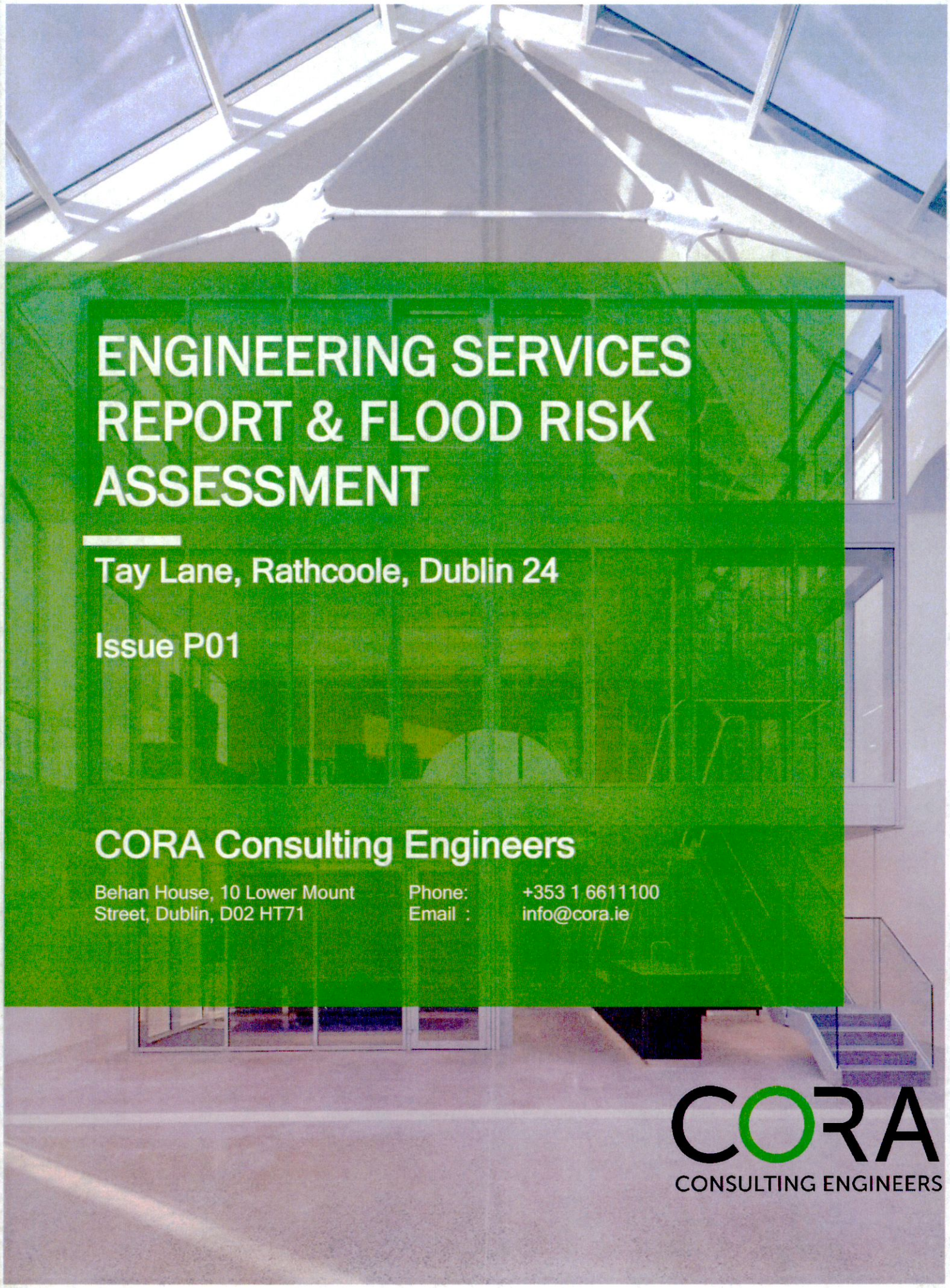

ENGINEERING SERVICES REPORT & FLOOD RISK ASSESSMENT

Tay Lane, Rathcoole, Dublin 24

Issue P01

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Executive Summary

- Development consists of 58No. residential apartments.
- Foul waste discharging to 525mm diameter public sewer at the western boundary of the site.
- Gravity network proposed for the Apartment Building and Community Facility
- Foul sewer attenuation with duty and assist pumps allowing discharge of foul water overnight only
- Surface water discharge to an on-site soakaway for dispersal to the ground within the site area.
- All hardstanding and pavements are to be permeable.
- 100mm diameter water supply proposed to serve the buildings and a fire hydrant.

