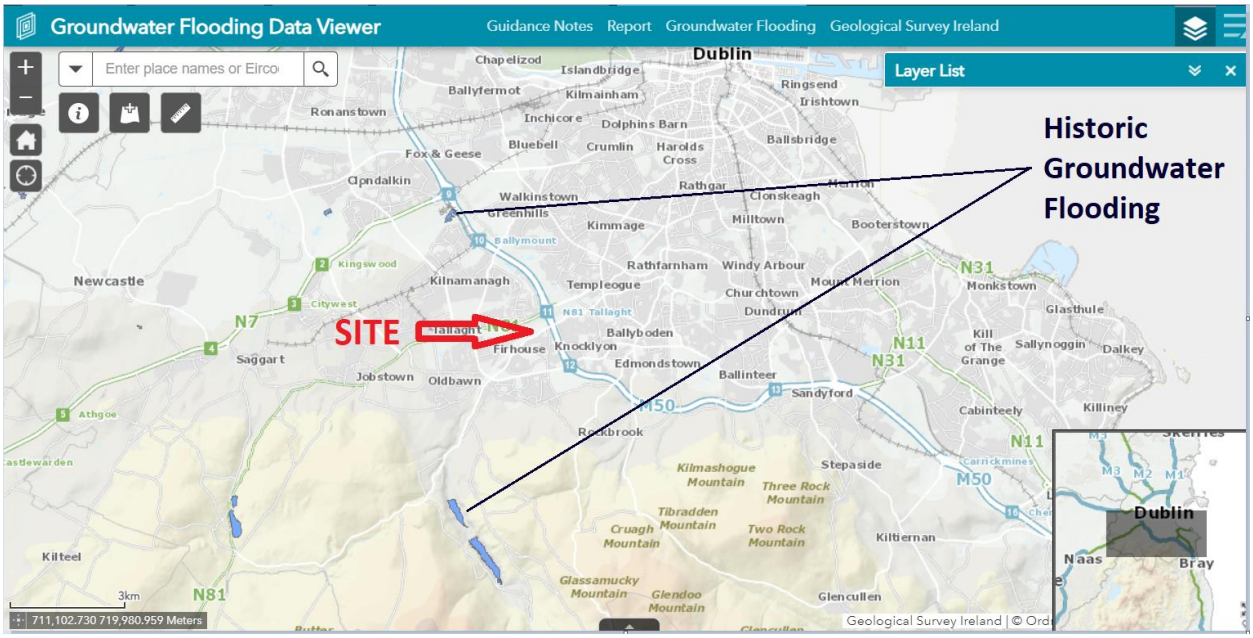


Fig 7.9 – Groundwater Flooding from www.gsi.ie

The site is not deemed at risk from Groundwater Flooding.

Having considered the various forms of flooding which presents risk to persons and property – Fluvial, Coastal, Pluvial, Groundwater, it is concluded that the proposed development is located within a Flood Zone C and therefore deemed acceptable under the Flood Protection Guidelines.

In relation to flooding from infrastructural failure the following is identified:

Existing 250mm dia. MDPE Watermain located on the south side of the Firhouse Road if fails will discharge water in the direction of the proposed development. A surface water channel is to be provided across the proposed Firhouse road entrance which will channel waters north of the entrance and around the development onto Mount Carmel Park.

Within the development surface/storm waters are to be managed in a sustainable manner through the provision of natural SuDS methods.

In storm event a large volume of water will be retained through various element provided throughout the development. All water retaining structures are to be provided with waterproof membranes and sealed at outlets to guarantee no water enters the building.

The SuDS system has been design to cater for the critical 1:30 year storm event without inundation of the site, the public roads or third party lands. Only in the event of a 1:100 storm will there be risk of inundation of the lower basement level to a maximum depth of 60mm.

The basement is provided with an internal pump sump for normal surface water collection and pumping out to the foul sewer system. In the rare event as a 1:100 year storm the overflow water to the basement will also be pumped to the foul sewer.

Particular to the gradient of the approach route to the basement carpark this will provide a conduit for surface waters to enter unnecessarily. A grated channel is to be provided under the archway entry to cut off this entry and convey captured waters back into the surface open space sub-pavement drainage system.

The area between the rear of the proposed building and the northern boundary stone wall is limited in width. It is proposed that this area will be provided in a manner that will drain naturally to ground. No additional area will be discharge to this area, effectively catering for its own area as a green area. Given the proximity of the existing boundary, utilising this area for the provision of drainage from other areas may pose risk to the boundary wall through excessively saturating the soils adjacent. The soils in this area naturally fall in a northern direction towards the treeline which is to be protected during and after construction and will provide uptake of waters which percolate through the soil thereby reinstating a natural regime of self-drainage.

8.0 Pre-application Consultation

As part to the SHD process, pre-planning consultations have taken place with the relevant Local Authority, South Dublin County Council (SDCC). Subsequent to said consultations the Opinion of SDCC has been issued and reviewed by the Design Team. In respect to engineering solutions the following table outlined the concerns/concerns raised and the proposed measures taken to address each of the concerns/comments.

SDCC Comments	Response
Summary of Key Issues	
Design, Character, Visual Impact and Layout	
Water Services and Drainage	
1. The proposed diversion of the existing 525mm surface water sewer is not acceptable as there is inadequate cover provided over the proposed diverted pipe i.e. less than 750mm. The Greater Dublin Regional Code of Practice for Drainage Works states that "The recommended minimum depth of cover over a main pipeline is 1.2m. If that cannot be achieved, the pipes shall be fully surrounded in 150mm thick concrete with an absolute minimum depth of cover of 750mm". The applicant is required to submit a revised diversion design for this pipe which fully complies with the above. Bends shall be minimised and shall be no greater than 90 degrees. The applicant shall also submit revised calculations which shows that the proposed diversion will not decrease the capacity of this pipe.	Res: The existing surface water sewer which runs parallel with the rear boundary through the site of the proposed development is not 525mm, but a 300mm diameter – as investigated by South Dublin County Council. The proposed diversion of this sewer is to be provided on Firhouse Road and along Mount Carmel Park. The tie-in to the existing line on Mount Carmel Park needs to be provided at the existing invert level. Full concrete surround is proposed where 1.2m cover is not achievable with an absolute minimum of 0.75m cover over the pipe. Bends of no greater than 45 degrees are proposed.
2. The applicant is required to submit a revised surface water drainage design report clearly showing a breakdown of all proposed surface types and surface areas (in m^2) as well as corresponding run off coefficients applied to each surface type. This is required for Water Services to fully assess surface water attenuation proposals.	Res: Individual surface areas and roofs, podium, open space areas are provided in the appended calculations and on the proposed drainage drawing. Cv's area also identified. Co-efficient are generally 0.95 for Roofs and 0.9 for paved areas.
3. Water Services have concerns regarding the proximity of the underground surface water attenuation system in relation the foundations on the south side of the proposed building. The applicant shall submit a drawing showing a cross section detail of all proposed attenuation systems which also highlights the distance between the underground attenuation system and adjacent building foundations. The applicant shall demonstrate how surface water attenuating systems are designed to ensure that surrounding building foundations are not undermined or	The original attenuation storage has been removed given the increased level of natural SuDS incorporated into the design. A minimal level of storage is now required in the form of an underground tank at the north eastern corner of the building and will be within the ownership lands of the development. This tank will be of reinforced concrete, which will be constructed as part of the main RC structure of the basement.

adversely affected over time.	
4. The proposed underground geocellular attenuation system is located in an area to be taken in charge by the Council. The applicant shall therefore change proposed underground attenuation system to an "Arch type" system as the council only take these systems in charge due to maintenance reasons.	Res: This geocellular attenuation system is no longer necessary given the redesigned surface water management train for the development.
5. Water services welcome all proposed Sustainable Drainage Systems (SuDS) proposed such as blue roofs, tree pits and permeable paving. The applicant is requested to investigate whether further SuDS can be incorporated into the surface water drainage design such as but not limited to the following: • Swales • Further Green roof/Blue roof coverage across buildings • Detention basins • Filter Drains • Rain Water Harvesting Submit a SuDS plan drawing and cross section details of all proposed SuDS (Sustainable Drainage Systems) features across the site at full planning application stage. The applicant shall also highlight the proposed surface water maximum discharge rate of 1.5L/S on the drainage layout drawing.	Res: Proposed SuDS include: Green/Blue roofs to ALL flat roof areas. Blue roof system to the Basement Podium at ground floor level. Infiltration Trenches within the public realm areas to the south and east of the building. Tree pits and raingarden areas to the public realm areas. Permeable surface paving and subsurface attenuation layer. Maximum discharge rate of 1.5 l/s noted on drainage layout at the outfall Hydrobrake manhole.
6. All drainage from basement level car parking shall pass through a Class 2 petrol interceptor and discharge to the foul drainage network in compliance with Greater Dublin Regional Code of Practice requirements. Submit a revised basement level drainage layout drawing which demonstrates this. The applicant is also required to demonstrate how basement drainage pumps will operate in the event of a power outage.	Res: Class 2 PI provided within the basement car park with a pumped discharge to the Foul sewer on Mount Carmel Park. Back-up generator to be provided at ground floor level as part of the M&E Installation.
7. Submit a drawing showing that proposed petrol interceptors are relocated so that they are located upstream of proposed storm water attenuation systems. This will prevent oils and hydrocarbons entering storm water attenuation system thus making the attenuation system easier to maintain and clean. All proposed petrol interceptor/s shall be designed as in accordance with section 20 of the Greater Dublin regional Code of Practice for Drainage Works.	Res: the proposed Class 1 PI is located upstream of the final attenuation. The level of individual SuDS provided along the Drainage train from roof surfaces to the final outfall will provided substantial removal of contaminates prior to reaching the PI. A review of the proposed systems in line with the SuDS Manual has been completed and deemed adequate without the need for a PI given the proposed usage of the catchment areas. A PI is still proposed as a final treatment provision.

An Bord Pleanala Comments	**Response**
11. Clarification at application stage regarding connection to water and drainage infrastructure having regard to the Irish Water submission, submitted to the Board on the 21.10.2021.	Refer to Section 6.1 & 6.2
16. A site layout plan indicating what areas, if any, are to be taken in charge by the planning authority.	The open space areas between the proposed building and the back of the public footpath contains substantial infrastructure specific to the proposed development. All existing Public infrastructure within this area is proposed to be re-located from onto the Public Road. It is not proposed to have this area Taken In Charge – Refer to OMP TIC Drawing No. 20022-OMP-00-SP-DR-A-1001.
17. Site Specific Construction and Demolition Waste Management Plan.	Refer to PHM Construction Waste Management Plan Report.

APPENDIX A

Foul Water Drainage

Foul Sewer Design

PIPE LAYOUT

Design Parameters		Appliance Flows(BS EN 752-4)					
Pipe	uPVC SN8	Density	1000 kg/m3	Discharge Rates		Frequency Factors	
Viscosity (Pa s)	0.0012	Limiting Vel	0.7-3.0 m/s	Apartment PE	2.3	Intermittent (Dwelling/Office)	0.50
Roughness (mm)	1.5			Dwelling PE	3.5	Frequent (School, Hospital, Rest)	0.70
Gravity (m/s2)	9.81			PE (l/h/d)	180	Congested (Public Facilities)	1.00
				PE (l/s-1DWF)	0.0021		

Section	Units Connected				Flow	Infiltration	Cumul Q	Cumul Q	Grd Lvl U/S	Grd Lvl D/S	Inv U/S	Inv D/S	Cover U/S	Cover D/S	Cover Check (>1.2m)		ΔH	Plan (L)	Pipe (L)	Section
	Dwelling	Apartment	Studio	Retail	l/s	l/s	l/s (1DWF)	l/s (6DWF)	m	m	m	m	m	m	Upstream	Dn.stream	m	m	m	
F1-F2		10		1	0.06	0.01	0.06	0.36	72.500	72.500	71.246	71.062	1.03	1.21	U.S OK	D.S OK	0.184	14.737	14.74	F1-F2
F2-F3		36	2		0.18	0.02	0.26	1.55	72.500	72.500	71.062	70.936	1.21	1.34	U.S OK	D.S OK	0.125	18.809	18.81	F2-F3
F3-F4		25	1	1	0.13	0.01	0.40	2.41	72.500	72.500	70.936	70.777	1.34	1.50	U.S OK	D.S OK	0.159	23.840	23.84	F3-F4
F4-F5					0.00	0.00	0.40	2.41	72.500	71.630	70.777	70.617	1.50	0.79	U.S OK	D.S FAIL	0.160	24.061	24.062	F4-F5
F5-F6			2	2	0.02	0.00	0.43	2.56	71.630	71.320	70.617	70.529	0.79	0.57	U.S FAIL	D.S FAIL	0.088	11.876	11.876	F5-F6
F6-F7(Ext)		34			0.16	0.02	0.61	3.63	71.320	71.220	70.529	70.500	0.57	0.49	U.S FAIL	D.S FAIL	0.029	3.636	3.636	F6-F7(Ext)
					0.00	0.00	0.00	0.00					0.00	0.00	*U.S FAIL*	*D.S FAIL*	#DIV/0!		#DIV/0!	
					0.00	0.00	0.00	0.00					0.00	0.00	*U.S FAIL*	*D.S FAIL*	#DIV/0!		#DIV/0!	
					0.00	0.00	0.00	0.00					0.00	0.00	*U.S FAIL*	*D.S FAIL*	#DIV/0!		#DIV/0!	
					0.00	0.00	0.00	0.00					0.00	0.00	*U.S FAIL*	*D.S FAIL*	#DIV/0!		#DIV/0!	
					0.00	0.00	0.00	0.00					0.00	0.00	*U.S FAIL*	*D.S FAIL*	#DIV/0!		#DIV/0!	
					0.00	0.00	0.00	0.00					0.00	0.00	*U.S FAIL*	*D.S FAIL*	#DIV/0!		#DIV/0!	
					0.00	0.00	0.00	0.00					0.00	0.00	*U.S FAIL*	*D.S FAIL*	#DIV/0!		#DIV/0!	
					0.00	0.00	0.00	0.00					0.00	0.00	*U.S FAIL*	*D.S FAIL*	#DIV/0!		#DIV/0!	
					0.00	0.00	0.00	0.00					0.00	0.00	*U.S FAIL*	*D.S FAIL*	#DIV/0!		#DIV/0!	
					0.00	0.00	0.00	0.00					0.00	0.00	*U.S FAIL*	*D.S FAIL*	#DIV/0!		#DIV/0!	
					0.00	0.00	0.00	0.00					0.00	0.00	*U.S FAIL*	*D.S FAIL*	#DIV/0!		#DIV/0!	
					0.00	0.00	0.00	0.00					0.00	0.00	*U.S FAIL*	*D.S FAIL*	#DIV/0!		#DIV/0!	
					0.00	0.00	0.00	0.00					0.00	0.00	*U.S FAIL*	*D.S FAIL*	#DIV/0!		#DIV/0!	

Foul Sewer Design

CAPACITY CHECK

Design Parameters			
Pipe Material	Upvc SN8	Density(kg/m3)	1000
Viscosityb(Pa s)	0.0012	Limiting Vel	0.7 - 3.0m/s
Roughness (mm)	1.5		
Gravity (m/s2)	9.81		

Section	Gradient	Gradient	Diameter	Manholes	d (water dp)	d/D	Angle	Wet Perimeter	Area of Liquid	M (Hyd Rad)	SQRT (32gmi)	Prop Vel	Velocity	Angle	Liquid	Q = VA	Capacity	Section
	dec	1 in	mm		mm		Rad	m	m2			m/s	Check	Rad	m2	l/s	Check	
F1-F2	0.013	80	225	OK	11	0.047	0.873	0.098	0.003	0.027	0.328	0.793	OK	0.873	0.003	2.140	OK	F1-F2
F2-F3	0.007	150	225	OK	31	0.137	1.518	0.171	0.013	0.077	0.401	1.151	OK	1.518	0.013	15.138	OK	F2-F3
F3-F4	0.007	150	225	OK	42	0.189	1.798	0.202	0.021	0.103	0.464	1.390	OK	1.798	0.021	28.976	OK	F3-F4
F4-F5	0.007	150	225	OK	42	0.189	1.798	0.202	0.021	0.103	0.464	1.390	OK	1.798	0.021	28.976	OK	F4-F5
F5-F6	0.007	135	225	OK	43	0.192	1.815	0.204	0.021	0.105	0.493	1.481	OK	1.815	0.021	31.678	OK	F5-F6
F6-F7(Ext)	0.008	125	225	OK	53	0.235	2.025	0.228	0.028	0.125	0.560	1.727	OK	2.025	0.028	49.203	OK	F6-F7(Ext)
	#DIV/0!	#DIV/0!		BACKFLOW	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	#DIV/0!	#DIV/0!		BACKFLOW	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	#DIV/0!	#DIV/0!		BACKFLOW	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	#DIV/0!	#DIV/0!		BACKFLOW	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	#DIV/0!	#DIV/0!		BACKFLOW	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
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	#DIV/0!	#DIV/0!		BACKFLOW	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	#DIV/0!	#DIV/0!		BACKFLOW	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

APPENDIX B

Surface Water Drainage

Storm Sewer Design

PIPE LAYOUT

Design Parameters				Pumping Requirements		
Pipe Material	Concrete	Density(kg/m3)	1000	Flow per Day		
Viscosity(Pa s)	0.0012	Limiting V(m/s)	0.7 - 3.0m/s	Sump invert		
Roughness(mm)	0.3	Storm event	1 in 5 yr	Manhole Invert		
Gravity(m/s2)	9.81			Rise Height		

A	B	C	D		
Pipe Ø	Length (m)	Approx. Outside Ø (mm) O/D	Approx. Wall Thickness (mm)	Approx. Weight in kgs	Pipe Type
150mm	1.25	290	33	80	S & S
225mm	1.25	392	38	122	S & S
300mm	2.0	505	60	358	S & S
375mm	2.5	606	65	565	S & S
450mm	2.5	707	69	730	S & S
525mm	2.5	808	77	980	S & S
600mm	2.5	909	91	1240	S & S
675mm	2.5	1008	97	1520	S & S

Section	Grd Lvl U/S	Grd Lvl D/S	Inv U/S	Inv D/S	Cover U/S	Cover D/S	ΔH	Plan (L)	Pipe (L)	Grad	Gradient	Diameter	Cover Check >1.2m		Section
	m	m	m	m	m	m	m	m	m	dec	1 in	m	Upstream	Dn.stream	
S13-S14	73.500	72.500	71.060	70.957	1.84	0.94	0.103	20.605	20.605	0.005	200	0.600	U.S OK	D.S FAIL	S13-S14
S14-S15	72.500	72.500	70.957	70.893	1.24	1.31	0.064	12.830	12.830	0.005	200	0.300	U.S OK	D.S OK	S14-S15
S15-S16	72.500	72.500	70.893	70.788	1.01	1.11	0.105	20.940	20.940	0.005	200	0.600	U.S FAIL	D.S OK	S15-S16
S16-S17	72.500	72.500	70.788	70.659	1.11	1.24	0.129	25.747	25.747	0.005	200	0.600	U.S OK	D.S OK	S16-S17
S17-S18	72.500	71.400	70.212	70.095	1.99	1.00	0.117	23.320	23.320	0.005	200	0.300	U.S OK	D.S OK	S17-S18
S18-S19	71.400	71.200	70.095	70.011	1.00	0.89	0.084	16.861	16.861	0.005	200	0.300	U.S OK	D.S FAIL	S18-PI(2)
S19-PI(2)	71.200	71.200	70.011	69.949	0.89	0.95	0.062	12.327	12.327	0.005	200	0.300	U.S FAIL	D.S OK	PI(2)-S19
PI(2)-S20	71.200	71.150	69.849	69.810	1.05	1.04	0.039	7.833	7.833	0.005	200	0.300	U.S OK	D.S OK	S19-S20
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		U.S FAIL	D.S FAIL	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		U.S FAIL	D.S FAIL	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		U.S FAIL	D.S FAIL	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		U.S FAIL	D.S FAIL	
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Storm Sewer Design

CAPACITY CHECK

Design Parameters							
Pipe Material	Polypipe	Density(kg/m3)		1000	Te min	4.00	
Viscosity(Pa s)	0.0012	Limiting V(m/s)		0.7 - 3.0m/s	Cv	0.95	
Roughness (mm)	0.3						
Gravity (m/s2)	9.81						

Return Period	Time of Entry (te) (min)
1	4 – 8
2	4 – 7
5	3 - 6
>5	2 - 4

Times of Entry (t_e) typically used for design purposes

Section	A	2gdi	Velocity	Velocity	ToF	ToC Section	ToC Used	Intensity	Imp Area	Imp Area	Cumul Area	Q Section	Q Cumul	Capacity	Capacity	Section
	m2		m/s	Check	min	min	min	mm/hr	m2	ha	ha	l/s	l/s	l/s	Check	
S13-S14	0.28	0.2426	1.85	OK	0.19	4.19	4.19	95.73	347	0.035	0.035	11.39	11.39	522.72	OK	S13-S14
S14-S15	0.07	0.1716	1.20	OK	0.18	4.36	4.36	93.27	826	0.083	0.117	26.42	37.81	84.56	OK	S14-S15
S15-S16	0.28	0.2426	1.85	OK	0.19	4.55	4.55	90.85	1049	0.105	0.222	32.68	70.50	522.72	OK	S15-S16
S16-S17	0.28	0.2426	1.85	OK	0.23	4.79	4.79	88.09	861	0.086	0.308	26.01	96.51	522.72	OK	S16-S17
S17-S18	0.07	0.1716	1.20	OK	0.32	4.32	4.32	93.80	424	0.042	0.351	13.64	13.64	84.56	OK	S17-S18
S18-PI(2)	0.07	0.1716	1.20	OK	0.23	4.79	4.79	88.06	103	0.010	0.361	3.11	16.75	84.56	OK	S18-PI(2)
PI(2)-S19	0.07	0.1716	1.20	OK	0.17	4.96	4.96	86.15	0	0.000	0.361	0.00	16.75	84.56	OK	PI(2)-S19
S19-S20	0.07	0.1716	1.20	OK	0.11	5.07	5.07	84.99	0	0.000	0.361	0.00	1.57	84.56	OK	S19-S20
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
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	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
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	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
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	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Diverted Storm Sewer Design

A	B	C	D		
Pipe Ø	Length (m)	Approx. Outside Ø (mm) O/D	Approx. Wall Thickness (mm)	Approx. Weight in kgs	Pipe Type
150mm	1.25	290	33	80	S & S
225mm	1.25	392	38	122	S & S
300mm	2.0	505	60	358	S & S
375mm	2.5	606	65	565	S & S
450mm	2.5	707	69	730	S & S
525mm	2.5	808	77	980	S & S
600mm	2.5	909	91	1240	S & S
675mm	2.5	1008	97	1520	S & S

PIPE LAYOUT

Design Parameters				Pumping Requirements		
Pipe Material	Concrete	Density(kg/m3)	1000	Flow per Day		
Viscosity(Pa s)	0.0012	Limiting V(m/s)	0.7 - 3.0m/s	Sump invert		
Roughness(mm)	0.3	Storm event	1 in 5 yr	Manhole Invert		
Gravity(m/s2)	9.81			Rise Height		

Section	Grd Lvl U/S	Grd Lvl D/S	Inv U/S	Inv D/S	Cover U/S	Cover D/S	ΔH	Plan (L)	Pipe (L)	Grad	Gradient	Diameter	Cover Check >1.2m		Section
	m	m	m	m	m	m	m	m	m	dec	1 in	m	Upstream	Dn.stream	
S1(Ext)-S2	73.920	93.950	72.320	72.184	1.30	21.47	0.136	11.675	11.676	0.012	86	0.300	*U.S OK*	*D.S OK*	**S1(Ext)-S2**
S2-S3	93.950	73.650	72.184	72.053	21.47	1.30	0.131	11.265	11.266	0.012	86	0.300	*U.S OK*	*D.S OK*	**S2-S3**
S3-S4	73.650	73.350	72.053	71.500	1.30	1.55	0.553	30.766	30.771	0.018	56	0.300	*U.S OK*	*D.S OK*	**S3-S4**
S4-S5	73.350	72.850	71.500	70.700	1.55	1.85	0.800	45.184	45.191	0.018	56	0.300	*U.S OK*	*D.S OK*	**S4-S5**
S5-S6	72.850	72.207	70.700	70.500	1.85	1.41	0.200	11.637	11.639	0.017	58	0.300	*U.S OK*	*D.S OK*	**S5-S6**
S6-S7	72.207	71.320	70.500	70.000	1.41	1.02	0.500	27.149	27.154	0.018	54	0.300	*U.S OK*	*D.S FAIL*	**S6-S7**
S7-S8	71.320	71.107	70.000	69.900	1.02	0.91	0.100	20.344	20.344	0.005	203	0.300	*U.S FAIL*	*D.S FAIL*	**S7-S8**
S8-S9 (Ext)	71.107	70.880	69.900	69.800	0.91	0.78	0.100	20.159	20.159	0.005	202	0.300	*U.S FAIL*	*D.S FAIL*	**S8-S9 (Ext)**
S10-S11	73.350	72.900	71.200	70.770	1.70	1.68	0.430	31.071	31.074	0.014	72	0.450	*U.S OK*	*D.S OK*	**S10-S11**
S11-S12	72.900	72.580	70.770	70.630	1.68	1.50	0.140	10.026	10.027	0.014	72	0.450	*U.S OK*	*D.S OK*	**S11-S12**
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	
					0.00	0.00	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!		*U.S FAIL*	*D.S FAIL*	

Diverted Storm Sewer Design

CAPACITY CHECK

Design Parameters							
Pipe Material	Polypipe	Density(kg/m3)		1000	Te min	4.00	
Viscosity(Pa s)	0.0012	Limiting V(m/s)		0.7 - 3.0m/s	Cv	0.80	
Roughness (mm)	0.3						
Gravity (m/s2)	9.81						

Return Period	Time of Entry (te) (min)
1	4 – 8
2	4 – 7
5	3 - 6
>5	2 - 4

Times of Entry (t_e) typically used for design purposes

Section	A	2gdi	Velocity	Velocity	ToF	ToC Section	ToC Used	Intensity	Imp Area	Imp Area	Cumul Area	Q Section	Q Cumul	Capacity	Capacity	Section
	m2		m/s	Check	min	min	min	mm/hr	m2	ha	ha	l/s	l/s	l/s	Check	
S1(Ext)-S2	0.07	0.2618	1.84	OK	0.11	4.11	4.11	96.88	0	0.000	0.000	0.00	0.00	130.05	OK	S1(Ext)-S2
S2-S3	0.07	0.2616	1.84	OK	0.10	4.21	4.21	95.41	0	0.000	0.000	0.00	0.00	129.94	OK	S2-S3
S3-S4	0.07	0.3253	2.29	OK	0.22	4.43	4.43	92.39	0	0.000	0.000	0.00	0.00	162.02	OK	S3-S4
S4-S5	0.07	0.3228	2.27	OK	0.33	4.76	4.76	88.35	0	0.000	0.000	0.00	0.00	160.79	OK	S4-S5
S5-S6	0.07	0.3181	2.24	OK	0.09	4.09	4.09	97.16	0	0.000	0.000	0.00	0.00	158.38	OK	S5-S6
S6-S7	0.07	0.3292	2.32	OK	0.20	4.63	4.63	89.95	0	0.000	0.000	0.00	0.00	164.02	OK	S6-S7
S7-S8	0.07	0.1701	1.19	OK	0.29	4.91	4.91	86.66	0	0.000	0.000	0.00	0.00	83.82	OK	S7-S8
S8-S9 (Ext)	0.07	0.1709	1.19	OK	0.28	4.91	4.91	86.71	0	0.000	0.000	0.00	0.00	84.22	OK	S8-S9 (Ext)
S10-S11	0.16	0.3496	2.59	OK	0.20	4.20	4.20	95.52	0	0.000	0.000	0.00	0.00	411.67	OK	S10-S11
S11-S12	0.16	0.3511	2.60	OK	0.06	4.26	4.26	94.63	0	0.000	0.000	0.00	0.00	413.54	OK	S11-S12
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.000	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

APPENDIX C

Stormwater Management

Proposed Development at Firhouse Road

SURFACE WATER GREENFIELD RUN-OFF

COPAS Formula C = (Q * ts) - [P(ts + tc) + P(P * tc / Q)]

C = Storage requirment	(m^3)
Q = Discharge	(m^3/min) or (l/s)
ts = Storm Duration	(min)
P = Permitted outfall rate	(m^3/min) or (l/s)
tc = Time of concentration	(min)
R = Rainfall Intensity	(mm/hr)
A(Imp) = Impermeable area of site	(ha)
A = Site Area	(ha)

tc =	5	min	
P =	0.09	m^3/min	3.44 l/s/ha
A(Imp) =	0.40	ha	
A =	0.46	ha	

Hydro Q	**1.57 l/s**

Q_{BAR} = Mean Annual Peak Flow (m^3/s)
SAAR = Standard Annual Average Rainfall (mm)
SOIL = Soil Index
AREA = Total Area of Site (km^2)

$Q_{BAR} = 0.00108 \times (AREA)^{0.89} \times (SAAR)^{1.17} \times (SOIL)^{2.17}$

AREA =	0.5	km^2	Ha =	50	
SAAR =	817	mm			
SOIL =	0.37				

Q_{BAR} Rural (Large)	0.171	m^3/s	=	170.6 l/s	3.41 l/s/ha	
	10.234	m^3/min		3.41 l/s/ha	0.205	m^3/min/ha
	0.09	m^3/min	Site			
Q_{BAR} Rural (Small)	0.172	m^3/s	=	172.1 l/s	3.44 l/s/ha	
	10.327	m^3/min		3.44 l/s/ha	0.207	m^3/min/ha
	0.09	m^3/min	Site			
Q_{BAR} (GDSDS)	0.1	m^3/s	=	100.0 l/s	2.00 l/s/ha	
	6.000	m^3/min		**2.00** l/s/ha	0.120	m^3/min/ha
	0.05	m^3/min	Site			

Proposed Development at Firhouse Road

Met Eireann Records + 20% CC expressed as mm/hr

mm		Years					
DURATION	**Minutes**	**1**	**2**	**5**	**10**	**30**	**100**
30	30	**19.68**	**23.04**	**34.32**	**43.44**	**60.72**	**86.64**
60	60	**12.84**	**15.00**	**22.20**	**27.96**	**38.76**	**54.84**
2	120	**8.46**	**9.84**	**14.40**	**18.00**	**24.78**	**34.68**
4	240	**5.58**	**6.45**	**9.33**	**11.58**	**15.84**	**21.99**
6	360	**4.36**	**5.02**	**7.24**	**8.96**	**12.18**	**16.82**
9	540	**3.41**	**3.92**	**5.61**	**6.92**	**9.37**	**12.88**
12	720	**2.86**	**3.29**	**4.69**	**5.77**	**8.99**	**10.66**
24	1440	**1.88**	**2.16**	**3.04**	**3.72**	**4.98**	**6.76**
48	2880	**1.16**	**1.31**	**1.80**	**2.16**	**2.83**	**3.75**

