PUNCH
consulting engineers

Mixed Use Development, Greenhills Road, Tallaght, Dublin 24

Engineering Planning Report

202253-PUNCH-XX-XX-RP-C-0001

May 2021

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1 Introduction

This report was prepared to accompany a planning application for the proposed development on a site located on Greenhills Road, Tallaght, Dublin 24.

This report deals specifically with the surface water drainage; foul water drainage; watermain design and roads & traffic for the planning application. This report has been prepared with reference to the "Greater Dublin Regional Code of Practice for Drainage Works", "Greater Dublin Strategic Drainage Study" and the "Irish Water Code of Practice for Wastewater Infrastructure". The site location is shown in Figure 1-1 below.

The subject site is located within lands at the Greenhills Road, Tallaght, Dublin 24. The site is located within South Dublin County Council (SDCC) remit. The site currently includes existing residential buildings including a basement and landscaped areas. The site is bounded by a Priority Youth Reach facility to the north, Old Greenhills Road to the west, Greenhills Road to the east, and a currently undeveloped site to the south.

In preparation of this report, and design of the development, PUNCH Consulting Engineers have liaised with the following parties:

- Ronan Toft, SDCC Drainage
- John Joe Hegarty, SDCC Roads

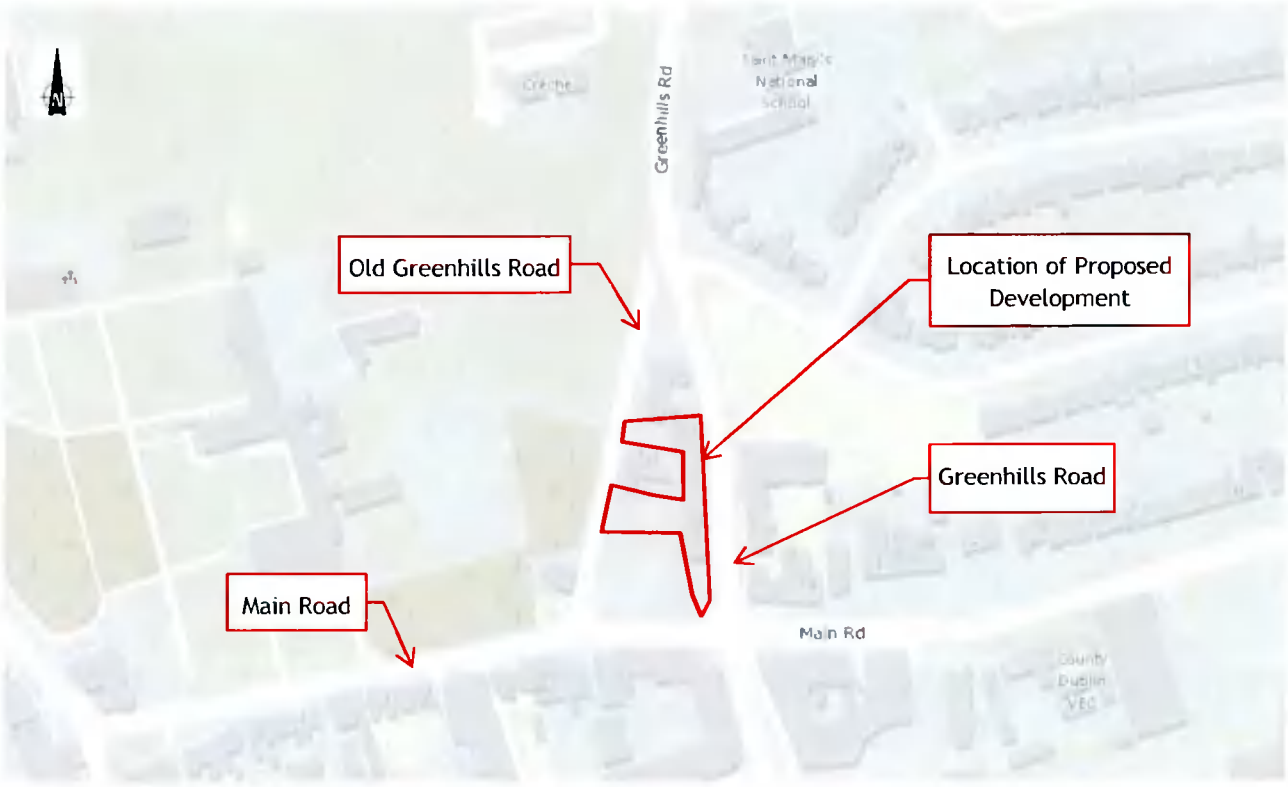


Figure 1-1: Site Location of the Proposed Development

1.1 Proposed Development

The proposed works are outlined in a series of architectural drawings prepared by TOT Architects and engineering drawings prepared by PUNCH Consulting Engineers and supplied as part of the planning documentation.

The proposed development will consist of the demolition of the southern block of existing apartments and a multi-storey extension of the current apartments that are located on the Greenhills Road and a new multi storey apartment block located on the western side of the site with the upgraded basement facing Old Greenhills Road. There are landscape areas proposed throughout the development, both on podium and on grade. Please refer to planning documentation for a full development description.

2 Surveys

2.1 Topographical survey

A topographical survey of the entire site was commissioned for the project and completed by Apex Surveys. The survey includes contours, spot levels on the site (all to Malin Head datum), the site boundary, road and kerb lines bounding the site as well as existing drainage, chambers and additional services within the site.

Please refer to Appendix B for a copy of the Topographical Survey

2.2 Ground Penetrating Radar Utility Survey

A ground penetrating radar (GPR) survey was undertaken by Apex Surveys with the resulting information submitted to the design team indicating underground services. This survey gives a clearer indication of existing underground services within the site when compared to existing services drawings and historical information.

Please refer to Appendix B for a copy of the Utility Survey.

3 Stormwater Drainage Design

3.1 Existing Stormwater Drainage

3.1.1 Existing Surface Water Drainage - Public Records

Based on existing records drawings and a recently completed GPR survey there is the following existing surface water network adjacent the site:

- 300mm diameter concrete public surface water sewer to the north-west of the site along Old Greenhills Road (GPR survey).
- 900mm diameter concrete public surface water sewer in the junction between Main street and the R819 Greenhills Road which bounds the southern border of the side (Records).

Please refer to Appendix A for Existing Stormwater Record Drawings and Appendix B for GPR survey illustrating the existing stormwater drainage arrangement. An extract from the record drawings is shown in Figure 3-1 below.

It should be noted that there is inconsistency between the drainage records and the survey information. All existing services will be confirmed at detailed design stage and all connections will be agreed with Irish Water / SDCC Drainage.

3.1.2 Existing Surface Water Drainage - Surveys

A survey has been undertaken of existing surface water sewerage. A copy of the survey is also included in Appendix B. As noted above the survey indicates a 300mm diameter concrete public surface water sewer to the north-west of the site along Old Greenhills Road which is not shown on the Records drawings. The survey also identifies the 225mm PVC pipe to the east of the site as a foul network and not storm as indicated on the record drawings.