Introduction

CORA Consulting Engineers have been commissioned by Riverside Projects Ltd to carry out the planning design of the foul, surface water and water supply networks to serve the site along with the completion of a Site Specific Flood Risk Assessment (SSFRA) for the proposed clearance of the subject site, demolition of existing out-building and construction of a new multi-storey residential building at **St Bridget's Tay Lane**, Rathcoole, Dublin 24. This report and SSFRA was prepared to comply with current planning legislation and forms part of proposed planning application for the subject site.

Project Description

The project site is located at **St Bridget's Tay Lane**, Rathcoole, Dublin 24. The site, which is approximately 4,730m^2 is currently occupied by a single detached out-building with dense vegetation throughout the majority of the site. An aerial view of the site is indicated in Figure 1 below:

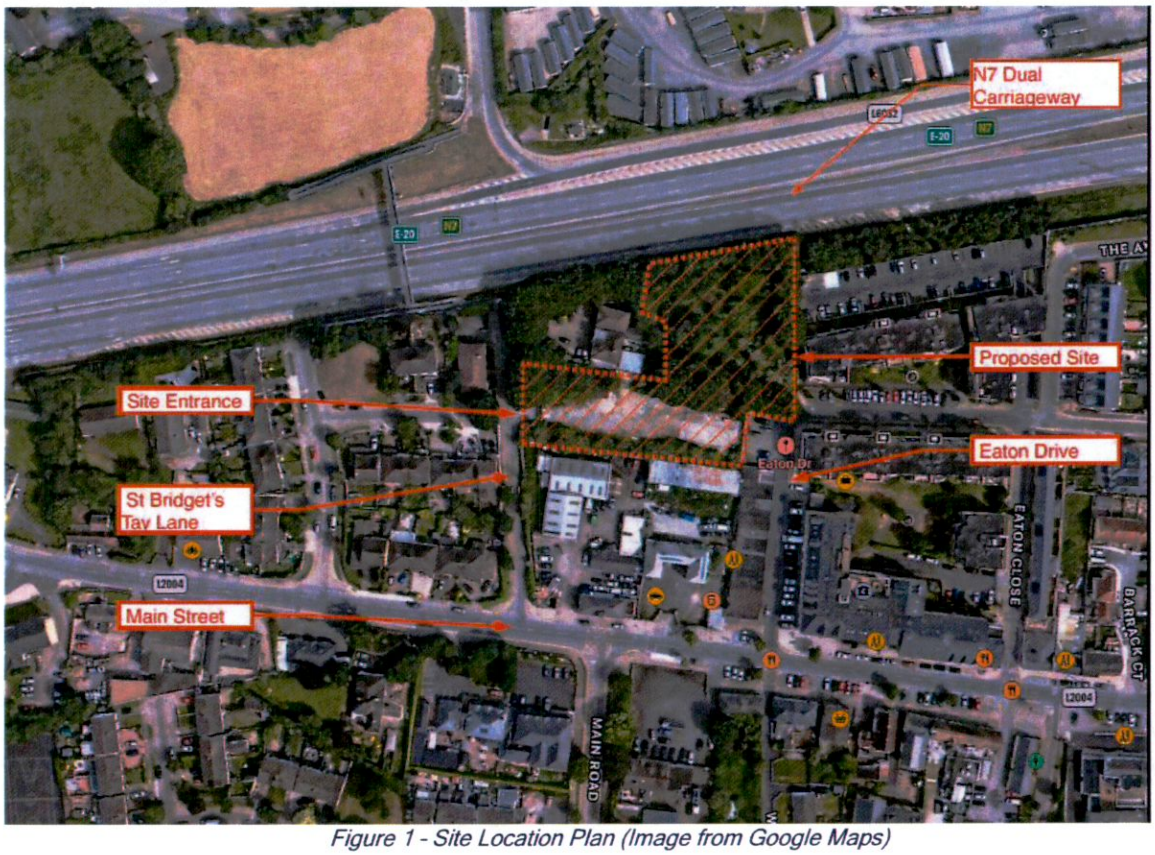


Figure 1 - Site Location Plan (Image from Google Maps)

The site is bounded by St Bridget's Tay Lane to the west, a residential property and the N7 - Naas Road to the north, commercial premises to the east and commercial properties to the south along Main Street, Rathcoole as indicated on the map above. The north-western portion of the site is heavily overgrown with vegetation.