Met Eireann Records

mm		Years					
DURATION	**Minutes**	**1**	**2**	**5**	**10**	**30**	**100**
30	30	8.2	9.6	14.3	18.1	25.3	36.1
60	60	10.7	12.5	18.5	23.3	32.3	45.7
2	120	14.1	16.4	24.0	30	41.3	57.8
4	240	18.6	21.5	31.1	38.6	52.8	73.3
6	360	21.8	25.1	36.2	44.8	60.9	84.1
9	540	25.6	29.4	42.1	51.9	70.3	96.6
12	720	28.6	32.9	46.9	57.7	89.9	106.6
24	1440	37.6	43.1	60.8	74.4	99.5	135.1

Proposed Development at Firhouse Road **SUSTAINABLE DRAINAGE CALCULATIONS**

Cv Pitched Roof	1.00		
Cv Flat Roof	0.95		
Cv Paved Area	0.9		

tc = ToC 5 min

Q_{BAR} 3.44 l/s/ha 2.065E-05 m3/min/m2

Hydro Q **1.57 l/s**

									10 yr	30 yr	100 yr			
	Roof 3A	**Rainfall Volume (m3)**							**Required**	**Required**	**Required**	**Max**	**Time to**	
		Return Years						**Outflow**	**Storage**	**Storage**	**Storage**	**Depth**	**1/2 Empty**	
Hr	Min	**1**	**2**	**5**	**10**	**30**	**100**	m^3	m^3	m^3	m^3	mm	Hrs	
0.5	30	1.0	1.1	1.7	2.1	2.9	4.2	0.2	1.9	2.8	4.0	36	16.8	
1	60	1.2	1.4	2.1	2.7	3.7	5.3	0.3	2.4	3.4	5.0	44	16.8	
2	120	1.6	1.9	2.8	3.5	4.8	6.7	0.6	2.9	4.2	6.1	54	16.8	
4	240	2.2	2.5	3.6	4.5	6.1	8.5	1.2	3.3	4.9	7.3	65	16.8	
6	360	2.7	3.1	4.4	5.5	7.4	10.3	1.8	3.7	5.7	8.5	75	16.8	
9	540	3.0	3.4	4.9	6.0	8.2	11.2	2.6	3.4	5.5	8.6	76	16.8	
12	720	3.3	3.8	5.4	6.7	10.4	12.4	3.5	3.2	6.9	8.9	79	16.8	
24	1440	4.4	5.0	7.0	8.6	11.5	15.7	6.9	1.7	4.6	8.7	77	16.8	
48	2880	5.4	6.1	8.3	10.0	13.1	17.4	13.8	-3.8	-0.7	3.5	31	16.8	
	Catch	**Storage Provided**											Additional	
	Area	Reduction	Max Depth	Porosity									Storage	
	m^2		mm	%		m^3			m^3	m^3	m^3		Required	
	113	0.9	100	95	Max Prov.	**9.7**		Max Req'd	3.7	6.9	8.9		**-0.78**	-> Overtop to
	Pass Forward Flow		0.08	l/s										Firhouse Open Space

									10 yr	30 yr	100 yr			
	Roof 3B								**Required**	**Required**	**Required**	**Max**	**Time to**	
		Return Years						**Outflow**	**Storage**	**Storage**	**Storage**	**Depth**	**1/2 Empty**	
Hr	Min	**1**	**2**	**5**	**10**	**30**	**100**	m^3	m^3	m^3	m^3	mm	Hrs	
0.5	30	2.5	2.9	4.4	5.5	7.7	11.0	0.3	5.2	7.4	10.7	36	19.7	
1	60	3.3	3.8	5.7	7.1	9.9	14.0	0.6	6.5	9.3	13.3	45	19.7	
2	120	4.3	5.0	7.3	9.2	12.6	17.7	1.2	8.0	11.4	16.5	55	19.7	
4	240	5.7	6.6	9.5	11.8	16.1	22.4	2.4	9.4	13.8	20.1	67	19.7	
6	360	6.7	7.7	11.1	13.7	18.6	25.7	3.5	10.2	15.1	22.2	75	19.7	
9	540	7.8	9.0	12.9	15.9	21.5	29.5	5.2	10.6	16.3	24.3	82	19.7	
12	720	8.7	10.1	14.3	17.6	27.5	32.6	7.0	10.7	20.5	25.6	86	19.7	
24	1440	11.5	13.2	18.6	22.7	30.4	41.3	13.9	8.9	16.5	27.4	92	19.7	
48	2880	14.1	16.0	22.0	26.4	34.6	45.8	27.7	-1.2	6.9	18.1	61	19.7	
	Catch	**Storage Provided**											Additional	
	Area	Reduction	Max Depth	Porosity									Storage	
	m^2		mm	%		m^3			m^3	m^3	m^3		Required	
	298	0.80	100	95	Max Prov.	**22.6**		Max Req'd	10.7	20.5	27.4		**4.79**	-> Overtop to
	Pass Forward Flow		0.16	l/s										Mt Carmel Open Space

									10 yr	30 yr	100 yr			
	Roof 2A								**Required**	**Required**	**Required**	**Max**	**Time to**	
		Return Years						**Outflow**	**Storage**	**Storage**	**Storage**	**Depth**	**1/2 Empty**	
Hr	Min	**1**	**2**	**5**	**10**	**30**	**100**	m^3	m^3	m^3	m^3	mm	Hrs	
0.5	30	1.5	1.8	2.7	3.4	4.8	6.8	0.2	3.2	4.6	6.6	36	27.2	
1	60	2.0	2.3	3.5	4.4	6.1	8.6	0.3	4.1	5.8	8.3	45	27.2	
2	120	2.6	3.1	4.5	5.6	7.8	10.9	0.6	5.0	7.2	10.3	56	27.2	
4	240	3.5	4.0	5.8	7.2	9.9	13.8	1.2	6.1	8.7	12.6	69	27.2	
6	360	4.1	4.7	6.8	8.4	11.4	15.8	1.8	6.7	9.7	14.0	77	27.2	
9	540	4.8	5.5	7.9	9.7	13.2	18.1	2.6	7.1	10.6	15.5	85	27.2	
12	720	5.4	6.2	8.8	10.8	16.9	20.0	3.5	7.4	13.4	16.5	90	27.2	
24	1440	7.1	8.1	11.4	14.0	18.7	25.4	6.9	7.0	11.7	18.4	101	27.2	
48	2880	8.7	9.8	13.5	16.2	21.2	28.1	13.8	2.4	7.4	14.3	78	27.2	
	Catch	**Storage Provided**											Additional	
	Area	Reduction	Max Depth	Porosity									Storage	
	m^2		mm	%		m^3			m^3	m^3	m^3		Required	
	183	0.9	100	95	Max Prov.	**15.6**		Max Req'd	7.4	13.4	18.4		**2.78**	-> Overtop to
	Pass Forward Flow		0.08	l/s										Grd Podium

									10 yr	30 yr	100 yr			
	Roof 1A								**Required**	**Required**	**Required**	**Max**	**Time to**	
		Return Years						**Outflow**	**Storage**	**Storage**	**Storage**	**Depth**	**1/2 Empty**	
Hr	Min	**1**	**2**	**5**	**10**	**30**	**100**	m^3	m^3	m^3	m^3	mm	Hrs	
0.5	30	0.4	0.5	0.8	1.0	1.4	2.0	0.2	0.8	1.3	1.9	36	7.7	
1	60	0.6	0.7	1.0	1.3	1.8	2.6	0.3	1.0	1.5	2.3	43	7.7	
2	120	0.8	0.9	1.3	1.7	2.3	3.2	0.6	1.1	1.7	2.6	51	7.7	
4	240	1.0	1.2	1.7	2.2	3.0	4.1	1.2	1.0	1.8	2.9	57	7.7	
6	360	1.2	1.4	2.0	2.5	3.4	4.7	1.8	0.8	1.7	3.0	57	7.7	
9	540	1.4	1.7	2.4	2.9	3.9	5.4	2.6	0.3	1.3	2.8	54	7.7	
12	720	1.5	1.8	2.6	3.2	5.0	6.0	3.5	-0.2	1.6	**2.5**	48	7.7	
24	1440	2.0	2.4	3.4	4.2	5.6	7.6	6.9	-2.8	-1.3	0.7	13	7.7	
48	2880	2.5	2.8	3.8	4.6	6.0	8.0	13.8	-9.2	-7.8	-5.9	-113	7.7	
	Catch	**Storage Provided**											Additional	
	Area	Reduction	Max Depth	Porosity									Storage	
	m^2		mm	%		m^3			m^3	m^3	m^3		Required	
	52	0.9	100	95	Max Prov.	**4.4**		Max Req'd	1.1	1.8	3.0		**-1.47**	-> Overtop to
	Pass Forward Flow		0.08	l/s										Firhouse Open Space

									10 yr	30 yr	100 yr			
	Roof 1B								**Required**	**Required**	**Required**	**Max**	**Time to**	
		Return Years						**Outflow**	**Storage**	**Storage**	**Storage**	**Depth**	**1/2 Empty**	
Hr	Min	**1**	**2**	**5**	**10**	**30**	**100**	m^3	m^3	m^3	m^3	mm	Hrs	
0.5	30	0.3	0.4	0.6	0.7	1.0	1.4	0.2	0.5	0.8	1.2	33	5.6	
1	60	0.4	0.5	0.7	0.9	1.3	1.8	0.3	0.6	0.9	1.5	39	5.6	
2	120	0.5	0.6	0.9	1.2	1.6	2.3	0.6	0.6	1.0	1.7	44	5.6	
4	240	0.7	0.8	1.2	1.5	2.1	2.9	1.2	0.3	0.9	1.7	44	5.6	
6	360	0.8	1.0	1.4	1.7	2.4	3.3	1.8	0.0	0.6	1.5	40	5.6	
9	540	1.0	1.1	1.6	2.0	2.7	3.8	2.6	-0.6	0.1	1.2	30	5.6	
12	720	1.1	1.3	1.8	2.2	3.5	4.2	3.5	-1.2	0.0	0.7	18	5.6	
24	1440	1.5	1.7	2.4	2.9	3.9	5.3	6.9	-4.0	-3.1	-1.7	-44	5.6	
48	2880	1.8	2.0	2.8	3.4	4.4	5.8	13.8	-10.5	-9.4	-8.0	-211	5.6	
	Catch	**Storage Provided**											Additional	
	Area	Reduction	Max Depth	Porosity									Storage	
	m^2		mm	%		m^3			m^3	m^3	m^3		Required	
	38	0.9	100	95	Max Prov.	**3.2**		Max Req'd	0.6	1.0	1.7		**-1.57**	-> Overtop to
	Pass Forward Flow		0.08	l/s										Mt Carmel Open Space

									10 yr	30 yr	100 yr			
	Grd Podium + 0.25 B02								**Required**	**Required**	**Required**	**Max**	**Time to**	
		Return Years						**Outflow**	**Storage**	**Storage**	**Storage**	**Depth**	**1/2 Empty**	
Hr	Min	**1**	**2**	**5**	**10**	**30**	**100**	m^3	m^3	m^3	m^3	mm	Hrs	
0.5	30	6.0	7.0	10.4	13.2	18.4	26.3	1.5	11.8	17.1	25.0	53	7.7	
1	60	7.8	9.1	13.5	17.0	23.5	33.3	2.8	14.5	21.0	30.8	66	7.7	
2	120	10.3	12.0	17.5	21.9	30.1	42.1	5.4	17.1	25.3	37.3	80	7.7	
4	240	13.6	15.7	22.7	28.1	38.5	53.4	10.6	18.7	29.1	44.0	94	7.7	
6	360	15.9	18.3	26.4	32.7	44.4	61.3	15.8	18.6	30.4	47.3	101	7.7	
9	540	18.7	21.4	30.7	37.8	51.2	70.4	23.5	16.9	30.3	49.5	106	7.7	
12	720	20.8	24.0	34.2	42.1	65.5	77.7	31.3	14.2	37.7	49.9	107	7.7	
24	1440	27.4	31.4	44.3	54.2	72.5	98.5	62.4	-1.3	17.0	43.0	92	7.7	
48	2880	16.8	19.1	26.2	31.5	41.2	54.6	124.6	-79.3	-69.6	-56.2	-120	7.7	
	Catch	**Storage Provided**											Additional	
	Area	Reduction	Max Depth	Porosity									Storage	
	m^2		mm	%		m^3			m^3	m^3	m^3		Required	
	468	0.9	100	95	Max Prov.	**40.0**		Max Req'd	18.7	37.7	49.9		**16.63**	-> Overtop to
	Pass Forward Flow		0.72	l/s										Firhouse Open Space
														including overtopping from
														Roofs 3A, 3B, 2A,

									10 yr	30 yr	100 yr			
	Public Open Space Area on Firhouse Road + 0.75 B02 + 0.5 B01								**Required**	**Required**	**Required**	**Max**	**Time to**	
		Return Years						**Outflow**	**Storage**	**Storage**	**Storage**	**Depth**	**1/2 Empty**	
Hr	Min	**1**	**2**	**5**	**10**	**30**	**100**	m^3	m^3	m^3	m^3	mm	Hrs	
0.5	30	16.7	19.5	29.1	36.8	51.4	73.3	2.7	35.9	50.6	72.5	36	18.3	
1	60	21.7	25.4	37.6	47.3	65.6	92.8	5.0	45.8	64.1	91.3	45	18.3	
2	120	28.6	33.3	48.8	60.9	83.9	117.4	9.6	57.9	80.9	114.4	56	18.3	
4	240	37.8	43.7	63.2	78.4	107.3	148.9	18.8	72.5	101.4	143.0	70	18.3	
6	360	44.3	51.0	73.5	91.0	123.7	170.9	28.0	82.3	115.0	162.1	80	18.3	
9	540	52.0	59.7	85.5	105.4	142.8	196.3	41.9	92.4	129.7	183.2	90	18.3	
12	720	58.1	66.8	95.3	117.2	182.6	216.6	55.7	99.8	165.2	199.2	98	18.3	
24	1440	76.4	87.6	123.5	151.2	202.2	274.5	111.0	116.5	167.5	239.8	118	18.3	
48	2880	46.9	53.1	73.0	87.9	114.9	152.3	221.6	18.6	45.7	83.0	41	18.3	
	Catch	**Storage Provided**											Additional	
	Area												Storage	
	m^2					m^3			m^3	m^3	m^3		Required	
	2034				Max Prov.	**168.8**		Max Req'd	116.5	167.5	239.8		**87.68**	-> Overtop to Basement
	Pass Forward Flow		1.28	l/s										including overtopping from
														Grd Podium

									10 yr	30 yr	100 yr			
	Public Open Space Area on Mt Carmel incl 0.5B01								**Required**	**Required**	**Required**	**Max**	**Time to**	
		Return Years						**Outflow**	**Storage**	**Storage**	**Storage**	**Depth**	**1/2 Empty**	
Hr	Min	**1**	**2**	**5**	**10**	**30**	**100**	m^3	m^3	m^3	m^3	mm	Hrs	
0.5	30	3.8	4.5	6.7	8.5	11.9	16.9	1.3	7.7	11.0	16.1	38	5.7	
1	60	5.0	5.9	8.7	10.9	15.2	21.4	2.5	9.4	13.6	19.9	47	5.7	
2	120	6.6	7.7	11.3	14.1	19.4	27.1	4.8	11.1	16.4	24.1	57	5.7	
4	240	8.7	10.1	14.6	18.1	24.8	34.4	9.4	12.2	18.9	28.5	67	5.7	
6	360	10.2	11.8	17.0	21.0	28.6	39.5	14.0	12.3	19.8	30.7	72	5.7	
9	540	12.0	13.8	19.8	24.4	33.0	45.3	20.9	11.3	19.9	32.3	76	5.7	
12	720	13.4	15.4	22.0	27.1	42.2	50.0	27.8	9.7	24.8	32.6	77	5.7	
24	1440	17.6	20.2	28.5	34.9	46.7	63.4	55.5	0.2	12.0	28.7	68	5.7	
48	2880	10.8	12.3	16.9	20.3	26.5	35.2	110.8	-48.9	-42.7	-34.1	-80	5.7	
	Catch	**Storage Provided**											Additional	
	Area												Storage	
	m^2					m^3			m^3	m^3	m^3		Required	
	424				Max Prov.	**26.1**		Max Req'd	12.3	24.8	32.6		**6.49**	-> Overtop to Basement
	Pass Forward Flow		0.64	l/s										

	Roof / Paving Areas contributing to SuDS:				Q
					l/s
	Roof 3A	A(Imp) =	113	m^2	0.08
	Roof 3B	A(Imp) =	298	m^2	0.16
	Roof 2A	A(Imp) =	183	m^2	0.08
	Roof 1A	A(Imp) =	52	m^2	0.08
	Roof 1B	A(Imp) =	38	m^2	0.08
	Grd Podium	A(Imp) =	468	m^2	0.72
	Build 02 Pitched Roof =		784	m^2	
	Build 01 Pitched Roof =		378	m^2	
	Open Space Firhouse Rd		1061	m^2	1.28
	Open Space Mt Carmel		235	m^2	0.64

				No. of	No. of
	Restricted Flows		l/s	Outlets	10mm Orif
	3A --> Grd		0.08	1	1
	3B --> Grd		0.16	1	2
	2A --> Grd		0.08	1	1
	1A --> Grd		0.08	1	1
	Grd Podium		0.72	2	9
	1B --> Mt Car		0.08	1	1
	Firhouse Open Space		1.28	2	16
	Mt Carmel Open Space		0.64	2	8
	Total Contributing Area		3375	m^2	
	1/30 yr Total Volume Required			273.6	m^3
	1/100yr Total Volume Required			381.7	m^3

	SuDS Volumes Provided over multiple areas of development:				
	Volume Provided				m^3
	Roof 3A				**9.7**
	Roof 3B				**22.6**
	Roof 2A				**15.6**
	Roof 1A				**4.4**
	Roof 1B				**3.2**
	Grd Podium + 0.25 B02				**40.0**
	Firhouse Rd Open Space				**168.8**
	Mt Carmel Open Space				**26.1**
	Total SuDS Volume Provided =				290.5

	Breakdown of Firhouse Road Public Open Space SuDS				
		Area	Depth	Void	Volume
		m^2	m	Ratio	m^3
	Tree Pits	160	1.5	0.2	48
		Length	Sect Area	Void	Volume
		m	m^2	Ratio	m^3
	Trench Type	74	1.5	0.53	58.83
		Area	Depth	Void	Volume
		m^2	m	Ratio	m^3
	Perm Paving	344	0.45	0.4	61.9
		Total Volume Provided			**168.8**

	Breakdown of Mount Carmel Road Public Open Space SuDS				
		Area	Depth	Void	Volume
		m^2	m	Ratio	m^3
	Tree Pits	25.0	1.5	0.2	7.5
		Length	Sect Area	Void	Volume
		m	m^2	Ratio	m^3
	Trench Type	0	1.0	0.53	0
		Area	Depth	Void	Volume
		m^2	m	Ratio	m^3
	Perm Paving	103.5	0.45	0.4	18.6
		Total Volume Provided			**26.1**

Hydrobrake Control Outfall Rate =	l/s	1.57
SuDS Flows to Hydrobrake =	l/s	1.92

E/O Storage Req'd for Storm Events reaching Hydrobrake MH
Storage provided as structural tank part of basement -->

Tank Storage Required in Critical Storm Events

Duration	E/O
Min	m^3
30	0.6
60	1.3
120	2.5
240	5.0
360	7.6
540	11.4
720	15.1
1440	30.3

In the event of a 1/100 year storm the system will surcharge				
Overflow to be provided to the basement carparking level -1				
The extent of flooding in the carpark given the critical 12 hour				
storm event is calculated below:				
Addit. storage required 1/100 yr =			m^3	63.9
Max depth of flooding in basement carpark				
allowing for floor gradients 1/200 =			m^2	1973
			m^3	mm
9 Hr, 1:100 Yr			30.0	**30.4**
12 Hr, 1:100 Yr			46.8	**47.4**
24 Hr, 1:100 Yr			76.6	**77.7**

APPENDIX D

Met Eireann Records

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 311289, Northing: 227532,

	Interval		Years											
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.6,	3.8,	4.5,	5.5,	6.2,	6.7,	8.6,	10.7,	12.1,	14.1,	16.0,	17.4,	19.6,	21.4,	22.9,	N/A ,
10 mins	3.6,	5.3,	6.2,	7.6,	8.6,	9.4,	11.9,	14.9,	16.9,	19.7,	22.2,	24.2,	27.4,	29.8,	31.9,	N/A ,
15 mins	4.3,	6.2,	7.3,	9.0,	10.1,	11.0,	14.0,	17.5,	19.8,	23.2,	26.2,	28.5,	32.2,	35.1,	37.5,	N/A ,
30 mins	5.6,	8.2,	9.6,	11.7,	13.2,	14.3,	18.1,	22.4,	25.3,	29.5,	33.2,	36.1,	40.6,	44.2,	47.1,	N/A ,
1 hours	7.5,	10.7,	12.5,	15.2,	17.1,	18.5,	23.3,	28.7,	32.3,	37.5,	42.1,	45.7,	51.3,	55.6,	59.2,	N/A ,
2 hours	9.9,	14.1,	16.4,	19.8,	22.2,	24.0,	30.0,	36.8,	41.3,	47.7,	53.4,	57.8,	64.7,	70.1,	74.5,	N/A ,
3 hours	11.7,	16.6,	19.2,	23.1,	25.8,	27.9,	34.7,	42.5,	47.7,	54.9,	61.4,	66.4,	74.2,	80.2,	85.2,	N/A ,
4 hours	13.2,	18.6,	21.5,	25.8,	28.8,	31.1,	38.6,	47.1,	52.8,	60.7,	67.8,	73.3,	81.7,	88.3,	93.7,	N/A ,
6 hours	15.5,	21.8,	25.1,	30.1,	33.5,	36.2,	44.8,	54.5,	60.9,	69.9,	77.9,	84.1,	93.7,	101.1,	107.2,	N/A ,
9 hours	18.3,	25.6,	29.4,	35.2,	39.1,	42.1,	51.9,	63.0,	70.3,	80.5,	89.6,	96.6,	107.4,	115.7,	122.6,	N/A ,
12 hours	20.6,	28.6,	32.9,	39.3,	43.6,	46.9,	57.7,	69.9,	77.9,	89.0,	98.9,	106.6,	118.3,	127.4,	134.9,	N/A ,
18 hours	24.3,	33.6,	38.5,	45.9,	50.8,	54.6,	67.0,	80.8,	89.9,	102.6,	113.8,	122.4,	135.7,	145.9,	154.4,	N/A ,
24 hours	27.3,	37.6,	43.1,	51.2,	56.6,	60.8,	74.4,	89.6,	99.5,	113.4,	125.6,	135.1,	149.5,	160.7,	169.9,	201.9,
2 days	34.4,	46.2,	52.3,	61.3,	67.3,	71.9,	86.6,	102.8,	113.3,	127.8,	140.4,	150.1,	164.9,	176.2,	185.5,	217.5,
3 days	40.1,	53.1,	59.8,	69.5,	75.9,	80.9,	96.5,	113.6,	124.5,	139.6,	152.8,	162.8,	178.0,	189.6,	199.1,	231.6,
4 days	45.1,	59.1,	66.2,	76.6,	83.4,	88.6,	105.1,	122.9,	134.4,	150.0,	163.6,	173.9,	189.5,	201.4,	211.1,	244.3,
6 days	53.8,	69.5,	77.5,	88.9,	96.4,	102.1,	120.0,	139.2,	151.4,	168.0,	182.4,	193.2,	209.6,	222.0,	232.1,	266.5,
8 days	61.6,	78.8,	87.4,	99.7,	107.8,	113.8,	132.9,	153.3,	166.1,	183.6,	198.7,	210.0,	227.0,	239.9,	250.4,	285.9,
10 days	68.7,	87.2,	96.4,	109.5,	118.1,	124.5,	144.6,	166.0,	179.5,	197.7,	213.4,	225.1,	242.8,	256.1,	266.9,	303.5,
12 days	75.4,	95.0,	104.8,	118.6,	127.6,	134.4,	155.4,	177.7,	191.8,	210.7,	226.9,	239.1,	257.3,	271.0,	282.1,	319.6,
16 days	87.8,	109.4,	120.2,	135.3,	145.1,	152.4,	175.2,	199.1,	214.1,	234.3,	251.5,	264.3,	283.5,	298.0,	309.6,	348.9,
20 days	99.2,	122.8,	134.3,	150.6,	161.1,	168.9,	193.2,	218.6,	234.4,	255.6,	273.7,	287.2,	307.3,	322.3,	334.5,	375.2,
25 days	112.7,	138.3,	150.8,	168.4,	179.6,	188.0,	213.9,	240.9,	257.7,	280.2,	299.2,	313.3,	334.4,	350.2,	362.9,	405.3,

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

APPENDIX E

Hydrobrake Details

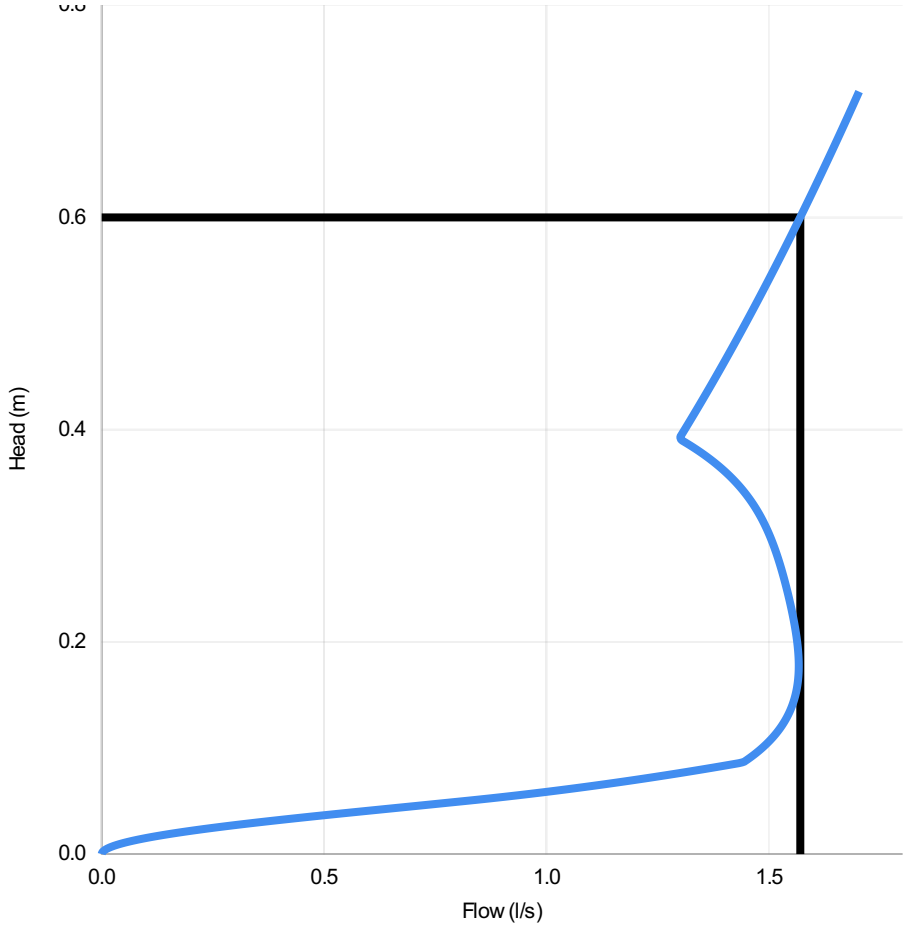
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	0.600	1.570
Flush-Flo	0.177	1.567
Kick-Flo®	0.391	1.297
Mean Flow		1.362

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4596

WRc APPROVED
PT/329/0412

hydro-int.com/patents



Head (m)	Flow (l/s)
0.000	0.000
0.021	0.179
0.041	0.611
0.062	1.064
0.083	1.391
0.103	1.493
0.124	1.533
0.145	1.556
0.166	1.565
0.186	1.566
0.207	1.561
0.228	1.552
0.248	1.541
0.269	1.527
0.290	1.511
0.310	1.490
0.331	1.462
0.352	1.422
0.372	1.367
0.393	1.300
0.414	1.330
0.434	1.359
0.455	1.387
0.476	1.415
0.497	1.442
0.517	1.469
0.538	1.495
0.559	1.520
0.579	1.545
0.600	1.570

DESIGN ADVICE

The head/flow characteristics of this SHE-0065-1570-0600-1570 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

! **The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.**

Hydro International®

DATE	17/05/2022 14:54
Site	Firhouse Inn
DESIGNER	Philip O'Regan
Ref	110-36

SHE-0065-1570-0600-1570

Hydro-Brake Optimum®

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	0.600	1.570
Flush-Flo™	0.177	1.567
Kick-Flo®	0.391	1.297
Mean Flow		1.362

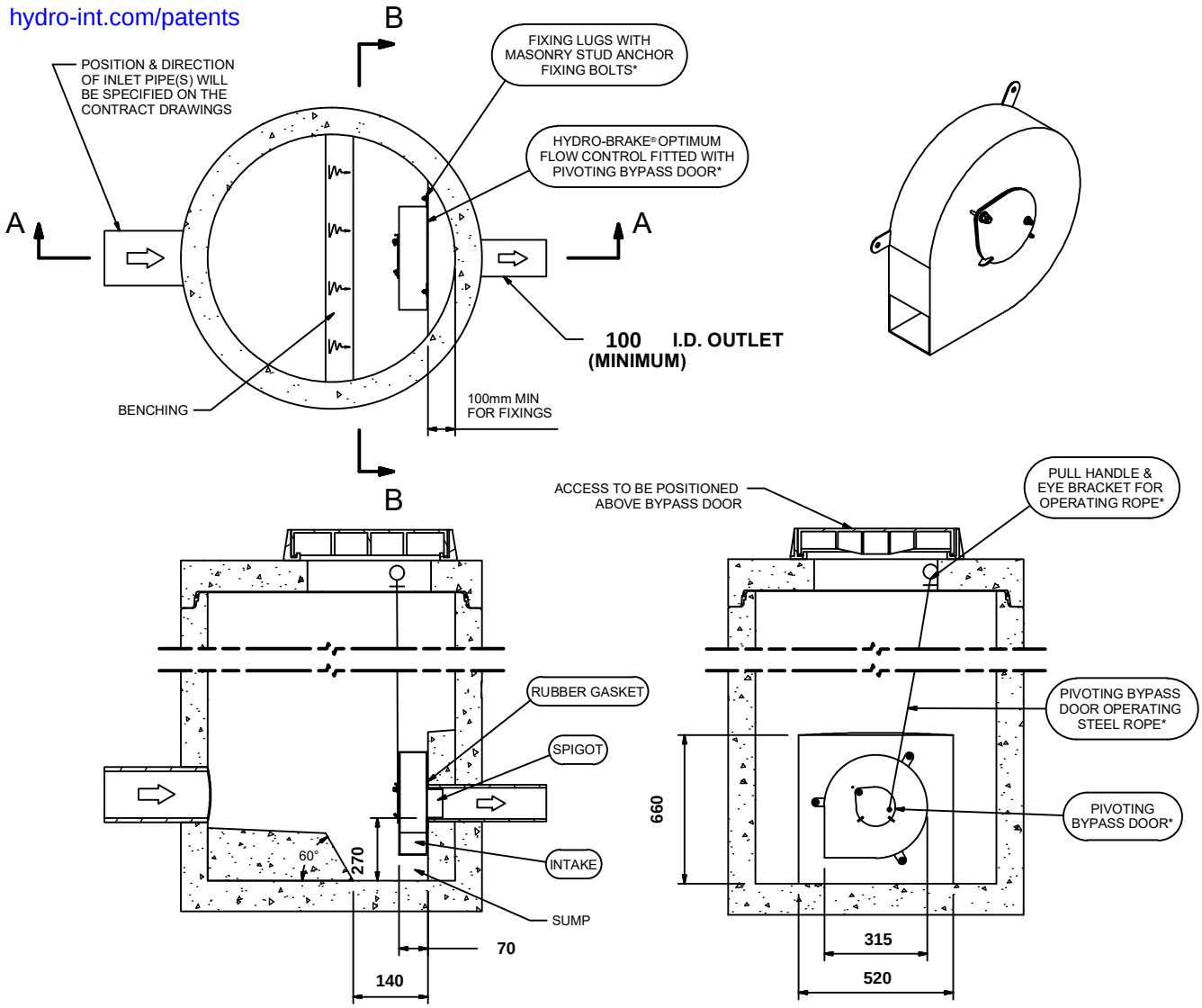
Hydro-Brake® Optimum Flow Control including:

- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet
- Indicative Weight: 46 kg

BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE 08/4596

WRc Approved PT/329/0412

hydro-int.com/patents



SECTION A-A

SECTION B-B

IMPORTANT: ⬭ LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
ALL CIVIL AND INSTALLATION WORK BY OTHERS
* WHERE SUPPLIED
HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE® OPTIMUM FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE

The head/flow characteristics of this SHE-0065-1570-0600-1570 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro International®

DATE	5/17/2022 2:54 PM
SITE	Firhouse Inn
DESIGNER	Philip O'Regan
REF	110-36

SHE-0065-1570-0600-1570
Hydro-Brake® Optimum

philip.oregan@phm.ie

APPENDIX F

Klargester Details

Bauder Blue Roof

SuDS Index

SEPARATORS

A RANGE OF FUEL/OIL SEPARATORS
FOR PEACE OF MIND

Kingspan

Klargester

60 YEARS OF
Expertise &
1955–2015 Innovation

Separators

A RANGE OF FUEL/OIL SEPARATORS FOR PEACE OF MIND

Surface water drains normally discharge to a watercourse or indirectly into underground waters (groundwater) via a soakaway. Contamination of surface water by oil, chemicals or suspended solids can cause these discharges to have a serious impact on the receiving water.