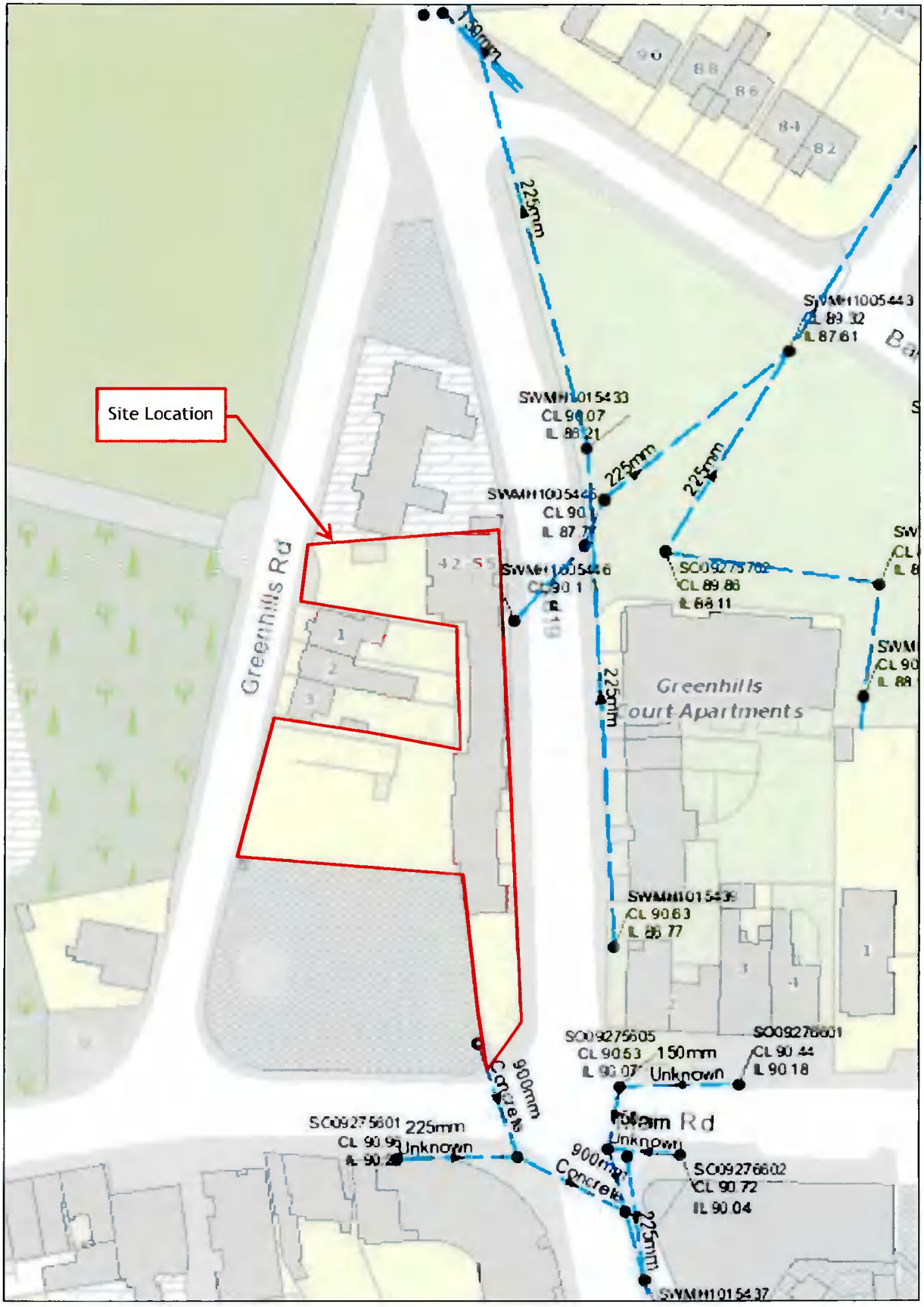


Figure 3-1: Existing Stormwater Drainage Network (Extract from SDCC Records)

3.2 Proposed Stormwater Drainage

3.2.1 General

The proposed surface water drainage system has been designed using Causeway Flow software in accordance with the Department of Environment and Local Government's guidance document "Recommendations for Site Development Works for Housing Areas", with guidance taken from the "Greater Dublin Strategic Drainage Study" (GDSDS) and the SDCC Development Plan, SDCC Strategic flood Risk Assessment, and CIRIA Publications C644 - "Building Greener".

A new surface water sewer network shall be provided for the proposed development which will be entirely separated from the foul water sewer network. All surface water run-off from roof areas and hardstanding areas are designed to be collected by a gravity pipe network. Existing drainage is proposed to be retained for the existing buildings within the redline boundary.

The SDCC Development Plan 2016-2022 in conjunction with the Greater Dublin Strategic Drainage Study (GDSDS) requires that the site discharge is reduced. The runoff is to be reduced for the 1% AEP (1:100 year storm return period), with an additional 10% to be added to rainfall to allow for climate change.

The development plan requires that the site discharge is limited to either 2l/s/Ha or Qbar, whichever is greater. Please refer to section 3.2.9 for an explanation of the proposed surface water discharge. The flow will be limited by the pump so therefore a Hydrobrake is not required.

The drainage system has been designed with the aim of providing a sustainable drainage solution ensuring, in so far as feasible, that the development has a minimal impact on the existing public surface water sewer system. This is achieved with the incorporation of Sustainable urban Drainage Systems (SuDS).

3.2.2 Infiltration Potential

The proposed basement and proposed buildings take up the majority of the area of the site. Therefore, no infiltration is proposed for this site.

3.2.3 Drainage Catchments and Discharge Flow Control

All surface water run-off from the site will be treated as hardstanding regardless of whether greenspace or paving. This is due to the fact that the basement will be under the majority of the open area, and as such no infiltration will occur.

Due to the proposed site layout, there are three drainage catchments proposed at the site.

1. South - The majority of the newly developed site will drain to the south catchment. This catchment includes the reconstructed part of the existing building, new building, and podium area. This area will drain to the proposed attenuation tank under the basement.
2. East - This includes the existing building. All existing surface water drainage is to be retained for this building. Attenuation tanks and flow controls are not intended for this catchment since the building and all drainage is existing.
3. North - This includes the area to the north of the site with the proposed bin enclosure and on grade Go car parking spaces.

Please refer to PUNCH drawing 202253-PUNCH-XX-XX-DR-C-0102 for catchment map indicating catchment locations.

3.2.4 Proposed Drainage Network - Ground

South Catchment

All surface water from the proposed building areas will be collected in downpipes and connected into a new surface water network within the proposed basement. The collected clean water will discharge at basement level and connect to a proposed attenuation tank under the basement. Drainage will be pumped from the attenuation tank to ground level. Please refer section 3.2.10, 3.2.11, and 3.2.12 for information regarding the attenuation tank, flow control and discharge location.

North Catchment

All surface water from the northern car park/ landscape area will be collected by an inground gravity drainage system before discharge to the existing public network. Please refer section 3.2.10, 3.2.11, and 3.2.12 for information regarding the attenuation tank, flow control and discharge location.

Please refer to PUNCH Drawing No. 202253-PUNCH-XX-XX-DR-C-0100 for details of the proposed surface water drainage system.

3.2.5 Proposed Drainage Network - Basement (South Catchment only)

Surface water gullies are proposed in the basement to collect any surface run-off from cars. The basement drainage will also collect upper level drainage from above before connecting to the proposed attenuation tank. A petrol interceptor will be located upstream of the attenuation tank, and the treated basement drainage will connect to the proposed attenuation tank.

Please refer to PUNCH drawing 202253-PUNCH-XX-XX-DR-C-0101 for the proposed basement drainage layout.

