



Engineering Assessment Report

Proposed Shared Living Strategic Housing Development at
Western Way, Dublin 7

November 2020

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This document has been prepared and checked in accordance with
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Comments

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- B. GDSDS Attenuation Calculations

1. Introduction

1.1 Background of Report

This engineering assessment report has been prepared by Waterman Moylan as part of the planning documentation for a proposed shared living development on the site of the disused Hendrons facility at 36-40 Dominick Street Upper, Broadstone, Dublin 7.

This report assesses wastewater and surface water drainage, water supply infrastructure and the road and transportation network in the vicinity of the site, and details the criteria used to design the proposed wastewater and surface water drainage, water supply and road networks.

1.2 Site Location and Description

The subject site is located in Broadstone, Phibsborough, Dublin 7, and is bounded by Western Way to the north and west, Palmerston Place to the east and Dominick Street Upper to the south. A portion of the north-eastern perimeter is also bounded by the gardens of neighbouring houses.

The site is located prominently on Western Way, to the east of Constitution Hill. Existing ground levels at the site fall from c. 19.8m OD Malin at the south-west to c. 18.4m OD Malin at the north of the site.

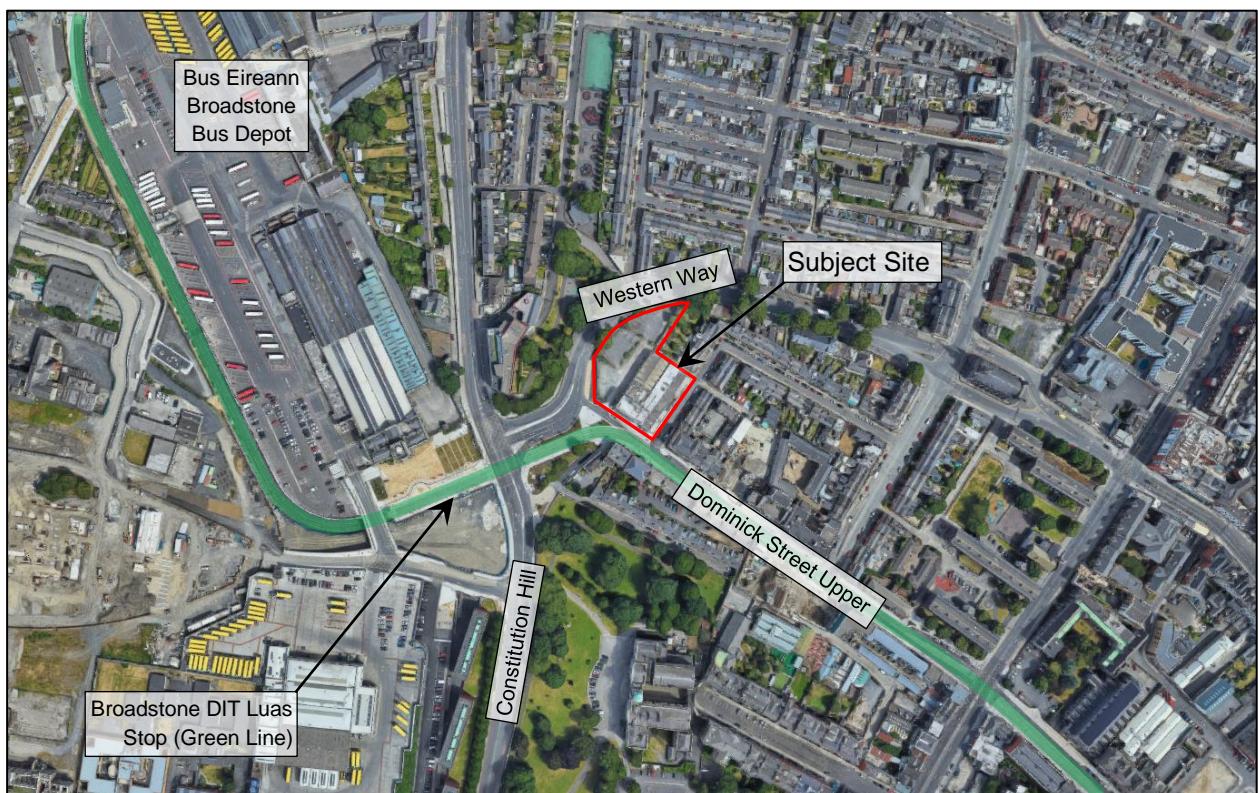


Figure 1 | Site Location (Source: Google Maps)

The existing site is approximately 3,285m² and is a brownfield site comprising of a carpark along the western side of the site and a building complex to the south-east.

The building complex includes the Hendrons building, No.36 Dominick Street Upper and warehouses. The Hendrons building is a former showroom and workshop built between 1946 and 1959, No.36 Dominick Street Upper is a three-storey building in an advanced state of structural decay and the warehouse building is a two-storey over basement linear industrial building fronting onto Palmerston Place.

Main access to the site is from Dominick Street Upper, with a private gated side access road from Palmerston Place running between the existing building complex and the neighbouring property to the north.

The site is zoned Z3 "to provide for and improve neighbourhood facilities" under the Dublin City Development Plan 2016-2022. The site falls just outside of the Phibsborough Local Area Plan.

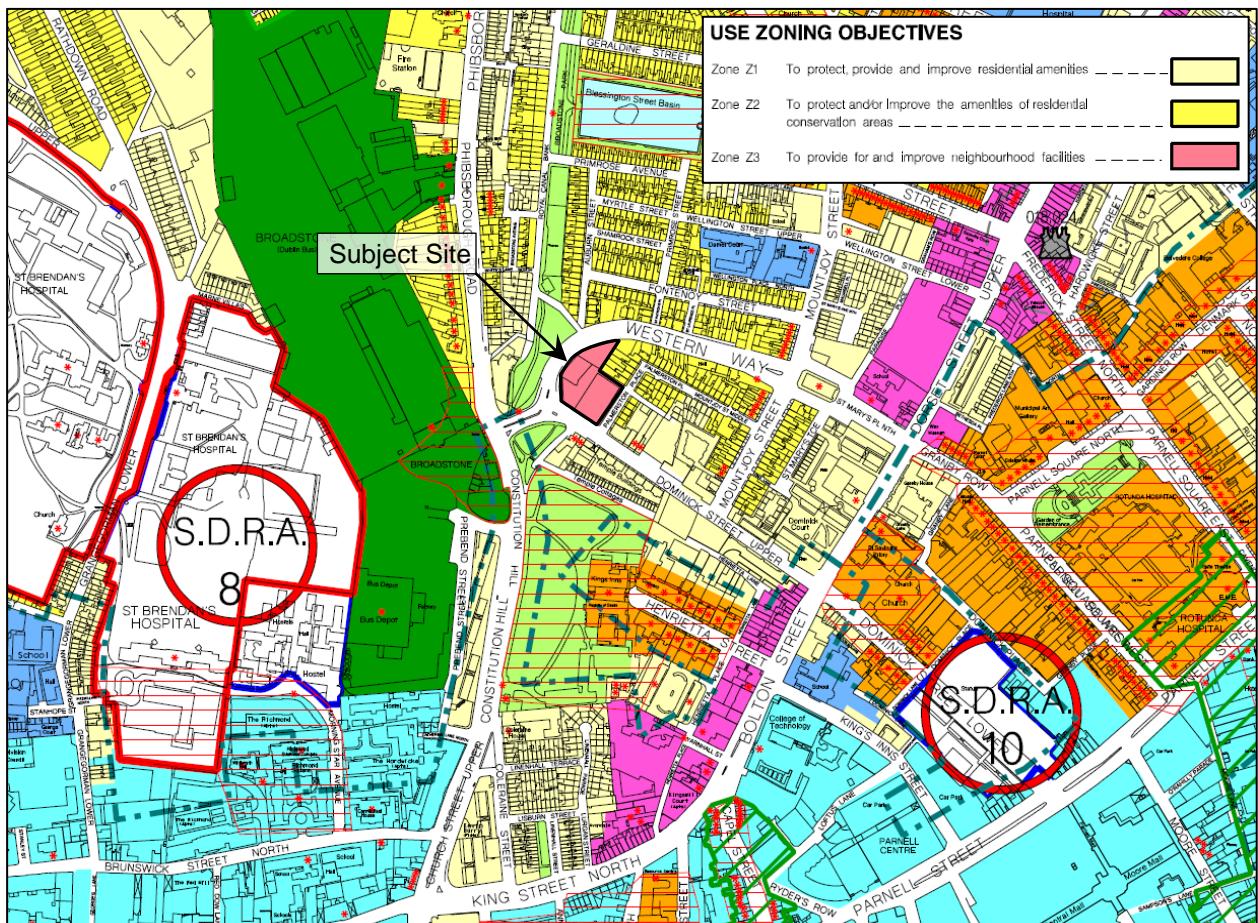


Figure 2 | Extract from Dublin City Council Development Plan 2016-2022

1.2.1 Site History

The subject site is currently home to the Hendrons Building, a former showroom and workshop built between 1946 and 1959.