Access to the site is to the west of the site with pedestrian and vehicular access from St Bridget's Tay Lane.

The proposed development calls for the clearance of the vegetation and existing hard-standings on site to facilitate the construction of 58 no. apartments over 4 storeys with external car parking spaces, additional store areas and landscaping. The additional store areas include bin storage, bike storage, community spaces, sub-station and plant room facilities.

Existing Site Condition

The existing site is located south of the N7 dual-carriageway with Tay Lane and Eaton Drive to the western and eastern boundaries respectively. The site is largely overgrown with a single disused outbuilding toward the rear of the site. The site is not currently served by mains water or with either a foul or surface water drainage connection to the public sewers. It is proposed to provide new connections for both the supply of water and the disposal of foul and surface water.

The site is circa 4,730m^2 in area, with a slope from east to west. A topographic survey carried out on the site shows the site slopes from 111.760m AOD at the entrance on Tay Lane up to approximately 113.740m at the south east corner of the site.

The majority of the site, with the exception of the building and access road is covered in vegetation, particularly to the northern end of the site which is extensively covered in vegetative growth with limited access available currently.

Proposed Site Condition

The proposed development calls for the construction of new residential apartment buildings which will contain a total of 58 no. units. These apartments will be constructed over four stories with external car park areas providing 27 no. car parking spaces and 3 no. disabled car parking spaces. 2 no. bike storage spaces shall also be provided within the development.

The entrance will be retained at the western boundary of the site which will provide vehicular and pedestrian access to the site. The proposed site arrangement is shown in Figure 2 overleaf.