3.2.6 Causeway Flow Modelling

The proposed surface water drainage system has been designed using Causeway Flow software in accordance with the Department of Environment and Local Government's guidance document "Recommendations for Site Development Works for Housing Areas", with guidance taken from the "Greater Dublin Strategic Drainage Study" (GDSDS) and the South Dublin County Council Development Plan.

The model has analysed a range of storms at the 1% AEP (1 in 100-year return period storm), with a 10% additional rainfall to allow for climate change.

The network has been modelled with the proposed attenuation tank volume and associated pump to limit the outflow.

Depths of water in the network model (including pipework, manholes and attenuation tank) have been assessed for surcharging and flood risk. The model is established such that a flood risk is identified in the model results if the water rises to within 300mm of the cover level. If the water level rises to a level below this, it is identified as a surcharge within the model results. It is important to note that this warning is given related to proposed ground level at the node and not related to Finished Floor level. All proposed drainage is within vehicle routes in the basement.

Causeway includes a design setting called "additional storage". This is included in the software to account for storage volume in the network provided by secondary drainage including access junctions, inspection chambers, service connections etc. This provides additional storage in the network above the storage provided within the attenuation tank and primary drainage network. $20m^3/ha$ is the standard allowance provided for in Causeway Flow and was utilised for this design.

Please refer to detailed Causeway calculations (inputs and outputs) enclosed in Appendix C.

3.2.7 Geotechnical & Soils

The GSI quaternary map was reviewed and an extract from this map is shown in Figure 3-2. This indicates the area to be 'Till derived from limestones.'

Based on the above, a soil value of 4 was used for the design which characteristics the soil as 'Clayey, poorly drained'.

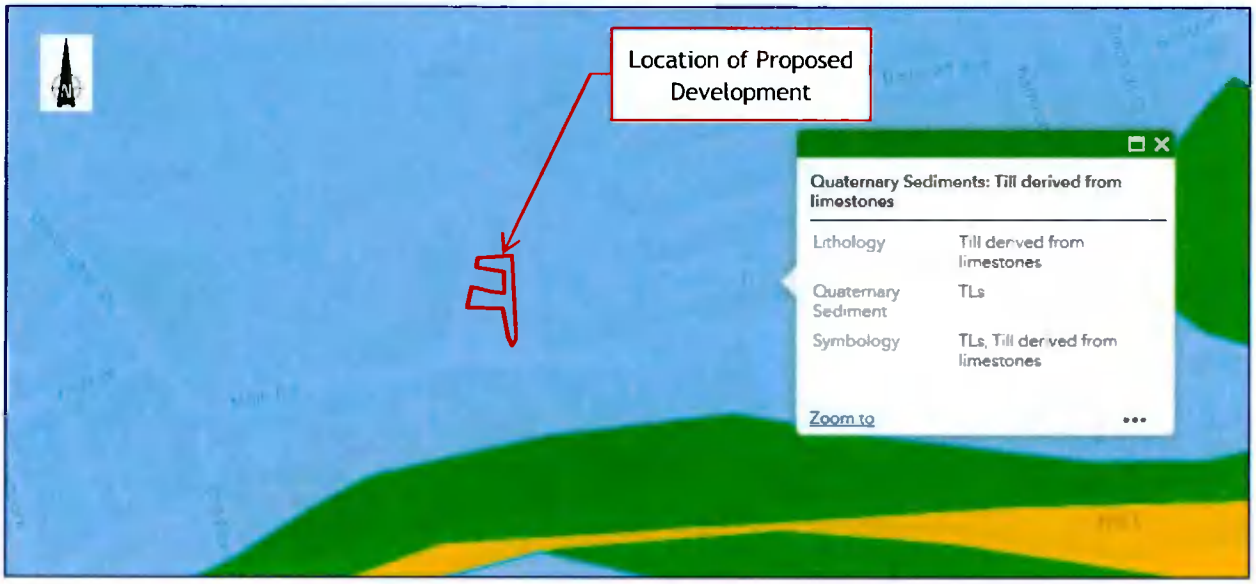


Figure 3-2: Extract from GSI Quaternary Map

3.2.8 Rainfall Data

Use was also made of Met Eireann Rainfall Data which can be found in Appendix D.

A M5-60 Value of 18.5 and an R Value of 0.263 have been used for modelling purposes.

3.2.9 Qbar Calculation

The following values have been used to calculate Qbar:

- SAAR = 825 mm - (refer section 3.2.8)
- SOIL = 0.45 - (refer section 3.2.7)

To establish Qbar for a site less than 50ha, Qbar for 50Ha is calculated, and then proportionately reduced to the actual site area.

Refer below for Qbar calculation:

Qbar for 50Ha:

$$Qbar\ (50Ha) = 0.00108xAREA^{0.89}SAAR^{1.17}SOIL^{2.17}$$

$$Qbar\ (50Ha) = 0.00108x0.50^{0.89}825^{1.17}0.45^{2.17} = 266.21l/s$$

Qbar per Hectare:

Proportionate Qbar for 10,000m²:

$$Qbar\ (site) = \frac{Qbar(50Ha)xSite\ area}{50{,}000}$$

$$Qbar\ (site) = \frac{266.21x10{,}000}{500{,}000} = 5.32\ l/s$$

This results in a Qbar value of 5.32 l/s/Ha

Qbar for Impervious Catchment

Proportionate Qbar for 1300m²:

$$Qbar\ (site) = \frac{Qbar(50Ha)xSite\ area}{500{,}000}$$

$$Qbar\ (site) = \frac{266.21x1300}{500{,}000} = 0.69\ l/s$$

This results in a Qbar value of 0.69 l/s

This Qbar value results in a discharge rate that would result in a excessively small outlet diameter that would lead to excessive blockages in the drainage system. As a result a discharge rate of 2l/s for the entire site has been adopted. This is split equally between the north catchment and south catchment. Please refer to section 3.2.10 for discussion attenuation storage and discharge rates.

3.2.10 Attenuation Storage and Proposed Surface Water Discharge Rates

South Catchment

It is proposed to attenuate all surface water for the south catchment within 1 no. attenuation tank below the basement and will service the entire south catchment.

The attenuation tank has been sized to attenuate the 1:100 year return period storm event, plus 10% climate change discharged at a flow rate of 1l/s. The attenuation tank has been modelled as part of a surface water drainage network system in Causeway Flow. The results of this model require a total attenuation storage volume of 70m³.

The Tank and associated infrastructure will be 'Hazard Zoned' to ensure that it is properly sectioned off from unauthorised personnel for safety reasons. This will be achieved as the attenuation tank is proposed below the basement and only accessed via manholes within the basement area. The manholes can have a lock provided.

During times of future maintenance, the basement attenuation tank will be maintained in terms of desilting by pressure jetting and pump out from manholes can be implemented, similar to external tanks. Pressure jetting may require long pipelines from water supply trucks parked at road level or on the ramp. Works can be undertaken at off peak times to limit disruption.

North Catchment

Drainage for the north catchment will be attenuated via an oversized pipe with a hydrobrake flow control. Due to the small size of this catchment, the hydrobrake flow control will be set to 1l/s. Hydrobrake flow controls less than this value would result in excessively small hydrobrake diameters becoming liable to blockage.

Summary

Table 3-1 below summarise the design parameters and the Proposed surface water drainage design.

Please refer to Appendix C for calculations and details of the proposed attenuation system and associated network.