The Hendrons Building is a six-bay four-storey building fronting onto Dominick Street Upper, and forms part of a larger building complex on the site which includes two-storey buildings behind. It is a distinctive and well-known landmark in the area, and the building is to be maintained and incorporated into the proposed development, with the remainder of the complex to be demolished. The building includes a partial basement, and the ground floor of the existing building is at c.19.1m OD Malin.

Behind the Hendrons building, the building complex comprises a warehouse building and no.36 Dominick Street Upper, which proposed to be demolished. No.36 Dominick Street Upper is a three-storey building in an advanced state of structural decay. The warehouse building is a two-storey over basement linear industrial building fronting onto Palmerston Place.



Figure 3 | Existing Hendrons Building façade, as viewed from Dominick Street Upper

Historic maps dating to 1888 show that the subject site has been developed for more than 130 years, with the road layout adjacent to the site remaining largely unchanged.

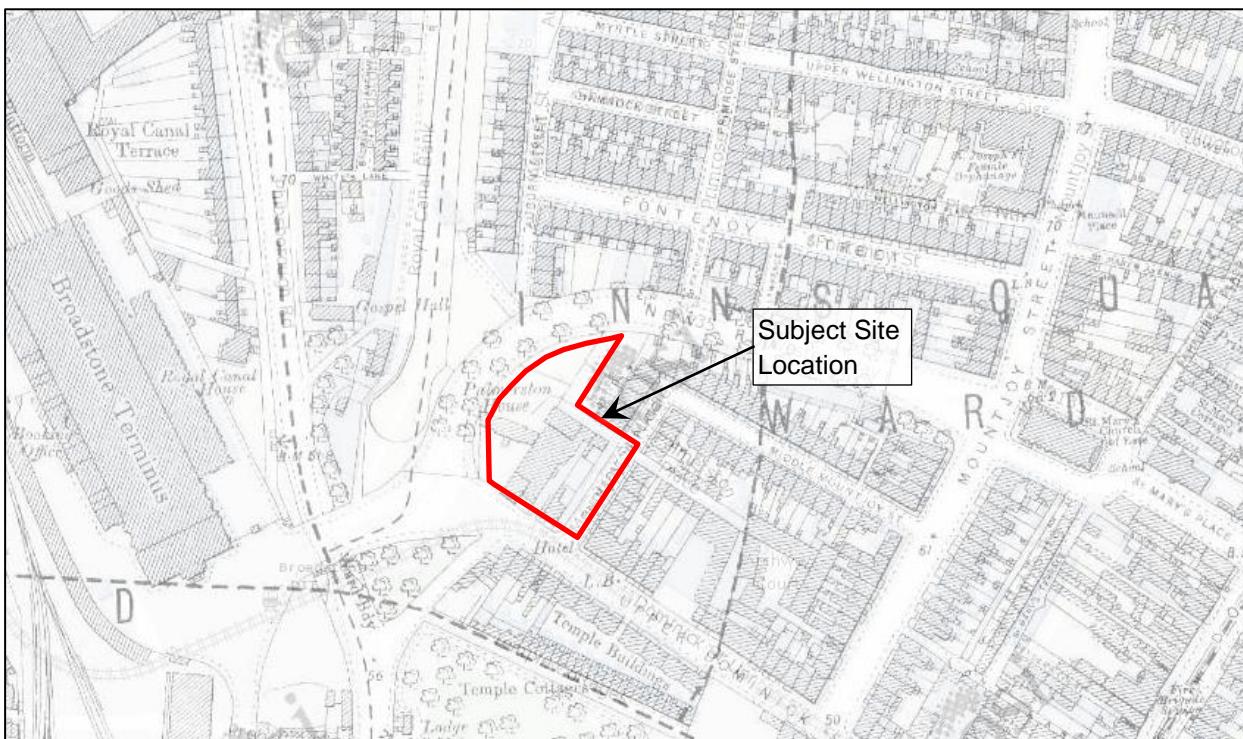


Figure 4 | Historic Mapping (1888)

The existing building is located prominently on Western Way, near to the peak of Constitution Hill, with the ground levels falling away from the Hendrons building in all directions. The building's ground level finished floor sits up to 300mm below the adjacent back of footpath.

1.3 Proposed Development

The proposed development comprises demolition of the existing warehouse buildings and no. 36 Dominick Street Upper and retention of the Hendrons Building as part of an overall redevelopment of the site to accommodate a build-to-rent shared living scheme and publicly accessible neighbourhood uses (including café/shop, gym and yoga studios). The scheme will include; 280 no. shared living rooms (281 no. bed-spaces), internal and external amenity space over 5 no. blocks ranging in height from 5 no. storeys to 9 no. storeys, secure bicycle parking, site-wide landscaping, ESB substation and switch-room and site development works all on the 0.3285 hectare site.

2. Foul Water Network

2.1 Existing Foul Water Network

Irish Water records for the surrounding area have been provided by Dublin City Council and are extracted below.

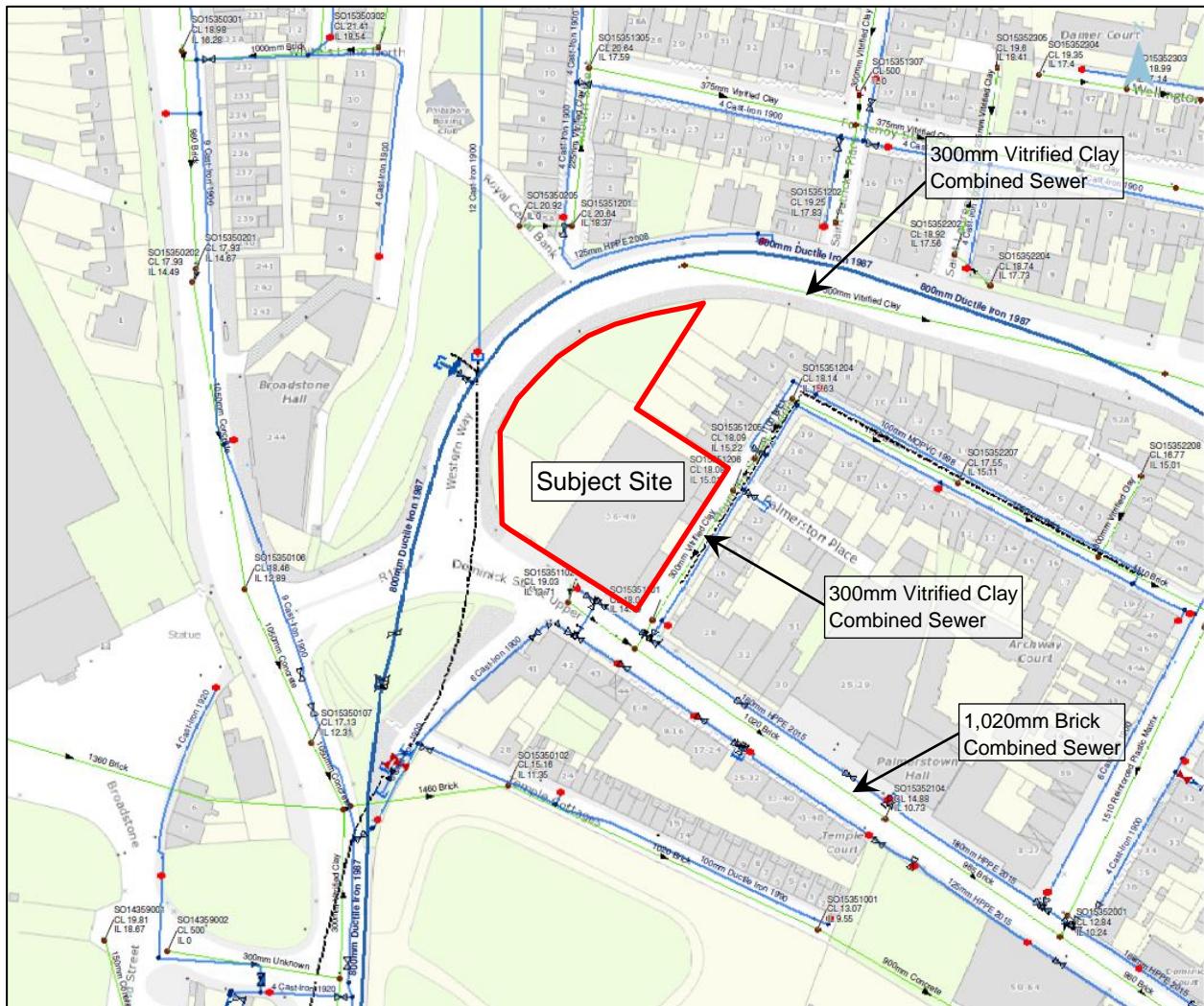


Figure 5 | Extract of Irish Water's Foul Water Service Records (provided by DCC)

The record drawings indicate that the drainage sewers in the vicinity of the site are combined foul and surface water sewers.