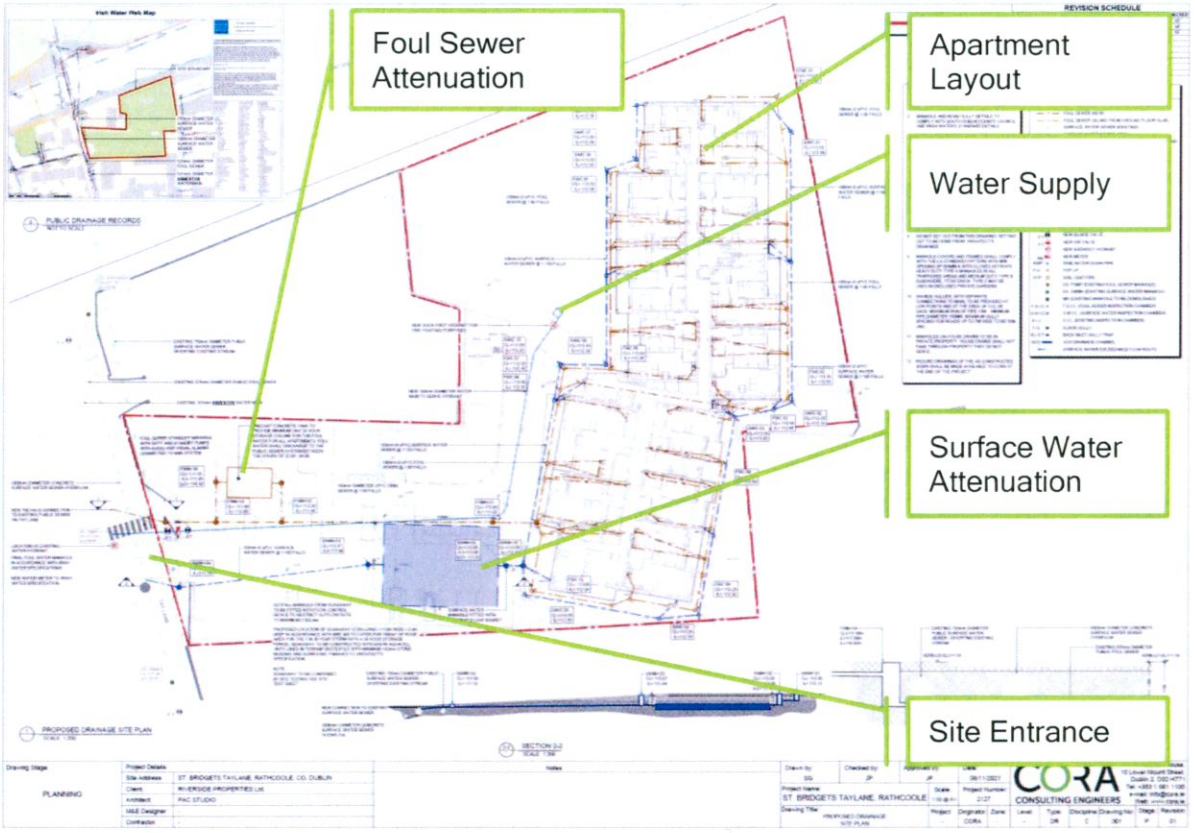


Figure 2 - Proposed Site Layout

Existing Public Service

Records obtained from Irish Water indicate that the site is bounded by the following drainage services:

- 525mm diameter foul sewer running south to north along Tay Lane toward the west of the site.
- 1050mmm concrete surface water sewer running south to north along the western boundary of the site along Tay Lane.
- Additionally, there is a culvert running along all properties on Tay Lane which has a 750mm concrete pipe across the entrance area of the site

The records also show the following public water services are available:

- A 101mm asbestos water main is also located along Tay Lane at the western side of the subject site

The location of the available services are shown in Figure 3 below:

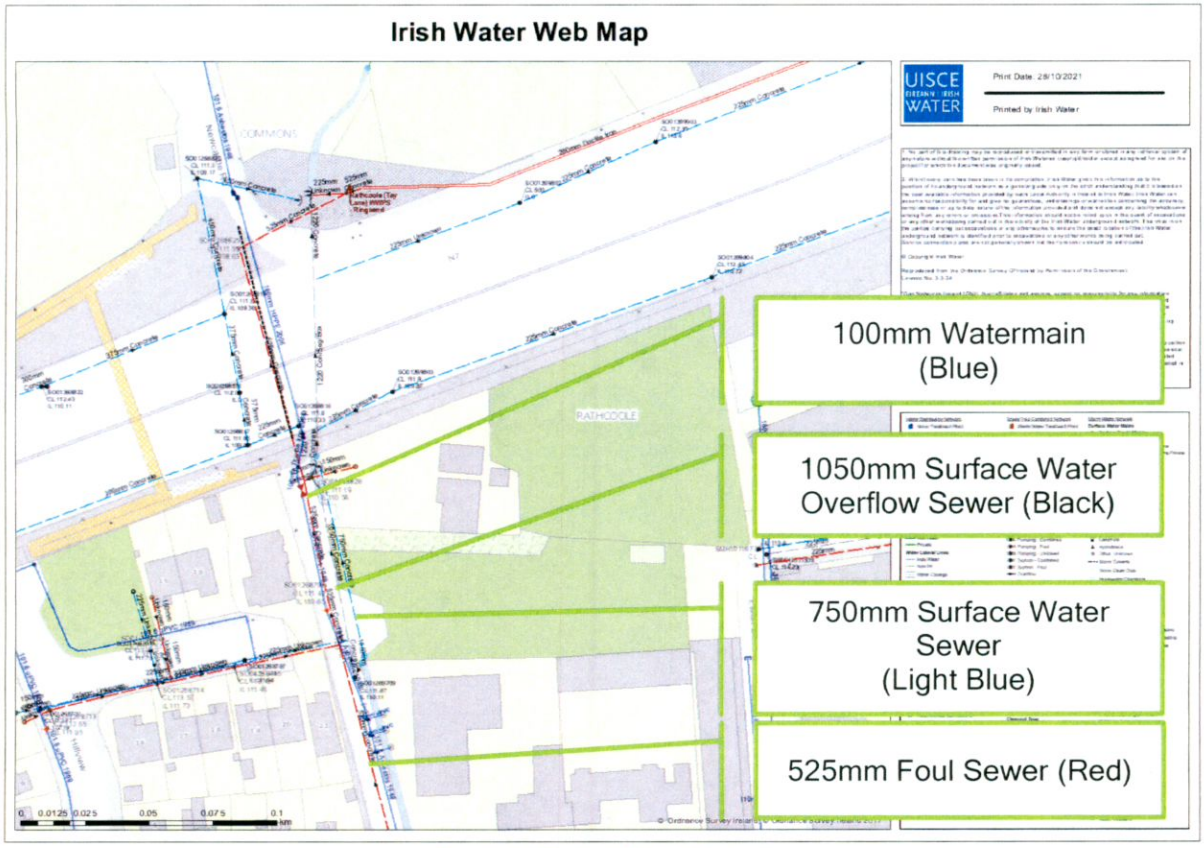


Figure 3 - Existing Public Services

Reference Publications

The following documents were used in the preparation of the engineering services report:

- Code of Practice - Wastewater Treatment and Disposal Systems Serving Single Houses (p.e. ≤ 10)
- Greater Dublin Strategic Drainage Study - Volumes 1 to 6
- Greater Dublin Regional Code of Practice for Drainage Works - Version 6.0
- Technical Guidance Documents - Part H
- Recommendations for Site Development Works for Housing Areas
- BRE Digest 365 - Soakaway Design (2016)
- Irish Water Codes of practice for Water and Wastewater Services.

Foul Water Drainage

Existing Foul Network

The site is not currently connected to the public drainage network. It is proposed to provide a new network of drainage infrastructure within the site to serve the proposed development which shall discharge to the public foul sewer system through a proposed new connection to the public network.

Proposed Foul Network

It is proposed to drain the foul waste generated within the site by gravity to discharge to the existing 525mm diameter foul sewer located on Tay Lane to the western boundary of the site. The contours of the site shall generally suit the gradient of the proposed pipework for the drainage. Therefore, the proposed network shall drain by gravity from the proposed development across the landscaped site to the public sewer system.
The proposed foul drainage arrangement is detailed on CORA drawing 2127-C.001 which is included with this report.

The breakdown in the apartment numbers per block adopted is shown below:

	1 Bed Unit	2 Bed Unit	Totals
Level			
Ground	4	10	14
First	4	10	14
Second	6	9	15
Third	6	9	15
Total	20	38	58

Proposal for a 58 unit apartment development consisting of:

- 20 no. 1 bedroom units
- 38 no. 2 bedroom units

Population Equivalent:

- 1 bedroom unit: 2 PE
- 2 bedroom unit: 3 PE

Total Population Equivalent:	[20 x 2] + [38 x 3] = 154 PE	
Daily Water Demand:	150L / person / day	
Total Daily Discharge:	154 x 150 =	23,100 L / day
Assume Flow occurs over	24 hours	
Average Discharge Rate:	[23100 /24] =	963/ hour
Average Discharge Rate:	[963 / 3600] =	0.267 L / sec (1DWF)
Design Discharge = 6DWF:	[6 x 0.267] =	1.61 L / sec