Please refer to PUNCH Drawings 202253-PUNCH-XX-XX-DR-C-0100, and 202253-PUNCH-XX-XX-DR-C-0101 for the arrangement and details of the proposed drainage.

3.2.11 Proposed flow control

South Catchment

The attenuation storage is to be flow controlled using a dual pump system (duty and standby). The flow of the pump will be set at 1 l/s.

If a malfunction occurs with the pumping system, there will be floats provided in the pump chamber linked to an alarm system to warn if the water level is too high - within 300mm of tank soffit level. This alarm will be connected to an appropriate management company personnel and will be backed up by the generator.

In the event of a power cut during a storm or heavy periods of rainfall a generator will be available as a power supply back-up and will be provided (in a secure area) to allow the stormwater to be discharged. Fuel fill lines can be provided at ground level, with venting provided at appropriate locations.

The pump control panel as well as a diesel-powered backup generator will be provided in a secure area. Please refer to architectural documentation for location of generator.

North Catchment

The oversized pipe will be flow controlled using a hydrobrake flow control set to 1 l/s.

3.2.12 Proposed Discharge Location

South Catchment

It is proposed to discharge surface water from the rising main at a new surface water manhole before connecting to the existing 300mm diameter surface water sewer to the west of the site.

North Catchment

It is proposed to discharge surface water by gravity to the existing 300mm diameter surface water sewer to the west of the site.

Please refer to PUNCH drawing 202253-PUNCH-XX-XX-DR-C-0100 for the proposed arrangement.

3.2.13 Surface Water Drainage Summary

The proposed stormwater sewers have been designed using Causeway Flow software. Table 3-1 describes the stormwater drainage design parameters used and detailed calculations are enclosed in Appendix C.

Table 3-1: Surface Water Drainage Summary

Description	Value
Total Impervious Site area	0.234 ha
Return period target	Pipe Design 1 in 5 year. Network Design 1 in 30 year + CC. Check 1 in 100 year + CC for flooding.
Climate Change	10%
M5-60	18.5
Ratio R	0.264
SOIL type	4 (clayey)
Soil value	0.45
SAAR	825mm
Flow reduction parameter	1 l/s
Controlled Outflow	South Catchment 1 l/s North Catchment 1 l/s
Flow restriction method	South Catchment: Pump North Catchment: Hydrobrake
Attenuation Tank Storage Volume	South Catchment: 70 m3 North Catchment: 0 m3 (storage in 600mm diameter pipework)

Please refer to the following drawings for further details:

- 202253-PUNCH-XX-XX-DR-C-0100: Proposed Ground Floor Drainage Layout
- 202253-PUNCH-XX-XX-DR-C-0101: Proposed Basement Drainage Layout
- 202253-PUNCH-XX-XX-DR-C-0102: Proposed Drainage Catchment Areas Layout
- 202253-PUNCH-XX-XX-DR-C-0150: Proposed SuDS Measures
- 202253-PUNCH-XX-XX-DR-C-0500: Attenuation Tank Details

A breakdown of the surface types, approximate surface areas and surface runoff coefficients assumed are provided in below Table 3-2:

Table 3-2: Development Surface Areas and Design Runoff Coefficients

Structure Type	North Catchment Area Ha (Hectares)	South Catchment Area Ha (Hectares)	East Catchment Area Ha (Hectares)	Total Area Ha (Hectares)	Runoff Parameter
Buildings	0.000	0.029	0.052	0.081	Impervious allowance
Green Roofs	0.000	0.042	0.000	0.042	Impervious allowance
Roads	0.014	0.000	0.000	0.014	Impervious allowance
Pathways	0.014	0.027	0.006	0.047	Impervious allowance
Permeable Paving	0.004	0.000	0.000	0.004	Impervious allowance
Landscaped areas	0.013	0.028	0.006	0.046	Not allowed for in drainage design
Total	**0.044**	**0.126**	**0.063**	**0.234**	

Causeway Flow software has been used for the drainage design in this report. Causeway Flow does not use different runoff coefficients for different surface types to assess drainage. All areas are taken to be impervious.

3.3 Sustainable Urban Drainage Systems (SUDs) Proposals

The proposed development has been assessed in relation to Sustainable Urban Drainage Systems (SuDS). A variety of SuDS measures may be adopted to comply with Council recommendations. All SuDS measures are to be implemented with reference to the UK Suds Manual and South Dublin County Council drainage requirements.

Relatively small volumes of rainwater collected on the respective SuDS devices will enter the public sewer network during typical low intensity storms. This is because the proposed SuDS measures will retain rainwater until it is either used via evapotranspiration in the green areas or otherwise by other methods.

The SuDS processes decrease the impact of the development on the receiving environment by providing amenity and biodiversity in many cases. Regular maintenance of the SuDS proposals is required to ensure they are operating to their optimal level throughout their design life.

The specific measures adopted for the proposed development have been discussed with South Dublin County Council and comprise the following:

- Green Roof areas
- Petrol Interceptors within basement area
- Attenuation Tank
- Podium Landscaping
- On grade landscape areas
- Pervious Pavements

3.3.1 Green Roofs

Green roofs are areas of living vegetation, installed on the top of buildings, for a range of reasons including visual benefit, ecological value, enhanced building performance and the reduction of surface water runoff.

It is proposed to provide a significant extent of green roofs within the development. These shall be provided at roof level in the form of sedum green roofs. Green roofs are widely recognised as an effective SuDS solution and an important tool in mitigating the adverse effects of development on rainfall run-off and for managing urban flood risk. The detail of the green roof as well as associated roof drainage and access systems are to be provided by the architect.

Research in the UK (Kellagher and Lauchlan, 2005, CIRIA, 2007) indicates that green roofs are effective in providing both attenuation and volume reduction in runoff for small rainfall events but suggests that these advantages are reduced (but not completely lost) for larger rainfall events.

Please refer to landscape architect documentation for details of proposed green roof.

3.3.2 Petrol Interceptor

It is proposed that all surface water run-off from the basement car park area will outfall via a Class 1 Bypass Separator located upstream of the proposed attenuation tank. This device will remove hydrocarbons and fine sediment particles from the site runoff and lower the risk of downstream contamination following an oil spillage on site.

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. Class 1 devices are designed to achieve a concentration of less than 5mg/l of oil under standard test conditions.

3.3.3 Attenuation Tank

The proposed attenuation tank is sized to reduce the peak runoff from the site. Please refer to section 3.2.10 above for details of the proposed attenuation tank.

3.3.4 Podium Landscaping

Intensive podium landscaping is proposed within the internal courtyard. This will function in a similar way to green roofs, as referenced above. Please refer to landscape architect documentation for details of the proposed podium landscape.

3.3.5 On grade landscape areas

There will be some areas of on grade landscape areas, particularly to the north of the site.

3.3.6 Pervious Pavements

On grade external car parks will be provided with pervious pavements.

To manage discharge of oils, and because the soil below the car parks is expected to be impermeable clay, the proposed permeable pavement is to be sealed below the gravel layers.

The treatment processes that occur within permeable pavements include:

I. Filtration of silt and the attached pollutants - the majority of silt is trapped within the top 30mm of the jointing material between the blocks.
II. Biodegradation of organic pollutants, such as petrol and diesel within the pavement construction
III. Adsorption of pollutants (pollutants attach or bind to surfaces within the construction) which depends on factors such as texture, aggregate structure and moisture content.
IV. Settlement and retention of solids.