The nearest public sewers to the site include a 1,020mm brick combined sewer on Dominick Street Upper and two separate Ø300mm combined sewers, one on Palmerston Place connecting to the sewer on Dominick Street Upper and the other travelling eastwards on Western Way, north of the site. The existing disused Hendrons Building has an existing connection to the sewer on Dominick Street Upper.

2.2 Proposed Foul Water Drainage

It is proposed to provide a new 225mm connection to the existing 300mm diameter sewer on Palmerston Place, which discharges to the existing 1,020mm brick combined sewer on Dominick Street Upper. There

is an existing connection to the disused Hendrons building from Dominick Street Upper, which is proposed to be decommissioned. This existing drain will be capped from within the site to decommission the pipe. The proposed drainage layout is shown on Waterman Moylan's Drainage Layout Drawing No. 18-039-P200, which accompanies this submission.

Although the existing drainage infrastructure consists of combined foul and surface water sewers, private foul and surface water drainage will be drained on completely separate systems throughout the development.

It is proposed to have a surface water manhole with dead leg to the boundary, with a view to connecting to any future separate surface water network that could be introduced in the area. The final surface water manhole will be diverted to the adjoining final foul water manhole before joining the existing combined water network, as per the below Figure (extracted from the Greater Dublin Regional Code of Practice V.6.0).

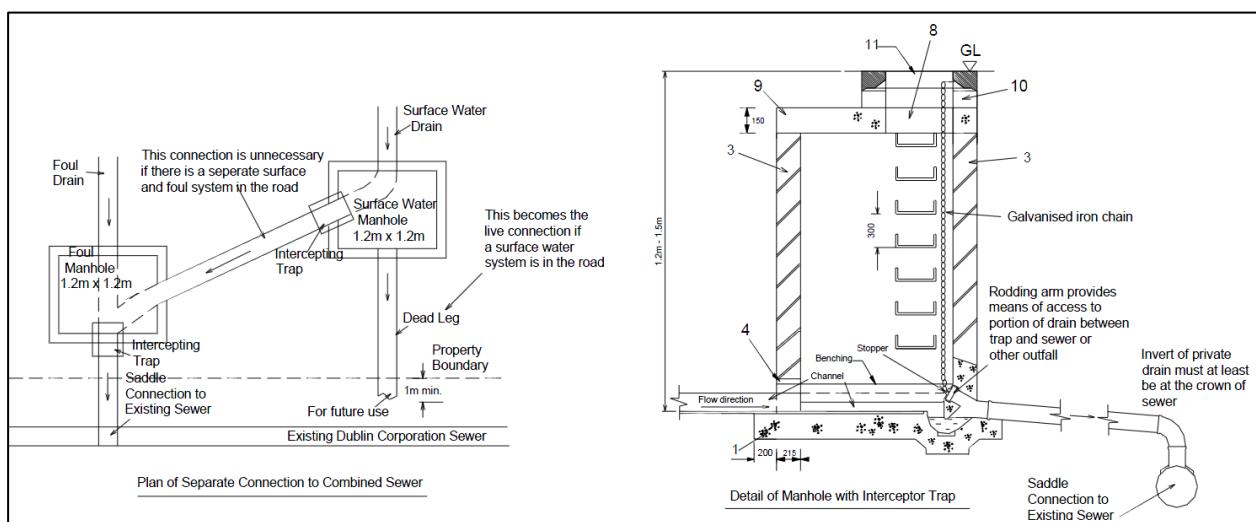


Figure 6 | Detail Extracted from Greater Dublin Regional Code of Practice V.6.0

A pre-connection enquiry was submitted to Irish Water on 28 April 2020 to determine whether the existing wastewater infrastructure has sufficient capacity to cater for the proposed development. On 15 June 2020 Irish Water issued a confirmation of feasibility letter, which is included in Appendix A of this report. The letter notes that new connection to the existing network is feasible without upgrades to the network. A Statement of Design Acceptance for the proposal was subsequently issued by Irish Water on 21 October 2020 and is also included in Appendix A.

The letter notes that the receiving sewer is combined (as described above), and that the development should incorporate Sustainable Drainage Systems (SuDS) and attenuation in the management of stormwater to reduce surface water inflow into the receiving combined sewer. Appropriate SuDS measures, including appropriately sized attenuation storage, are proposed as described in Section 3, below.

2.3 Foul Water Drainage Calculations

The calculated foul water flows at the subject development are set out in the table below. Wastewater loads have been calculated based on a per capita daily wastewater flow of 150 litres for residents and 60 litres for staff, along with a 10% unit consumption allowance, in line with Section 3.6 of the Irish Water Code of Practice for Wastewater Infrastructure. A peak flow multiplier of 3 has been used, as per Section 1.2.5 of Appendix C of the Code of Practice.

Description	Total Population	Load per Capita	Daily Load	Total DWF	Peak Flow
	No. People	l/day	l/day	l/s	l/s
Residents	281	150	46,365.0	0.537	1.610
Staff	9	150	1,485.0	0.017	0.052
Total	290	150	47,850.0	0.554	1.661

Table 1 | Calculation of Total Foul Water Flow from the Development

The total dry weather flow from the development is 0.554 l/s, with a peak flow of 1.661 l/s.

2.4 Foul Water Drainage – General

Foul water sewers will be constructed strictly in accordance with Irish Water requirements. No private drainage will be located within public areas.

Drains will be laid to comply with the requirements of the latest Building Regulations, and in accordance with the recommendations contained in the Technical Guidance Document H.

3. Surface Water Network

3.1 Existing Surface Water Drainage

Irish Water records for the surrounding area have been provided by Dublin City Council. The existing public drainage network in the vicinity of the site consists of combined sewers – the existing surface water network is therefore the same as the existing foul water network described in Section 2.1 above and illustrated in Figure 3.

The nearest public sewers to the site include a 1,020mm brick combined sewer on Dominick Street Upper and two separate Ø300mm combined sewers, one on Palmerston Place connecting to the sewer on Dominick Street Upper and the other travelling eastwards on Western Way, north of the site. The existing disused Hendrons Building has an existing connection to the sewer on Dominick Street Upper.

The site is located prominently on Western Way, near to the top of Constitution Hill, with existing ground levels at the site falling from c. 19.8m OD Malin at the south-west to c. 18.4m OD Malin at the north of the site.

During rainfall events, surface water currently drains overland to gullies located along the western side of the existing building. The existing site is almost 100% hardstanding, with minimal planted areas, and surface water currently discharges uncontrolled and unattenuated to the combined sewer on Dominick Street Upper.

3.2 Proposed Surface Water Network and SuDS Strategy

It is proposed to drain surface water from the development to the existing public combined sewer network at Palmerston Place. Storm water will discharge to the public sewer network at a controlled rate, limited to the greenfield equivalent runoff (as calculated in Section 3.3 below). Excess surface water runoff during storm events will be attenuated in a new privately managed and maintained StormTech or similar approved attenuation chamber located in the courtyard, as shown on Waterman Moylan's Drainage Layout Drawing No. 18-039-P200.

The proposed development will be designed to incorporate best drainage practice. Section 3.3, below, sets out the methodology used in determining the existing greenfield runoff rates and calculating attenuation storage requirements for the site. The relevant calculations are included in full in Appendix B. As noted above, the existing site is almost 100% hardstanding, with minimal planted areas, and as such the introduction of any SuDS features will result in a net reduction in the surface water discharging from the site compared to the current scenario.

It is proposed to incorporate a Storm Water Management Plan through the use of various SuDS techniques to treat and minimise surface water runoff from the site. The methodology involved in developing a Storm Water Management Plan for the subject site is based on recommendations set out in the Greater Dublin Strategic Drainage Study (GDSDS) and in the SuDS Manual (Ciria C753). Based on three key elements – Water Quantity, Water Quality and Amenity – the targets of the SuDS train concept have been implemented in the design, providing SuDS devices for each of the following:

- Source Control
- Site Control
- Regional Control

3.2.1 Source Control

Green Roof (Sedum):

It is proposed to introduce sedum roofing as a source control device. The sedum roofing shall consist of 75mm substrate with a sedum blanket. The Landscape Architect's impression of the green roof as a residential amenity has been included as Figure 7 below.



Figure 7 | Landscape Architect's Preliminary Green Roof Proposal

The substrate and the plant layers in a sedum roof absorb large amounts of rainwater and release it back into the atmosphere by transpiration and evaporation. They also filter water as it passes through the layers, so the run-off, when it is produced, has fewer pollutants. Rainfall not retained by green roofs is detained, effectively increasing the time to peak and slowing peak flows.

A sedum roof can reduce annual percentage runoff by between 40% and 80% through this retention and evapotranspiration, with the impact dependent on a range of factors including the depth of substrate, the saturation of substrate at the onset of a rain event, the angle of the roof, the range of vegetation growing, intensity of rainfall and the time of year.