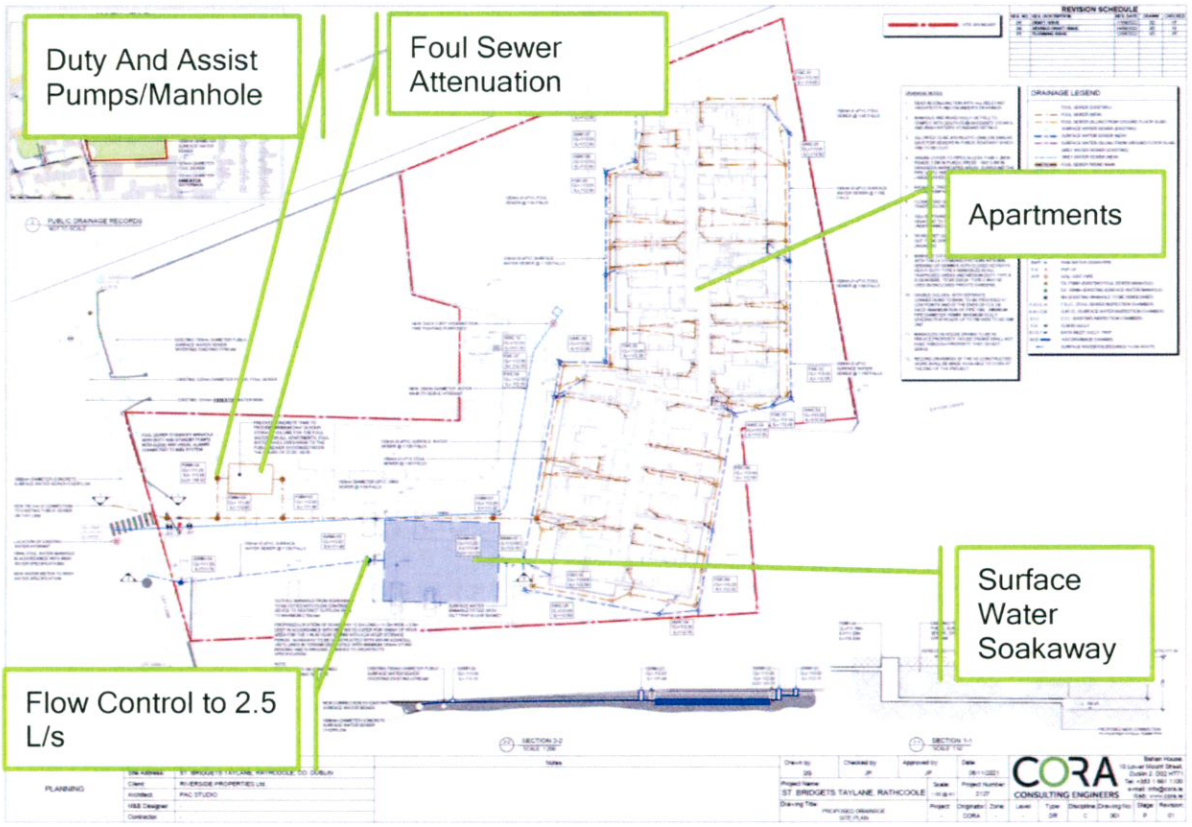


Figure 4 - Proposed Site Layout

The capacity of a 150mm diameter pipe with a gradient of 1:100 would be approximately 16.5 litres per second which exceeds the potential outflow.

Irish Water have been engaged and have stated that the foul drainage network in the area is in the process of being upgraded with a proposed completion date of early 2026. It is proposed to install a storage tank with a volume of 24m^3 which will provide 24-hour storage volume for the proposed apartment development. The attenuation tank shall discharge to the public network at times of reduced volumes, i.e. overnight, and therefore have minimal

impacts at times of peak flows within the public sewer network. The correspondence received from Irish Water is shown in Appendix A. When the public network is upgraded it is proposed that the offline storage tank is decommissioned to allow the direct discharge of foul water from the site. Details of the proposed foul drainage are shown on CORA Drawing CORA-2127-C.001.

Surface Water Drainage

The site is predominantly permeable with vegetation/grassed areas noted throughout with the exception of the existing detached out-building and some localised hard standings.

The proposed scheme will introduce additional impermeable surfaces such as the various roof areas. It is proposed to construct pavements and similar landscaping areas as permeable surfaces to minimise the volume of surface water ultimately being disposed of to the public surface water sewer. A series of measures will be adopted to delay and minimise surface water discharging from the site.

Surface water generated within the site will be collected via a new, separate, surface water drainage network which will flow by gravity mainly from east to west on the site. This surface water shall discharge to a large soakaway which has been designed in accordance with the recommendations of BRE 365: Design of Soakaways (2016). The soakaway shall be constructed with proprietary modular units with a void ratio of 0.95 to enable the discharge of the surface water generated on the roof areas to the ground within the subject site area.

As the adjacent area of land outside the site entrance is susceptible to flood water it may be possible that the elevated level of ground water fills the constructed soakaway. It is therefore proposed to provide an overflow pipe from the soakaway to the public surface water sewer which will enable the discharge of the surface water during such events. A hydrobreak flow control device shall be fitted to the overflow outlet to ensure that the maximum flow rate toward the main sewer shall be restricted to 2.5L/s. During normal rainfall events the soakaway shall disperse the rainwater to the surrounding ground with no discharge to the public network.

Calculations justifying the use of a 15.5m x 11.0m x 0.8m deep soakaway are included in Appendix C to accommodate the rainwater runoff from all roof areas proposed on site. An additional calculation has been included in Appendix D showing that the soakaway has sufficient storage volume for a 24-hour period during an extreme flood event. As stated, the tank is proposed to be constructed using a proprietary cellular type attenuation tank with a voids ratio of 0.95.

Surface Water Flow Paths:

Roof Drainage

The water collected on the new roof areas shall flow to roof outlets which will be connected to a rainwater pipe discharging to a gully trap at ground level. A network of surface water drainage pipes shall collect the water from each gully trap. This new surface water network will flow toward the newly constructed surface water soakaway. This soakaway has been designed to suit the local area rainfall data and also allows for a twenty percent increase due to climate change.