The Environment Regulators, Environment Agency, England and Wales, SEPA, Scottish Environmental Protection Agency in Scotland and Department of Environment & Heritage in Northern Ireland, have published guidance on surface water disposal, which offers a range of means of dealing with pollution both at source and at the point of discharge from site (so called 'end of pipe' treatment). These techniques are known as 'Sustainable Drainage Systems' (SuDS).

Where run-off is draining from relatively low risk areas such as car-parks and non-operational areas, a source control approach, such as permeable surfaces or infiltration trenches, may offer a suitable means of treatment, removing the need for a separator.

Oil separators are installed on surface water drainage systems to protect receiving waters from pollution by oil, which may be present due to minor leaks from vehicles and plant, from accidental spillage.

Effluent from industrial processes and vehicle washing should normally be discharged to the foul sewer (subject to the approval of the sewerage undertaker) for further treatment at a municipal treatment works.

SEPARATOR STANDARDS AND TYPES

A British (and European) standard (EN 858-1 and 858-2) for the design and use of prefabricated oil separators has been adopted. New prefabricated separators should comply with the standard.

SEPARATOR CLASSES

The standard refers to two 'classes' of separator, based on performance under standard test conditions.

CLASS I

Designed to achieve a concentration of less than 5mg/l of oil under standard test conditions, should be used when the separator is required to remove very small oil droplets.

CLASS II

Designed to achieve a concentration of less than 100mg/l oil under standard test conditions and are suitable for dealing with discharges where a lower quality requirement applies (for example where the effluent passes to foul sewer).

Both classes can be produced as full retention separators. The oil concentration limits of 5 mg/l and 100 mg/l are only applicable under standard test conditions. It should not be expected that separators will comply with these limits when operating under field conditions.

FULL RETENTION SEPARATORS

Full retention separators treat the full flow that can be delivered by the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 65mm/hr.

On large sites, some short term flooding may be an acceptable means of limiting the flow rate and hence the size of full retention systems.

BYPASS SEPARATORS

Bypass separators fully treat all flows generated by rainfall rates of up to 6.5mm/hr. This covers over 99% of all rainfall events. Flows above this rate are allowed to bypass the separator. These separators are used when it is considered an acceptable risk not to provide full treatment for high flows, for example where the risk of a large spillage and heavy rainfall occurring at the same time is small.

FORECOURT SEPARATORS

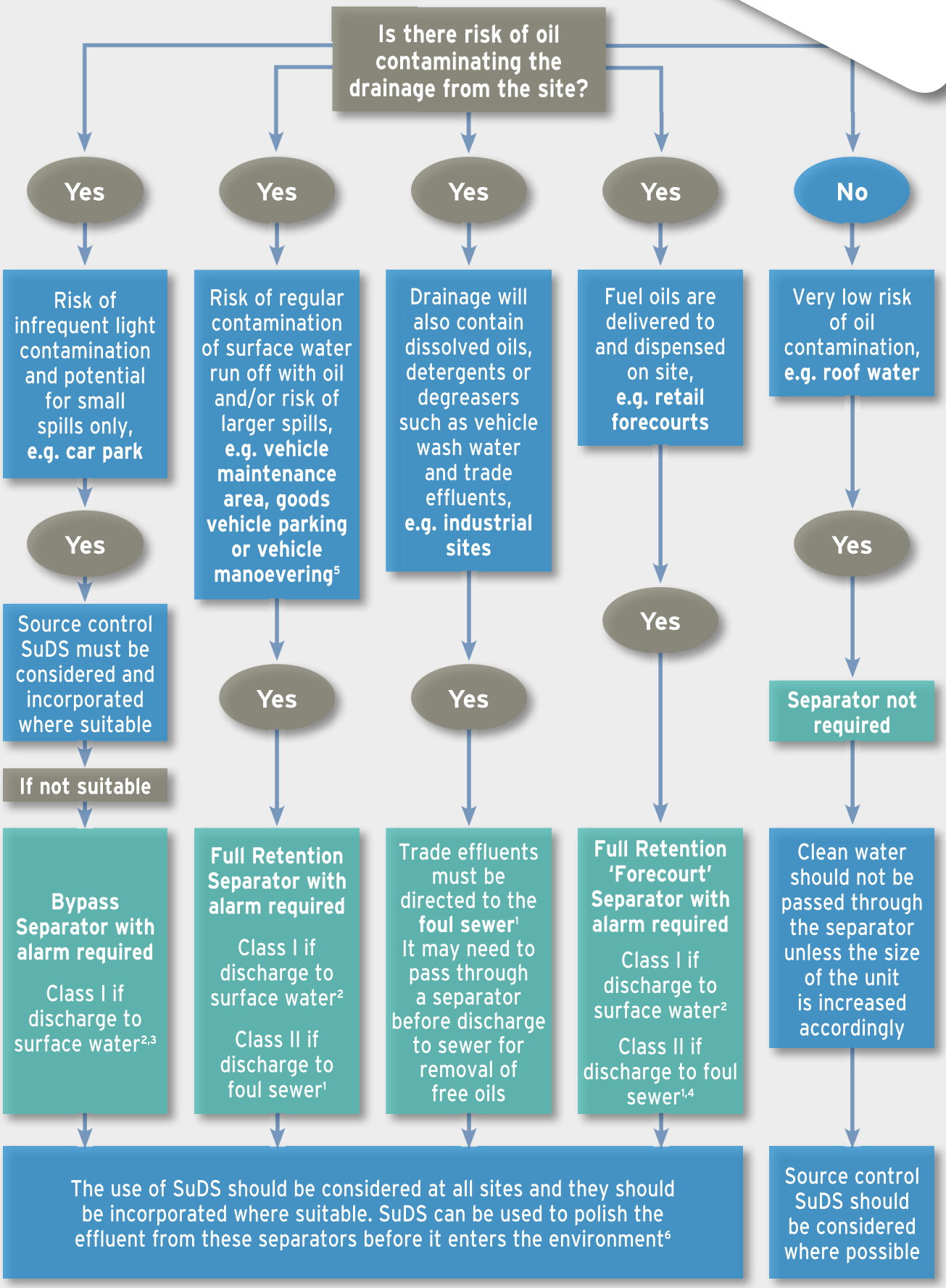
Forecourt separators are full retention separators specified to retain on site the maximum spillage likely to occur on a petrol filling station. They are required for both safety and environmental reasons and will treat spillages occurring during vehicle refuelling and road tanker delivery. The size of the separator is increased in order to retain the possible loss of the contents of one compartment of a road tanker, which may be up to 7,600 litres.

SELECTING THE RIGHT SEPARATOR

The chart on the following page gives guidance to aid selection of the appropriate type of fuel/oil separator for use in surface water drainage systems which discharge into rivers and soakaways.

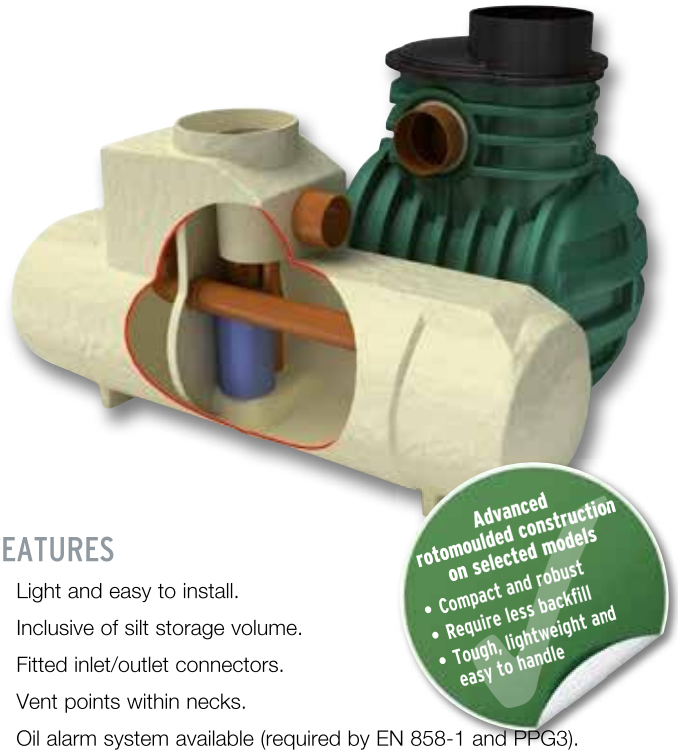
For further detailed information, please consult the Environment Agency Pollution Prevention Guideline 03 (PPG 3) 'Use and design of oil separators in surface water drainage systems' available from their website.

Kingspan Klargester has a specialist team who provide technical assistance in selecting the appropriate separator for your application.



1 You must seek prior permission from your local sewer provider before you decide which separator to install and before you make any discharge.
2 You must seek prior permission from the relevant environmental body before you decide which separator to install.
3 In this case, if it is considered that there is a low risk of pollution a source control SuDS scheme may be appropriate.
4 In certain circumstances, the sewer provider may require a Class 1 separator for discharges to sewer to prevent explosive atmospheres from being generated.
5 Drainage from higher risk areas such as vehicle maintenance yards and goods vehicle parking areas should be connected to foul sewer in preference to surface water.
6 In certain circumstances, a separator may be one of the devices used in the SuDS scheme. Ask us for advice.

Bypass NSB RANGE



APPLICATION

Bypass separators are used when it is considered an acceptable risk not to provide full treatment, for very high flows, and are used, for example, where the risk of a large spillage and heavy rainfall occurring at the same time is small, e.g.

- Surface car parks.
- Roadways.
- Lightly contaminated commercial areas.

PERFORMANCE

Klargester were one of the first UK manufacturers to have separators tested to EN 858-1. Klargester have now added the NSB bypass range to their portfolio of certified and tested models. The NSB number denotes the maximum flow at which the separator treats liquids. The British Standards Institute (BSI) tested the required range of Kingspan Klargester Bypass separators and certified their performance in relation to their flow and process performance assessing the effluent qualities to the requirements of EN 858-1. Klargester bypass separator designs follow the parameters determined during the testing of the required range of bypass separators.

Each bypass separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Oil storage volume.
- Silt storage capacity.
- Coalescer.

The unit is designed to treat 10% of peak flow. The calculated drainage areas served by each separator are indicated according to the formula given by PPG3 NSB = 0.0018A(m2). Flows generated by higher rainfall rates will pass through part of the separator and bypass the main separation chamber.

Class I separators are designed to achieve a concentration of 5mg/litre of oil under standard test conditions.

FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Oil alarm system available (required by EN 858-1 and PPG3).
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size bypass separator, the following information is needed:-

- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the flow is not pumped.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

UNIT NOMINAL SIZE	FLOW (l/s)	PEAK FLOW RATE (l/s)	DRAINAGE AREA (m²)	STORAGE CAPACITY (litres) SILT	OIL	UNIT LENGTH (mm)	UNIT DIA. (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	STANDARD FALL ACROSS (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA.
NSBP003	3	30	1670	300	45	1700	1350	600	1420	1320	100	500	160
NSBP004	4.5	45	2500	450	60	1700	1350	600	1420	1320	100	500	160
NSBP006	6	60	3335	600	90	1700	1350	600	1420	1320	100	500	160
NSBE010	10	100	5560	1000	150	2069	1220	750	1450	1350	100	700	315
NSBE015	15	150	8335	1500	225	2947	1220	750	1450	1350	100	700	315
NSBE020	20	200	11111	2000	300	3893	1220	750	1450	1350	100	700	375
NSBE025	25	250	13890	2500	375	3575	1420	750	1680	1580	100	700	375
NSBE030	30	300	16670	3000	450	4265	1420	750	1680	1580	100	700	450
NSBE040	40	400	22222	4000	600	3230	1920	600	2185	2035	150	1000	500
NSBE050	50	500	27778	5000	750	3960	1920	600	2185	2035	150	1000	600
NSBE075	75	750	41667	7500	1125	5841	1920	600	2235	2035	200	950	675
NSBE100	100	1000	55556	10000	1500	7661	1920	600	2235	2035	200	950	750
NSBE125	125	1250	69444	12500	1875	9548	1920	600	2235	2035	200	950	750

Rotomoulded chamber construction GRP chamber construction * Some units have more than one access shaft – diameter of largest shown.

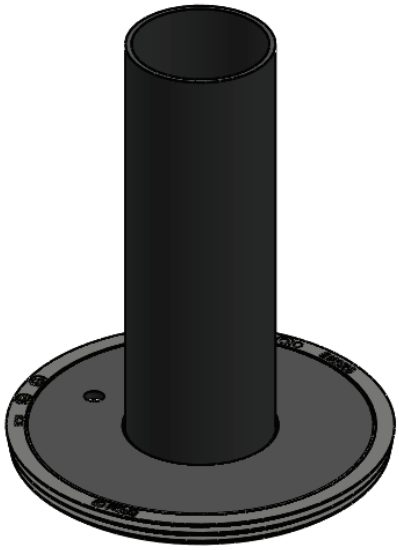
Revision: 20/06/2019 V2

PRODUCT DATA SHEET

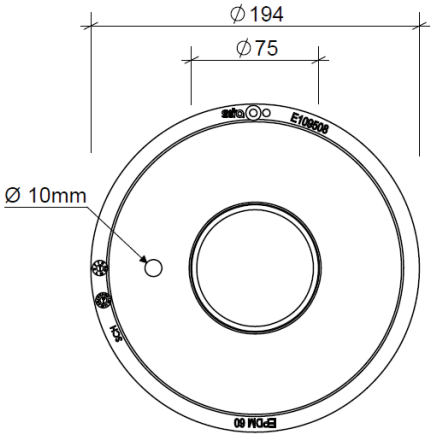
Bauder Bitumen Blue Roof Flow Restrictor

The Bauder Bitumen Blue Roof Flow Restrictor is designed to be used in conjunction with a standard Bauder Bitumen Blue Roof Vertical Outlet DN70. The Bauder Blue Roof Bitumen Flow Restrictor is comprised of four parts; Baseplate, overflow pipe, Baseplate inner and Baseplate outer seal. The polyamide Baseplate fits within the 70mm vertical outlet, with the EPDM outer seal creating a watertight fit. The HDPE Overflow slots into the central hole of the Baseplate with an inner EPDM seal preventing any leaks.

Baseplate has a number (1-12) of 10mm restrictive flow holes bespoke to the project.

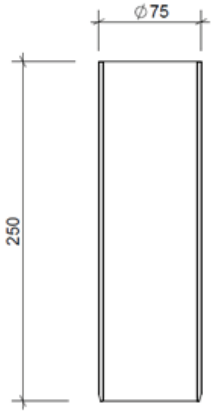


Baseplate



PRODUCT INFORMATION AND TECHNICAL PERFORMANCE		
Characteristic	**Unit**	**Baseplate**
Material		Polyamide
Height	mm	30
Diameter	mm	176 (excluding outer seal)
Overflow Aperture	mm	85
Supply Form		As part of a 4-part set
Note: this product requires additional products to complete the system		

Overflow Pipe



PRODUCT INFORMATION AND TECHNICAL PERFORMANCE		
Characteristic	**Unit**	**Overflow Pipe**
Material		HDPE
Height	mm	250 max (cut down to H-Max)
Diameter	mm	75
Supply Form		As part of a 4-part set
Note: this product requires additional products to complete the system		

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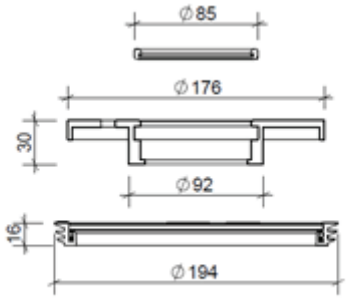
Baseplate Inner Seal and Baseplate Outer Seal

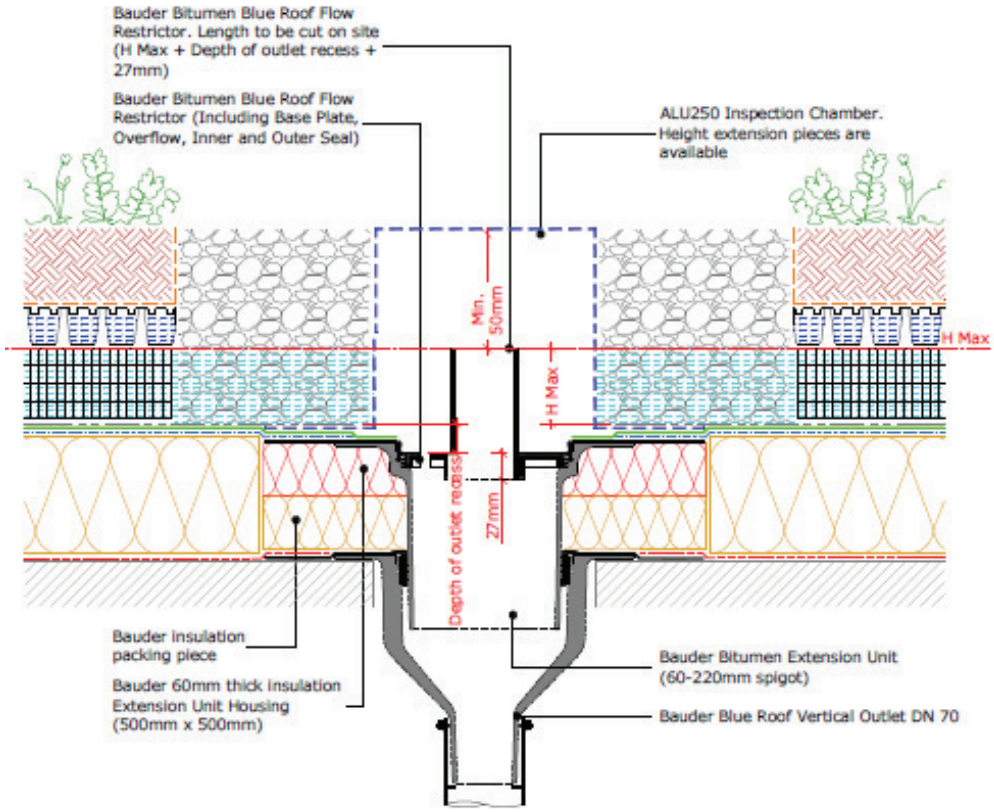


PRODUCT INFORMATION AND TECHNICAL PERFORMANCE		
Characteristic	**Unit**	**Inner & Outer Seal**
Material		EPDM
Diameter	mm	85 (inner seal) 194 (outer seal)
Supply Form		As part of a 4-part set
Note: this product requires additional products to complete the system		

MAIN CHARACTERISTICS

- Robust, low maintenance design
- Overflow pipe is a bespoke length to individual project
- UV/IR radiation resistant
- Number of 10mm restrictive flow holes is unique to the project and designated discharge for that particular roof/site.
- Follows the NFRC (National Federation of Roofing Contractors) Technical Guidance Notes for the Construction and Design of Blue Roofs.

SECTION DETAIL



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bauder.ie

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BLUE ROOF SURFACE FINISHES

Blue Roofs should have a surface finish above the water attenuation layers, this surface finish can be constructed from any suitable permeable surface, to provide visual masking, protection of the system, filtration of airborne debris to prevent blockages and ballasting preventing wind uplift and flotation of the components. An impermeable surface can be used but adequate measures should be taken to ensure the water can filter into the Blue Roof attenuation void.

BLUE ROOF DESIGN GUIDANCE

- A Blue Roof should not be considered as a water storage solution.
- No British or European standard covers this type of application at the present time.
- The Blue Roof must be designed to attenuate the predicted rainfall volume required to prevent ponding or flooding on the roof surface. The surfacing should drain by direct permeability or drainage channels linking into the Blue Roof system.
- Emergency drainage must be provided within the primary outlet or by a secondary method of drainage to facilitate the removal of excess rainfall if the designed capacity is exceeded, this should be placed at the top of the water attenuation layer.
- The Blue Roof, void forming components, thermal insulation and waterproofing must have the correct structural capacity to resist the permanent (dead) load of the required finishes and any temporary (live) loading produced by maintenance/emergency vehicles or other elements. The components should be designed to accommodate the full capacity of the predicted storm water for a 24-hour period.
- All components must have chemical resistance to all potential hazardous material e.g. Fertilisers, petrochemicals and water bound pollutants carried in by rainfall typically from 4-9PH.
- An electronic or suitable integrity test should take place, by an independent and competent person, on the completed waterproofing prior to the installation of any Blue Roof void forming or landscaping components. The satisfactory waterproofing integrity certification must be retained.

BLUE ROOF MAINTENANCE GUIDANCE

When maintaining a blue roof, the following considerations should apply: -

Regularly clear all debris from the roof surface, rainwater outlets, chutes, gutters etc. Debris must be removed from the roof and not simply flushed down rainwater pipes.

Annually inspect the waterproofing system visible at all upstands, to ensure it is firmly adhered to the detail that it is waterproofing.

Cut back tree limbs that overhang the roof to give a 1 metre clearance outside the roof edge. This will significantly reduce blockage of drainage ways due to fallen leaves.

Ensure that all rainwater pipes are free from blockages and that water flows freely through them.

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SIMPLE INDEX APPROACH: TOOL

1. The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).

2. The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.

3. The process that is automated in this tool is described in the SuDS Manual, Chapter 26 (Section 26.7)

3. Relevant design examples are included in the SuDS Manual Appendix C.

4. Each of the steps below are part of the process set out in the flowchart on Sheet 3.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

6. Interception should be delivered for all upstream impermeable areas as part of the strategy for water quantity and quality control for the site. This is required in order to deliver both of the water quality criteria set out in Chapter 4 of the SuDS Manual

DROP DOWN LIST RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP

USER ENTRY USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index

- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down lists.

	Runoff Area Land Use Description	*Pollution Hazard*	*Pollution Hazard Indices* Total Suspended Solids	Metals	Hydrocarbons	*DESIGN CONDITIONS* 1	2
Select land use type from the drop down list (or 'Other' if none applicable): →	Low traffic roads (e.g. residential roads and general access roads, < 300 traffic movements/day)	Low	0.5	0.4	0.4		
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:							
	Landuse Pollution Hazard Index	**Low**	**0.5**	**0.4**	**0.4**		

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the rows below the drop down lists

SuDS Component Description	*Pollution Mitigation Indices* Total Suspended Solids	Metals	Hydrocarbons	*DESIGN CONDITIONS* 1	2	3

Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: →	Pervious pavement (where the pavement is not designed as an infiltration component)	0.7	0.6	0.7	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: →	Bioretention system (where the system is not designed as an infiltration component)	0.8	0.8	0.8	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: →	None	0	0	0	
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:	PI	0.99	0.99	0.99	
	Aggregated Surface Water Pollution Mitigation Index	**>0.95**	**>0.95**	**>0.95**	

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes ? Go to Step 2B
No ? Go to Step 2C

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

		Pollution Mitigation Indices			*DESIGN CONDITIONS*			
		Total Suspended Solids	**Metals**	**Hydrocarbons**	1	2	3	4
Select type of groundwater protection from the drop down list: →	Bioretention component underlain by 300 mm minimum depth of soils with good contamination attenuation potential	0.8	0.8	0.8	All designs must include a minimum of 1 m unsaturated depth of subsoil or aquifer material between the infiltration surface and the maximum likely groundwater level. Infiltration components should always be preceded by upstream component(s) that trap(s) silt, or designed specifically to retain sediment in a separate lined zone, easily accessible for maintenance, such that the sediment will not be re-suspended in subsequent events	The underlying soils must provide good contaminant attenuation potential (eg as recommended in Sniffer 2008 (a) and (b) / Scott Wilson (2010) or other appropriate guidance). Alternative depth and soil combinations must provide equivalent protection to the underlying groundwater		
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:								
	Groundwater Protection Pollution Mitigation Index	**0.8**	**0.8**	**0.8**				

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices		
	Total Suspended Solids	**Metals**	**Hydrocarbons**
Combined Pollution Mitigation Indices for the Runoff Area	**>0.95**	**>0.95**	**>0.95**

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site by site basis.

DESIGN CONDITIONS

	Sufficiency of Pollution Mitigation Indices		
	Total Suspended Solids	**Metals**	**Hydrocarbons**
	Sufficient	**Sufficient**	**Sufficient**

Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), Interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.

1

Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see *Chapter 7 The SuDS design process*). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England

APPENDIX G

Irish Water Correspondence

CoF

SoDA

Diversion Agreement

Philip O'Regan

PHM Consulting
11 Mallow Street
Co. Limerick
V94WRN4

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

28 January 2021

Re: CDS20006237 pre-connection enquiry - Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 120 unit(s) at Firhouse Road, Tallaght, Co. Dublin

Dear Sir/Madam,

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

SERVICE	**OUTCOME OF PRE-CONNECTION ENQUIRY** **THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.**
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible without infrastructure upgrade by Irish Water
SITE SPECIFIC COMMENTS	
Water Connection	Please note that according to our records there is an existing water main & sewer running through this site (see drawing attached). It will not be permitted to build over any Irish Water infrastructure. The layout of the development must ensure that this pipe is protected and adequate separation distances are provided between Irish Water infrastructure and any structures on site. Alternatively you may enter into a diversion agreement with Irish Water and divert the pipe to accommodate your development. If you wish to proceed with this option please contact Irish Water at Diversions@water.ie and submit detailed design drawings before submitting your planning application. It will be necessary to provide a wayleave over this pipe to the benefit of Irish Water and ensure that it is accessible for maintenance.

Wastewater Connection	Connection is feasible to the 225 mm sewer within the site.
Strategic Housing Development	Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. 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.
The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.	

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

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

Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available

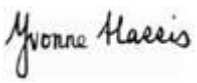
information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

General Notes:

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

If you have any further questions, please contact Marko Komso from the design team on 022 54611 or email mkomso@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations

Philip O'Regan
PHM Consulting
11 Mallow Street
V94WRN4
Limerick
Ireland

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

13 May 2022

Re: Design Submission for Firhouse Road, Tallaght, Co. Dublin (the "Development") (the "Design Submission") / Connection Reference No: CDS20006237

Dear Philip O'Regan,

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: Antonio Garzón
Phone: 0838983711
Email: Antonio.garzon@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

- 110-36-121 D2
- 110-36-140 D2-A
- 110-36-130 D2 (Foul Longitudinal Section)

Additional Comments
The design submission will be subject to further technical review at connection application stage

While Irish Water notes that the wastewater services infrastructure will remain private and not be vested, we have the following comments: It is recommended that the foul sewer should have 3 m clearance from the proposed building.

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.