A paper entitled *Green Roofs Over Dublin: A Green Roof Policy Guidance Paper for Dublin* was published in August 2008 with guidelines for DCC to develop planning directives for the incorporation of green roofs in new development. The below table is taken from this document and shows the percentage of total rainfall retention over a 14-month period for different green roof treatments.

Slope	Media Depth	Light Rain <2mm	Medium Rain 2mm-6mm	Heavy Rain >6mm	Overall
2.0%	25mm	95.1%	82.9%	64.7%	69.8%
2.0%	40mm	97.1%	85.5%	65.1%	70.1%
6.5%	40mm	94.9%	83.1%	59.5%	65.9%
6.5%	60mm	95.8%	84.6%	62.0%	68.1%

Table 2 | Percentage of Total Rainfall Retention Over a 14-Month Period (Aug 2002-Oct 2003)

The proposed sedum roofing shall be on flat roofs with 2% slope with a media depth of 75mm, exceeding the depths shown above. Thus, the percentage of total rainfall retention can be expected to exceed the tabulated figures.

Permeable Paving:

It is proposed to introduce permeable paving within the courtyard area. The goal of permeable paving is to control stormwater at the source to reduce runoff. In addition to reducing surface runoff, permeable paving has the dual benefit of improving water quality by trapping suspended solids and filtering pollutants in the substrata layers.

3.2.2 Site Control

Flow Control:

A Hydrobrake or similar approved flow control device is proposed before the outfall to the public network, with an online attenuation system provided to store excess rainwater during storm events. Flows will be limited to the greenfield equivalent runoff rate.

Underground Attenuation Storage System:

A StormTech or similar approved private underground attenuation storage system is proposed to store excess surface water during storm events before discharging to the public network at the greenfield equivalent runoff rate. The attenuation chamber is to be located in the courtyard and is to be privately managed and maintained.

3.2.3 Regional Control

Surface water from the development will be treated and attenuated privately on site, and as such no regional control measures are proposed.

3.3 Interception or Treatment Storage and Attenuation Storage

As noted above, the methodology involved in developing the Storm Water Management Plan for the subject site is based on recommendations set out in the Greater Dublin Strategic Drainage Study (GDSDS) and in the SuDS Manual. Appendix E of the Greater Dublin Strategic Drainage Study (GDSDS) sets out criteria for determining the provision of interception or treatment storage, attenuation storage and long term storage at a development site. These calculations are included in full in Appendix B and are summarised below:

3.3.1 Criterion 1: River Water Quality Protection

Criterion 1.1: Interception

The Greater Dublin Strategic Drainage Study (GDSDS) states that approximately 30% to 40% of rainfall events are sufficiently small that there is no measurable runoff from greenfield areas into the receiving waters. These events are generally considered as the first 5mm of rainfall. Assuming 80% runoff from paved surfaces and 0% from pervious surfaces for the first 5mm of rainfall yields the following:

Paved surfaces connected to drainage system	$3285m^2 \times 0.7 \times 0.75 =$ 1,724.63m ²	3,285m ² site area 70% of the site is paved 75% of the paved area
Volume of Interception Storage	$1724.625m^2 \times 5mm \times 0.8 =$ 6.90m ³	Paved area directly drained 5mm rainfall depth 80% paved runoff factor

Table 3 | Interception Calculation

The required interception volume is 6.90m³. It is not proposed to provide the entire required interception volume. Criterion 1.2 will therefore be assessed to provide the required River Water Quality Protection in accordance with Criterion 1.

Criterion 1.2: Treatment Volume

For events larger than 5mm, and in situations where interception storage cannot be provided, surface water runoff treatment is provided using a retention pond or wetland in accordance with the CIRIA design manual C521.

Assuming 80% runoff from paved surfaces and 0% from pervious surfaces for the first 15mm of rainfall:

Paved surfaces draining to river	$3285m^2 \times 0.7 \times 0.75 =$ 1,724.63m ²	3,285m ² site area 70% of the site is paved 75% of the paved area
Volume of Treatment Storage	$1724.625m^2 \times 15mm \times 0.8 =$ 20.70m³	Paved area directly drained 15mm rainfall depth 80% runoff from paved surfaces

Table 4 | Treatment Volume Calculation

The proposed sedum roofing amounts to a cumulative area of approximately 582m². The sedum roofing shall consist of 75mm substrate with a sedum blanket. Assuming a 30% water volume retention, this amounts to approximately 13.1m³ of treatment storage volume.

Permeable paving is proposed in the courtyard and accounts for a total cumulative area of c. 475m². Assuming a depth of 0.4m with 33% voids, this yields a treatment volume of c. 62.7m³.

The total treatment volume provided is approximately 75.8m³, well in excess of the required 20.70m³.

3.3.2 Criterion 2: River Regime Protection

Attenuation storage is provided to limit the discharge rate from the site into receiving waters. As per the GDSDS, the required attenuation volume is calculated assuming 100% runoff from paved areas, and has been calculated for the 1-year, 30-year and 100-year return periods, identifying the critical storm for each – refer to the calculations included in Appendix B.

Based on these calculations, the required attenuation storage volume is 90.76m³. This volume is sufficient for the 1-in-100 year storm, accounting for a 20% increase due to climate change. Surface water currently runs uncontrolled/unattenuated from the subject site, which is almost entirely hardstanding, so the introduction of SuDS devices, a flow control device and appropriately sized attenuation will result in a net decrease in the total surface water discharge rate and in the peak discharge rate.

To meet the required attenuation storage volume, a StormTech or similar approved underground attenuation structure is proposed beneath the courtyard area, as indicated on drainage drawing 18-039-P200. The attenuation tank shall have a volume of 105m³, with 90% voids, thus providing 94.5m³ of storage. This is sufficient storage for the 1-in-100 year volume of 90.76m³.

Surface water runoff shall be restricted via a hydro-brake or similar approved flow control device, limited to 2 l/s, before the outfall to the existing public surface water network.

3.3.3 Criterion 3: Levels of Service

There are four criteria for levels of service. These are:

- Criterion 3.1: No external flooding except where specifically planned (30-year high intensity rainfall event).
- Criterion 3.2: Not internal flooding (100-year high intensity rainfall event).
- Criterion 3.3: No internal flooding (100-year river event and critical duration for site storage).
- Criterion 3.4: No flood routing off site except where specifically planned (100-year high intensity rainfall event).

Both internal and external flooding have been assessed in the Flood Risk Assessment report which will accompany this Engineering Assessment report. The Flood Risk Assessment is carried out in accordance with the *DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management* published in November 2009.

The assessment identifies the risk of both internal and external flooding at the site from various sources and sets out mitigation measures against the potential risks of flooding. The sources of possible flooding assessed in the report include coastal, fluvial, pluvial (direct heavy rain), groundwater and human/mechanical errors.

As a result of the flood risk management and mitigation measures proposed, the residual risk of internal or external flooding for the 30-year and 100-year flood events is low, and accordingly all four of the above criteria have been met. Please refer to the accompanying Flood Risk Assessment report for the full analysis of the flood risk at the subject site.

3.3.4 Criterion 4: River Flood Protection

The long term storage volume is a comparison of pre- and post-development runoff volumes. The objective is to limit the runoff discharged after development to the same as that which occurred prior to development.

Of the three methods described in the GDSDS for establishing River Flood Protection by comparison of the pre- and post-development runoff volumes, (Criteria 4.1, 4.2 and 4.3 respectively), Criteria 4.3 is selected for use as the most practical criteria at this stage in the design.

The Criteria 4.3 approach is for all runoff to be limited to either Q_{BAR} or to 2 l/s/Ha, whichever is the greater. The proposed drainage system includes a flow control device to ensure that the discharge rate is limited to the greenfield equivalent and ample attenuation is provided for the 1-in-100 year storm, accounting for a 20% increase due to climate change.

The extra runoff volume of the development runoff over greenfield runoff, Vol_{xs} , as calculated in Appendix B is 73.03m³. Note that as stated in the GDSDS, this volume is not additional to the attenuation storage volume but is effectively an element of it.

3.4 Surface Water Drainage – General

Surface water sewers will generally consist of PVC (to IS 123) or concrete socket and spigot pipes (to IS 6) and laid strictly in accordance with Dublin City Council requirements for taking in charge. It is intended that all sewers within the public domain will be handed over to Dublin City Council for taking in charge.

All private outfall manholes will be built in accordance with the Greater Dublin Regional Code of Practice for Drainage Works. No private drainage will be located within public areas.

Drains will be laid in accordance with the requirements of the Building Regulations, Technical Guidance Document H.

3.5 Flood Risk Assessment

A site-specific Flood Risk Assessment has been carried out for the proposed development and accompanies this report under separate cover.

4. Water Supply Network

4.1 Existing Water Supply

Irish Water records for the surrounding area have been provided by Dublin City Council and are extracted below.