The use of permeable pavers for car parks is proposed as an alternative to an oil separator for the car parking areas. The use of permeable pavers for this purpose is supported by the treatment processes outlined above.

3.3.7 SuDS Summary

Please refer to PUNCH drawing 202253-PUNCH-XX-XX-DR-C-0150, as well as landscape documentation and architectural documentation for details of proposed SUDS measures.

3.4 Compliance with the GDSDS

The design is provided to comply as much as possible with the requirements of the GDSDS, in particular regarding providing attenuation for the development for the Q100 return period storms. Please also refer to the PUNCH Site Specific Flood Risk Assessment.

4 Foul Water Drainage Design

4.1 Existing Foul Water Drainage

Based on existing records and recently completed GPR survey, the following foul sewer mains exist adjacent to the site:

- 225mm diameter public foul sewer located crossing the R819 Greenhills Road to the north of the site boundary falling from west to east.
- 300mm diameter public foul sewer located to the east of the R819 Greenhills Road.
- As outlined by Irish water, a redundant foul sewer runs along the R819 Greenhills Road to the North East of the site falling to the South.
- An existing 100mm diameter foul sewer is located within the site extents.

Please refer to Appendix A for Existing Foul Water Network Record drawings illustrating the existing drainage arrangement. An extract is shown in Figure 4-1 below. Please also refer to associated PUNCH drainage drawings for further details.

It should be noted that there is inconsistency between the drainage records and the survey information. All existing services will be confirmed at detailed design stage and all connections will be agreed with Irish Water / SDCC Drainage.

4.2 Existing Foul Water Drainage - Surveys

A utility survey has been undertaken of existing foul sewerage. A copy of the survey is included in Appendix B.

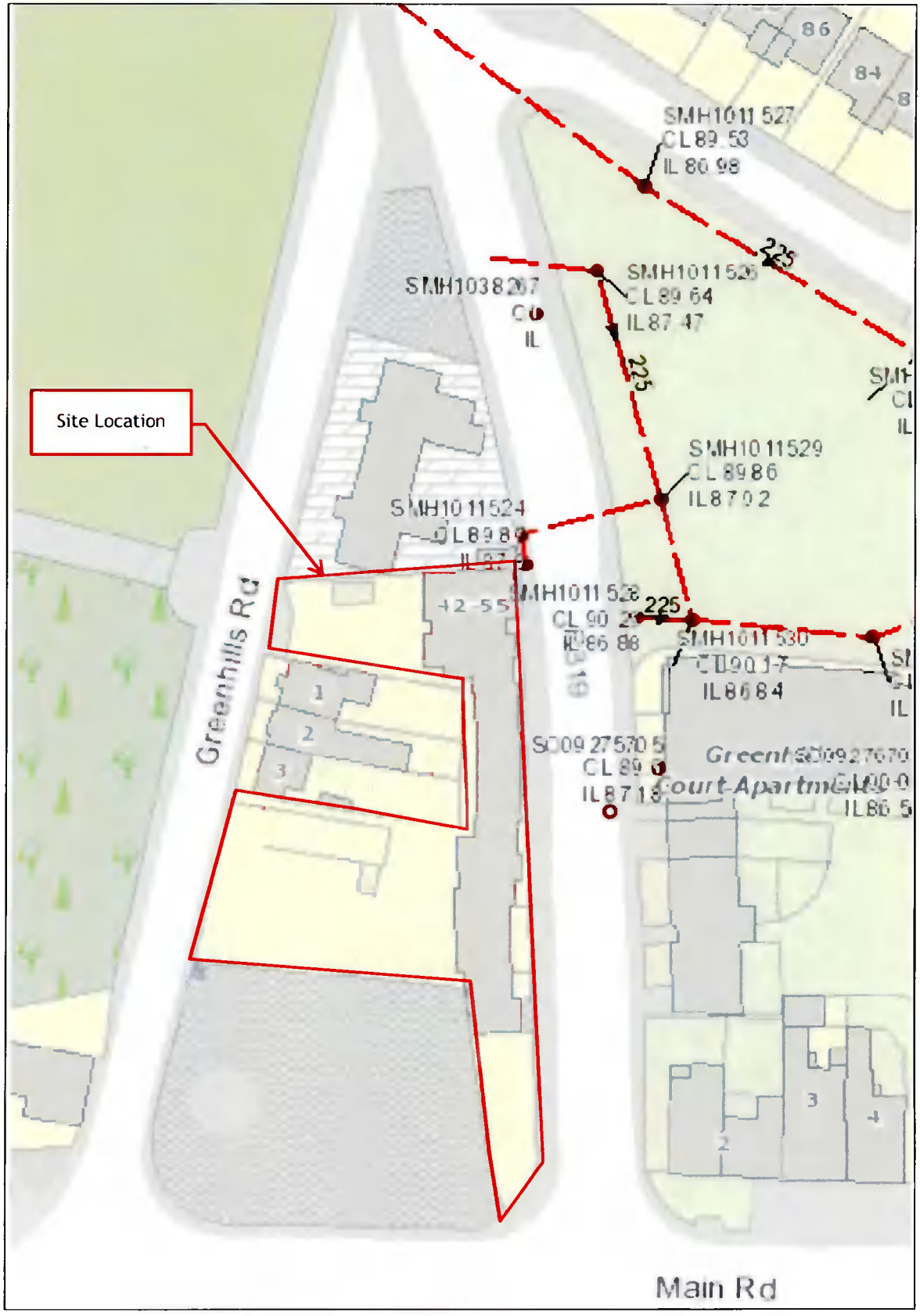


Figure 4-1: Existing Foul Sewer Network (Extract from SDCC Records)

4.3 Proposed Foul Water Drainage

4.3.1 General

The proposed foul water sewers have been designed using Causeway Flow software in accordance with the DOE's "*Recommendations for Site Development Works for Housing Areas*". The foul loading has been calculated in accordance with "Code of Practice for Wastewater Infrastructure" (particularly clause 36, Appendix C and Appendix D) published by Irish Water.

4.3.2 Proposed Foul Water Flows

It is proposed that the foul sewer will discharge by gravity to the existing foul sewer that resides on The Greenhills Road to the east of the site.

Please refer to PUNCH Drawing 202253-PUNCH-XX-XX-DR-C-0100 for details of the proposed foul water drainage system.

Table 4-1 describes the foul water drainage design parameters used, and detailed calculations are enclosed in Appendix F.

Table 4-1: Foul Water Drainage Design Parameters

Description	Value
Residential Flow Rate	150 l/per/day
Persons per Dwelling	2.7
Café Flow Rate	300 l/day/100sq.m
Infiltration	10%
Peaking Factor	6 DWF (Residential)
Minimum Self Cleansing Velocity	0.75m/s
Minimum Pipe Diameter	150mm

Table 4 2 summarises the predicted foul flows for the proposed development. The total dry weather flow (DWF) and peak flow are as indicated in Table 4-2. The sewers are designed for a peak flow of 6 times dry weather flow (6DWF).

It is noted that the new component of the development will incorporate water conservation measures in the sanitary facilities throughout. These will include low flow dual flush toilets, and monobloc low volume push taps. These will reduce the foul discharge from the development.