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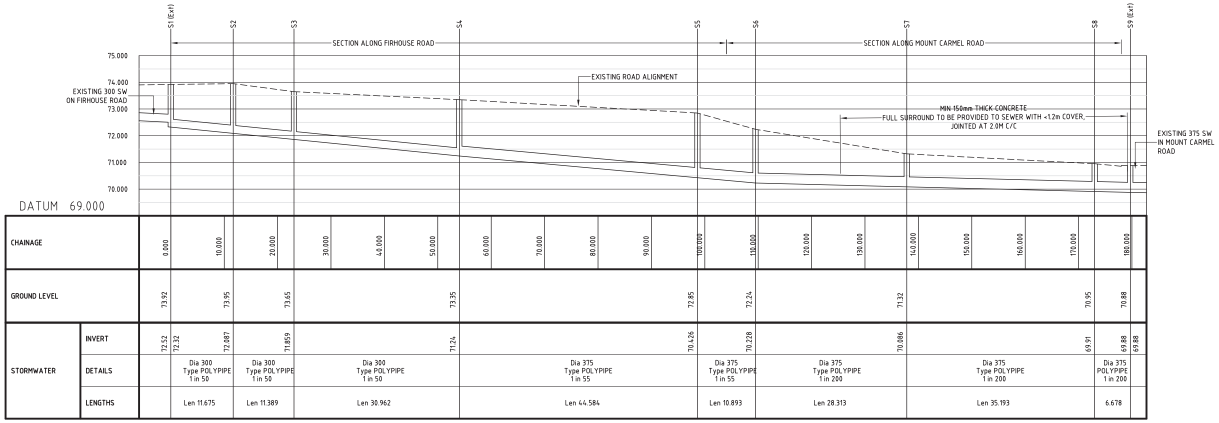
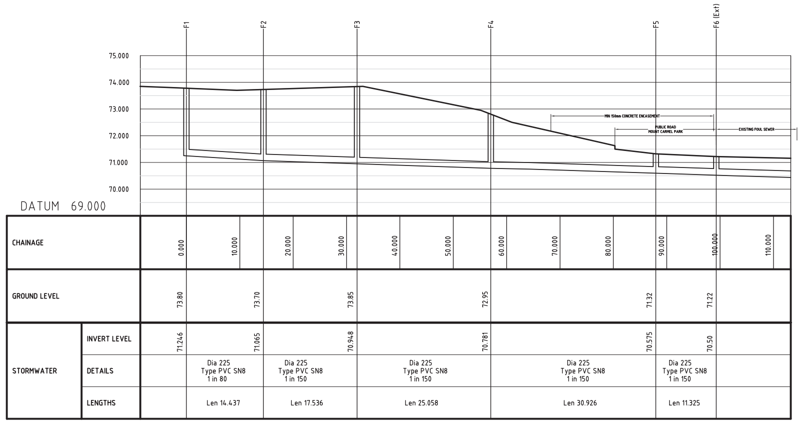
NOTES:



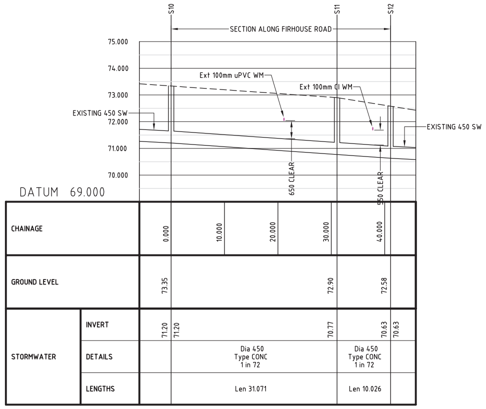
SECTION ALONG FIRHOUSE ROAD
SECTION ALONG MOUNT CARMEL ROAD
EXISTING ROAD ALIGNMENT
EXISTING 300 SW ON FIRHOUSE ROAD
MIN 150mm THICK CONCRETE FULL SURROUND TO BE PROVIDED TO SEWER WITH <1.2m COVER, JOINTED AT 2.0M C/C
EXISTING 375 SW IN MOUNT CARMEL ROAD
DATUM 69.000
CHAINAGE
GROUND LEVEL
STORMWATER
INVERT
DETAILS
LENGTHS
Dia 300 Type POLYPIPE 1 in 50 — Len 11.675
Dia 300 Type POLYPIPE 1 in 50 — Len 11.389
Dia 300 Type POLYPIPE 1 in 50 — Len 30.962
Dia 375 Type POLYPIPE 1 in 55 — Len 44.584
Dia 375 Type POLYPIPE 1 in 55 — Len 10.893
Dia 375 Type POLYPIPE 1 in 200 — Len 28.313
Dia 375 Type POLYPIPE 1 in 200 — Len 35.193
Dia 375 POLYPIPE 1 in 200 — 6.678

STORM SEWER SECTION - 300mm DIVERSION
SCALE : H=1:500, V=1:100

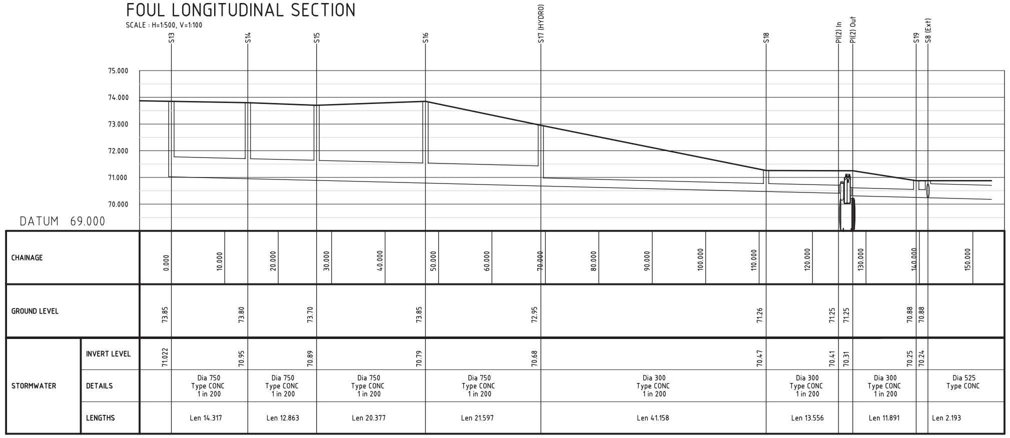


DATUM 69.000
CHAINAGE
GROUND LEVEL
STORMWATER
INVERT LEVEL
DETAILS
LENGTHS
Dia 225 Type PVC SN8 1 in 80 — Len 14.437
Dia 225 Type PVC SN8 1 in 150 — Len 17.536
Dia 225 Type PVC SN8 1 in 150 — Len 25.058
Dia 225 Type PVC SN8 1 in 150 — Len 30.926
Dia 225 Type PVC SN8 1 in 150 — Len 11.325

FOUL LONGITUDINAL SECTION
SCALE : H=1:500, V=1:100

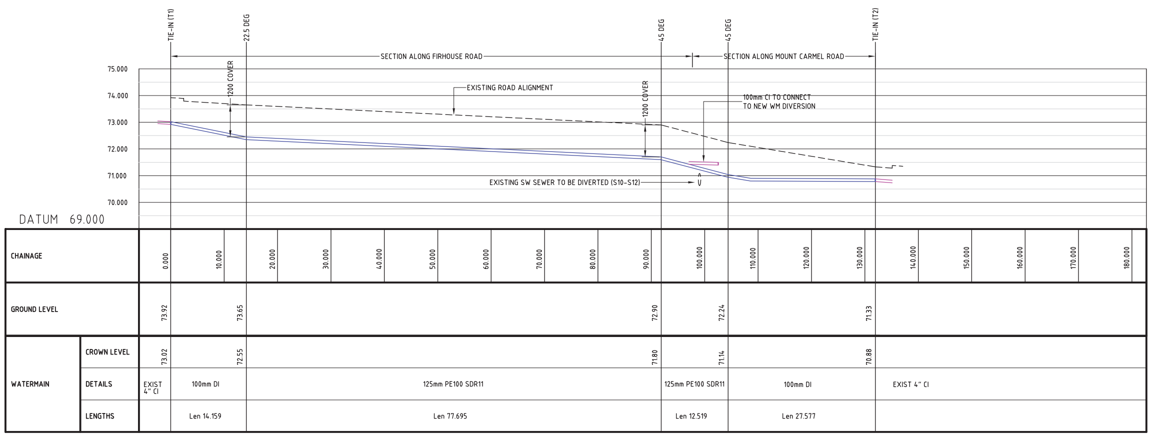


STORM SEWER SECTION - 450 DIVERSION
SCALE : H=1:500, V=1:100



S17 (HYDRO)
P(2) In
P(2) Out
S8 (Ext)
DATUM 69.000
CHAINAGE
GROUND LEVEL
STORMWATER
INVERT LEVEL
DETAILS
LENGTHS
Dia 750 Type CONC 1 in 200 — Len 14.317
Dia 750 Type CONC 1 in 200 — Len 12.863
Dia 750 Type CONC 1 in 200 — Len 20.377
Dia 750 Type CONC 1 in 200 — Len 21.597
Dia 300 Type CONC 1 in 200 — Len 41.158
Dia 300 Type CONC 1 in 200 — Len 13.556
Dia 300 Type CONC 1 in 200 — Len 11.891
Dia 525 Type CONC — Len 2.193

STORM LONGITUDINAL SECTION
SCALE : H=1:500, V=1:100



TIE-IN (T1)
22.5 DEG
45 DEG
45 DEG
TIE-IN (T2)
SECTION ALONG FIRHOUSE ROAD
SECTION ALONG MOUNT CARMEL ROAD
EXISTING ROAD ALIGNMENT
1200 COVER
100mm CI TO CONNECT TO NEW WM DIVERSION
EXISTING SW SEWER TO BE DIVERTED (S10-S12)
DATUM 69.000
CHAINAGE
GROUND LEVEL
WATERMAIN
CROWN LEVEL
DETAILS
LENGTHS
EXIST 4" CI
100mm DI — Len 14.159
125mm PE100 SDR11 — Len 77.695
125mm PE100 SDR11 — Len 12.519
100mm DI — Len 27.577
EXIST 4" CI

WATERMAIN SECTION - 100 DIVERSION
SCALE : H=1:500, V=1:100

NOT TO BE USED FOR CONSTRUCTION

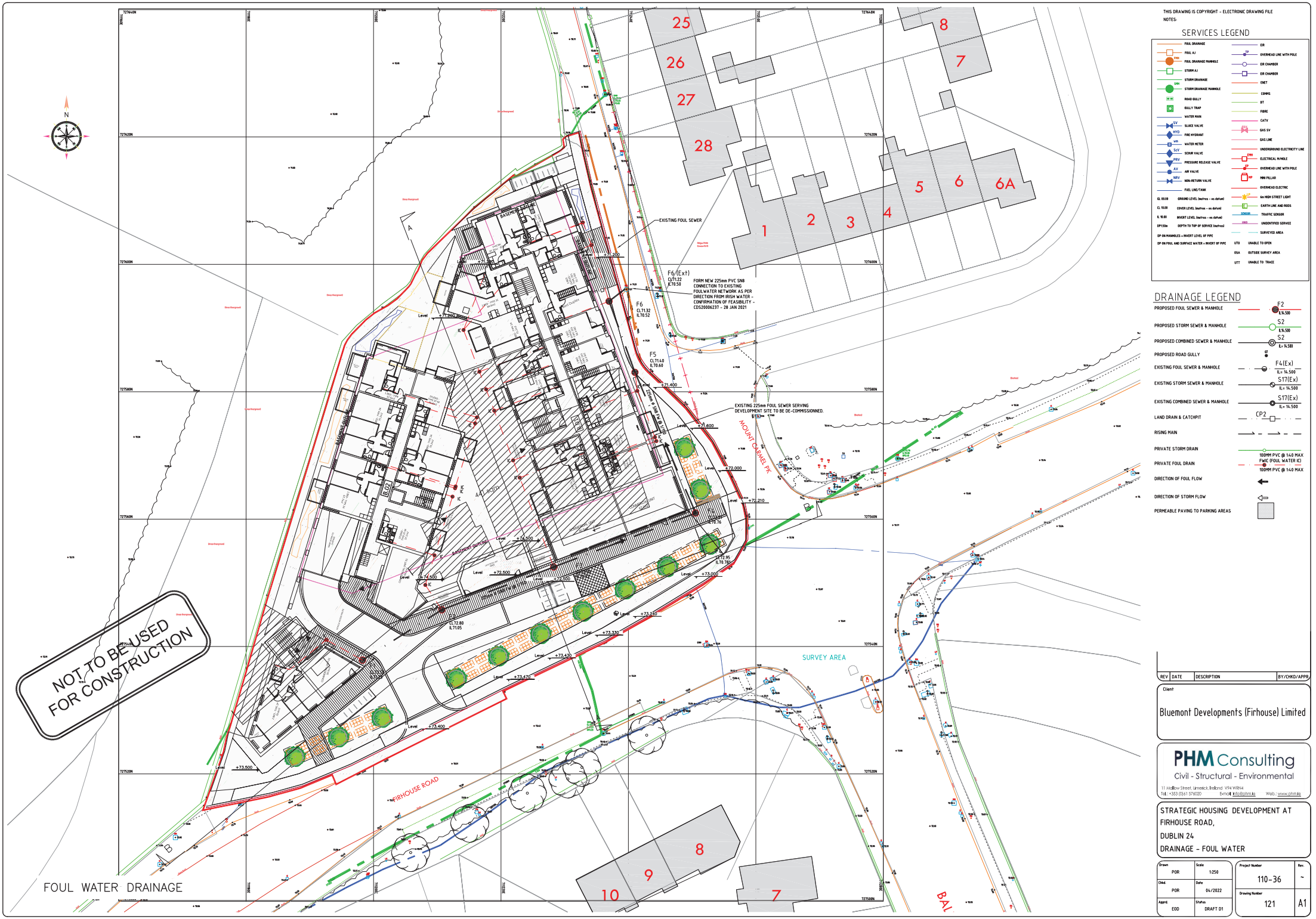
REV	DATE	DESCRIPTION	BY/CHKD/APPR

Client
Bluemont Developments (Firhouse) Limited

PHM Consulting
Civil - Structural - Environmental
11 Mallow Street, Limerick, Ireland V94 WRN4
Tel.: +353 (0)61 576020 E-mail: info@phm.ie Web.: www.phm.ie

STRATEGIC HOUSING DEVELOPMENT AT
FIRHOUSE ROAD,
DUBLIN 24
DRAINAGE - LONGITUDINAL SECTIONS

Drawn	Scale	Project Number	Rev.
POR	AS SHOWN	110-36	~
Chkd. POR	Date 04/2022	Drawing Number 130	A1
Appd. EOD	Status PLANNING D2		



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NOTES:

SERVICES LEGEND

FOUL DRAINAGE
FOUL AJ
FOUL DRAINAGE MANHOLE
STORM AJ
STORM DRAINAGE
STORM DRAINAGE MANHOLE
ROAD GULLY
GULLY TRAP
WATER MAIN
SLUICE VALVE
FIRE HYDRANT
WATER METER
SCOUR VALVE
PRESSURE RELEASE VALVE
AIR VALVE
NON-RETURN VALVE
FUEL LINE/TANK
GL 69.00 GROUND LEVEL (metres - os datum)
CL 70.00 COVER LEVEL (metres - os datum)
IL 70.00 INVERT LEVEL (metres - os datum)
DP1.50m DEPTH TO TOP OF SERVICE (metres)
DP ON MANHOLES = INVERT LEVEL OF PIPE
DP ON FOUL AND SURFACE WATER = INVERT OF PIPE

EIR
OVERHEAD LINE WITH POLE
EIR CHAMBER
EIR CHAMBER
ENET
COMMS
BT
FIBRE
CATV
GAS SV
GAS LINE
UNDERGROUND ELECTRICITY LINE
ELECTRICAL MANOLE
OVERHEAD LINE WITH POLE
MINI PILLAR
OVERHEAD ELECTRIC
6m HIGH STREET LIGHT
EARTH LINE AND RODS
TRAFFIC SENSOR
UNIDENTIFIED SERVICE
SURVEYED AREA
UTO UNABLE TO OPEN
OSA OUTSIDE SURVEY AREA
UTT UNABLE TO TRACE

DRAINAGE LEGEND

PROPOSED FOUL SEWER & MANHOLE — F2 IL 14.500
PROPOSED STORM SEWER & MANHOLE — S2 IL 14.500
PROPOSED COMBINED SEWER & MANHOLE — S2 IL= 14.500
PROPOSED ROAD GULLY — GT
EXISTING FOUL SEWER & MANHOLE — F4(Ex) IL= 14.500
EXISTING STORM SEWER & MANHOLE — S17(Ex) IL= 14.500
EXISTING COMBINED SEWER & MANHOLE — S17(Ex) IL= 14.500
LAND DRAIN & CATCHPIT — CP2
RISING MAIN
PRIVATE STORM DRAIN — 100MM PVC @ 1:40 MAX
PRIVATE FOUL DRAIN — FWC (FOUL WATER IC) 100MM PVC @ 1:40 MAX
DIRECTION OF FOUL FLOW
DIRECTION OF STORM FLOW
PERMEABLE PAVING TO PARKING AREAS

REV	DATE	DESCRIPTION	BY/CHKD/APPR

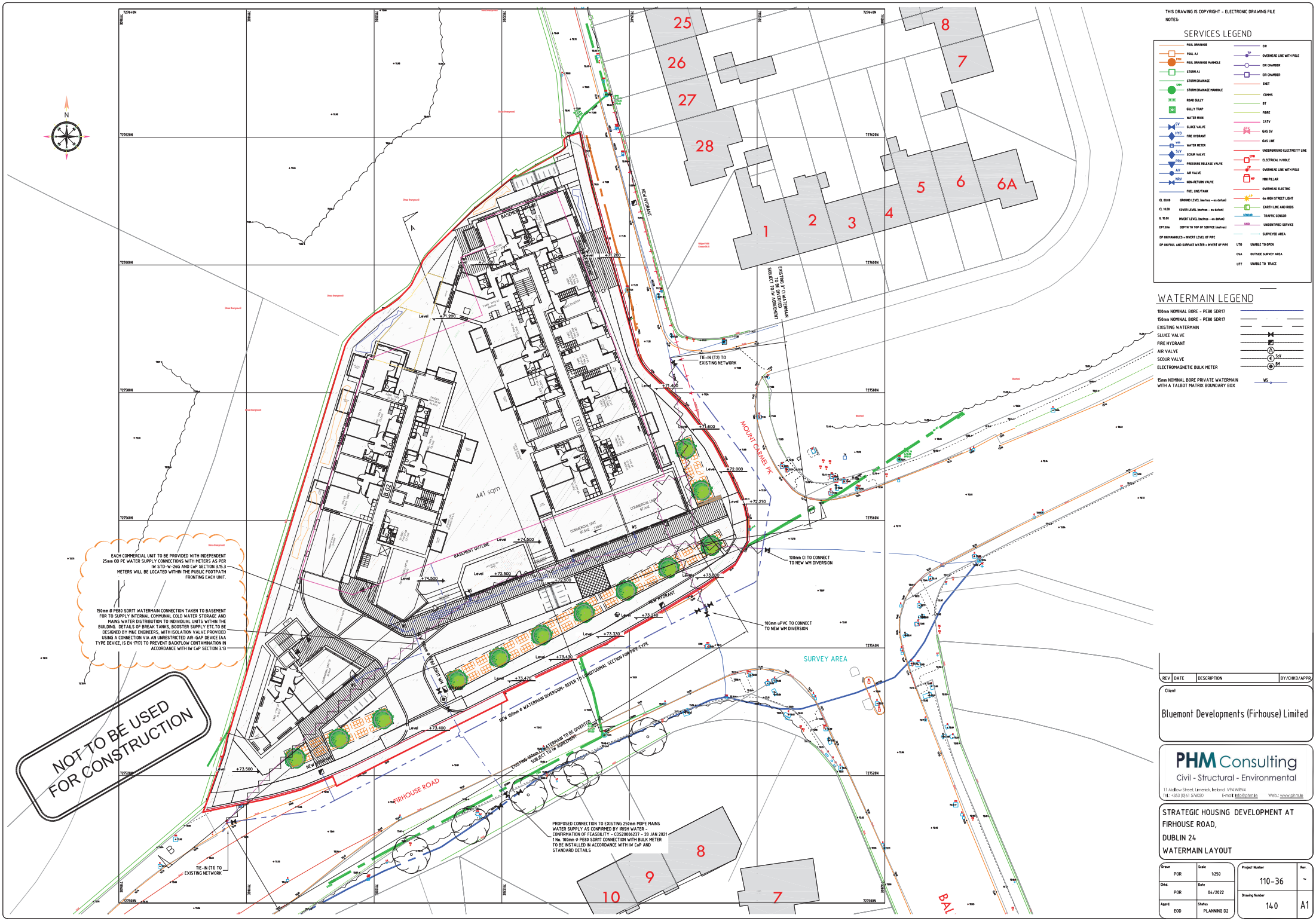
Client

Bluemont Developments (Firhouse) Limited

PHM Consulting
Civil - Structural - Environmental
11 Mallow Street, Limerick, Ireland V94 WRN4
Tel: +353 (0)61 576020 Email: info@phm.ie Web: www.phm.ie

STRATEGIC HOUSING DEVELOPMENT AT FIRHOUSE ROAD,
DUBLIN 24
DRAINAGE - FOUL WATER

Drawn: POR	Scale: 1:250	Project Number: 110-36	Rev.: -
Chkd: POR	Date: 04/2022	Drawing Number: 121	A1
Apprd: EOD	Status: DRAFT D1		


THIS DRAWING IS COPYRIGHT - ELECTRONIC DRAWING FILE
NOTES:
SERVICES LEGEND
FOUL DRAINAGE
FOUL AJ
FOUL DRAINAGE MANHOLE
STORM AJ
STORM DRAINAGE
STORM DRAINAGE MANHOLE
ROAD GULLY
GULLY TRAP
WATER MAIN
SLUICE VALVE
FIRE HYDRANT
WATER METER
SCOUR VALVE
PRESSURE RELEASE VALVE
AIR VALVE
NON-RETURN VALVE
FUEL LINE/TANK
GROUND LEVEL (metres - os datum)
COVER LEVEL (metres - os datum)
INVERT LEVEL (metres - os datum)
DEPTH TO TOP OF SERVICE (metres)
OP ON MANHOLES = INVERT LEVEL OF PIPE
OP ON FOUL AND SURFACE WATER = INVERT OF PIPE
EIR
OVERHEAD LINE WITH POLE
EIR CHAMBER
ENET
COMMS
BT
FIBRE
CATV
GAS SV
GAS LINE
UNDERGROUND ELECTRICITY LINE
ELECTRICAL MANHOLE
MINI PILLAR
OVERHEAD ELECTRIC
6m HIGH STREET LIGHT
EARTH LINE AND RODS
TRAFFIC SENSOR
UNIDENTIFIED SERVICE
SURVEYED AREA
UTO UNABLE TO OPEN
OSA OUTSIDE SURVEY AREA
UTT UNABLE TO TRACE
WATERMAIN LEGEND
100mm NOMINAL BORE - PE80 SDR17
150mm NOMINAL BORE - PE80 SDR17
EXISTING WATERMAIN
SLUICE VALVE
FIRE HYDRANT
AIR VALVE
SCOUR VALVE
ELECTROMAGNETIC BULK METER
15mm NOMINAL BORE PRIVATE WATERMAIN WITH A TALBOT MATRIX BOUNDARY BOX
EACH COMMERCIAL UNIT TO BE PROVIDED WITH INDEPENDENT 25mm OD PE WATER SUPPLY CONNECTIONS WITH METERS AS PER IW STD-W-26G AND CoP SECTION 3.15.3 METERS WILL BE LOCATED WITHIN THE PUBLIC FOOTPATH FRONTING EACH UNIT.
150mm Ø PE80 SDR17 WATERMAIN CONNECTION TAKEN TO BASEMENT FOR TO SUPPLY INTERNAL COMMUNAL COLD WATER STORAGE AND MAINS WATER DISTRIBUTION TO INDIVIDUAL UNITS WITHIN THE BUILDING. DETAILS OF BREAK TANKS, BOOSTER SUPPLY ETC.TO BE DESIGNED BY M&E ENGINEERS, WITH ISOLATION VALVE PROVIDED USING A CONNECTION VIA AN UNRESTRICTED AIR-GAP DEVICE (AA TYPE DEVICE, IS EN 1717) TO PREVENT BACKFLOW CONTAMINATION IN ACCORDANCE WITH IW CoP SECTION 3.13
NOT TO BE USED FOR CONSTRUCTION
TIE-IN (T1) TO EXISTING NETWORK
TIE-IN (T2) TO EXISTING NETWORK
PROPOSED CONNECTION TO EXISTING 250mm MDPE MAINS WATER SUPPLY AS CONFIRMED BY IRISH WATER – CONFIRMATION OF FEASIBILITY – CDS20006237 – 28 JAN 2021 1 No. 100mm Ø PE80 SDR17 CONNECTION WITH BULK METER TO BE INSTALLED IN ACCORDANCE WITH IW CoP AND STANDARD DETAILS
100mm CI TO CONNECT TO NEW WM DIVERSION
100mm uPVC TO CONNECT TO NEW WM DIVERSION
NEW 100mm Ø WATERMAIN DIVERSION- REFER TO LONGITUDINAL SECTION FOR PIPE TYPE
EXISTING 150mm Ø CI WATERMAIN TO BE DIVERTED SUBJECT TO IW AGREEMENT
EXISTING 2" CI WATERMAIN SUBJECT TO IW AGREEMENT
NEW HYDRANT
BASEMENT OUTLINE
441 sqm
SURVEY AREA
FIRHOUSE ROAD
MOUNT CARMEL PK
REV DATE DESCRIPTION BY/CHKD/APPR
Client
Bluemont Developments (Firhouse) Limited
PHM Consulting
Civil - Structural - Environmental
11 Mallow Street, Limerick, Ireland. V94 W8N4
Tel: +353 (0)61 574020 Email: info@phm.ie Web: www.phm.ie
STRATEGIC HOUSING DEVELOPMENT AT FIRHOUSE ROAD, DUBLIN 24
WATERMAIN LAYOUT
Drawn POR
Scale 1:250
Chkd. POR
Date 04/2022
Apprd. EOD
Status PLANNING D2
Project Number 110-36
Rev. -
Drawing Number 140
A1

Philip O'Regan

From: Jurica Matosevic (C) <jmatosevic@water.ie>
Sent: Wednesday 11 May 2022 15:18
To: Philip O'Regan
Cc: Diversions
Subject: RE: DIV21131 - Diversions Confirmation of Feasibility
Attachments: DIV21131_Watermain Diversion Agreement JM EDIT.pdf; DIV21131 - Issue of Diversion Agreement

Dear Sir,

Following up to our telephone conversation, please see Diversion Agreement amended in accordance with the newest set of drawings.

Re-issuing of a Confirmation of Feasibility is not required from the standpoint of IW.

In relation to the Diversion Agreement, please see the original email with the instructions.

Any issues, feel free to reach me on my mobile phone.

Best regards

Jurica Matosevic
Diversions, Connections and Developer Services (Diversions)

Uisce Éireann
Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86, Éire
Irish Water
Colvill House, 24-26 Talbot Street, Dublin 1, D01 NP86, Ireland

T + 01 892 5846
M +353 83 8688850
jmatosevic@water.ie
Facebook | Twitter | LinkedIn

From: Maurice Feehan <maufeehan@water.ie>
Sent: Wednesday 11 May 2022 10:31
To: Jurica Matosevic (C) <jmatosevic@water.ie>
Cc: Kieran O'Neill <kioneill@water.ie>
Subject: FW: DIV21131 - Diversions Confirmation of Feasibility

Hi Jurica
Do you mind taking this one please?
Thanks
Maurice Feehan
Major CDS Lead (Diversions)
Uisce Éireann
Teach na hAbhann Móire, Páirc Ghnó Mhala, Mala, Contae Chorcaí, Éire

Irish Water
Blackwater House, Mallow Business Park, Mallow County Cork, Ireland
T + 353 22 52284
M +353 87 902 7174
maufeehan@water.ie
www.water.ie
Facebook | Twitter | LinkedIn

From: Kieran O'Neill
Sent: Tuesday 10 May 2022 14:37
To: Maurice Feehan
Subject: FW: DIV21131 - Diversions Confirmation of Feasibility

Maurice,
Please see below from Philip O'Regan in PHM Consulting.
I am just off the phone to him and it looks like he is looking the diversion COF and agreement reissued with the new design drawings included as the development design has changed. He states that there is no impact to the diversion so no requirement to change diversion design but would need checked.
Regards,
Kieran

From: Philip O'Regan <philip.oregan@phm.ie>
Sent: Thursday 28 April 2022 17:22
To: Kieran O'Neill <kioneill@water.ie>
Cc: newconnections <newconnections@water.ie>
Subject: DIV21131 - Diversions Confirmation of Feasibility

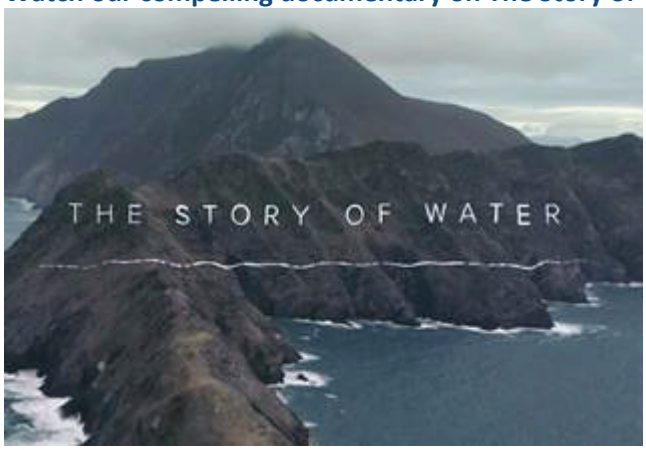
Firhouse Inn SHD, Firhouse Road, Tallaght, Dublin 24
Kieran,
I refer to the attached CoF and Diversion Agreement previously issued in respect to DIV21131.
Following the tripartite meeting between An Bord Pleanala, South Dublin Co. Co. and the Applicant the proposed development scheme has been redesigned.
The principal redesign pertains to the proposed building.
As the previous CoF and Agreement refer to the original design we require re-issue with reference to the new design.
There has been no modification to the proposed diversions.
The following drawings are attached:
110-36-100 D2 – Site Location Map
110-36-101 D2 – Site Survey and Utility Survey
110-36-121 D2 – Drainage Ground Level
110-36-130 D2 – Drainage Longitudinal Sections
110-36-140 D2 – Watermain Layout
110-36-141 D2 – Water Services Details
110-36-142 D2 – Watermain Diversion Tie-Ins
You might confirm if a Statement of Design Acceptance is also required, particular to the Diversion, for the formal SHD Application.
Please note that there is a submission deadline of mid-May for this SHD Application.
Regards,

Philip O'Regan ***Dip Eng NCEA***
Director
Tel.:+353 (0)61 576020
Mob.: +353 (0)86 8344613

For and on behalf of PHM Consulting
PHM Consulting
Civil - Structural - Environmental

From: Kieran O'Neill [mailto:kioneill@water.ie]
Sent: Monday 8 November 2021 15:51

To: Philip O'Regan <philip.oregan@phm.ie>
Subject: DIV21131 - Diversions Confirmation of Feasibility
Philip,
Please see attached diversions 'Confirmation of Feasibility' related to case reference DIV21131 for a development at Firhouse Inn, Firhouse Road, Tallaght, Dublin 24.
I will now proceed with drafting a diversion agreement with a view to issuing it out to the applicant for signing. Please remove the label 'NOT TO BE USED FOR CONSTRUCTION' from the drawings and resubmit.
Kind regards,
Kieran
Kieran O'Neill
Design Engineer
Diversions Team
Connections and Developer Services
CUSTOMER OPERATIONS
Irish Water
Colvill House | 24-26 Talbot Street | Dublin 1
T: 01 8925611**| M**: +353 877093850 **T**: 0044 2830889633 **| E:** kioneill@water.ie
Watch our compelling documentary on The Story of Water here



Please consider the environment before printing this e-mail

Thank you for your attention.