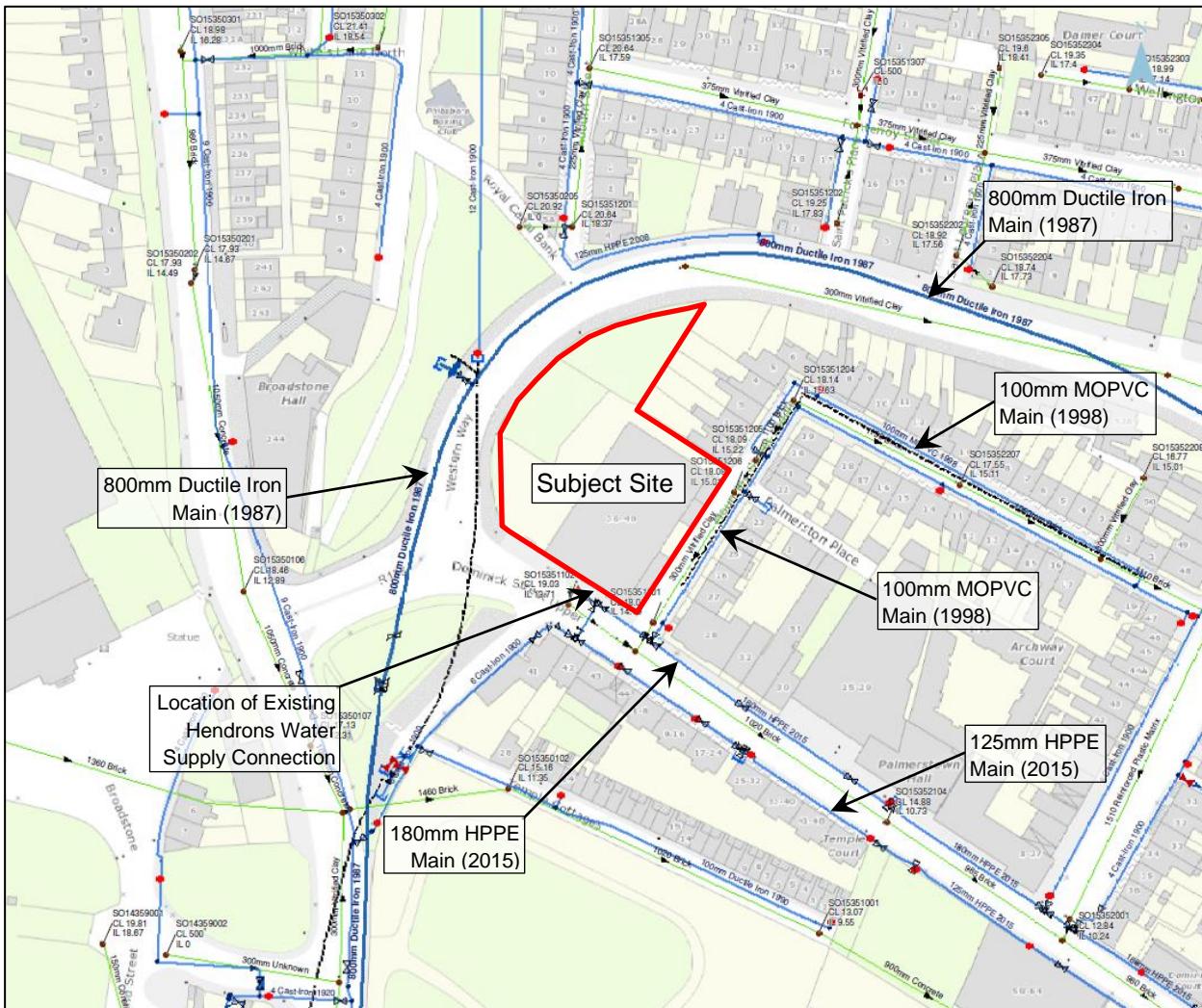


Figure 8 | Extract of Irish Water's Water Supply Service Records (provided by DCC)

There are a number of water mains in the vicinity of the subject site, including a 180mm diameter HPPE main in Dominick Street Upper, an 800mm diameter ductile iron main in Western Way and a 100mm diameter MOPVC main in Palmerston Place. The existing disused Hendrons Building has an existing connection to the watermain on Dominick Street Upper.

4.2 Proposed Water Supply

It is proposed to connect to the existing 180mm diameter HPPE main in Dominick Street Upper, where there is already an existing connection for the disused Hendrons building. A new 150mm connection is proposed to serve the development. The proposed watermain layout is shown on Waterman Moylan's Watermain Layout Drawing No. 18-039-P300, which accompanies this submission.

A pre-connection enquiry was submitted to Irish Water on 28 April 2020 to determine whether the existing water supply infrastructure has sufficient capacity to cater for the proposed development. On 15 June 2020 Irish Water issued a confirmation of feasibility letter, which is included in Appendix A of this report. The letter notes that new connection to the existing network is feasible without upgrades to the network. A Statement of Design Acceptance for the proposal was subsequently issued by Irish Water on 21 October 2020 and is also included in Appendix A.

4.3 Water Supply Calculations

The calculated water demand at the subject development is set out in the table below. The calculated water demand has been established based on a daily per capita consumption of 150 litres for residents and 60 litres for staff, along with a 10% allowance factor. The average day/peak week demand has been taken as 1.25 times the average daily demand, while the peak demand has been taken as 5 times the average day/peak week demand, as per Section 3.7.2 of the Irish Water Code of Practice for Water Infrastructure.

Description	Total Population	Water Demand	Average Demand	Average Peak Demand	Peak Demand
	No. People	l/day	l/s	l/s	l/s
Residents	281	46,365	0.537	0.671	3.354
Staff	9	1,485	0.017	0.021	0.107
Total	290	47,850	0.554	0.692	3.461

Table 5 | Calculation of Total Water Demand for the Development

Based on the above calculations, the average demand for the proposed development is 0.554 l/s, with a peak demand of 3.354 l/s.

4.4 Water Supply – General

All watermains will be laid strictly in accordance with Irish Water requirements for taking in charge.

Valves, hydrants, scour and sluice valves and bulk water meters will be provided in accordance with the requirements of Irish Water.

5. Road and Transport Network

This section provides an overview of the existing and proposed road and transportation network in the vicinity of the site. A comprehensive Traffic and Transport Assessment has also been prepared by Waterman Moylan in accordance with the requirements of the Traffic and Transport Assessment Guidelines published by National Roads Authority in May 2014, and accompanies this submission under separate cover.

5.1 Existing Roads Network

The subject site has road frontage on all sides, though a portion of the north-eastern perimeter is bounded by the gardens of neighbouring houses. The site is bounded by Western Way to the west and north, Palmerston Place to the east and Dominick Street Upper to the south. Access to the site is via Dominick Street Upper.

The subject site falls within the extended Dublin City Centre 30 km/h speed limit zone introduced in March 2017. The Western Way connects with the Phibsborough Road/Constitution Hill Road (R135) approximately 65m south-west of the site. As an arterial road, the R135 was excluded from the extended slow-zone and has a higher speed limit of 50 km/h.