The provision of the soakaway will ensure that no surface water will discharge to the public network. Details of the proposed soakaway are shown on drawing no. CORA-C001.

Pavements and Hardstanding:

It is proposed that all hardstanding and pavements will be constructed as permeable with surface water discharging to ground and will not contribute to the surface water discharge figures from the site.

Details of the proposed hardstanding finishes etc are shown on the Landscape Architects plans.

Water Supply

Existing Water Supply Network

The existing site is not currently connected to the public water mains. It is proposed to form a new connection to the public mains to provide a water supply to the proposed development. The existing public water main is positioned approximately along the centre line of Tay Lane to the west of the site.

Proposed Water Supply Network

In order to quantify the water demand for the property, we have calculated the volume required based on the following calculations:

	1 Bed Unit	2 Bed Unit	Totals
Ground	4	10	14
First	4	10	14
Second	6	9	15
Third	6	9	15
Total	20	38	58

Proposal for a 58 unit apartment development consisting of:

- 20 no. 1 bedroom units
- 38 no. 2 bedroom units

Population Equivalent:

- 1 bedroom unit: 2 PE
- 2 bedroom unit: 3 PE

Total Population Equivalent:	[20 x 2] + [38 x 3] =	154 PE
Daily Water Demand:	150L / person / day	
Total Daily Demand:	154 x 150 =	23,100 L / day
Assume water demand over	24 hours	
Average Water Demand:	[23100 /24] =	963 L/ hour
Average Water Demand:	[963 / 3600] =	0.267 L / sec
Design Water Demand:	[3 x average] =	0.802 L/sec

There is also a requirement for the provision of 1 no. fire hydrant to be installed as part of the development works. The hydrant should be served by a 100mm diameter water main. This main will also have sufficient capacity to serve the development.

It is proposed to connect to the existing 100mm asbestos public water main that is located on Tay Lane to the west of the development.

Confirmation has been received from Irish Water that sufficient capacity exists within the public network to serve the proposed development.

Site Flood Risk Assessment

Introduction

CORA Consulting Engineers were commissioned by the Riverside Projects Ltd to prepare a Site Specific Flood Risk Assessment (SSFRA) for the proposed development of a vacant site along Tay Lane in Rathcoole, Co. Dublin. The development shall include the demolition of a single derelict out-building and the removal of dense scrub across the majority of the site to facilitate the construction of 58 no. residential apartments. This SSFRA was prepared to comply with current planning legislation and forms part of the overall planning application for the subject site.

Background Information
Objectives

The objectives of this report are to inform the planning authority regarding flood risk for the potential development of the lands. The report will assess the site and development proposals in accordance with the requirements of "*The Planning System and Flood Risk Management Guidelines for Planning Authorities*".

The report will provide the following;

- The site's flood zone category.
- Information to allow an informed decision of the planning application in the context of flood risk.
- Appropriate flood risk mitigation and management measures for any residual flood risk.

Flood Risk Assessment Scope

This SSFRA relates only to the proposed development site in the vicinity of St. Bridget's Tay Lane and its immediate surroundings. This report uses information obtained from various sources, together with an assessment of flood risk for the existing land and proposed development. The report follows the requirements of '*The Planning System & Flood Risk Management - Guidelines for Planning Authorities*', (referred to as the *Guidelines* for the remainder of this report) and the South Dublin County Council Development Plan 2016-2022 Strategic Flood Risk Assessment (SFRA).

Planning Guidelines and Flood Risk Assessment

The FRM Guidelines provide "mechanisms for the incorporation of flood risk identification, assessment and management into the planning process...." They ensure a consistent approach throughout the country requiring identification of flood risk and flood risk assessment to be key considerations when preparing development plans, local area plans and planned development.

"The core objectives of the FRM Guidelines are to:

- Avoid inappropriate development in areas at risk of flooding.
- Avoid new developments increasing flood risk elsewhere.
- Ensure effective management of residual risks for development permitted in floodplains.
- Avoid unnecessary restriction of national, regional or local economic and social growth.
- Improve the understanding of flood risk among relevant stakeholders; and
- Ensure the requirements of EU and national law in relation to the natural environment and nature conservation are complied with for flood risk management."