IRISH WATER

AGREEMENT RELATING TO THE DIVERSION OF A WATER MAIN

Between

IRISH WATER

And

BLUEMOUNT DEVELOPMENTS (FIRHOUSE) LIMITED

DIV21131

FIRHOUSE INN, FIRHOUSE ROAD, TALLAGHT, DUBLIN 24

THIS AGREEMENT is made on the day of 202

BETWEEN

1. **IRISH WATER,** a designated activity company incorporated in Ireland with company's registration office number 530363 and having its registered office at Colvill House, 24-26 Talbot Street, Dublin 1 ("**Irish Water**"); and
2. **BLUEMOUNT DEVELOPMENTS (FIRHOUSE) LIMITED,** with company registration number 680238 and having its registered office at Clonminch House, Clonminch Hi Tech Park, Tullamore, Co. Offaly, Tullamore, Offaly, R35XK38 (the "**Developer**").

WHEREAS: -

(1) The Developer has an interest in land through which public water main(s) vested in Irish Water run.

(2) The Developer has requested the permission of Irish Water to alter or remove the water main(s) to enable the Developer to carry out a proposed improvement of the said land.

(3) Irish Water has agreed to allow the Developer to divert the water main(s) to facilitate the proposed improvement.

(4) The land is shown edged red on the drawing number 110-36-SK002-A3 annexed hereto in Part 1 of the Schedule and is hereinafter referred to as the "**Land**".

(5) The Developer and Irish Water have agreed to secure the replacement of the existing water main(s) by means of the laying and the connection of the lengths of new public water main (hereinafter called the "**Works**" which includes the carrying out of the works described in Part 4 of the Schedule hereto) approximately in the position and at the levels indicated on drawing numbers 110-36-130-A1, 110-36-140-A1, 110-36-141-A1 & 110-36-142-A1 annexed hereto in Part 1 of the Schedule (which said lengths of water main and the said works are hereinafter referred to as the "**Diverted Water Main**").

(6) The Developer and Irish Water have agreed subject as hereinafter appears that the Works shall be undertaken at the Developer's expense either by the Developer or by a contractor of the Developer's choice in accordance with this Agreement.

(7) The design of the Diverted Water Main has been undertaken by or on behalf of the Developer and Irish Water will issue a statement of no objection in respect of the design before the commencement of the Works.

NOW it is hereby agreed by and between the parties hereto: -

1. The parties hereto shall take steps to secure the provision of the Works, in accordance with the conditions of this Agreement and in accordance with a programme and design to be prepared by the Developer and agreed in writing between the Developer and Irish Water.

2. The Diverted Water Main shall belong to the Developer until such time as Irish Water procures that flows begin to pass through the Diverted Water Main in accordance with Clause 21 hereof. At the time that flows begin to pass through the Diverted Water Main, the Developer agrees that the Diverted Water Main

shall be vested in Irish Water as a public water main, and this Clause 2 shall constitute a vesting declaration in respect of the Diverted Water Main.

3. [Not Used]

DEVELOPER'S PRE-CONSTRUCTION OBLIGATIONS

4. The Developer shall submit to Irish Water for approval the information contained in Part 2 of the Schedule hereto. The Developer shall at its own expense undertake the Works for and on behalf of Irish Water under Irish Water's inspection. The Developer shall carry out the Works in all respects in accordance with the design agreed by Irish Water and the Design Standards listed in Part 3 of the Schedule hereto. The Developer shall not interfere with the operation of the existing water main at any time during the Works without receiving written permission from Irish Water that it is acceptable to do so.

5. The Developer may undertake the Works either directly or by a contractor/design team of the Developer's choice (the "Contractor") provided that Irish Water must first be satisfied as to the appropriateness of the Contractor and the Contractor's ability to undertake the Works. The Developer shall procure that the Contractor (including, for the avoidance of doubt, any designers of the Diverted Water Main and any relevant sub-contractors with design responsibility) will be required to provide Irish Water with collateral agreements for all design and construction elements of the Diverted Water Main in a form reasonably acceptable to Irish Water but which will, in any event, provide for a six year limitation period for the relevant warrantors. Where the Works are undertaken by the Developer itself, it shall procure collateral agreements in favour of Irish Water from its design team in respect of the Diverted Water Main.

6. Prior to the commencement of the Works the Developer shall provide a detailed method statement from both the Developer's design team and Contractor incorporating techniques and related information to be used in connection with the Works and the proposed abandonment of the existing water main(s) along with the order in which work is to proceed and health and safety risk assessments, for approval in writing by Irish Water. Any amendments to the method statements referred to in this Clause 6 during the course of the Works shall be agreed in writing in advance of that amended method statement being put into operation in connection with the Works.

7. Prior to the commencement of the Works the Developer must ensure that it and the Contractor hold a pre-construction site meeting with Irish Water (having given at least 14 days' notice in writing to Irish Water) in order to agree a start date, construction practices, and arrangements for inspections by or on behalf of Irish Water. The start date shall be confirmed in writing by Irish Water. No part of the Works shall be commenced until Irish Water has provided written confirmation of the start date.

8. The Works must be carried out strictly in accordance with the programme and design, method statements, construction practices, inspection arrangements and risk assessments that have been previously agreed in writing with Irish Water.

LAND ENTRY

9. Neither the Developer nor the Contractor may take entry nor carry out any works in pursuance of this Agreement onto any land (a) which is not in the ownership of the Developer or (b) which forms part of a road (as defined in section 2 of the Roads Act 1993) unless (i) the Developer or the Contractor gets the

consent in writing from the owner of the lands; (ii) the road forms part of the Land; or (iii) the Developer or the Contractor obtains a road opening licence in respect of the works in question.

10. There shall be no requirement for Irish Water to serve upon the Developer statutory notice of entry onto the Land in respect of the Works, or in respect of the work which shall take place pursuant to Clause 21 hereof, the Developer hereby acknowledging that completion of this Agreement constitutes notice under Section 271 of the Public Health (Ireland) Act 1878.

11. The Developer shall arrange for Irish Water and its agents and contractors to have access at all reasonable times and with reasonable notice to Developer to the areas where the Diverted Water Main is being constructed. The Developer shall, at its own cost, provide all relevant plant, equipment (including safety equipment) signing, guarding, lighting and personnel whilst Irish Water is on the Land pursuant to the provisions of this Agreement. Irish Water (including its agents and contractors) shall have the right at all times to enter upon and temporarily occupy so much of the Land as may be reasonably required for completing any works incidental to laying and/or connecting the Diverted Water Main and Irish Water may break open or otherwise interfere with the Land so far as may be reasonably necessary for the purposes aforesaid or for the purpose of making connection to the Diverted Water Main or for examining, inspecting, maintaining, altering, repairing, renewing or removing water mains. Irish Water (including its agents and contractors) shall also have the right at all reasonable times and with reasonable notice to Developer to enter upon and temporarily occupy so much of the Land as may be required in order to inspect the Works, observe the carrying out of the Works or rectify defects.

IRISH WATER'S RIGHT TO TERMINATE

12. If it becomes necessary to construct any part of the Diverted Water Main (including any associated re-connections) in land which (a) is not in the ownership of the Developer or (b) forms part of a road and (i) that part of the road does not form part of the Land and (ii) neither the Developer nor the Contractor obtains the necessary consents as set out at Clause 9 of this Agreement or a road opening licence in respect of the works referred to above in this Clause 12, then Irish Water shall have the right to terminate this Agreement and refund any payments received, on giving to the Developer 7 days' notice in writing. Irish Water shall be entitled to deduct from such payments all abortive expenditure incurred by Irish Water as detailed by Irish Water in a certificate giving a breakdown of such abortive expenditure. If the amount of abortive expenditure exceeds the amount of any payments that have been received from the Developer, then the Developer shall pay to Irish Water upon demand the difference between those two sums.

PROJECT SUPERVISOR CONSTRUCTION STAGE ("PSCS") AND PROJECT SUPERVISOR DESIGN PROCESS ("PSDP")

13. The Developer elects to be treated for the purposes of the Safety, Health and Welfare at Work (Construction) Regulations 2013 (the "SHW Regulations") as the only client (and Irish Water agrees with such election by the Developer). The Developer accepts and understands its duties and responsibilities pursuant to the SHW Regulations including its obligation as a client to appoint a PSCS and PSDP.

DEVELOPER'S OBLIGATIONS DURING CONSTRUCTION

14. The Developer shall:

14.1 adhere to all relevant hygiene procedures in place from time to time, to ensure that the infrastructure installed is fit for use as water supply works for the delivery of wholesome or potable water fit for human consumption;

14.2 inform Irish Water immediately of any person employed on the Works known to have a waterborne disease or gastric disorder and the Developer shall procure that the employee shall immediately cease involvement in the installation of the Works and shall not return until granted appropriate medical clearance;

14.3 ensure that all materials in contact with water intended for human consumption shall achieve compliance with Statutory Instrument 122 of 2014, European Union (Drinking Water) Regulations 2014; and

14.4 ensure that the Diverted Water Main has been pressure tested, scoured, flushed, cleaned and disinfected and that water samples are taken and bacteriological tests undertaken, the results of which will be available to Irish Water upon request and which have indicated that the Diverted Water Main is suitable for conveying water intended for human consumption. These works are to be outlined in a method statement(s) to be agreed in writing with Irish Water.

15. The Developer shall ensure that all operations necessary to carry out the Works shall be carried on so as not to interfere unnecessarily or improperly with public convenience or access to or use or occupation of public or private roads and footpaths and the Developer shall indemnify Irish Water in respect of all claims demands proceedings damages costs charges and expenses whatsoever arising out of or in relation to any such matters.

16. The Developer shall ensure that the Works shall be carried out without unreasonable noise and disturbance. The Developer shall indemnify Irish Water from and against any liability for damages on account of noise or other disturbance created while carrying out the Works and from and against all claims demands proceedings damages costs charges and expenses whatsoever in regard or in relation to such liability.

17. The Developer shall throughout the progress of the Works have full regard for the safety of all persons and shall carry out the Works in a manner appropriate to the avoidance of risks to all persons who may be affected thereby. The Developer shall be responsible for ensuring that the works are carried out in full compliance with all relevant health and safety legislation.

18. The Developer shall be responsible for ensuring that the works are carried out in full compliance with all relevant waste management and environmental legislation.

19. The Developer shall ensure that appropriate and adequate insurance cover is in place throughout the duration of the Works in relation to the matters referred to in Clauses 15, 16, 17 and 18. The Developer shall within five days following a written request from Irish Water, furnish Irish Water with evidence that the insurances referred to below are being maintained in accordance with this Clause 19. The following insurance levels are required:

- Employers Liability insurance cover with a minimum indemnity limit of €13million any one accident/occurrence unlimited in the period of insurance.

- Public/Products/Pollution Liability insurance cover with a minimum indemnity limit of €6.5million any one accident/occurrence unlimited period of insurance under the Public Liability and in the aggregate, in respect of Products & Pollution Liability.
- Contractors "All Risks" insurance for the full reinstatement value of the proposed works in respect of any one claim.
- Motor insurance cover with a minimum third-party property damage limit of €6.5million for all vehicles owned, leased, rented or run by the applicant (to include tools of trade use) in connection with the services to be provided by it.
- Professional Indemnity insurance cover with a minimum indemnity limit of €6.5million in respect of any one claim and in the aggregate.

The Public/Products/Pollution Liability and Contractors "All Risks" policies detailed above must include a specific indemnity to Irish Water.

The Developer shall obtain all necessary permits and consents to carry out the Works.

20. To agree any changes in the Diverted Water Main, or to discuss proposals to rectify any notified defects, the Developer (or the Contractor on behalf of the Developer) must give a minimum of 3 days (excluding Saturdays, Sundays and public holidays) notice in writing to Irish Water (or such shorter period as Irish Water may agree). A meeting involving the Developer the Contractor and Irish Water must then be held and Irish Water's written consent must be obtained by the Developer before any change to the Diverted Water Main is started.

POST-CONSTRUCTION

21. Following construction of the Diverted Water Main the Developer shall seek Irish Water's written consent to put the water main into operation. After Irish Water has inspected the Diverted Water Main and is satisfied that the Works have been properly carried out in accordance with this Agreement, **Irish Water or its agents will carry out the connection(s) of the Diverted Water Main to the existing water supply network (including the connection to the Diverted Water Main of any existing connections that were fed from the section of water main that has been decommissioned as part of the Works). Under no circumstances shall the Developer make the connection(s) to the existing water network themselves.** In accordance with Clause 2 of this Agreement, the Developer agrees that the Diverted Water Main shall become vested in Irish Water as a public water main at the time that flows begin to pass through the Diverted Water Main.

22. The use of the existing public water mains that are being replaced by the Diverted Water Main shall be abandoned in accordance with the method statements referred to in Clause 6 hereof and discontinued upon the diversion of flows into the Diverted Water Main.

23. On the completion of the Works (and including the connection(s) to be carried out by Irish Water) the Developer shall clear away and remove all surplus material and rubbish of every kind from that part of the Land that is affected by the Diverted Water Main and shall ensure that all trenches and excavations are backfilled and consolidated so as to provide appropriate support for the Diverted Water Main and shall leave the land through which the Diverted Water Main has been laid (including all working areas) in a clean and workmanlike condition to Irish Water's satisfaction.

24. The Developer shall execute or secure the execution of all works of repair reconstruction rectification and making good of defects imperfections shrinkages or other faults in respect of the Diverted Water Main (excluding where such reconstruction rectification or making good of defects is as a result of construction works carried out by Irish Water pursuant to Clause 21 hereof) as may be required of the Developer in writing by Irish Water within a period of twelve months from the date of completion of the Works as certified by Irish Water. All such works shall be carried out at the Developer's expense. If the Developer shall fail to execute or secure the execution of works as aforesaid Irish Water shall be entitled to carry out such works and shall be entitled to recover from the Developer the expenses and/or costs incurred by Irish Water.

25. The Developer shall within 14 days of completion of the Works provide "as constructed" drawings of the Diverted Water Main in Autocad and PDF formats and containing such information as is required by and acceptable to Irish Water, and a safety file to include services plans, ground condition information, evidence of tests undertaken as part of the construction works and information on unusual construction.

FINANCIAL ARRANGEMENTS

26. Any invoices or requests for payment by the Contractor shall be made directly to the Developer (and not to Irish Water) who shall reimburse the Contractor in accordance with Developer's agreement with the Contractor direct for all costs fees and expenses he incurs in relation to the Works and shall indemnify Irish Water against any claims made against Irish Water by the Contractor arising from the Works.

27. Subject to the provisions of Clause 31 hereof no sums whatsoever shall under any circumstances become payable or allowable by Irish Water to the Developer following the Works.

28. The Developer shall ensure that the Contractor is made fully aware of the matters contained in Clauses 4 to 25 inclusive hereof and shall take all steps to ensure that the Contractor complies therewith.

29. On or before the execution of this Agreement and before the Works commence, the Developer shall pay to Irish Water the sum or sums as set out in Part 6 of the Schedule hereto, being Irish Water's estimated costs relating to professional charges, administration, contract management, design, inspection, connections and such other costs as Irish Water may reasonably incur in connection with the Works performed by the Developer under this Agreement (such costs being hereinafter called "**Irish Water's Costs**").

30. [Not Used]

31. In the event that Irish Water incurs Default Costs (see below) at any time up to 12 months from completion of the Works, Irish Water shall issue an invoice to the Developer for the difference between Irish Water's Costs and the Default Costs. The Developer shall discharge the relevant invoice by the date specified thereon.

*"**Default Costs**" means costs which Irish Water may incur in (a) undertaking any works of construction reconstruction maintenance rectification or repair or making good of defects imperfections shrinkages or other faults by reason of the Developer or the Contractor failing to complete in a good and workmanlike manner and in accordance with the specification aforesaid the entirety of the Diverted Water Main or (b) towards invoices or sums payable by virtue of any actions, claims or demands made against Irish Water by any third party as a result of any act or default by the Developer or the Contractor.*

32. [Not Used]

33. All amounts payable under this Agreement are inclusive of any applicable Value Added Tax and may be subject to other lawful taxes or levies applicable by reason of the performance of the Agreement and the Parties agree that an amount equal to any applicable lawful taxes or levies lawfully chargeable in respect of the performance of the Agreement shall be payable or repayable, as the case may be, at the same time as those sums.

34. The Developer shall bear and indemnify Irish Water against all claims demands proceedings damages costs charges or expenses or losses arising from the Works or any act or default of the Developer or the Contractor or any of their servants, agents or workmen in relation to the Works.

GENERAL PROVISIONS

35. Any certificate statement or other document specified under this Agreement shall be deemed sufficiently delivered to the recipient party if delivered personally or sent by pre-paid post to the recipient party at that party's aforementioned address or sent by email to the email address to be notified by each party to the other for the purpose of receiving notices under this Agreement. A certificate statement or other document sent by post in this way shall be deemed to be delivered at the time when in due course of post it would be delivered at the address to which it was sent, or if sent by email at the time that the email enters the email system of the recipient provided no error message indicating failure to deliver is received by the sender.

36. Where a dispute exists between Irish Water and the Developer under or in relation to this Agreement, either party may serve upon the other a notice setting out the nature of the dispute, following receipt of which the parties shall refer the matter to appropriate senior representatives of each party, who shall meet and attempt to resolve the dispute.

37. If the dispute remains unresolved by senior representatives for 28 days following service of the notice, either party may refer the matter to the Mediator's Institute of Ireland ("MII") to appoint a mediator in order that the dispute be referred to mediation.

38. If the parties agree to mediation, the parties shall meet with the mediator within 14 days of his appointment (or such period as may be determined by the mediator or by MII) in order to agree a programme for the exchange of all relevant information and the structure to be adopted for the mediation. Unless agreed otherwise, the mediation and all correspondence and documentation connected with it, including any settlement or agreement relating to it, shall be conducted in confidence.

39. If the parties fail to reach agreement on the resolution of the dispute within 28 days of the mediator being appointed (or such longer period as may be agreed in writing between the parties), or if the parties did not agree to mediation, either party may commence court proceedings.

40. This Agreement together with the Schedule and correspondence attached hereto (which correspondence shall indicate and confirm matters agreed between the Developer and Irish Water in relation to the obligations contained within this Agreement and its Schedule) sets out the entire agreement and understanding between the parties in relation to the alteration or removal of a public water main to facilitate a proposed improvement of the Land.

41. This Agreement may be executed in any number of counterparts, which shall together constitute one Agreement. Any party may enter into this Agreement by signing any such counterpart.

42. The provisions of this Agreement are governed and interpreted in accordance with Irish Law and, subject to Clauses 36-39 hereof, the parties submit to the exclusive jurisdiction of the Irish Courts but any judgment of such court may be enforced in any court of competent jurisdiction.

SCHEDULE

Part 1 – THE LAND

110-36-100

110-36-101

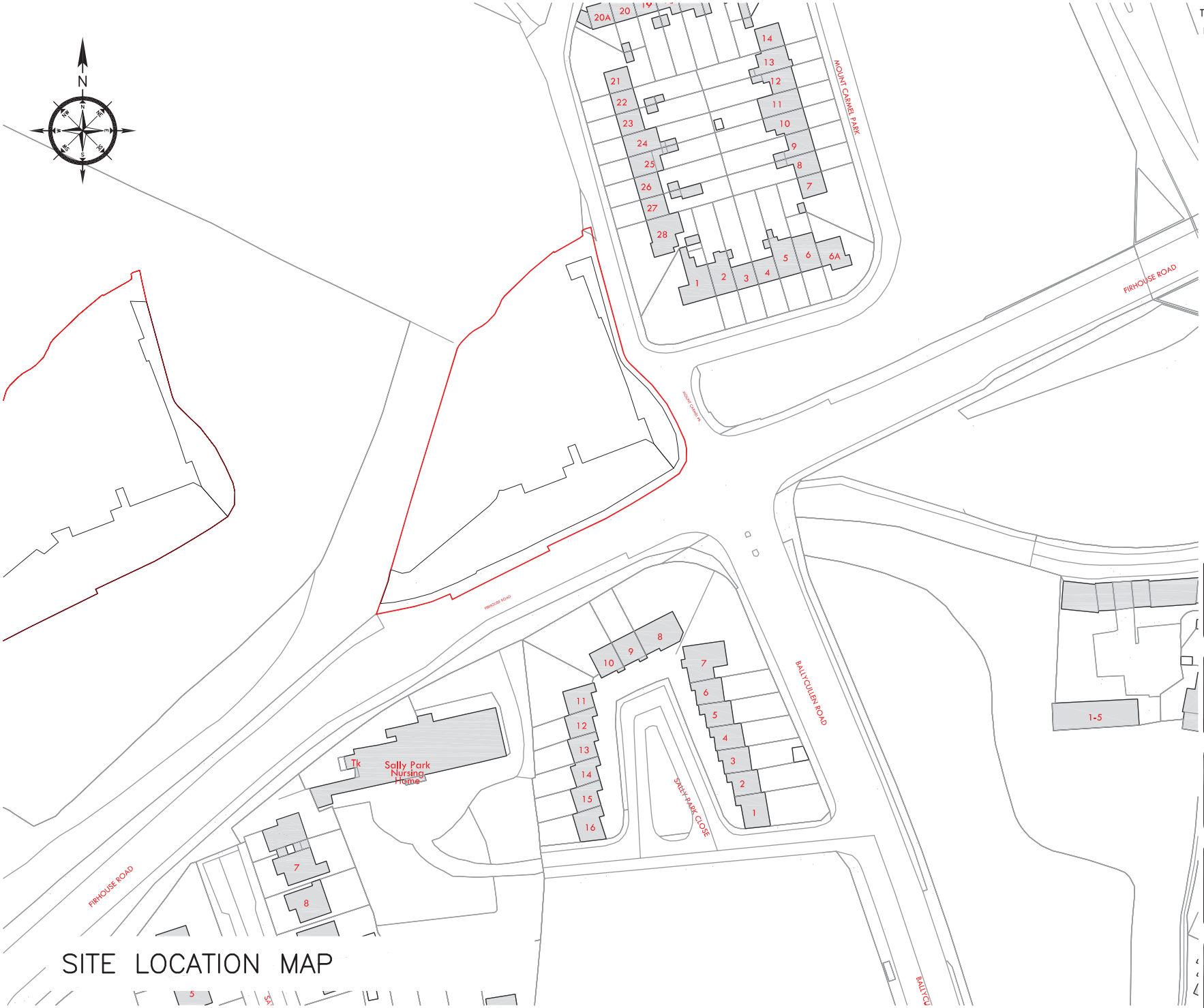
110-36-121

110-36-130

110-36-140

110-36-141

110-36-142



SITE LOCATION MAP

NOTES:

REV	DATE	DESCRIPTION	

Client

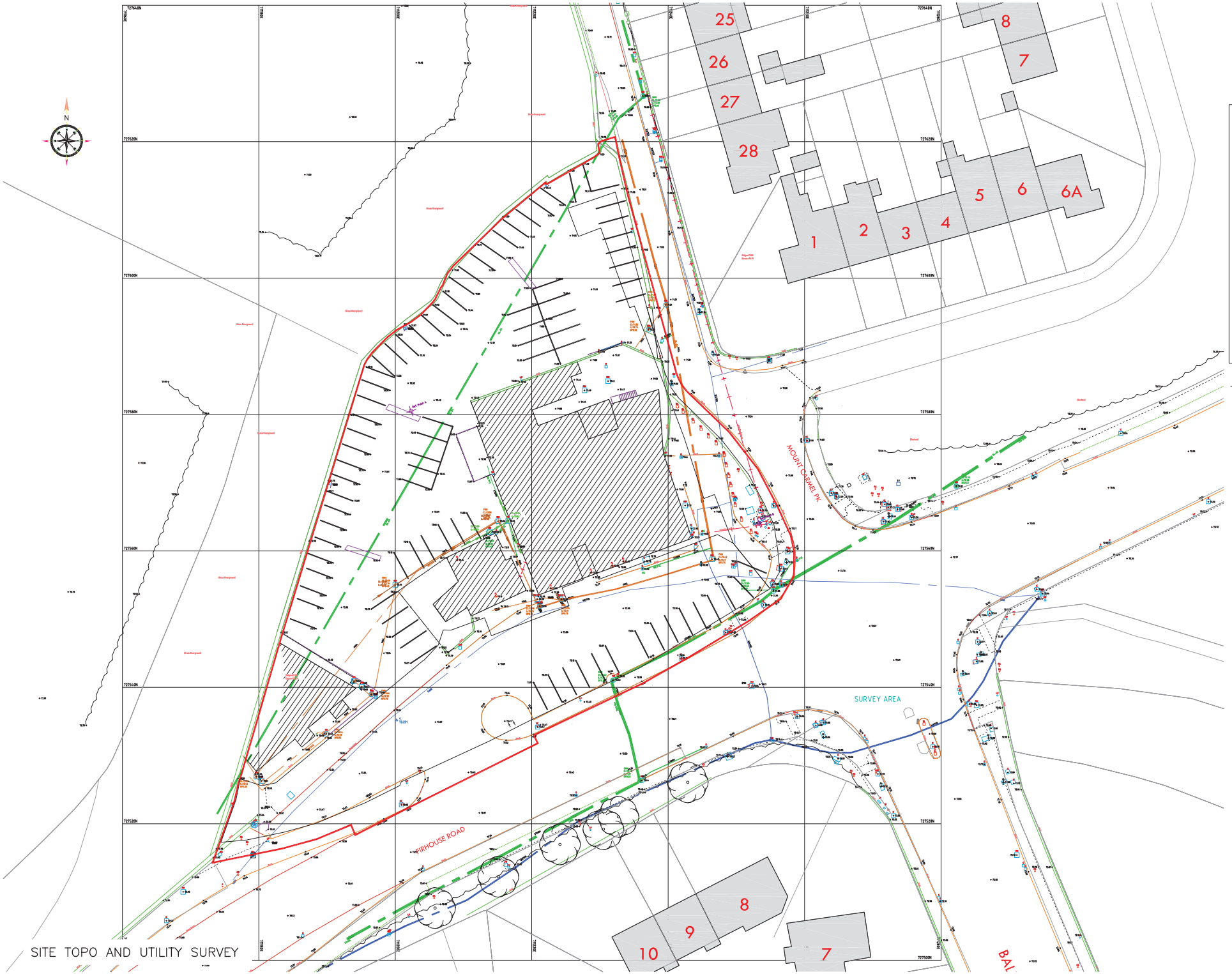
Bluemont Developments (Firhouse) Ltd.

PHM Consulting
Civil - Structural - Environmental
11 Mallow Street, Limerick, Ireland
Tel.: +353 (0)61 576020 E-mail: info@phm.ie Web.: www.phm.ie

APARTMENT DEVELOPMENT AT FIRHOUSE INN, FIRHOUSE ROAD TALLAGHT, DUBLIN 24
SITE LOCATION MAP

Drawn	Scale
POR	1:1000
Chkd.	Date
POR	04/2022
Apprd.	Status
EOD	PLANNING D2

Project Number	Rev.
110-36	~
Drawing Number	
100	A3



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NOTES:
1. ALL HOUSE DRAINS TO BE 100mmØ.
2. LOCAL DRAINS TO RUN AT A GRADIENT OF 1/40 UNLESS OTHERWISE NOTED.
3. DOUBLE GULLIES TO BE PROVIDED AT ALL ROAD SAG CURVES & CUL DE SACS WHERE INDICATED. SEPARATE CONNECTIONS 150mm DIA. SHALL BE PROVIDED FOR EACH GULLY. NO GULLEY SHALL BE MORE THAN 10m FROM A SURFACE WATER CONNECTION.
4. HOUSE DRAINS SHALL NOT PASS THROUGH A PROPERTY THEY DO NOT SERVE.
5. FOR SEWER LONG SECTIONS SEE DRAWING 's 150 SERIES
6. FOR ROAD CONSTRUCTION DETAILS SEE DRG's 150 SERIES.
7. FOR DRAINAGE CONSTRUCTION DETAILS SEE DRG's 160 SERIES.
8. FOR WATERMAIN CONSTRUCTION DETAILS SEE DRG's 170 SERIES.