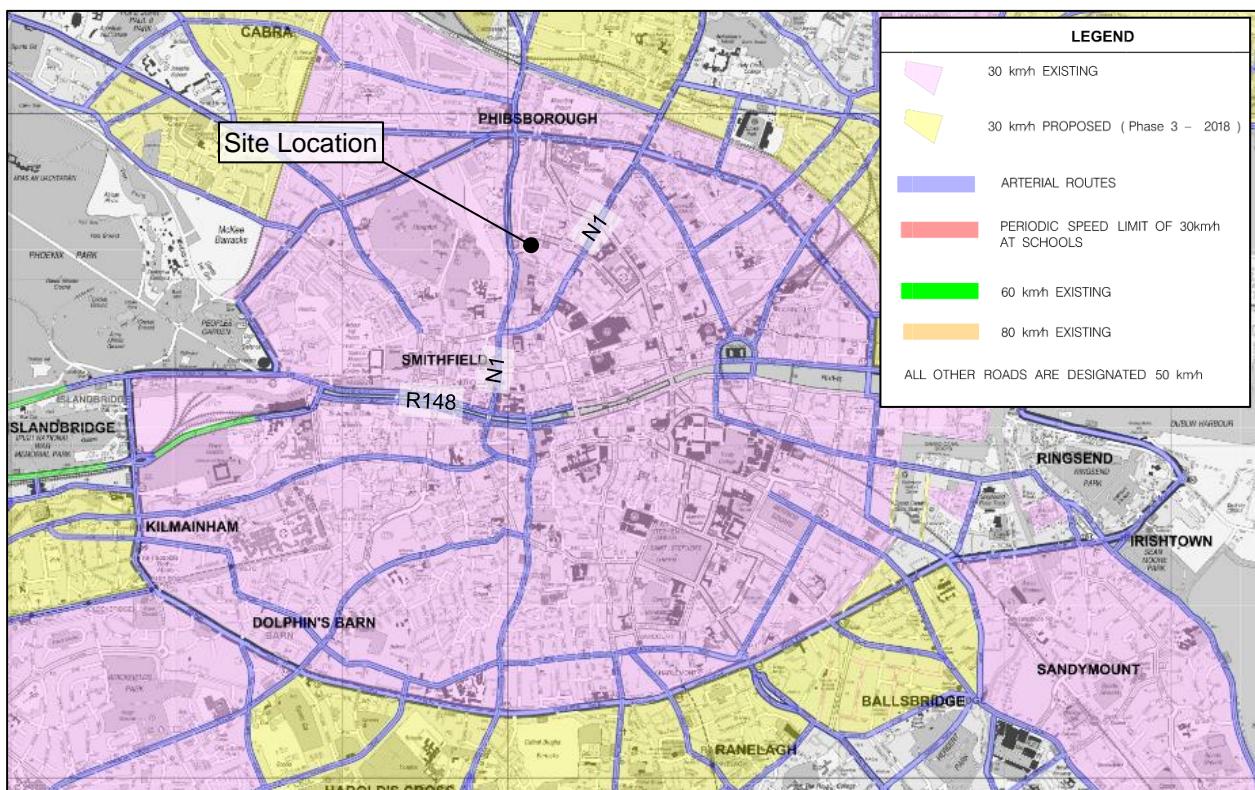


Figure 9 | Dublin City Council Speed Limit Map

5.2 Proposed Roads Network

No substantial changes are proposed to the road network. The development proposes no car parking at the site and does not allow for any residential parking at or near the premises. However, vehicular access is possible via the main entrance for emergency vehicles, with sufficient turning radius in the courtyard for fire tender.

Waterman Moylan Consulting Engineers considers that the proposal is consistent with the principles and guidance outlined in the Design Manual for Urban Roads and Streets (DMURS).

Any service vehicles making deliveries to the site will be scheduled in advance and will be instructed by management to utilise the existing loading bay on Dominick Street Upper. Refuse vehicles will make regular collections. The proposed refuse room has an access ramp at the west of the site, for staff only, which bypasses the main entrance to the development. Refuse vehicles will pull into the loading bay to collect waste from the bins which will be brought out to the street via this ramp.

The development is designed with the intention for residents to make use of the public transport facilities in the vicinity of the site (as described in the Traffic and Transport Assessment report) as well as local cycle and pedestrian facilities. The site is centrally located, within an acceptable commuter range of numerous office, medical, and industrial locations throughout Dublin City Centre and also some Third Level institutions. These include The Mater, Rotunda, Temple Street, St. James's and Coombe Hospitals, commercial/office hubs such as Grand Canal Dock, the IFSC, EastPoint Business Park, Grafton Street, Merrion Square, Temple Bar, Omni Park Santry, St. Stephen's Green, Technological University Dublin Grangegorman campus, Trinity College Dublin and Dublin Business School, and also industrial centres such as Dublin Port, Jamestown Business Park and Dublin Industrial Estate.

A Travel Plan has been developed to provide guidance on how to create a positive atmosphere for residents, staff and visitors to the proposed development with regards to transportation and accessibility – refer to Section 4 of the accompanying Traffic and Transport Assessment.

5.3 Traffic and Transport Assessment

As noted above, this section provides an overview of the existing and proposed road and transportation network in the vicinity of the site. A comprehensive Traffic and Transport Assessment has also been prepared by Waterman Moylan and accompanies this submission under separate cover.

Appendices

A. Confirmation of Feasibility Letter and Statement of Design Acceptance

Denis Boland
2 Washington Street
South Circular Road
Dublin 8, Co. Dublin

15 June 2020

Uisce Éireann
Bosca OP 448
Oifig Sheachadha na
Cathrach Theas
Cathair Choráil

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

Dear Denis Boland,

**Re: Connection Reference No CDS20002722 pre-connection enquiry -
Subject to contract | Contract denied**

**Connection for Business Connection of 1 unit(s) (330 bed spaces) at Hendrons Building,
Constitution Hill, Dublin 7, Co. Dublin.**

Irish Water has reviewed your pre-connection enquiry in relation to a water connection at Hendrons Building, Constitution Hill, Dublin 7, Co. Dublin.

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

Water

New connection to the existing network is feasible without upgrade.

This Confirmation of Feasibility to connect to the Irish Water infrastructure does not extend to your fire flow requirements. Please note that Irish Water can not guarantee a flow rate to meet fire flow requirements and in order to guarantee a flow to meet the Fire Authority requirements, you should provide adequate fire storage capacity within your development.

Wastewater

New connection to the existing network is feasible without upgrade.

Receiving sewer is combined. The development has to incorporate Sustainable Drainage Systems/Attenuation in the management of stormwater and to reduce surface water inflow into the receiving combined sewer. Full details of these have to be agreed with LA Drainage Division.

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.

All infrastructure should be designed and installed in accordance with the Irish Water Codes of Practice and Standard Details. A design proposal for the water and/or wastewater infrastructure should be submitted to Irish Water for assessment. Prior to submitting your planning application, you are required to submit these detailed design proposals to Irish Water for review.

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

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

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

Yours sincerely,



Maria O'Dwyer

Connections and Developer Services

Denis Boland
2 Washington Street
South Circular Road
Dublin 8, Co. Dublin

21 October 2020

Uisce Éireann
Bosca OP 448
Oifig Sheachadha na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.
www.water.ie

**Re: Design Submission for Hendrons Building, Constitution Hill, Dublin 7, Co. Dublin (the “Development”)
(the “Design Submission”) / Connection Reference No: CDS20002722**

Dear Denis Boland,

Many thanks for your recent Design Submission.

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

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

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

If you have any further questions, please contact your Irish Water representative:

Name: Alvaro Garcia
Email: agarcia@water.ie

Yours sincerely,



Maria O'Dwyer
Connections and Developer Services

Appendix A

Document Title & Revision

18-039-P200 Drainage Layout
18-039-P300 Watermain Layout

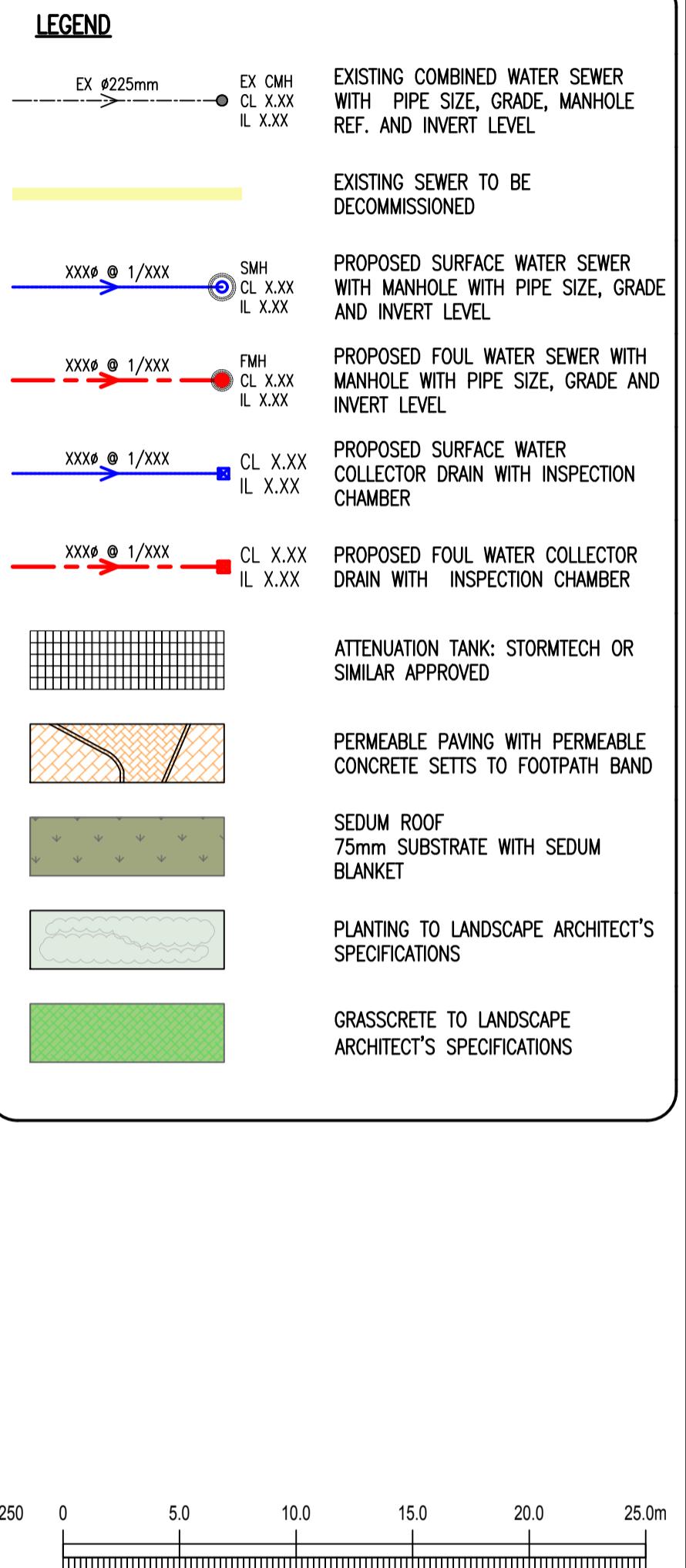
For further information, visit www.water.ie/connections

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.