Table 4-2: Calculation of Peak Daily Wastewater Flow

Category	Quantity	Flow Rate	Daily Flow (l/day)	DWF (l/s)	Design Peak Flow (6DWF) (l/s)
Existing Demand	17 units =>46 persons	165 l/person/day	7,590	0.088	0.528
Proposed Residential Demand	40 units =>108 persons	165 l/person/day	17,820	0.206	1.238
Proposed Café Demand	83 sq.m	330 l/day/100sq.m	274	0.003	0.019
Increased Demand	23 units => 62 persons	165 l/person/day	10,230	0.118	0.729

4.3.3 Proposed Foul Water Drainage System

It is proposed that the foul water from the proposed development shall be discharged by gravity to the public foul sewers located to the east of the site on Greenhills Road.

Existing foul connections are to be retained for the existing building that is not to be demolished. A new connection is proposed to service the new building component.

It is noted that a self-cleansing velocity of 0.75 m/s is achieved within the foul network design as per Irish Water requirements. Please refer to Appendix F for detailed calculations related to the foul water drainage system.

A Pre-Connection Enquiry Form has been issued to Irish Water in relation to the proposed development. Irish water has provided a response, advising that the wastewater connections is feasible without any infrastructure upgrade. Please refer to Appendix E for Irish Water correspondence.

Please refer to PUNCH drawing 202253-PUNCH-XX-XX-DR-C-0100 for the proposed drainage arrangement.

5 Watermain Design

5.1 Existing Watermain

Based on existing records and the recent GPR survey, the following existing watermains exist adjacent to the site:

- 100mm diameter cast iron watermain running along Main Street to the south of the site and along Old Greenhills road to the West of the site.
- 300mm diameter PVC watermain running along the R819 Greenhills Road to the east of the site.

Please refer to Appendix A for Irish Water Record Drawings illustrating the existing watermain arrangement in the area. An extract is shown in Figure 5-1 below.

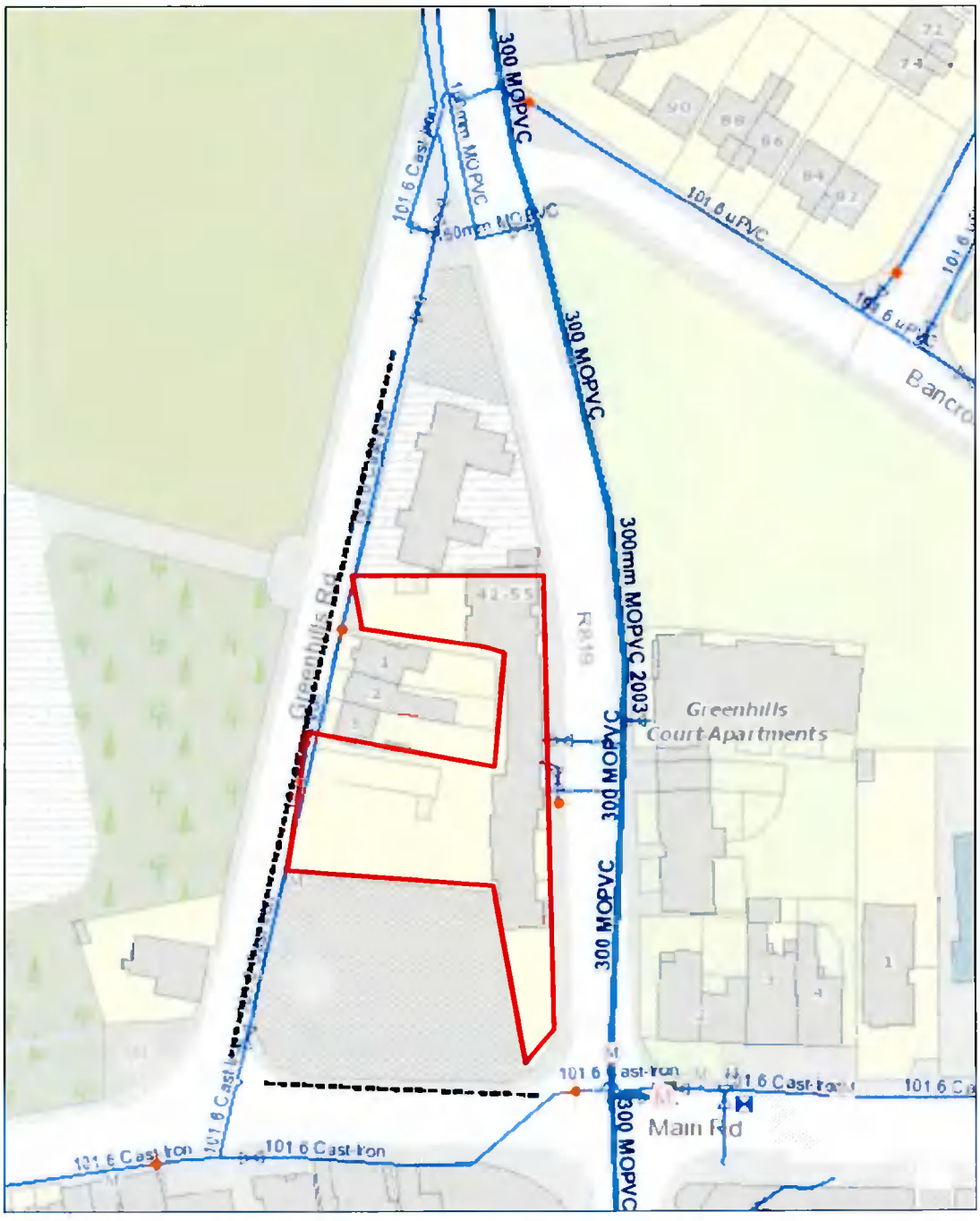


Figure 5-1: Existing Watermain Network (Extract from Irish Water records)

5.2 Watermain Infrastructure in Close Proximity

To the west of the proposed building outline is an existing 100mm watermain as outlined in the previous section. Due to its close proximity, PUNCH have consulted with Irish Water to determine if a diversion is required.

Irish water have provided a confirmation of feasibility with regard to the proposal.

Please refer below in relation to the proposed interface between the existing watermain and the proposed basement wall construction:

1. The proposed basement excavation will not have any effect on the existing watermain. This is because the proposed piles will act as shoring to retain the ground while the basement is excavated.
2. There will be no structural loading on the watermain resulting from the basement structure being constructed.
3. The basement will not require excavations outside the developer's private ownership.
4. There will be significant space available on the other side of the watermain for maintenance.
5. The watermain is a minor service (100mm diameter) and is recorded as being cast iron, constructed in 1912.

To protect the existing pipe from the possible damage during the piling a temporary construction platform could be constructed to support relevant construction machinery. This would be designed to not damage the watermain below. Appropriate site survey checks would also be undertaken to confirm the location of the existing watermain prior to construction. This shall include local excavation by hand to confirm the watermain location.

Please refer to Appendix G for correspondence with Irish Water as well as their confirmation of feasibility in relation to the existing watermain.

Please refer to PUNCH Drawing 202253-PUNCH-XX-XX-DR-C-0301 for watermain dimensions and distances.

5.3 Proposed Watermain

It is generally accepted that the design loading for foul drainage can be used to evaluate an approximation of the water demand on the site. With reference to Irish Water's Code of Practice for Water Infrastructure, the average daily flow is calculated as the number of persons multiplied by the flow rate per person. The average day peak week flow is taken to be 1.25 x the average flow, and the peak demand is taken to be the average day peak week flow multiplied by a peaking factor of 5.

Table 5-1 describes the watermain design parameters used.