SERVICES LEGEND

FOUL DRAINAGE
FOUL A/J
FOUL DRAINAGE MANHOLE
STORM A/J
STORM DRAINAGE
STORM DRAINAGE MANHOLE
ROAD GULLY
GULLY TRAP
WATER MAIN
SLUICE VALVE
FIRE HYDRANT
WATER METER
SCOUR VALVE
PRESSURE RELEASE VALVE
AIR VALVE
NON-RETURN VALVE
FUEL LINE/TANK
GL 00.00 GROUND LEVEL (metres - os datum)
CL 10.00 COVER LEVEL (metres - os datum)
IL 18.00 INVERT LEVEL (metres - os datum)
DP150m DEPTH TO TOP OF SERVICE (metres)
DP ON MANHOLES = INVERT LEVEL OF PIPE
DP ON FOUL AND SURFACE WATER = INVERT OF PIPE

ESB
OVERHEAD LINE WITH POLE
ESB CHAMBER
ESB CHAMBER
ENET
COMMS
BT
FIBRE
CATV
GAS SV
GAS LINE
UNDERGROUND ELECTRICITY LINE
ELECTRICAL MH/HOLE
OVERHEAD LINE WITH POLE
MINI PILLAR
OVERHEAD ELECTRIC
6m HIGH STREET LIGHT
EARTH LINE AND RODS
TRAFFIC SENSOR
UNIDENTIFIED SERVICE
SURVEYED AREA
UTO UNABLE TO OPEN
OSA OUTSIDE SURVEY AREA
UTT UNABLE TO TRACE

DRAINAGE LEGEND

PROPOSED FOUL SEWER & MANHOLE — F2 IL 14.500
PROPOSED STORM SEWER & MANHOLE — S2 IL 14.500
PROPOSED COMBINED SEWER & MANHOLE — S2 IL 14.500
PROPOSED ROAD GULLY — GT
EXISTING FOUL SEWER & MANHOLE — F4(Ex) IL= 14.500
EXISTING STORM SEWER & MANHOLE — S17(Ex) IL= 14.500
EXISTING COMBINED SEWER & MANHOLE — S17(Ex) IL= 14.500
LAND DRAIN & CATCHPIT — CP2
RISING MAIN
PRIVATE STORM DRAIN — 100MM PVC @ 1:40 MAX
PRIVATE FOUL DRAIN — FWIC (FOUL WATER IC) 100MM PVC @ 1:40 MAX
DIRECTION OF FOUL FLOW
DIRECTION OF STORM FLOW
PERMEABLE PAVING TO PARKING AREAS

REV	DATE	DESCRIPTION	BY/CHKD/APPR

Client
Bluemont Developments (Firhouse) Limited

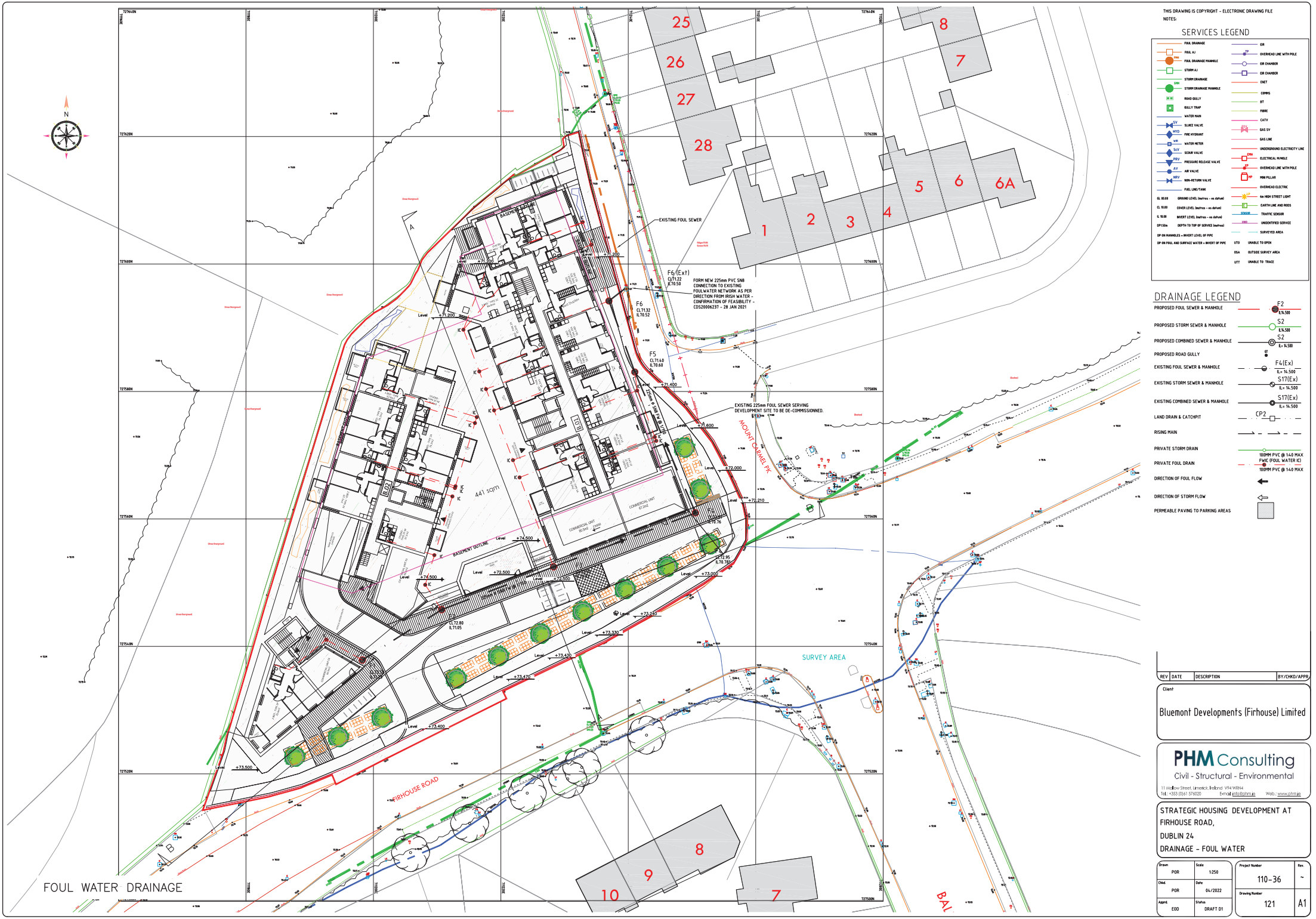
PHM Consulting
Civil - Structural - Environmental
11 Mallow Street, Limerick, Ireland. V94 W8N4
Tel: +353 (0)61 576020 Email: info@phm.ie Web: www.phm.ie

STRATEGIC HOUSING DEVELOPMENT AT
FIRHOUSE ROAD,
DUBLIN 24
SITE SURVEY AND UTILITY SURVEY

Drawn	Scale
POR	1:250
Chkd.	Date
POR	04/2022
Apprd.	Status
EOD	PLANNING D2

Project Number	Rev.
110-36	~
Drawing Number	
101	A1

SITE TOPO AND UTILITY SURVEY



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NOTES:

SERVICES LEGEND

- FOUL DRAINAGE
- FOUL MH
- FOUL DRAINAGE MANHOLE
- STORM MH
- STORM DRAINAGE
- SDMH
- STORM DRAINAGE MANHOLE
- RG
- ROAD GULLY
- GT
- GULLY TRAP
- WATER MAIN
- SV
- SLUICE VALVE
- HYD
- FIRE HYDRANT
- WM
- WATER METER
- SCV
- SCOUR VALVE
- PRV
- PRESSURE RELEASE VALVE
- AV
- AIR VALVE
- NRV
- NON-RETURN VALVE
- FUEL LINE/TANK
- GL 00.00 GROUND LEVEL (metres - os datum)
- CL 10.00 COVER LEVEL (metres - os datum)
- IL 18.00 INVERT LEVEL (metres - os datum)
- DP1.50m DEPTH TO TOP OF SERVICE (metres)
- DP ON MANHOLES = INVERT LEVEL OF PIPE
- DP ON FOUL AND SURFACE WATER = INVERT OF PIPE
- EIR
- TP OVERHEAD LINE WITH POLE
- EIR CHAMBER
- EIR CHAMBER
- ENET
- COMMS
- BT
- FIBRE
- CATV
- GAS SV
- GAS LINE
- UNDERGROUND ELECTRICITY LINE
- EMH ELECTRICAL MANHOLE
- TP OVERHEAD LINE WITH POLE
- MP MINI PILLAR
- OVERHEAD ELECTRIC
- LP 6m HIGH STREET LIGHT
- EARTH LINE AND RODS
- SENSOR TRAFFIC SENSOR
- UNID UNIDENTIFIED SERVICE
- SURVEYED AREA
- UTO UNABLE TO OPEN
- OSA OUTSIDE SURVEY AREA
- UTT UNABLE TO TRACE

DRAINAGE LEGEND

- PROPOSED FOUL SEWER & MANHOLE — F2 IL 14.500
- PROPOSED STORM SEWER & MANHOLE — S2 IL 14.500
- PROPOSED COMBINED SEWER & MANHOLE — S2 IL= 14.500
- PROPOSED ROAD GULLY — GT
- EXISTING FOUL SEWER & MANHOLE — F4(Ex) IL= 14.500
- EXISTING STORM SEWER & MANHOLE — S17(Ex) IL= 14.500
- EXISTING COMBINED SEWER & MANHOLE — S17(Ex) IL= 14.500
- LAND DRAIN & CATCHPIT — CP2
- RISING MAIN
- PRIVATE STORM DRAIN — 100MM PVC @ 1:40 MAX
- PRIVATE FOUL DRAIN — FWC (FOUL WATER IC) 100MM PVC @ 1:40 MAX
- DIRECTION OF FOUL FLOW
- DIRECTION OF STORM FLOW
- PERMEABLE PAVING TO PARKING AREAS

REV	DATE	DESCRIPTION	BY/CHKD/APPR

Client

Bluemont Developments (Firhouse) Limited

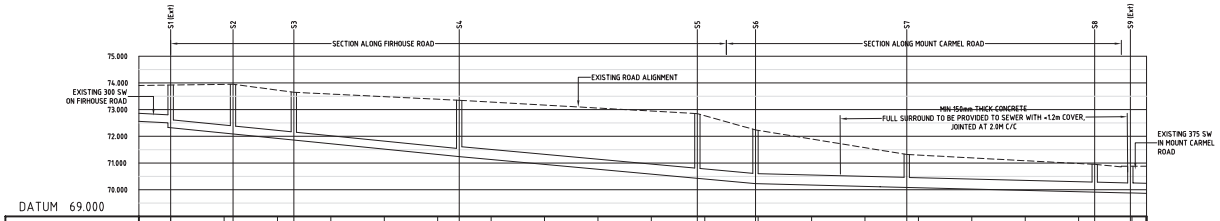
PHM Consulting
Civil - Structural - Environmental
11 Mallow Street, Limerick, Ireland. V94 W8N4
Tel: +353 (0)61 576020 Email: info@phm.ie Web: www.phm.ie

STRATEGIC HOUSING DEVELOPMENT AT FIRHOUSE ROAD, DUBLIN 24

DRAINAGE - FOUL WATER

Drawn: POR	Scale: 1:250	Project Number: 110-36	Rev.: ~
Chkd.: POR	Date: 04/2022	Drawing Number: 121	A1
Apprd.: EOD	Status: DRAFT D1		

NOTES:

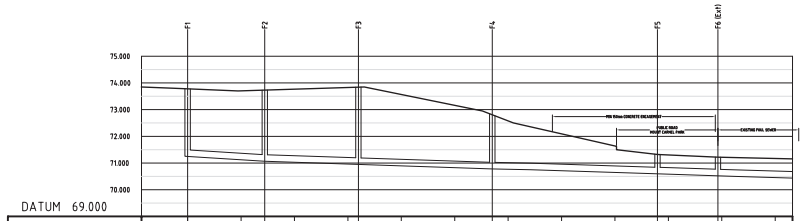


DATUM 69.000

CHAINAGE		0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	150.000	160.000	170.000	180.000
GROUND LEVEL		73.92	73.95	73.65	73.35						72.85	72.24	71.32			70.95			70.88	
STORMWATER	INVERT	72.52	72.32	72.087	71.859	71.24					70.426	70.228	70.086			69.91			69.88	69.88
	DETAILS		Dia 300 Type POLYPIPE 1 in 50		Dia 300 Type POLYPIPE 1 in 50	Dia 300 Type POLYPIPE 1 in 50	Dia 375 Type POLYPIPE 1 in 55					Dia 375 Type POLYPIPE 1 in 55	Dia 375 Type POLYPIPE 1 in 200			Dia 375 Type POLYPIPE 1 in 200			Dia 375 POLYPIPE 1 in 200	
	LENGTHS		Len 11.675		Len 11.389	Len 30.962	Len 44.584					Len 10.893	Len 28.313			Len 35.193			6.678	

STORM SEWER SECTION - 300mm DIVERSION

SCALE : H=1:500, V=1:100

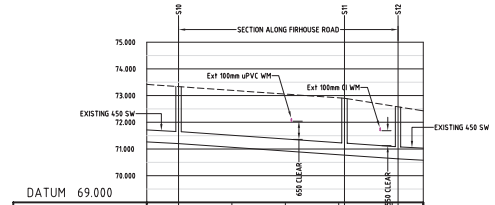


DATUM 69.000

CHAINAGE		0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000
GROUND LEVEL		73.80	73.70	73.85			72.95			71.32	71.22		
STORMWATER	INVERT LEVEL	71.246	71.065	70.948			70.781			70.575	70.50		
	DETAILS		Dia 225 Type PVC SN8 1 in 80	Dia 225 Type PVC SN8 1 in 150		Dia 225 Type PVC SN8 1 in 150		Dia 225 Type PVC SN8 1 in 150		Dia 225 Type PVC SN8 1 in 150	Dia 225 Type PVC SN8 1 in 150		
	LENGTHS		Len 14.437	Len 17.536		Len 25.058		Len 30.926		Len 11.325			

FOUL LONGITUDINAL SECTION

SCALE : H=1:500, V=1:100

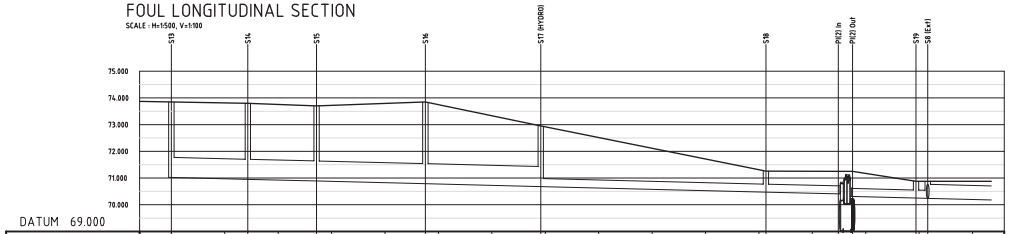


DATUM 69.000

CHAINAGE		0.000	10.000	20.000	30.000	40.000
GROUND LEVEL		73.35		72.90		72.58
STORMWATER	INVERT	71.20	71.20		70.77	70.63	70.63
	DETAILS		Dia 450 Type CONC 1 in 72			Dia 450 Type CONC 1 in 72	
	LENGTHS		Len 31.071			Len 10.026	

STORM SEWER SECTION - 450 DIVERSION

SCALE : H=1:500, V=1:100

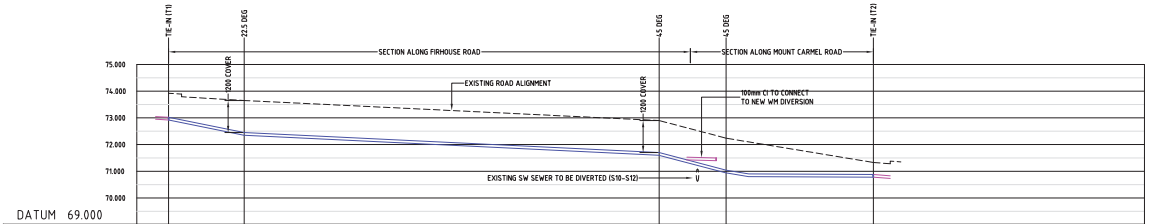


DATUM 69.000

CHAINAGE		0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	150.000		
GROUND LEVEL		73.85	73.80	73.70	73.85		72.95			71.26				71.25	71.25	70.88	70.88		
STORMWATER	INVERT LEVEL	71.022	70.95	70.89	70.79		70.68			70.47				70.41	70.31	70.25	70.24		
	DETAILS		Dia 750 Type CONC 1 in 200	Dia 750 Type CONC 1 in 200	Dia 750 Type CONC 1 in 200	Dia 750 Type CONC 1 in 200			Dia 300 Type CONC 1 in 200					Dia 300 Type CONC 1 in 200		Dia 300 Type CONC 1 in 200		Dia 525 Type CONC	
	LENGTHS		Len 14.317	Len 12.863	Len 20.377	Len 21.597			Len 41.158					Len 13.556		Len 11.891		Len 2.193	

STORM LONGITUDINAL SECTION

SCALE : H=1:500, V=1:100



DATUM 69.000

CHAINAGE		0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	150.000	160.000	170.000	180.000
GROUND LEVEL		73.92	73.65								72.90	72.24			71.33					
WATERMAIN	CROWN LEVEL	73.82	72.55								71.80	71.14			70.88					
	DETAILS	EXIST 4" CI	100mm DI	125mm PE100 SDR11								125mm PE100 SDR11	100mm DI		EXIST 4" CI					
	LENGTHS		Len 14.159	Len 77.695								Len 12.519	Len 27.577							

WATERMAIN SECTION - 100 DIVERSION

SCALE : H=1:500, V=1:100

REV	DATE	DESCRIPTION	BY/CHKD/APPR

Client

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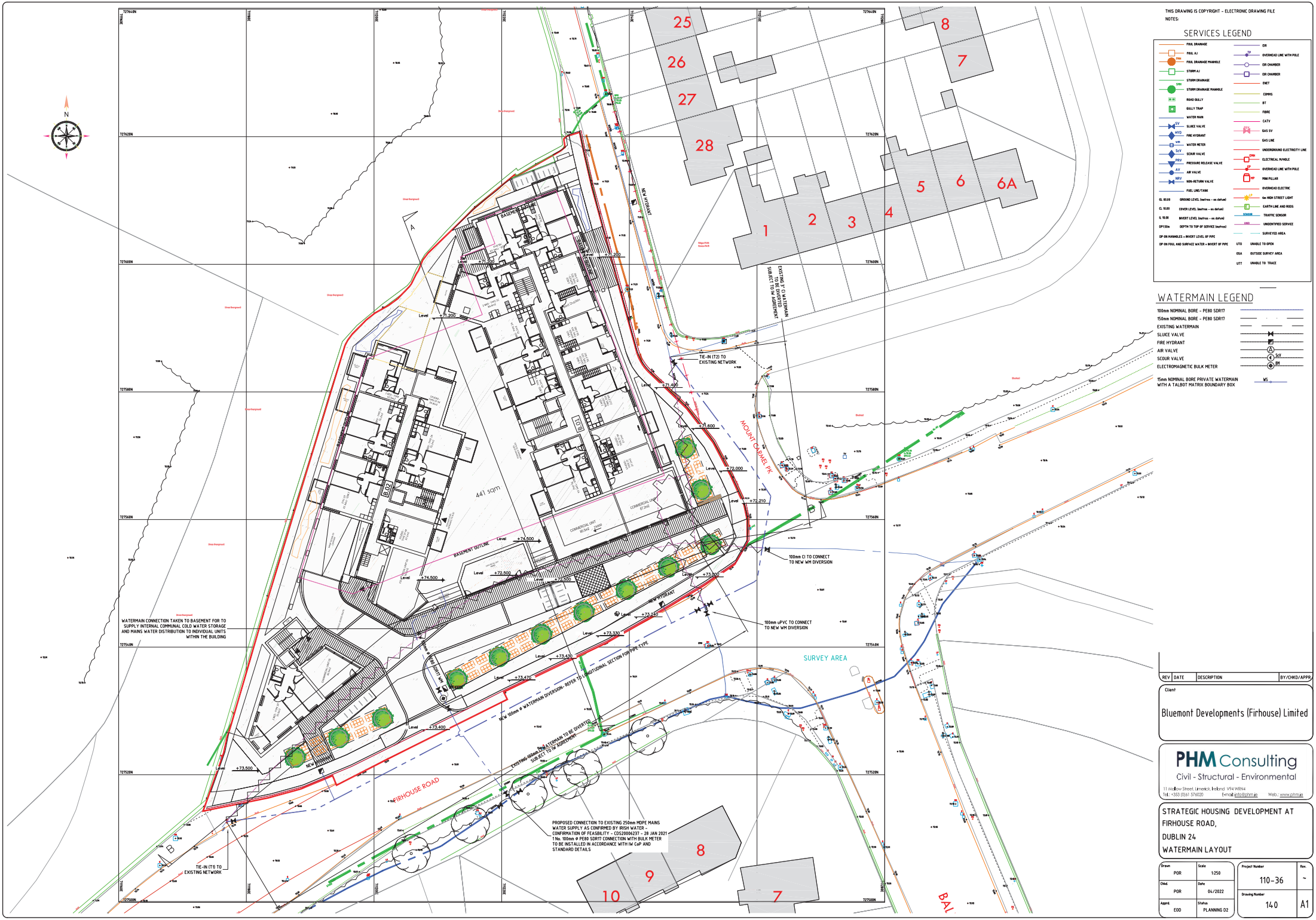
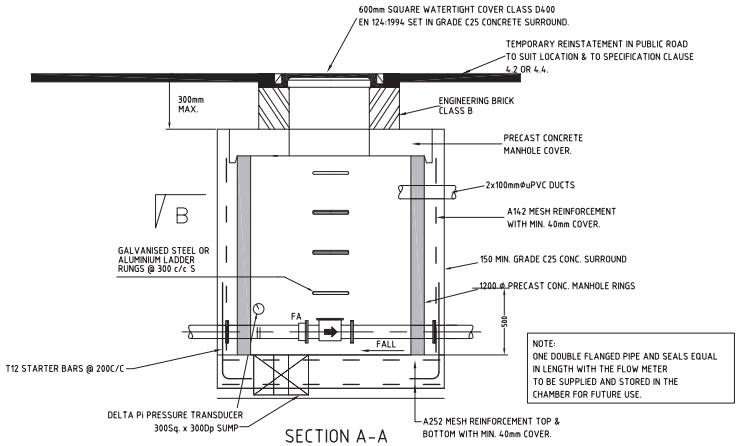
STRATEGIC HOUSING DEVELOPMENT AT FIRHOUSE ROAD,
DUBLIN 24
DRAINAGE - LONGITUDINAL SECTIONS

Drawn	POR	Scale	AS SHOWN
Chkd.	POR	Date	04/2022
Apprd.	EOD	Status	PLANNING D2

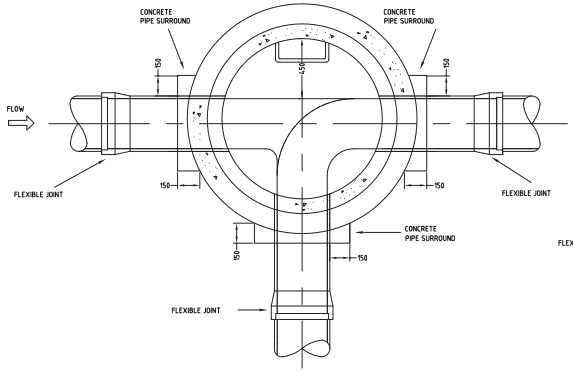
Project Number	Rev.
110-36	~
Drawing Number	
130	A1


THIS DRAWING IS COPYRIGHT - ELECTRONIC DRAWING FILE
NOTES:
SERVICES LEGEND
FOUL DRAINAGE
FOUL AJ
FOUL DRAINAGE MANHOLE
STORM AJ
STORM DRAINAGE
STORM DRAINAGE MANHOLE
ROAD GULLY
GULLY TRAP
WATER MAIN
SLUICE VALVE
FIRE HYDRANT
WATER METER
SCOUR VALVE
PRESSURE RELEASE VALVE
AIR VALVE
NON-RETURN VALVE
FUEL LINE/TANK
GROUND LEVEL (metres - os datum)
COVER LEVEL (metres - os datum)
INVERT LEVEL (metres - os datum)
DEPTH TO TOP OF SERVICE (metres)
OP ON MANHOLES = INVERT LEVEL OF PIPE
OP ON FOUL AND SURFACE WATER = INVERT OF PIPE
EIR
OVERHEAD LINE WITH POLE
EIR CHAMBER
EIR CHAMBER
ENET
COMMS
BT
FIBRE
CATV
GAS SV
GAS LINE
UNDERGROUND ELECTRICITY LINE
ELECTRICAL MANOLE
OVERHEAD LINE WITH POLE
MINI PILLAR
OVERHEAD ELECTRIC
6m HIGH STREET LIGHT
EARTH LINE AND RODS
TRAFFIC SENSOR
UNIDENTIFIED SERVICE
SURVEYED AREA
UNABLE TO OPEN
OUTSIDE SURVEY AREA
UNABLE TO TRACE
WATERMAIN LEGEND
100mm NOMINAL BORE - PE80 SDR17
150mm NOMINAL BORE - PE80 SDR17
EXISTING WATERMAIN
SLUICE VALVE
FIRE HYDRANT
AIR VALVE
SCOUR VALVE
ELECTROMAGNETIC BULK METER
15mm NOMINAL BORE PRIVATE WATERMAIN WITH A TALBOT MATRIX BOUNDARY BOX
BASEMENT OUTLINE
441 sqm
NEW HYDRANT
TIE-IN (T2) TO EXISTING NETWORK
EXISTING 2" CI WATERMAIN SUBJECT TO BE DIVERTED SUBJECT TO IW AGREEMENT
MOUNT CARMEL PK
100mm CI TO CONNECT TO NEW WM DIVERSION
100mm uPVC TO CONNECT TO NEW WM DIVERSION
SURVEY AREA
WATERMAIN CONNECTION TAKEN TO BASEMENT FOR TO SUPPLY INTERNAL COMMUNAL COLD WATER STORAGE AND MAINS WATER DISTRIBUTION TO INDIVIDUAL UNITS WITHIN THE BUILDING
NEW 100mm Ø WATERMAIN DIVERSION- REFER TO LONGITUDINAL SECTION FOR PIPE TYPE
EXISTING 150mm Ø WATERMAIN TO BE DIVERTED SUBJECT TO IW AGREEMENT
FIRHOUSE ROAD
TIE-IN (T1) TO EXISTING NETWORK
PROPOSED CONNECTION TO EXISTING 250mm MDPE MAINS WATER SUPPLY AS CONFIRMED BY IRISH WATER - CONFIRMATION OF FEASIBLITY - CDS20006237 - 28 JAN 2021
1 No. 100mm Ø PE80 SDR17 CONNECTION WITH BULK METER TO BE INSTALLED IN ACCORDANCE WITH IW CoP AND STANDARD DETAILS
25
26
27
28
1
2
3
4
5
6
6A
7
8
9
10
REV DATE DESCRIPTION BY/CHKD/APPR
Client
Bluemont Developments (Firhouse) Limited
PHM Consulting
Civil - Structural - Environmental
11 Mallow Street Limerick Ireland V94 W8N4
Tel: +353 (0)61 576020 Email info@phm.ie Web: www.phm.ie
STRATEGIC HOUSING DEVELOPMENT AT FIRHOUSE ROAD, DUBLIN 24
WATERMAIN LAYOUT
Drawn POR
Scale 1:250
Chkd. POR
Date 04/2022
Apprd. EOD
Status PLANNING D2
Project Number 110-36
Rev. -
Drawing Number 140
A1

NOTES:

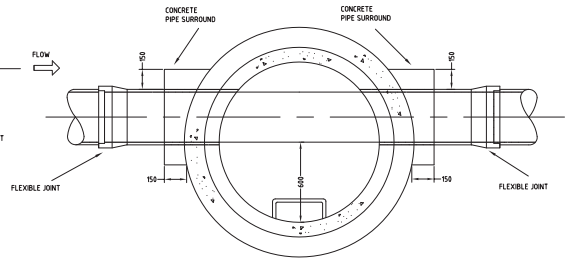


SECTION A-A



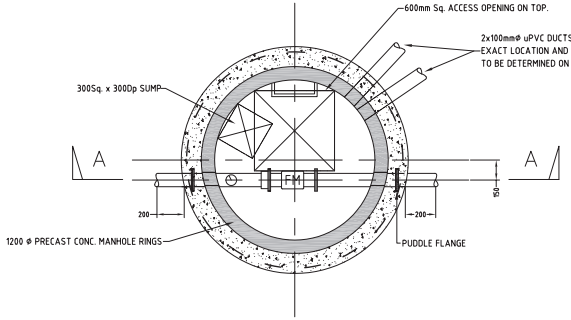
SECTIONAL PLAN A-A

(JUNCTION MANHOLE OR ANGLE > 45°)



SECTIONAL PLAN A-A

(STRAIGHT THROUGH OR ANGLE < 45°)



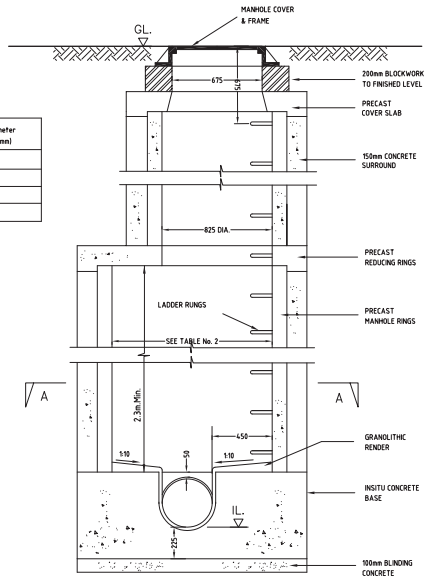
SECTIONAL PLAN B-B

METER CHAMBER

NOT TO SCALE

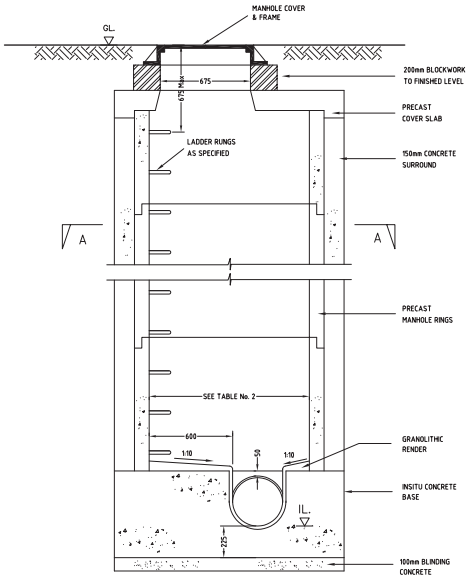
TABLE No.2

Diameter of largest pipe in manhole (mm)	Internal diameter of manhole (mm)
Less than 375	1200
375 - 450	1350
500 - 700	1500
750 - 900	1800



TYPE A MANHOLE

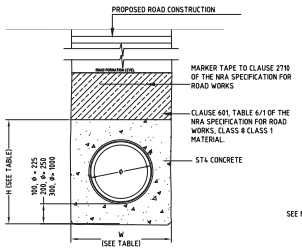
DEPTH FROM GL. TO SOFFIT OF PIPE 3.0 TO 6.0m



SURFACE WATER MANHOLE

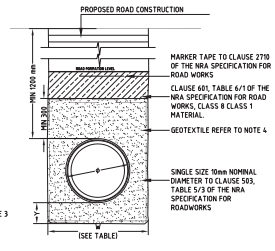
DEPTH FROM GL. TO SOFFIT OF PIPE 3.0m

PIPE Ø	TRENCH WIDTH	CONCRETE SURROUND
(mm)	W (mm)	H (mm)
80	500	400
100	500	400
150	600	450
200	600	450
250	750	650
300	750	650
350	750	750
400	900	850
450	900	850
500	1000	850
1050	2200	1600
1200	2400	1750



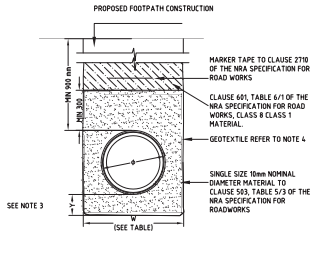
WATERMAIN CONCRETE BED & SURROUND

FOR USE IN TRAFFICKED AREAS MINIMUM COVER 0.9m



WATERMAIN TRENCH AND BEDDING DETAILS

FOR USE IN TRAFFICKED AREAS WITH MINIMUM COVER 1.2m



WATERMAIN TRENCH AND BEDDING DETAILS

FOR USE IN NON TRAFFICKED AREAS MINIMUM COVER 0.9m

NOTES:

1. TRENCH SIDES SHALL BE VERTICAL FROM BOTTOM OF TRENCH TO AT LEAST 300mm OVER CROWN OF PIPE. WHERE THE DEPTH OF COVER OVER THE PIPE BARREL EXCEEDS 2100mm THE LEVEL TO A HEIGHT OF 300mm OVER PIPE BARREL. TRENCH WIDTH SHALL BE RESTRICTED TO 2100 FROM FORMATION.