NOTES:

- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
- IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL WORKS ARE CONSTRUCTED IN ACCORDANCE WITH THE IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS. THE CODE OF PRACTICE AND STANDARD DETAILS ARE AVAILABLE TO DOWNLOAD FROM THE IRISH WATER WEBSITE AT WWW.WATER.IE/CONNECTIONS/DEVELOPER-SERVICES/ WHERE THE DETAILS CONTAINED ON THIS DRAWING DIFFER FROM THE IRISH WATER CODE OF PRACTICE OR STANDARD DETAILS THIS MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY. IRISH WATER STANDARDS WILL TAKE PRECEDENCE.



- NOTES:**
1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
 3. ALL PIPE MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 3.9 OF THE IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE. WATERMAINS SHALL BE EITHER DUCTILE IRON (DI) OR POLYETHYLENE (PE), WITH PE80 OR PE100 RATING (MDPE, HDPEOR HPPE). ALL PLASTIC WATER PIPES SHALL BE BLUE IN COLOUR.
 4. ALL SERVICE CONNECTIONS TO BE 250 HDPE(SDR-17).
 5. ALL WATERMAINS UNDER ROADS OR AT ROAD CROSSINGS TO BE HDPE OR DUCTILE IRON.
 6. HDPE DISTRIBUTION PIPES TO BE PE-100(SDR-17).
 7. DUCTILE IRON PIPES TO EN 545 WITH C40 POWER RATING.
 8. AIR VALVE AND HYDRANTS COVERS, WHERE LOCATED IN GRASS AREAS, SHALL BE SURROUNDED BY A CONCRETE PLINTH, 200mm ALL ROUND AND 100mm DEEP FORMED WITH C20/25 CONCRETE, 20mm AGGREGATE SIZE, BEDDED IN CLAUSE 804 MATERIAL. THE PLINTH SHALL INCORPORATE MILD STEEL REINFORCED LINKS AND SHALL HAVE BULL-NOSE FINISH AROUND ITS EXTERNAL PERIMETER.
 9. THRUST BLOCKS SHALL BE PROVIDED AT EACH BEND ALONG THE COURSE OF THE WATERMAIN.
 10. PLANTING ADJACENT TO WATER INFRASTRUCTURE SHALL COMPLY WITH IRISH WATER STANDARD DETAIL STD-W-12A.
 11. HORIZONTAL AND VERTICAL SERVICE LAYOUT DISTANCES SHALL BE AS PER IRISH WATER STANDARD DETAIL STD-W-11.
 12. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL WORKS ARE CONSTRUCTED IN ACCORDANCE WITH THE IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS. THE CODE OF PRACTICE AND STANDARD DETAILS ARE AVAILABLE TO DOWNLOAD FROM THE IRISH WATER WEBSITE AT WWW.WATER.IE/CONNECTIONS/DEVELOPER-SERVICES/, WHERE THE DETAILS CONTAINED ON THIS DRAWING DIFFER FROM THE IRISH WATER CODE OF PRACTICE OR STANDARD DETAILS THIS MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY. IRISH WATER STANDARDS WILL TAKE PRECEDENCE.

LEGEND	
XXXXmm HDPE WATERMAIN	EXISTING WATERMAIN
XXXXmm HDPE WATERMAIN	PROPOSED WATERMAIN
SV (S)	SLUICE VALVE
H (O)	HYDRANT
BWM	PROPOSED BULK WATER METER TO IRISH WATER REQUIREMENTS

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REV. DATE AMENDMENT DRN APPD

STATUS FOR PLANNING
NOT FOR CONSTRUCTION

Waterman Moylan
Engineering Consultants

BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 K7W7 IRELAND.
Tel: (01) 661 8900 Fax: (01) 661 3618
Email: info@waterman-moylan.ie www.waterman-moylan.ie

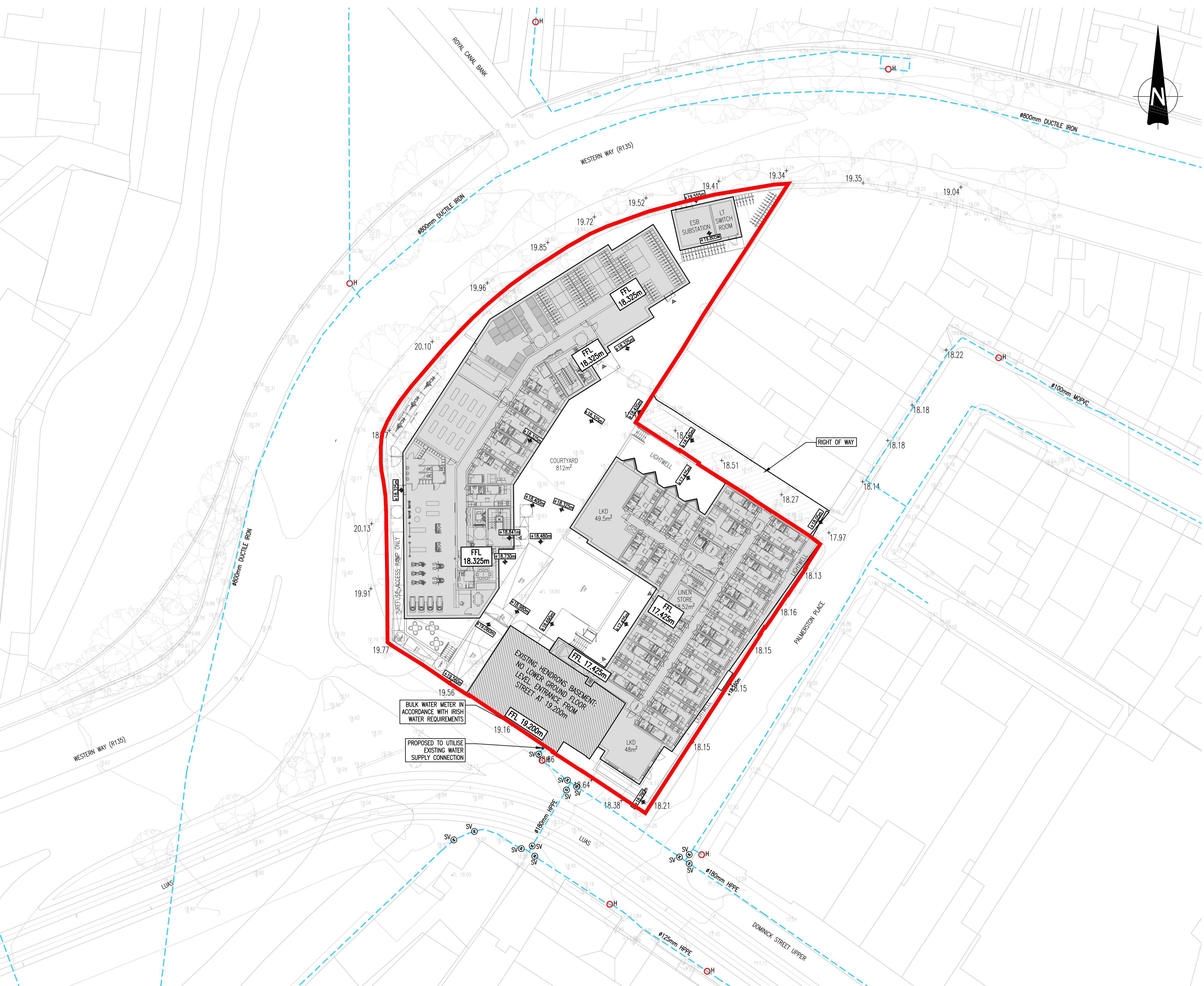
CLIENT WESTERN WAY DEVELOPMENTS LTD.
ARCHITECT JOHN FLEMING ARCHITECTS

PROJECT PROPOSED SHARED LIVING STRATEGIC HOUSING
DEVELOPMENT AT WESTERN WAY, PHIBSBOROUGH

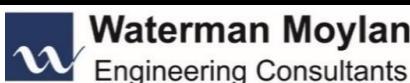
TITLE WATERMAIN LAYOUT

DRAWN PJD	DESIGNED SDN	APPROVED MD	DATE MAY 2020
SCALE 1:250	JOB NO. 18-039	DRG. NO. P300	REVISION

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B. GDSDS Attenuation Calculations