Table 5-1: Watermain Design Parameters

Description	Value
Residential Flow Rate	150 l/per/day
Persons per Dwelling	2.7
Café Flow Rate	300 l/day/100sq.m
Average Demand	1.25 DWF
Peak Demand	5 DWF

Table 5-2: Watermain Design Calculation

Category	Quantity	Flow Rate	Daily Flow (l/day)	DWF (l/s)	Average Demand (1.25DWF) (l/s)	Peak Demand (5DWF) (l/s)
Existing Demand	17 units => 46 persons	150 l/per/day	6,900	0.080	0.1	0.5
Proposed Residential Demand	40 units => 108 persons	150 l/per/day	16,200	0.188	0.235	1.175
Proposed Café Demand	83 sq.m	300 l/day/100sq.m	249	0.0028	0.0036	0.018
Increased Demand	23 units => 62 persons	150 l/per/day	9,300	0.108	0.135	0.693

The development will have a water demand as listed in Table 5-2 above.

It is proposed to construct a 100mm diameter watermain to serve the proposed development based on the above calculated demand. The proposed watermain will connect to the existing watermain on the Old Greenhills Road to the west of the site.

Please refer to drawing 202253-PUNCH-XX-XX-DR-C-0300 for proposed watermain layout.

This feed will provide potable water to the proposed development. A bulk water meter shall be provided at the site boundary at the location of the proposed connection to the existing watermain. The watermain layout has been designed in accordance with "Irish Water Code of Practice for Water Infrastructure". All watermains are to be constructed in accordance with Irish Water Code of Practice and the Local Authority's requirements. Fire coverage is to be reviewed and certified by the fire consultant.

To reduce the water demand on Local Authority water supplies and to reduce the foul discharge from the development, water conservation measures will be incorporated in the sanitary facilities throughout the development, e.g. dual flush toilets, monobloc low volume push taps and waterless urinals.

A Pre-Connection Enquiry Form has been issued to Irish Water in relation to the proposed development. Irish water has provided a response, advising that water servicing is feasible without any infrastructure upgrade. Please refer to Appendix E for Irish Water correspondence.

6 Flooding

A Flood Risk Assessment has been undertaken by PUNCH Consulting Engineers for the development which accompanies this planning submission.

7 Roads and Access

7.1 Proposed Roads & Access

Access to the site will be via the Old Greenhills Road.

The proposed basement access layout was designed in accordance with the Design Manual for Urban Roads and Streets (DMURS). DMURS aims to aid the design of safer, more attractive and vibrant streets which will generate and sustain communities and neighbourhoods. As well as cars and other vehicles this encompasses pedestrians, cyclists and those using public transport. Research has shown that narrow carriageways are one of the most effective measures of traffic calming. This has been factored into the design of the development vehicle access.

Sight lines at the basement access location were assessed in accordance with DMURS based on existing speed limits on the road.

Autotrack assessments were carried out on the existing / proposed road network and demonstrate that a fire tender and waste truck can safely negotiate the public road network to allow for their access.

Please refer to Traffic & Transportation Assessment for further information.

Please refer to PUNCH drawings 202253-PUNCH-XX-XX-DR-C-0600, 202253-PUNCH-XX-XX-DR-C-0601 and 202253-PUNCH-XX-XX-DR-C-0602 for autotracks.

The fire consultant has advised that fire tender access is not required to the central podium area.

7.2 Traffic Impact Statement

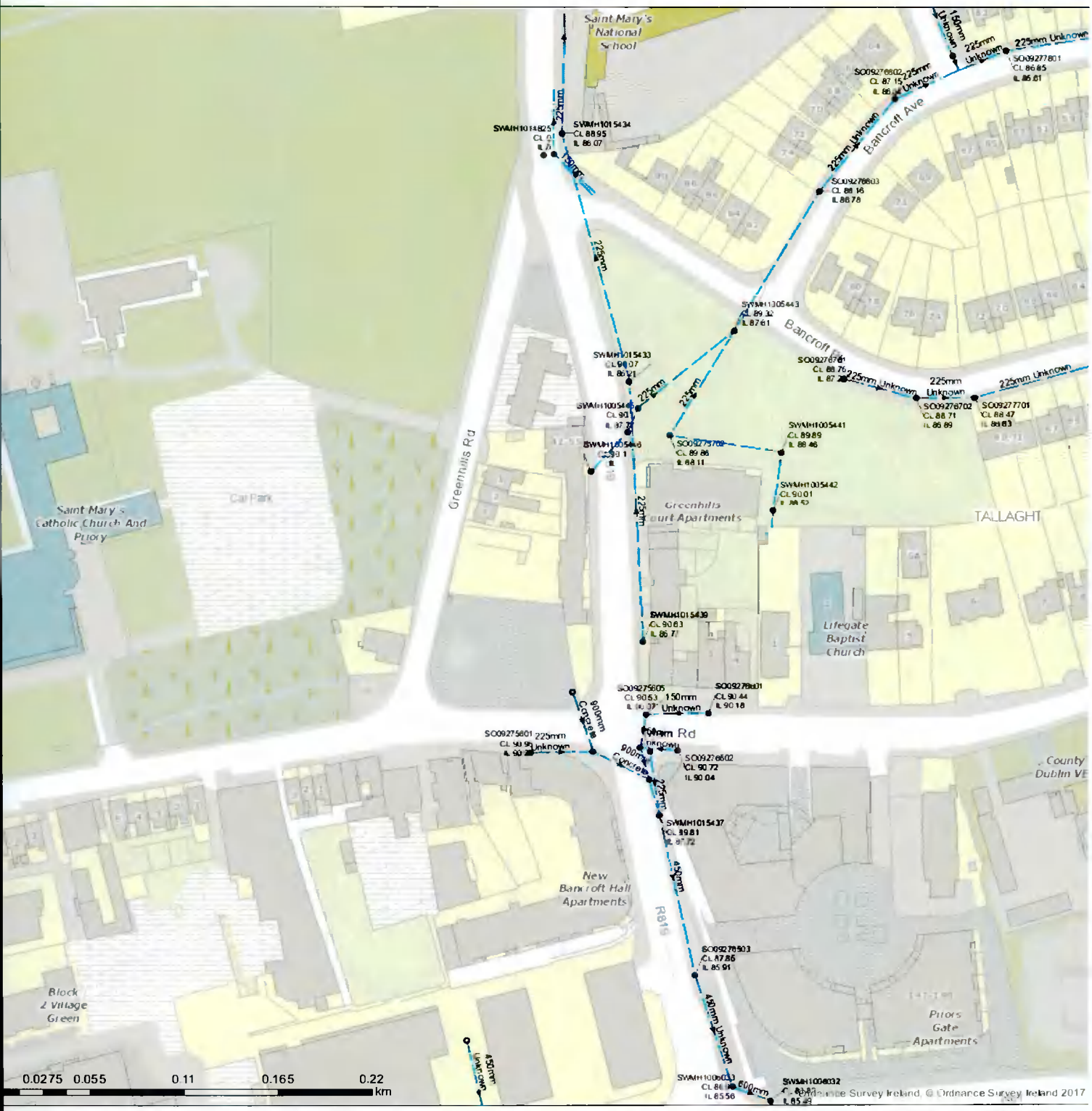
A Traffic & Transportation Assessment and Mobility Management Plan have been completed and are included in the planning application documentation which further detail the roads and access arrangements for the proposed development.

7.3 Parking

Please refer to architectural documentation, PUNCH Traffic & Transportation Assessment and PUNCH Mobility Management Plan.