2. SAND PIPE BEDDING LAYING AND SURROUND SHALL COMPLY WITH CLAUSE 503 OF THE NRA SPECIFICATION FOR ROADWORKS.

3. DIMENSION 'Y' SHALL BE:
OD/4 WITH A MINIMUM OF:
200mm DEPTH FOR PIPELINES IN ROCK
150mm DEPTH FOR PIPELINES IN UNIFORM SOILS AND
DEPTH TO BE MAINTAINED UNDER PIPE SOCKETS.

4. IN WET FINE-GRAINED SOILS THE MIGRATION OF FINE SOIL PARTICLES INTO THE VOIDS OF THE BEDDING IS TO BE MINIMISED BY SURROUNDING THE GRANULAR MATERIAL WITH A GEOTEXTILE FILTER, COMPLYING WITH CLAUSE 511 OF THE NRA SPECIFICATION FOR ROAD WORKS.

5. TRENCH FILL MATERIAL SHALL COMPLY WITH CLAUSE 601, TABLE 6/1 OF THE NRA SPECIFICATION FOR ROAD WORKS AND SHALL BE READILY COMPACTABLE MATERIAL FREE FROM TREE ROOTS, VEGETABLE MATTER, BUILDING RUBBISH, FROZEN SOIL, CLAY LUMPS EXCEEDING 75mm AND STONE EXCEEDING 25mm NOMINAL DIAMETER.

6. BEDDING MATERIAL FROM TRENCH FORMATION TO PIPE CROWN LEVEL SHALL BE WELL COMPACTED IN 150mm LAYERS. BEDDING MATERIAL FROM PIPE CROWN TO 300mm ABOVE CROWN SHALL BE LIGHTLY COMPACTED BY HAND IN 75mm LAYERS.

7. THIS DRAWING IS COPYRIGHT AND IS NOT TO BE COPIED OR REPRODUCED IN PART OR IN WHOLE WITHOUT THE WRITTEN APPROVAL OF THE ENGINEERS.

REV	DATE	DESCRIPTION	BY/CHKD/APPR

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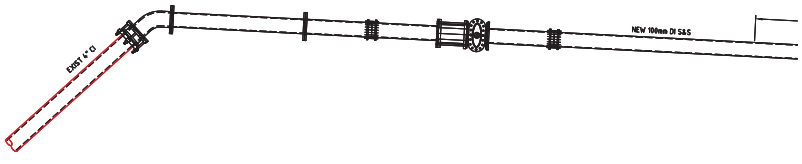
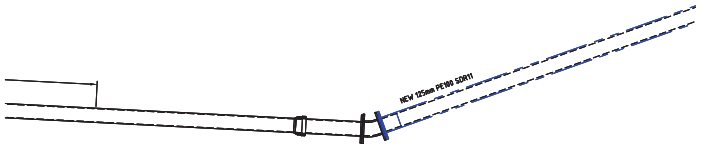
STRATEGIC HOUSING DEVELOPMENT AT
FIRHOUSE ROAD
DUBLIN 24
WATER SERVICES DETAILS

Drawn	Scale
POR	AS SHOWN
Chkd.	Date
POR	04/2022
Apprd.	Status
EOD	PLANNING D2

Project Number	Rev.
110-36	~
Drawing Number	
141	A1



PLAN
SCALE 1:20



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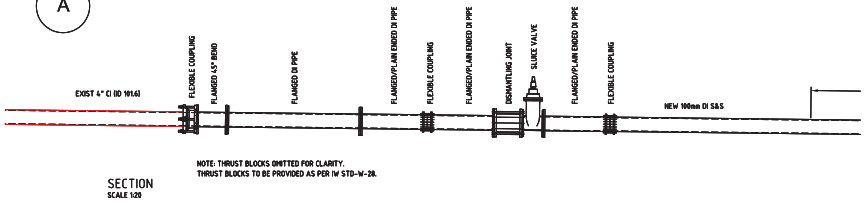
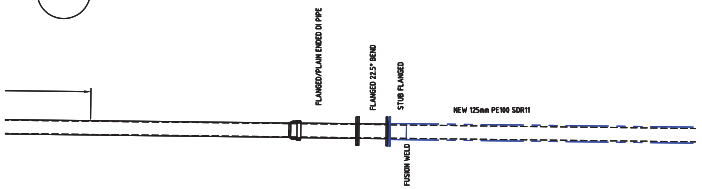


NOTE: THRUST BLOCKS OMITTED FOR CLARITY.
THRUST BLOCKS TO BE PROVIDED AS PER IW STD-W-28.

SECTION
SCALE 1:20

B



FIRHOUSE ROAD TIE-IN

PIPE COMPARISIONS
CI - CAST IRON - 4" - ID 101.6
DI - DUCTILE IRON - ID 100mm, OD 118mm
PE - POLYETHYLENE PE100 SDR11 - ID 101.2mm, OD 125

ALL PIPE TYPE TRANSITIONS TO BE IN ACCORDANCE WITH IW STD-W-04

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.

2. ALL BENDS, TEES, DEAD ENDS, ETC. OF PIPELINES TO BE ADEQUATELY RESTRAINED BY THRUST BLOCKS AS PER DRAWING No. STD-W-28. THRUST BLOCKS NOT SHOWN FOR CLARITY.

3. BUTT FUSION WELDING AND ELECTRO FUSION JOINTING OF PIPES SHALL ONLY BE CARRIED OUT BY TRAINED OPERATIVES IN POSSESSION OF A CURRENT TRAINING CERTIFICATE, USING FULLY AUTOMATIC APPROVED JOINTING MACHINE/RIGS IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. THE IDENTITY OF THE PE PIPELINE MANUFACTURER SHALL BE MADE KNOWN TO IRISH WATER PRIOR TO COMMENCEMENT OF THE INSTALLATION. CERTIFICATION AND TESTING (INCLUDING INDEPENDENT THIRD PARTY CERTIFICATION) SHALL BE PROVIDED TO CONFIRM QUALITY ASSURANCE COMPLIANCE. EACH JOINT SHALL BE CLEARLY MARKED WITH THE JOINT LOGGED AUTOMATICALLY ON THE JOINTING MACHINE. A PRINTOUT OF THE JOINT DETAILS, WITH A GPS LOCATION OF EACH JOINT, SHALL BE PROVIDED AND RETAINED FOR QUALITY ASSURANCE PURPOSES.

4. CONNECTING TO EXISTING MAINS IS TO BE CARRIED OUT BY IRISH WATER OR AN APPROVED IRISH WATER AGENT.

5. WHEN EXISTING AC WATERMAINS ARE PRESENT A SPECIFIC METHOD STATEMENT SHALL BE SUBMITTED TO IRISH WATER PRIOR TO WORKS TAKING PLACE AND SUBJECT TO WRITTEN APPROVAL, DETAILING THE PROTECTION TO BE PUT IN PLACE TO EXISTING MAINS, METHOD OF REMOVAL OF EXISTING AC, METHOD OF DISPOSAL OF EXISTING AC AND METHOD OF CONNECTION TO EXISTING AC.

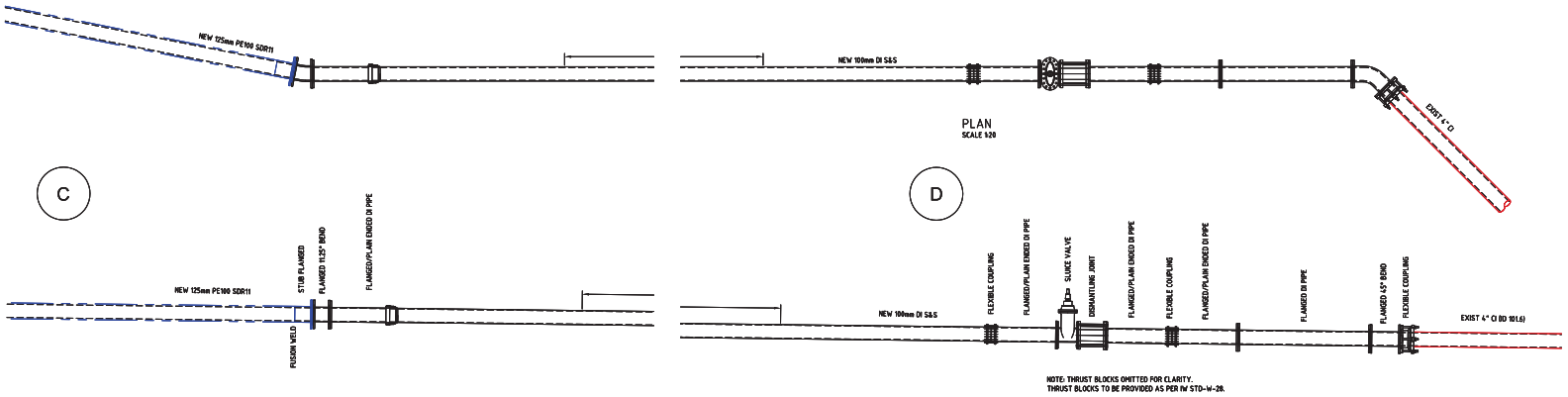
6. PIPE MATERIAL REFERENCES AS FOLLOWS:
AC - ASBESTOS CEMENT
DI - DUCTILE IRON
CI - CAST IRON
PE - POLYETHYLENE
uPVC - UNPLASTICISED POLY VINYL CHLORIDE
ST - STEEL OTHER - REFERS TO ALL EXISTING PIPE MATERIALS OTHER THAN PE
(TYPICALL AC, DI, CI, uPVC & ST).

7. SLUICE VALVE CHAMBERS TO BE IN ACCORDANCE WITH STD-W-14 (DI) AND STD-W-15 (PE). CHAMBERS NOT SHOWN FOR CLARITY.

8. ALL THRUST FLANGES TO BE ADEQUATELY RESTRAINED BY THRUST BLOCKS AS PER DRAWING No. STD-W-28. THRUST BLOCKS NOT SHOWN FOR CLARITY.

9. A HIGH LEVEL OF HEALTH & SAFETY PROCEDURES IS REQUIRED WHEN WORKING ON AC MAINS, & THE OPERATION OF DISMANTLING/ REMOVAL OF AC PIPES & JOINTS.

10. VALVES SHALL BE ARRANGED IN SUCH A MANNER TO ALLOW FOR THE NETWORK TO BE MANAGED TO ENSURE THAT NO MORE THAN 40 PROPERTIES LOSE WATER FROM A BURST ON THE SYSTEM AT ANY ONE TIME.



PLAN
SCALE 1:20

NOTE: THRUST BLOCKS OMITTED FOR CLARITY.
THRUST BLOCKS TO BE PROVIDED AS PER IW STD-W-28.

SECTION
SCALE 1:20

MOUNT CARMEL PLACE TIE-IN

KEY PLAN
SCALE 1:1000 (REFER TO DRG 110-36-140 FOR LAYOUT)

REV	DATE	DESCRIPTION	BY/CHKD/APPR

Client
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STRATEGIC HOUSING DEVELOPMENT AT
FIRHOUSE ROAD
DUBLIN 24
WATERMAIN DIVERSION TIE-INS

Drawn	Scale
POR	AS SHOWN
Chkd.	Date
POR	04/2022
Apprd.	Status
EOD	PLANNING D2

Project Number	Rev.
110-36	~
Drawing Number	
142	A1

Part 2 – DESIGN DETAILS TO BE PROVIDED

Ground Conditions (Soil and Groundwater)

Existing Asset Survey Information

For the proposed works:

- Plan Layout Drawings and Detailed Drawings (including trench details)
- Longitudinal Pipeline Sections (Trunk and Laterals)
- Tie-in Details
- Chamber, hydrant & valve Details
- Thrust block details
- Bend details
- Comparison of headloss through diverted water main against headloss through existing water main and associated calculation methodology.
- Materials proposed and Durability
- Structural and Geotechnical Design
- Provision for Access
- Proximity of Diverted Water Main to Proposed Permanent Structures
- Outline of Proposed Method of Construction
- Outline Main Temporary Works Items envisaged (Dewatering, Utility Diversions)
- Design Risk Assessments
- Traffic Management Plan

Part 3 – DESIGN STANDARDS

Civil Engineering Specification for the Water Industry (CESWI)

Irish Water Standards/Specification in place at the date of this Agreement including Irish Water's Standard Details and Codes of Practice which may be found at https://www.water.ie/connections/developer-services/

BS 9295:2010: Guide to the structural design of Buried Pipelines

Part 4 – DESCRIPTION OF WORKS

The Works required in order to facilitate the development at Firhouse Inn, Firhouse Road, Tallaght, Dublin 24 are shown on Drawing Nos. 110-36-130-A1, 110-36-140-A1, 110-36-141-A1 & 110-36-142-A1 and include the following:

- Design and construction of the Diverted Water Main to include/ensure:

    1. all fittings and described as approximately 91m of 125mm PE water main and 42m of 100mm ductile iron water main to replace the existing 100mm cast iron water main – Works by Developer;
    2. obtaining any required road opening licence (costs to be borne by the Developer) – Works by Developer;
    3. retention of any and all known and unknown existing individual service connections – Works by Developer;
    4. no vertical load is imposed by any structure onto non-load bearing components such as Irish Water's Diverted Water Main – Works by Developer;
    5. excavation may be carried out without impairing the integrity of adjacent buildings or other infrastructure including bringing footings or foundations to below the invert of the Diverted Water Main. This is to allow for future access and maintenance of the Diverted Water Main – Works by Developer;
    6. all testing of the Diverted Water Main including cleaning, testing, swabbing and disinfection and water quality testing – Works by Developer;
    7. final connection ('tie in') of the Diverted Water Main to the existing water main – works by Irish Water. Final connection will only be permitted following Irish Water being satisfied that:
        a. all pre-connection requirements have been met;
        b. all final documents (as defined in the Irish Water Codes of Practice) have been submitted and are deemed satisfactory;
        c. the Diverted Water Main is to an acceptable standard; and
        d. the Diverted Water Main is fit for purpose;
    8. backfilling and reinstatement following construction, testing and commissioning of the Diverted Water Main – Works by Developer
    9. decommissioning, safe removal and disposal of the existing redundant water main in accordance with all Health and Safety regulations – Works by Developer;
    10. flows in the existing Water Main are to be maintained at all times until such time as the Diverted Water Main is put into operation – Works by Developer;
    11. the Developer shall, prior to the commencement of the construction of the development, enter into a separate Connection Agreement with Irish Water.

All the Works shall be carried out in accordance with Irish Water's Standard Details and Codes of Practice which may be found at https://www.water.ie/connections/developer-services/

Part 5 – DEED OF GRANT OF EASEMENT

[Not Used]

Part 6 - IRISH WATER'S ESTIMATE OF THE EXPENDITURE TO BE INCURRED IN LAYING CONSTRUCTING AND (WHERE APPLICABLE) CONNECTING THE DIVERTED WATER MAIN

Item	**Amount**
Irish Water's Costs	€4,020
The Diverted Water Main Bond	[Not Used]

Part 7 - WORDING OF IRREVOCABLE AUTHORITY TO BE GIVEN BY DEVELOPER TO THEIR SOLICITOR

[Not Used]

Part 8 - WORDING OF SOLICITORS UNDERTAKING TO BE GIVEN ON HEADED PAPER OF THE SOLICITORS FIRM

[Not Used]

Part 9 - FORMS OF COLLATERAL AGREEMENT

CONSULTANTS COLLATERAL WARRANTY

THIS AGREEMENT is made on …… 202…

BETWEEN—

(1) **IRISH WATER,** a designated activity company incorporated in Ireland with company's registration number 530363 and having its registered office at Colvill House, 24-26 Talbot Street, Dublin 1 (the "**Beneficiary**", which includes its successors and permitted assignees);

(2) of (the "**Employer**"); and

(3) with company's registration number and having its registered office at (the "**Consultant**").

BACKGROUND

A. The Employer has appointed the Consultant under a contract (the "**Contract**") dated to provide certain professional services (the "**Services**") in relation to (the "**Project**"). Some of the works included in the Project (the "**Water Works**") are for the Beneficiary.

B. The Consultant has agreed to enter into this collateral warranty in favour of the Beneficiary when so required by the Employer.

C. Terms defined in the Contract have the same meaning in this Deed.

THE PARTIES AGREE AS FOLLOWS:

1. Consultant's Undertakings to the Beneficiary

1.1 The Consultant warrants and undertakes to the Beneficiary that it has not broken and will not break any express or implied term of the Contract.

1.2 The Consultant covenants with the Beneficiary that, in carrying out the Services under the Contract, the Consultant has exercised and will continue to exercise the standard of skill, care and diligence reasonably to be expected of properly qualified and competent persons providing services comparable in value, size, scope, character, complexity and quality to that required under the Contract.

2. Insurance

2.1 The Consultant shall take out and maintain professional indemnity insurance in the amount of at least €1.3m (One Million and Three Hundred Thousand Euro) per claim and on an annual aggregate limit covering all the Consultant's obligations under this Deed from start of performance of the Services until a date no earlier than six years from the date of substantial completion of the last works being undertaken pursuant to the Project.

2.2 The maximum excess shall be €50,000 (fifty thousand Euro).

2.3 When it is reasonably requested to do so by the Beneficiary, the Consultant shall produce for inspection satisfactory documentary evidence that its professional indemnity insurance is being maintained.

2.4 The Consultant shall immediately notify the Beneficiary of any cancellation, non-renewal or material reduction in the insurance.

3. Copyright

3.1 The copyright in all drawings, designs, reports, specifications, calculations and other similar documents and written information (including all information stored on any disk, computer or processing facility) obtained or provided by or on behalf of the Consultant in connection with the works undertaken as part of the Project (**Design Information**) will remain vested in the Consultant.

3.2 The Consultant grants to the Beneficiary, and all those authorised by it, an irrevocable royalty free non-exclusive licence to copy and use Design Information related to the Water Works and to reproduce the designs contained in them for any purpose related to the Services including, but without limitation, to construct, complete, maintain, extend, let, sell, promote, advertise, reinstate, maintain, alter and repair the Water Works.

3.3 The Consultant will not be liable for any use by the Beneficiary of the Design Information for any purpose other than that for which the Consultant prepared and provided them.

3.4 The Consultant shall pay and indemnify the Beneficiary against all royalties and other sums for the supply and use of any patented or copyrighted articles, processes, information or investigations required to perform its duties under the Contract.

3.5 The Consultant shall, on reasonable demand, produce to the Beneficiary a copy of all the Design Information.

3.6 The Consultant shall indemnify the Beneficiary against losses, liability, damages, claims, proceedings and costs suffered or incurred by reason of the Consultant infringing or being held to have infringed any copyright or other intellectual property rights in any Design Information.

4. Assignment

The benefit of this Deed is assignable.

5. Step In

5.1 The Beneficiary has no authority under this Deed to issue any instruction to the Consultant in relation to the Consultant's duties under the Contract, unless and until the Beneficiary has given notice under sub-clause 5.3 below.

5.2 The Consultant agrees that it will not, without first giving the Beneficiary at least 28 days written notice, exercise any right of termination of the Contract, or treat the Contract as having been repudiated, or discontinue carrying out the Contract. The notice to the Beneficiary must be accompanied by all of the information referred to in sub-clause 5.5 below. The Consultant's rights of termination (and the like) will cease if, within the 28-day period, the Beneficiary gives notice to the Consultant under sub-clause 5.3 below.

5.3 The Consultant agrees that, if the Beneficiary gives notice requiring the Consultant to accept the Beneficiary's instructions to the exclusion of the Employer, the Consultant will deal with and accept instructions solely from the Beneficiary in substitution for the Employer as if the Beneficiary had appointed the Consultant originally on the terms of the Contract.

5.4 Only if the Beneficiary gives notice under sub-clause 5.3 above, the Beneficiary will become liable for payment of the amounts payable to the Consultant for the Water Works under the Contract (except for amounts due for work for which the Beneficiary has already paid the Employer) and for performance of

the Employer's other obligations under the Contract in respect of the Water Works, but the Beneficiary's liability will not exceed the amounts particulars of which were given in the notice under sub-clause 5.2 above.

5.5 The Consultant and the Employer shall, if so required by the Beneficiary at any time, give the Beneficiary a copy of the whole Contract, particulars of the amounts paid to the Consultant under the Contract, particulars of amounts due and unpaid to the Consultant, particulars of amounts remaining to be paid to the Consultant under the Contract but not yet due, and any information requested by the Beneficiary that is relevant to these amounts.

5.6 If the Employer's obligation to complete the Water Works is terminated under the contract between the Beneficiary and the Employer for the Water Works, and the Beneficiary so requires, the Consultant shall enter into a contract with the Beneficiary or a replacement Consultant for the Consultant to complete its obligations under the Contract, in the same terms as the Contract with all necessary changes.

5.7 The Employer releases the Consultant from any obligation to inquire about whether the Beneficiary's rights under this clause have become exercisable, and from any liability to the Employer for complying with this clause.

6. Notices

Any notice to be given under this Deed must be in writing and will be considered given if delivered by hand or sent by prepaid registered post to the address of the relevant party at the top of this Deed, or at any other address the relevant party may specify by written notice to the other parties. A notice will be taken to have been received on the day of delivery if delivered by hand, or 48 hours later if sent by prepaid registered post.

7. Common Law Rights

Nothing in this Deed limits the Beneficiary's rights at law.

8. Law

This Deed is governed by and construed according to Irish law. The parties submit to the jurisdiction of the Irish courts in relation to all matters concerning it.

9. Procedure

If there is a conflict between this Deed and the Contract, this Deed takes precedence.

10. Joint and Several Liability

The obligations in this Deed of the persons comprising the Consultant are joint and several.

This document has been executed as a deed and is delivered and takes effect on the date stated at the beginning of it.

Given under the Beneficiary's common seal

……
Director
……
Director/Secretary

Given under the Employer's common seal

……
Director

……
Director/Secretary

Given under the Consultant's common seal

……
Director
……
Director/Secretary

CONTRACTORS COLLATERAL WARRANTY

THIS AGREEMENT is made on …….. 202…

BETWEEN—

(1) **IRISH WATER,** a designated activity company incorporated in Ireland with company's registration number 530363 and having its registered office at Colvill House, 24-26 Talbot Street, Dublin 1 (the "**Beneficiary**", which includes its successors and permitted assignees);

(2) of (the "**Employer**"); and

(3) , with company's registration number and having its registered office at (the "**Contractor**").

.

BACKGROUND

A. The Employer has appointed the Contractor under a contract (the "**Contract**") dated to provide (the "**Project**"). Some of the works included in the Project (the "**Water Works**") are for Irish Water.

B. Under the Contract the Contractor has agreed to enter into this collateral warranty in favour of the Beneficiary when so required by the Employer.

C. Terms defined in the Contract have the same meaning in this Deed.

THE PARTIES AGREE AS FOLLOWS:

1. Contractor's Undertakings to the Beneficiary

1.1 The Contractor warrants and undertakes to the Beneficiary that it has not broken and will not break any express or implied term of the Contract.

1.2 The Contractor covenants with the Beneficiary that, in carrying out the Contract, the Contractor has exercised and will continue to exercise the standard of skill, care and diligence reasonably to be expected of properly qualified persons providing works, services or supply comparable in value, size, scope, complexity and quality to that required under the Contract.

2. [Insurance] / [not used][1]

2.1 The Contractor shall maintain professional indemnity insurance in the amount of at least €1.3m (One Million and Three Hundred Thousand Euro) per claim and on an annual aggregate limit covering the Contractor's obligations under this Deed until a date no earlier than six years from the date of substantial completion of the last works being undertaken pursuant to the Project

2.2 The maximum excess shall be €50,000 (fifty Thousand Euro).

2.3 When it is reasonably requested to do so by the Beneficiary, the Contractor shall produce for inspection satisfactory documentary evidence that its professional indemnity insurance is being maintained.

2.4 The Contractor shall immediately notify the Beneficiary of any cancellation, non-renewal or material reduction in the insurance.

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[1] If a design consultant is appointed in respect of the Project, Clause 2 may be struck though by the Contractor.

3. Copyright

3.1 The copyright in all drawings, designs, reports, specifications, calculations and other similar documents and written information (including all information stored on any disk, computer or processing facility) obtained or provided by or on behalf of the Contractor in connection with the works undertaken as part of the Project (**Design Information**) will remain vested in the Contractor.

3.2 The Contractor grants to the Beneficiary, and all those authorised by it, an irrevocable royalty free non-exclusive licence to copy and use Design Information related to the Water Works and to reproduce the designs contained in them for any purpose related to the Water Works including, but without limitation, to construct, complete, maintain, extend, let, sell, promote, advertise, reinstate and repair the Water Works.

3.3 The Contractor will not be liable for any use by the Beneficiary of the Design Information for any purpose other than that for which the Contractor prepared and provided them.

3.4 The Contractor shall pay and indemnify the Beneficiary against all royalties and other sums for the supply and use of any patented or copyrighted articles, processes, information or investigations required to perform its duties under the Contract.

3.5 The Contractor shall, on reasonable demand, produce to the Beneficiary a copy of all the Contractor's Documents and Design Information.

3.6 The Contractor shall indemnify the Beneficiary against losses, liability, damages, claims, proceedings and costs suffered or incurred by reason of the Contractor infringing or being held to have infringed any copyright or other intellectual property rights in any Design Information.

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The benefit of this Deed is assignable.

5. Step In

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5.2 The Contractor agrees that it will not, without first giving the Beneficiary at least 28 days written notice, exercise any right of termination of the Contract, or treat the Contract as having been repudiated, or discontinue carrying out the Contract. The notice to the Beneficiary must be accompanied by all of the information referred to in sub-clause 5.5 below. The Contractor's rights of termination (and the like) will cease if, within the 28-day period, the Beneficiary gives notice to the Contractor under sub-clause 5.3 below.

5.3 The Contractor agrees that, if the Beneficiary gives notice requiring the Contractor to accept the Beneficiary's instructions to the exclusion of the Employer, the Contractor will deal with and accept instructions solely from the Beneficiary in substitution for the Employer as if the Beneficiary had appointed the Contractor originally on the terms of the Contract.

5.4 Only if the Beneficiary gives notice under sub-clause 5.3 above, the Beneficiary will become liable for payment of the amounts payable to the Contractor for the Water Works under the Contract (except for amounts due for work for which the Beneficiary has already paid the Employer) and for performance of the Employer's other obligations under the Contract in respect of the Water Works, but the Beneficiary's liability will not exceed the amounts particulars of which were given in the notice under sub-clause 5.2 above.

5.5 The Contractor and the Employer shall, if so required by the Beneficiary at any time, give the Beneficiary a copy of the whole Contract, particulars of the amounts paid to the Contractor under the Contract,

particulars of amounts due and unpaid to the Contractor, particulars of amounts remaining to be paid to the Contractor under the Contract but not yet due, and any information requested by the Beneficiary that is relevant to these amounts.

5.6 If the Employer's obligation to complete the Water Works is terminated under the contract between the Beneficiary and the Employer for the Water Works, and the Beneficiary so requires, the Contractor shall enter into a contract with the Beneficiary or a replacement contractor for the Contractor to complete its obligations under the Contract, in the same terms as the Contract with all necessary changes.

5.7 The Employer releases the Contractor from any obligation to inquire about whether the Beneficiary's rights under this clause have become exercisable, and from any liability to the Employer for complying with this clause.

6. Notices

Any notice to be given under this Deed must be in writing and will be considered given if delivered by hand or sent by prepaid registered post to the address of the relevant party at the top of this Deed, or at any other address the relevant party may specify by written notice to the other parties. A notice will be taken to have been received on the day of delivery if delivered by hand, or 48 hours later if sent by prepaid registered post.

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Nothing in this Deed limits the Beneficiary's rights at law.

8. Law

This Deed is governed by and construed according to Irish law. The parties submit to the jurisdiction of the Irish courts in relation to all matters concerning it.

9. Procedure

If there is a conflict between this Deed and the Contract, this Deed takes precedence.

10. Joint and Several Liability

The obligations in this Deed of the persons comprising the Contractor are joint and several.

This document has been executed as a deed and is delivered and takes effect on the date stated at the beginning of it.

Given under the Beneficiary's common seal

.....
Director
.....
Director/Secretary

Given under the Employer's common seal

.....

.....

Given under the Contractor's common seal

.....
Director
.....
Director/Secretary

DIVERSION AGREEMENT – EXECUTION PAGE

AS WITNESS WHEREOF this agreement has been executed by the parties on the day and year first above written.

SIGNED .....

Print Name……

being duly authorised to sign this Agreement on behalf of the **DEVELOPER**

SIGNED .....