Block S, EastPoint Business Park,
Alfie Byrne Road, Dublin D03 H3F4
t 01 664 8900 f 01 661 3618 e info@waterman-moylan.ie

Calculation By: SDN
Approved by: MD

Project Data

Project Name	Western Way SHD
Project Number	18-039
Client	Western Way Developments Ltd.
Architect	John Fleming Architects
Status	Planning
Date	26/11/2020

Description		%	Area
Total Site Area		-	3,285m ²
Paved Area	Total	70%	2,300m ²
	Drained	100%	2,300m ²
Soil Area	Total	30%	986m ²
	Drained	0%	0m ²

Soil Type:	Type 2
SPR Index (from FSR):	0.30
SAAR:	850mm
Rain Data:	Dublin Airport
Climate Change Factor:	20%

Greenfield Runoff:

$$Q_{BARrural} = 0.00108 \times \text{Area}^{0.89} \times \text{SAAR}^{1.17} \times \text{Soil}^{2.17}$$

Area = 0.00329km² ... Total site area in km²

SAAR = 850mm ... Standard Average Annual Rainfall in mm

SOIL = 0.30 ... The "SPR" index from FSR

Note: Where a site is <0.5km², the $Q_{BARrural}$ formula should be applied for 0.5km² and the result factored based on the ratio of the actual site area and the applied area.

$$Q_{BARrural} = 0.001\text{m}^3/\text{s}$$

$$Q_{BARrural} = 0.751 \text{ l/s} \quad \dots \text{Note: where greenfield runoff value is } <2\text{l/s, a value of } 2\text{l/s shall be taken}$$

$$Q_{BARrural} = 6.088 \text{ l/s/Ha}$$

Return Period	1-year	30-year	100-year
Growth Factor	0.85	2.10	2.60
Q _{BAR} (l/s)	1.70	4.20	5.20
Q _{BAR} (l/s/Ha)	5.18	12.79	15.83
Allowable Discharge	2.00	2.00	2.00

Rainfall Data:

Rain Data From: Dublin Airport

Climate Change Factor: 20%

Duration (Hours)	Return Period (Years)						
	1	5	10	20	30	50	100
0.5	9.0	14.4	17.9	22.0	24.2	28.8	33.6
1	12.0	18.6	22.9	27.6	30.4	36.0	42.0
2	15.7	23.8	28.8	34.8	37.6	43.2	50.4
4	21.2	31.2	37.2	43.2	46.4	52.8	61.2
6	25.6	37.2	43.2	50.4	54.4	62.4	70.8
12	32.4	46.8	18.0	63.6	68.0	76.8	86.4



Block S, EastPoint Business Park,
Alfie Byrne Road, Dublin D03 H3F4
t 01 664 8900 f 01 661 3618 e info@waterman-moylan.ie

Calculation By: SDN
Approved by: MD

Summary

Project Name	Western Way SHD
Project Number	18-039
Client	Western Way Developments Ltd.
Architect	John Fleming Architects
Status	Planning
Date	26/11/2020

Summary of GDSDS Calculations:

Criterion 1: River Protection Volume

Interception Volume	6.90m³
Treatment Volume	20.70m³

Criterion 2: River Regime Protection

1-in-1-Year Storm	18.59m ³
1-in-30-Year Storm	41.99m ³
1-in-100-Year Storm	30.18m ³
Reduction of Long-Term Storage	-73.03m ³
Volume Required	17.73m³

... Includes head-loss correction

Criterion 4: River Flood Protection

Long Term Storage (no interception provided)	73.03m³
Long Term Storage (Interception provided)	66.13m³

Total Attenuation Volume Requirement:

1-in-100 Year Storm

1-in-1-Year Storm	18.59m ³
1-in-30-Year Storm	41.99m ³
1-in-100-Year Storm	30.18m ³
Total	90.76m³

The maximum attenuation volume required is 90.76m³



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Criterion 1 River Protection Volume

Project Name	Western Way SHD
Project Number	18-039
Client	Western Way Developments Ltd.
Architect	John Fleming Architects
Calculation By:	SDN
Approved by:	MD
Status	Planning
Date	26/11/2020

1.1 Interception

Paved surfaces connected to drainage system	$3285m^2 \times 0.7 \times 0.75 =$ 1,724.63m ²	3,285m ² site area 70% of the site is paved 75% of the paved area
Volume of Interception Storage	$1724.625m^2 \times 5mm \times 0.8 =$ 6.90m³	Paved area directly drained 5mm rainfall depth 80% paved runoff factor

1.2 Treatment Volume

Paved surfaces draining to river	$3285m^2 \times 0.7 \times 0.75 =$ 1,724.63m ²	3,285m ² site area 70% of the site is paved 75% of the paved area
Volume of Treatment Storage	$1724.625m^2 \times 15mm \times 0.8 =$ 20.70m³	Paved area directly drained 15mm rainfall depth 80% runoff from paved surfaces



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Calculation By: SDN
Approved by: MD

Criterion 2

River Regime Protection

Project Name	Western Way SHD
Project Number	18-039
Client	Western Way Developments Ltd.
Architect	John Fleming Architects
Status	Planning
Date	26/11/2020

1-Year Return Period

(Climate Change Factor = 20%)

Duration	Rainfall Rate	Runoff = Rainfall Rate x Area x Soil Type				Discharge		Storage	
		Paved	Green	Total	Volume	Rate	Volume	Rate	Volume
Hours	(l/s/Ha)	l/s	l/s	l/s	m³	l/s	m³	l/s	m³
0.5	50.00	9.20	0.00	9.20	16.6	2.00	3.6	7.20	13.0
1	33.33	6.13	0.00	6.13	22.1	2.00	7.2	4.13	14.9
2	21.83	4.02	0.00	4.02	28.9	2.00	14.4	2.02	14.5
4	14.75	2.71	0.00	2.71	39.1	2.00	28.8	0.71	10.3
6	11.83	2.18	0.00	2.18	47.0	2.00	43.2	0.18	3.8
12	7.50	1.38	0.00	1.38	59.6	1.38	59.6	0.00	0.0

30-Year Return Period

(Climate Change Factor = 20%)

Duration	Rainfall Rate	Runoff = Rainfall Rate x Area x Soil Type				Discharge		Storage	
		Paved	Green	Total	Volume	Rate	Volume	Rate	Volume
Hours	(l/s/Ha)	l/s	l/s	l/s	m³	l/s	m³	l/s	m³
0.5	134.67	24.77	0.00	24.77	44.6	2.00	2.3	22.77	26.1
1	84.43	15.53	0.00	15.53	55.9	2.00	5.0	13.53	33.8
2	52.22	9.61	0.00	9.61	69.2	2.00	10.5	7.61	39.9
4	32.23	5.93	0.00	5.93	85.4	2.00	21.2	3.93	41.7
6	25.18	4.63	0.00	4.63	100.1	2.00	31.9	2.63	42.0
12	15.74	2.90	0.00	2.90	125.1	2.00	53.2	0.90	23.8

100-Year Return Period

(Climate Change Factor = 20%)

Duration	Rainfall Rate	Runoff = Rainfall Rate x Area x Soil Type				Discharge		Storage	
		Paved	Green	Total	Volume	Rate	Volume	Rate	Volume
Hours	(l/s/Ha)	l/s	l/s	l/s	m³	l/s	m³	l/s	m³
0.5	186.67	34.34	0.00	34.34	61.8	2.00	0.1	32.34	1.3
1	116.67	21.46	0.00	21.46	77.3	2.00	1.4	19.46	13.2
2	70.00	12.88	0.00	12.88	92.7	2.00	3.9	10.88	21.4
4	42.50	7.82	0.00	7.82	112.6	2.00	9.3	5.82	26.9
6	32.78	6.03	0.00	6.03	130.2	2.00	15.0	4.03	30.2
12	20.00	3.68	0.00	3.68	158.9	2.00	18.7	1.68	15.7



Block S, EastPoint Business Park,
Alfie Byrne Road, Dublin D03 H3F4
t 01 664 8900 f 01 661 3618 e info@waterman-moylan.ie

Criterion 4 River Flood Protection

Project Name	Western Way SHD
Project Number	18-039
Client	Western Way Developments Ltd.
Architect	John Fleming Architects
Calculation By:	SDN
Approved by:	MD
Status	Planning
Date	26/11/2020

$$Vol_{XS} = RD \times A \times 10 [(PIMP/100 \times \alpha 0.8) + (1 - (PIMP/100))(\beta \times Soil) - Soil]$$

Vol _{XS}	... Extra runoff volume of development over Greenfield runoff
RD	... Rainfall depth of the 100 year, 6 hour event mm
A	... Area of site
PIMP	... Impermeable area of total site
$\alpha 0.8$... Proportion of paved area drained to drainage network or river with 80% runoff
β	... Proportion of pervious area drained to the network or river
Soil	... SPR index

$$Vol_{XS} = 73.03m^3$$

UK and Ireland Office Locations