Appendix A Existing Drainage Record Drawings

Irish Water Web Map



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Water Distribution Network
Water Treatment Plant
Water Pump Station
Storage Cell/Tower
Dosing Point
Meter Station
Abstraction Point
Telemetry Kiosk
Reservoir
Potable
Raw Water
Water Distribution Mains
Irish Water
Private
Irish Water Mains
Irish Water
Private
Water Lateral Lines
Irish Water
Non IW
Water Casings
Water Abandoned Lines
Boundary Meter
Bulk/Check Meter
Group Scheme
Source Meter
Waste Meter
Unknown Meter / Other Meter
Non Return
PRV
PSV
Sluice Line Valve Open/Closed
Butterfly Line Valve Open/Closed
Sluice Boundary Valve Open/Closed
Butterfly Boundary Valve Open/Closed
Scour Valves

Single Air Control Valve
Double Air Control Valve
Water Stop Valves
Water Service Connections
Water Distribution Chambers
Water Network Junctions
Pressure Monitoring Point
Fire Hydrant
Fire Hydrant/Washout

Water Fittings
Cap
Reducer
Tap
Other Fittings

Sewer Foul Combined Network
Waste Water Treatment Plant
Waste Water Pump station

Sewer Mains Irish Water
Gravity - Combined
Gravity - Foul
Gravity - Unknown
Pumping - Combined
Pumping - Foul
Pumping - Unknown
Syphon - Combined
Syphon - Foul
Overflow

Sewer Mains Private
Gravity - Combined
Gravity - Foul
Gravity - Unknown
Pumping - Combined
Pumping - Foul
Pumping - Unknown
Syphon - Combined
Syphon - Foul
Overflow
Sewer Lateral Lines
Sewer Casings

Sewer Manholes
Standard
Backdrop
Cascade
Catchpit
Bifurcation
Hatchbox
Lamphole
Hydrobrake
Other Unknown

Discharge Type
Outfall
Overflow
Soakaway
Standard Outlet
Other Unknown

Cleanout Type
Hooding Eye
Flushing Structure
Other Unknown

Sewer Inlets
Catchpit
Gully
Standard
Other Unknown

Sewer Fittings
Vent/Col
Other Unknown

Storm Water Network
Surface Water Mains
Surface Gravity Mains
Surface Gravity Mains Private
Surface Water Pressurised Mains
Surface Water Pressurised Mains Private

Inlet Type
Gully
Standard
Other Unknown

Storm Manholes
Standard
Backdrop
Cascade
Catchpit
Bifurcation
Hatchbox
Lamphole
Hydrobrake
Other Unknown

Storm Culverts
Storm Clean Outs
Stormwater Chambers

Discharge Type
Outfall
Overflow
Soakaway
Other Unknown

Gas Networks Ireland
Transmission High Pressure Gasline
Distribution Medium Pressure Gasline
Distribution Low Pressure Gasline

ESB Networks
ESB HV Lines
HV Underground
HV Overhead
HV Abandoned

ESB MVLV Lines
MV Overhead Three Phase
MV Overhead Single Phase
LV Overhead Three Phase
LV Overhead Single Phase
MVLV Underground
Abandoned

Non Service Categories
Proposed
Under Construction
Out of Service
Decommissioned

Water Non Service Assets
Water Point Feature
Water Pipe
Water Structure

Waste Non Service Assets
Waste Point Feature
Sewer
Waste Structure

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Irish Water Web Map

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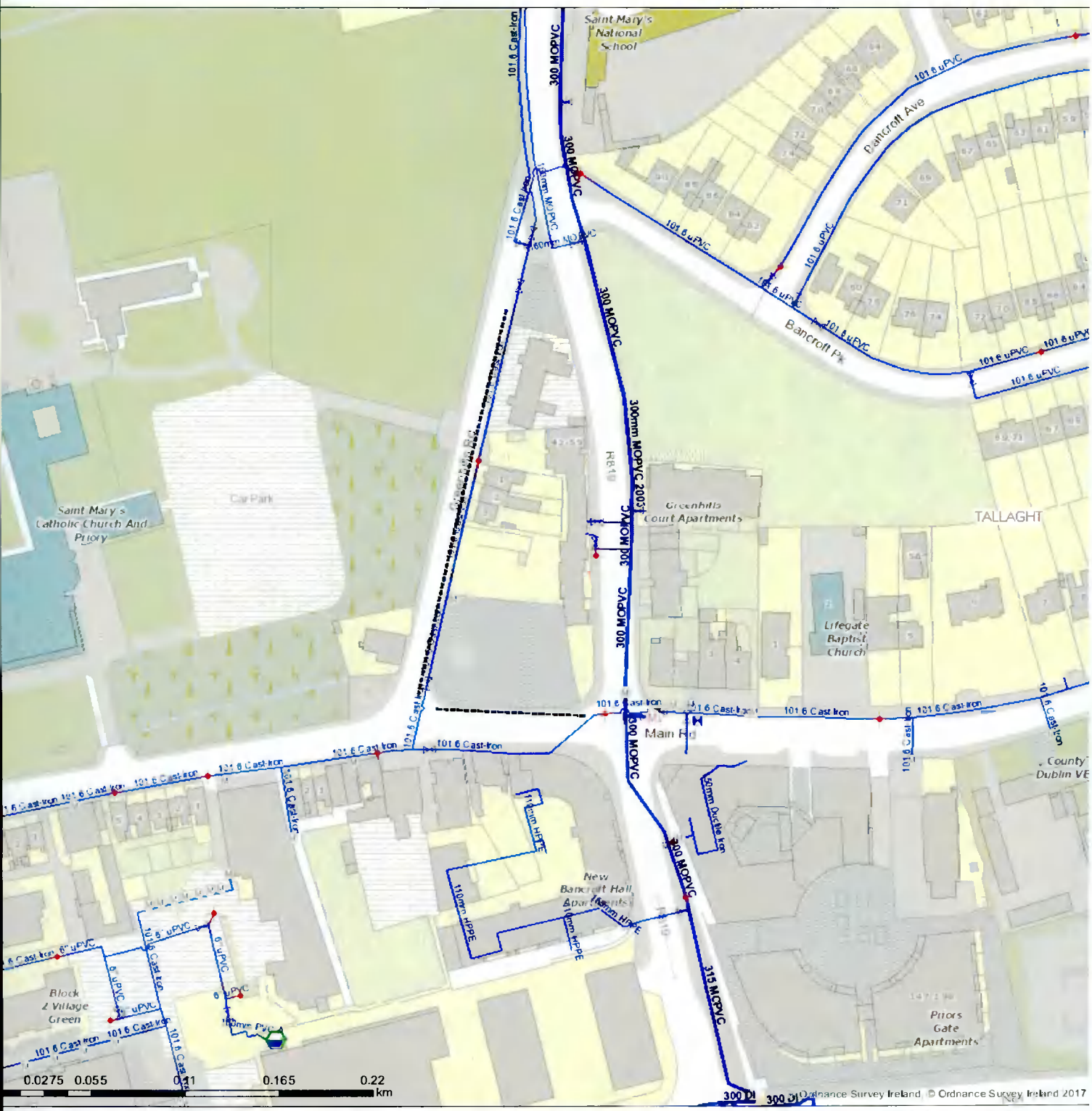
Irish Water Web Map



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Appendix B Topographic and GPR survey