Print Name……

being duly authorised to sign this Agreement on behalf of **IRISH WATER**

APPENDIX H

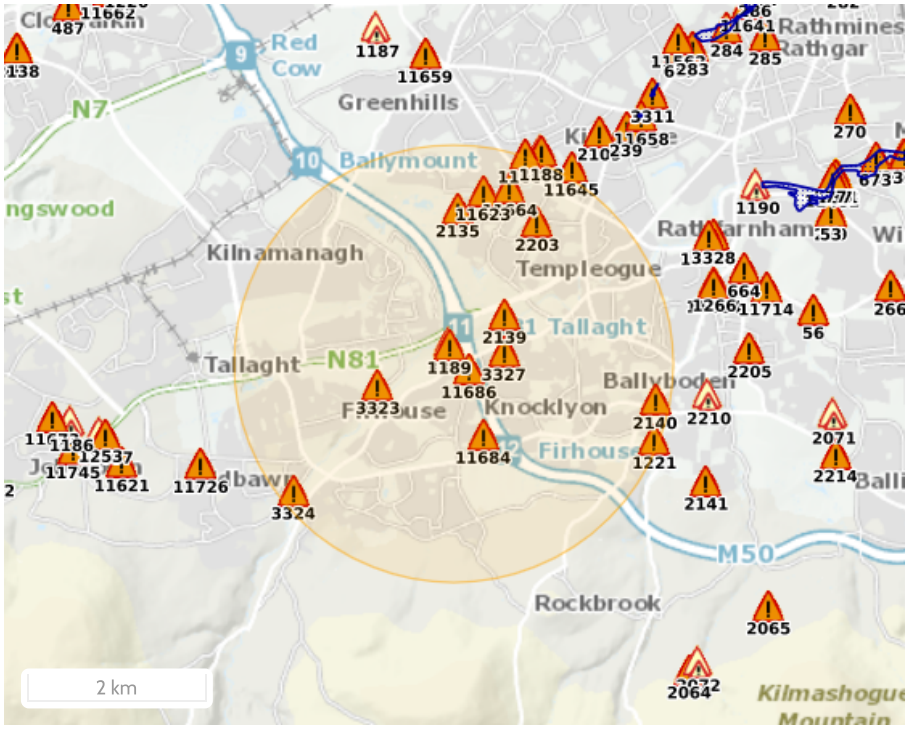
OPW Records

Past Flood Event Local Area Summary Report

Report Produced: **4/9/2021 10:38**

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

This report has been downloaded from www.floodinfo.ie (the "**Website**"). The users should take account of the restrictions and limitations relating to the content and use of the Website that are explained in the Terms and Conditions. It is a condition of use of the Website that you agree to be bound by the disclaimer and other terms and conditions set out on the Website and to the privacy policy on the Website.



Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

14 Results

	Name (Flood_ID)	Start Date	Event Location
1.	Dodder Mount Carmel Park recurring (ID-1189)	n/a	Approximate Point
	Additional Information: Reports (2) Press Archive (1)		
2.	Owenadoher Edmondstown Road. Nov 2000 (ID-1221)	05/11/2000	Approximate Point
	Additional Information: Reports (3) Press Archive (0)		
3.	Old City water Course Spawell House Feb 1994 (ID-2139)	03/02/1994	Exact Point
	Additional Information: Reports (1) Press Archive (0)		
4.	Boden Villas Feb 1994 (ID-2140)	03/02/1994	Exact Point
	Additional Information: Reports (1) Press Archive (0)		
5.	Poddle Glendown Crescent Feb 1994 (ID-2203)	03/02/1994	Exact Point
	Additional Information: Reports (1) Press Archive (0)		
6.	Dodder Avonmore Park Nov 2000 (ID-3323)	05/11/2000	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		

	Name (Flood_ID)	Start Date	Event Location
7.	Dodder Kiltipper Road Nov 2000 (ID-3324) **Additional Information:** Reports (1) Press Archive (0)	05/11/2000	Approximate Point
8.	Knocklyon Ave Nov 2000 (ID-3327) **Additional Information:** Reports (1) Press Archive (0)	05/11/2000	Approximate Point
9.	Mount Carmel Park Firhouse Nov 2000 (ID-3333) **Additional Information:** Reports (1) Press Archive (1)	05/11/2000	Approximate Point
10.	Flooding at Castlefield, Glenvara and Glenlyon, Knocklyon, Dublin 16.on 24th Oct 2011 (ID-11684) **Additional Information:** Reports (1) Press Archive (0)	24/10/2011	Exact Point
11.	Osprey Estate Nov 1982 (ID-2135) **Additional Information:** Reports (1) Press Archive (0)	05/11/1982	Exact Point
12.	Flooding at Limekiln Road, Ballyboden Rd, Co. Dublin on 24th Oct 2011 (ID-11623) **Additional Information:** Reports (1) Press Archive (0)	24/10/2011	Approximate Point
13.	Flooding at Wellington Lane, Dublin 24 on 24th Oct 2011 (ID-11664) **Additional Information:** Reports (1) Press Archive (0)	24/10/2011	Exact Point
14.	Flooding at Homeville, Knocklyon, Dublin 16.on 24th Oct 2011 (ID-11686) **Additional Information:** Reports (1) Press Archive (0)	24/10/2011	Exact Point

ESB International

MINUTES OF MEETING

Document No. / File Reference:	P4D403A – F310 – 030 – 004	
Project No.:	PD403A	
Project Title:	OPW Flood Hazard Mapping – Phase 1	
Purpose of Meeting:	South Dublin County Council – Areas of flooding – Drainage Division and Roads(North County)	
Participating:	Senior Executive Engineer Drainage Senior Engineer Env Serv (part-time) Roads Engineer Search Manage)	South Dublin County Council (SDCC) South Dublin County Council South Dublin County Council ESBI
Venue:	South Dublin County Council Offices, Tallaght	
Date(s) of Meeting:	25/04/05	
Copies to:	SDCC	
Status:	**Final**	
Compiled by:	Search Manager	
Approved for ESBI:	Search Manager	
Approved for South Dublin County Council	SEE Environmental Services Drainage	
Date:		

ESB INTERNATIONAL LTD.
Stephen Court, 18/21 St. Stephen's Green, Dublin 2, Ireland
Telephone: +353-1-7038000 Fax: +353-1-6764400
Website: www.esbi.ie

ITEM NO.	MINUTE	ACTION BY
1	**Documents Issued**	
1.1	The following were issued by SDCC to ESBI: A. A map of South Dublin County illustrating areas vulnerable to flooding derived from discussions within the Drainage Section of SDCC. B. A list of locations vulnerable to flooding generated by the SDCC Roads Section (North) was presented. C. A CD issued by JB Barry to SDCC containing ▪ Report of Flood Event 5/6 November 2000, ▪ Hydro Environmental Report on Lucan Village, ▪ Flood Extent mapping (Adobe pdf) ▪ Flood photos and ▪ As-built Flood Defence Asset drawings (AutoCAD).	
1.2	At the meeting, the locations vulnerable to flooding indicated on Map A (see heading 1.1) were reviewed by SDCC. The locations were assigned numbers and described. The locations and descriptions are listed below under Heading 2. The flooding information provided by the Roads Section (Document B heading 1.1) was added to Map A, then numbered and is described below under Heading 3.	
2	**Flood Locations (Drainage Section)**	
2.1	1. Newcastle Village – Glebe – Recurring. Basement of house. Flood ID 1181. 2. Peamount Road Recurring. Flood ID 1182. 3. Beech Row Cottages Ronanstown Recurring. 6 houses affected. Flood ID 1183. 4. Cappaghmore Culvert Recurring – 9th Lock Road. Flood ID 1184. 5. Camac Culvert recurring – Irish Farm Centre, Old Naas Road. Problems with structural integrity of culvert. Flood ID 1185. 6. Killinarden Stream Jobstown recurring. Blocked regularly with debris. Flood ID 1186. 7. Robinhood Stream Walkinstown Recurring. Flood ID 1187. 8. Whitehall Road Kimmage Recurring. Drainage Related. Flood ID 1188. 9. Dodder Mount Carmel Park recurring. Parkland. Flood ID 1189. 10. Dodder – Lower Dodder Road Recurring. Flood ID 1190. 11. Tobermaclog Backweston Stream Recurring. Refer to OPW and Kildare County Council. Flood ID 1211 12. Baldonnell Barney's Lane Recurring. Flood ID 1214 13. Newcastle Greenoge Recurring. Flood ID 1215 14. Palmerston – Mill Lane. Regular flooding near Liffey. Flood ID 1216 15. Camac Watery Lane Clondalkin Recurring. Flood ID 1220 16. Owendoher Stream Edmonstown Road. Nov 2000. Possible link to M50 works. Flood ID 1221 17. Hazelhatch Flooding Shinkeen recurring. Refer to OPW information	
3	**Flood Locations (Engineer - Roads Section – North by telephone)**	
3.1	18. Lucan St Edmonsbury. Flooding of Road. Flood ID 1222 19. Aylmer Road Newcastle. Location to be confirmed. Flood ID 1223 20. Rathcoole Bridge. Affects slip road Dublin bound traffic to Rathcoole. Flood ID	

ITEM NO.	MINUTE	ACTION BY
	1224 21. Lyons Road Newcastle. Recurring. Flood ID 1225	
4.	**Processing of Data**	
4.1	The locations listed under Headings 2 and 3 above will be incorporated into the project database as Flood Events. They will then be mapped in the project GIS as points in accordance with the locations indicated on Map B.	

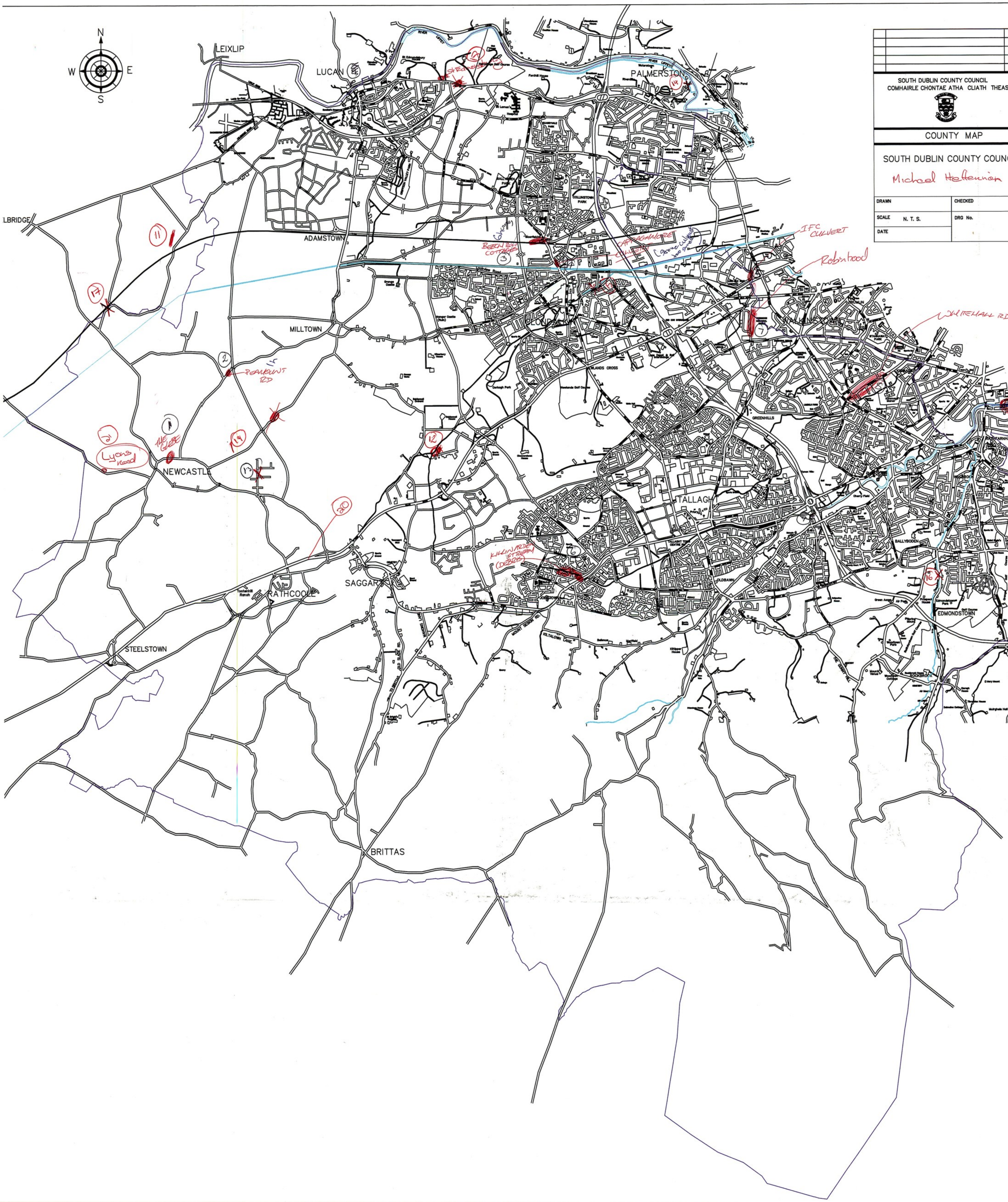
SOUTH DUBLIN COUNTY COUNCIL
COMHAIRLE CHONTAE ATHA CLIATH THEAS

COUNTY MAP

SOUTH DUBLIN COUNTY COUNC

Michael Heffernan

DRAWN		CHECKED	
SCALE	N. T. S.	DRG No.	
DATE			



Flooding at Homeville, Knocklyon, Dublin 16
24th October 2011

The information contained in this report has been extracted from a Flood Data Collection Form submitted to The Office Of Public Works (OPW) by Consultants working on the Eastern River Basin District (RBD) Catchment Flood Risk Assessment and Management (CFRAM) Project.

1 Location and date of flood event:

Location: Homeville, Knocklyon, Dublin 16.
Irish Grid Co-Ordinates: 311,475 227,465

This flooding event started at 6pm on 24th October 2011 and ended at 6am on 25th October 2011, the peak flood occurred at 10pm on 24th October 2011.

2 Source and cause:

The source of the flood waters was the overtopping of the Ballycullen Stream, which is in the Dodder Catchment.
Water level rose at culvert inlet under wall/shed. Residents reported that the trash screen was significantly blinded. (Trash screen witnessed by report writer to be over 50% blinded with old debris on 7/12/2011)
Water entered the Homeville Estate through a railing fence and flooded 2 properties. River is open channel through the garden of 2 and 3 Homeville. Water rose in the garden of no 2 at culvert inlet and contributed to flooding in 2 and 3 Homeville and 4, 5 and 6 Taoibh na Coille.

3 Flood data:

The following flood information was provided:

Flood Parameter	Max Value	Typical Value	Comments
Flood Level (metres OD Malin)			
Flood Depth (metres)		500mm	
Flood Flow (m^3/s)			
Flood Velocity (m/s)			

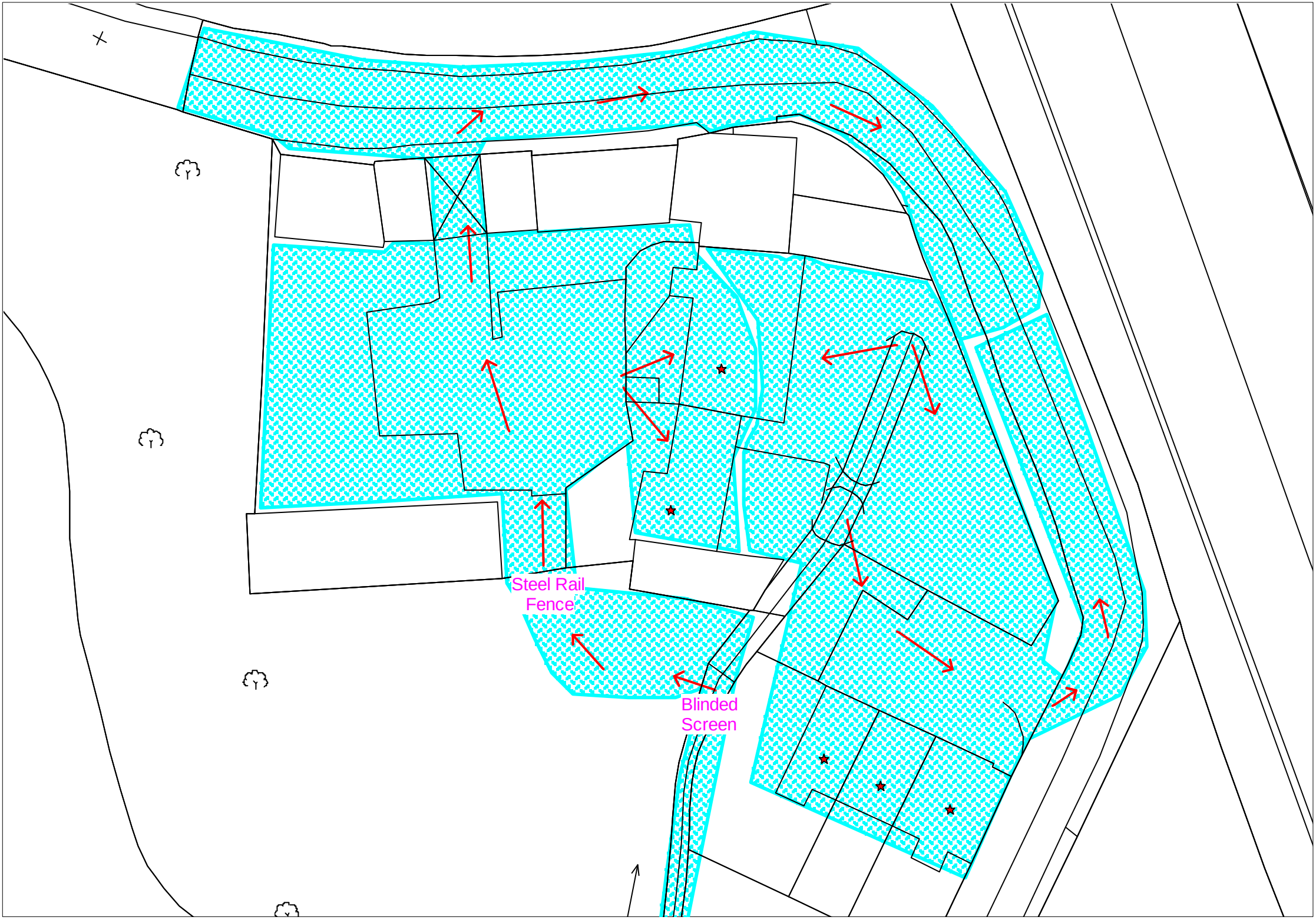
The stream has been realigned as part of the M50 construction. Residents report that there have been flooding problems in recent years.

4 Impacts of flooding event:

Impacts to people: There was no loss of life and it is not known if there was serious injury as a result of this flooding event.
Impacts to Property: Residential - There were 5 properties with approximately 15 people affected by this event.
Impacts to transport infrastructure: Roads – 200m of the Old Knocklyon Road (Urban) was affected by this event.

5 Documents Attached:

Photographs and a map of the area affected are attached.


Steel Rail
Fence
Blinded
Screen

Homeville, Knocklyon

01.jpg

02.jpg

03.jpg

04.jpg

05.jpg

06.jpg

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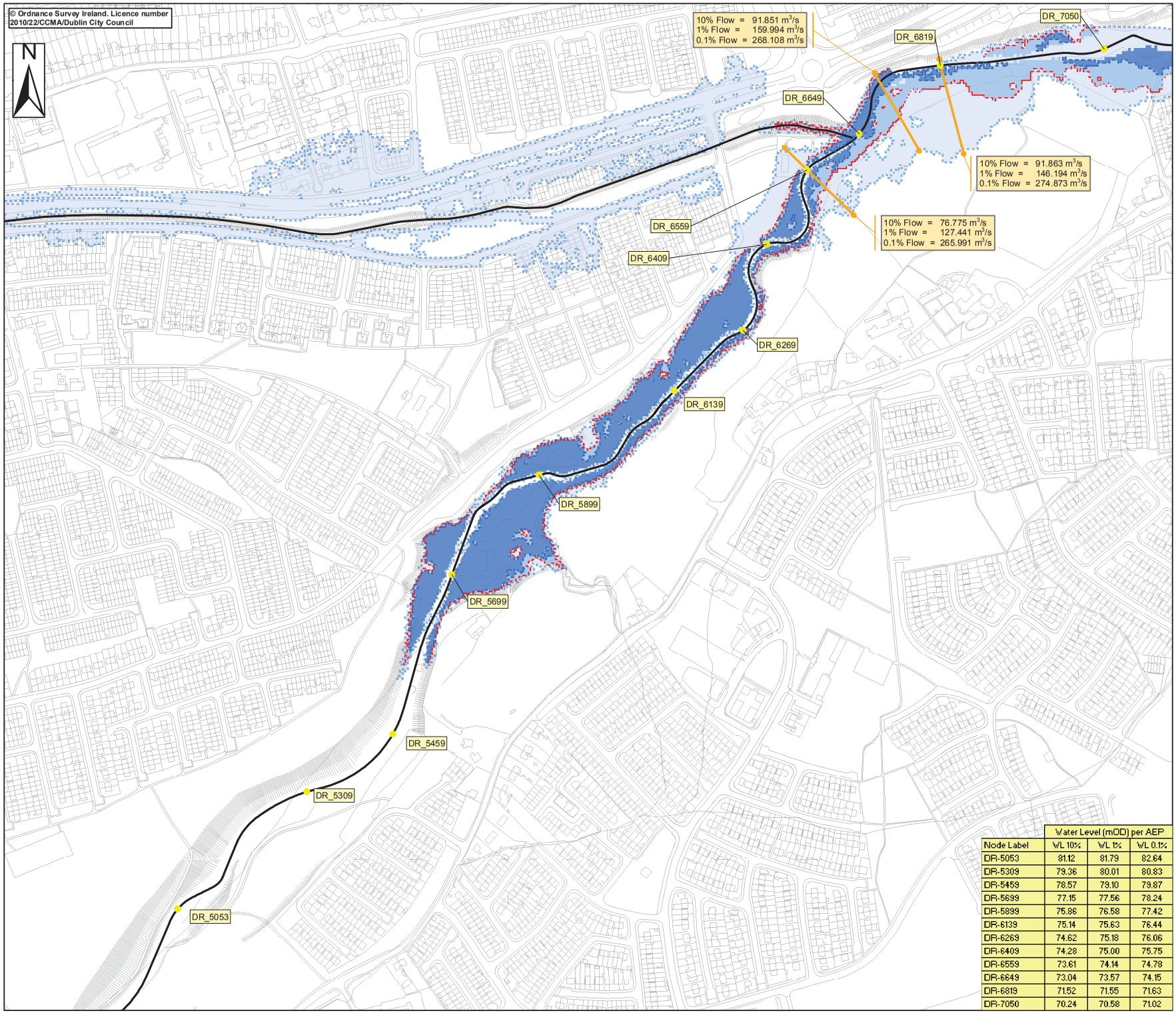
09.jpg

10.jpg

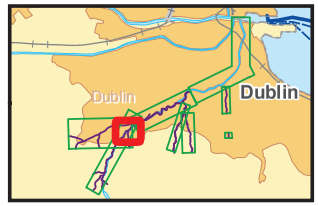
APPENDIX I

OPW/SDCC Flood Maps



Node Label	Water Level (mOD) per AEP		
	WL 10%	WL 1%	WL 0.1%
DR-5053	81.12	81.79	82.64
DR-5309	79.36	80.01	80.83
DR-5459	78.57	79.10	79.87
DR-5699	77.15	77.56	78.24
DR-5899	75.86	76.58	77.42
DR-6139	75.14	75.63	76.44
DR-6269	74.62	75.18	76.06
DR-6409	74.28	75.00	75.75
DR-6559	73.61	74.14	74.78
DR-6649	73.04	73.57	74.15
DR-6819	71.52	71.55	71.63
DR-7050	70.24	70.58	71.02

Location Plan:



Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Defended Area
- High Confidence (<20m) (10% AEP)
- Medium Confidence (<40m) (10% AEP)
- Low Confidence (>40m) (10% and 0.1% AEP)
- High Confidence (<20m) (1% AEP)
- Medium Confidence (<40m) (1% AEP)
- Low Confidence (>40m) (1% AEP)
- River Centreline
- Node Point
- OS_2975 Node Label (refer to table)
- Flow reporting location
- 10% Flow = 1.20 1% Flow = 1.56 0.1% Flow = 2.17 Peak flow during design flood extent

USER NOTE:

USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.

Client:

Dublin City Baile Átha Cliath | South Dublin County Council | Dún Laoghaire-Rathdown County Council Comhairle Contae Dhún Laoghaire-Ráth an Dúin | OPW

Project:

DODDER CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

Map:

PRESENT DAY DODDER

Map Type:	FLOOD EXTENT
Source:	FLUVIAL FLOODING
Map Area:	URBAN AREA
Scenario:	CURRENT
Drawn By :	A.A.B — Date : 26 November 2010
Checked By :	A.J. — Date : 26 November 2010
Approved By :	A.G.B — Date : 26 November 2010

Figure No. :

DR/EXT/UA/CURS/101

Map Series : Page 3 of 12

Drawing Scale : 1: 5,000 — Plot Scale : 1:1 @ A3

0 0.1 0.2 Kilometers

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TEL : 028 9066 7914
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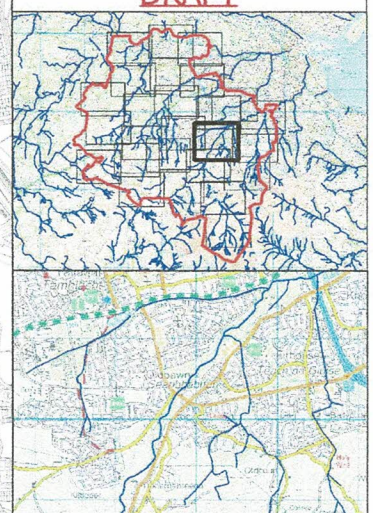
Legend

- Flood Zone A - 1% AEP Flood Extent (1 in 100 chance in any given year)
- Flood Zone B - 1% AEP Flood Extent (1 in 1000 chance in any given year)
- Defended Area
- Watercourse Centreline
- Indicative Flood Extents
- County Boundary

DRAFT



Comhairle Contae
Átha Cliath Theas
South Dublin County Council

Project: Strategic Flood Risk Assessment

Title: Fluvial Flood Zone Mapping

Figure: MDW657_0016

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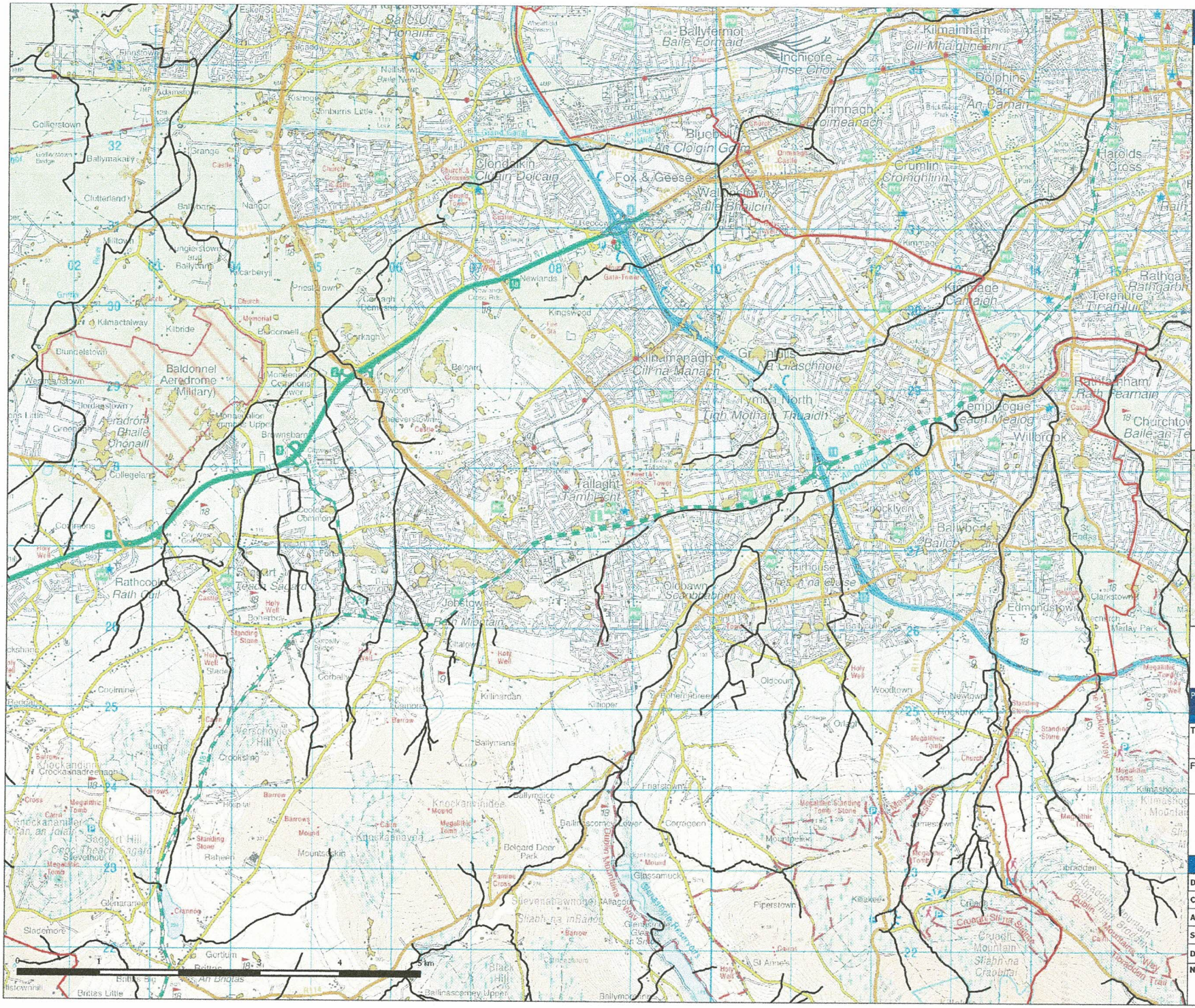
Issue Details

Drawn:	BT	Project No.	MDW0657
Checked:	JH	File Ref	MDW0657QG0010F02
Approved:	JH		
Scale:	1:6000 @ A1	Drawing No.	Projection
Date:	14/01/2016	16 of 26	IG

Notes
1. The viewer of this map should refer to the SFRA Report and Disclaimer



Comhairle Contae
Átha Cliath Theas
South Dublin County Council

Project: Strategic Flood Risk Assessment

Title: PFRA Indicative Pluvial Flood Zone Mapping

Figure: MDW0657_00029

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Issue Details

Drawn:	BT	Project No.	MDW0657
Checked:	JH	File Ref	MDW0657QG0012F02
Approved:	JH		
Scale:	1:20000	Drawing No.	3 of 4
Date:	14/01/2016	Projection	IG

Notes
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