The key principles of The FRM Guidelines are to apply the Sequential Approach to the planning process i.e.;

- "Avoid the risk, where possible,
- Substitute less vulnerable uses, where avoidance is not possible, and
- Mitigate and manage the risk, where avoidance and substitution are not possible."

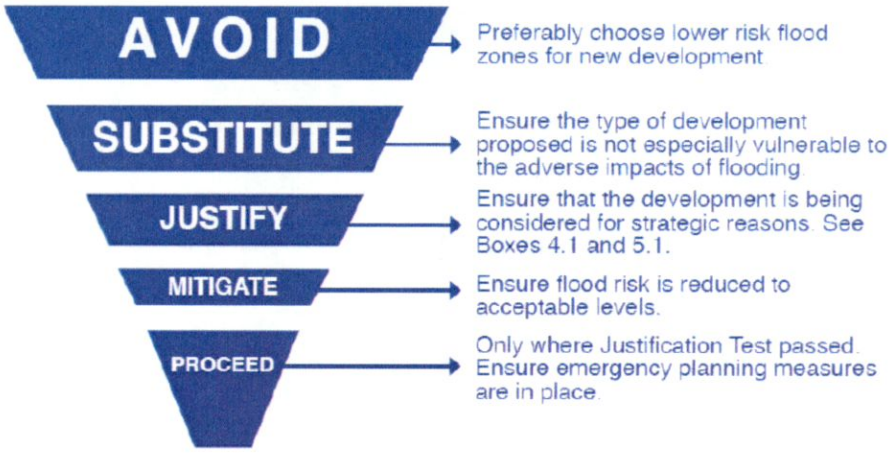


Figure 6 - Sequential Approach Principles in Flood Risk Management

Where the *Sequential Test's* **avoid** and **substitute** principals are not appropriate then the FRM Guidelines propose that a *Justification Test* be applied to assess the appropriateness, or otherwise, of particular developments that are being considered in areas of moderate or high flood risk.

Flood Risk Assessment

The assessment of flood risk requires an understanding of where water comes from (the source), how and where it flows (the pathways) and the people and assets affected by it (the receptors).

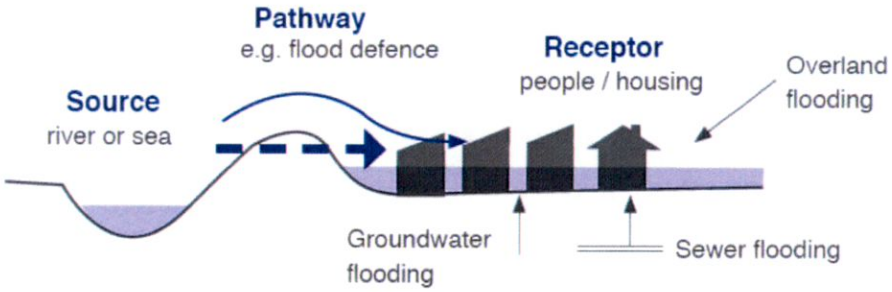


Figure 7 - Source - Pathway - Receptor Model

The principal sources are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets. The receptors can include people, their property and the environment. All three elements are examined as part of the flood risk assessment including the vulnerability and exposure of receptors to determine potential consequences. Mitigation measures typically used in development management can reduce the impact of flooding on people and communities e.g. by blocking or impeding pathways. The planning process is primarily concerned with the location of receptors and potential sources and pathways that might put those receptors at risk.

Risks to people, property and the environment should be assessed over the full range of probabilities, including extreme events. Flood risk assessment should cover all sources of flooding, including effects of run-off from a development locally and beyond the development site.

Flood Risk Assessment Stages

The FRM Guidelines outline that a staged approach should be adopted when carrying out a flood risk appraisal or assessment. "These stages are:

- *Stage 1 Flood risk identification*
- *Stage 2 Initial flood risk assessment*
- *Stage 3 Detailed flood risk assessment*

The FRM Guidelines require a SSFRA be undertaken to assess flood risk for individual planning applications. This SSFRA comprises Stages 1, 2 and 3 involving both identification and more detailed assessment of flood risks and surface water management related to the planned development site.

Flood Zones

The FRM Guidelines use flood zones to determine the likelihood of flooding and for flood risk management within the planning process. The three flood zone levels are:

- Flood Zone A - where the probability of flooding from rivers and the sea is highest (greater than 1% AEP (Annual Exceedance Probability) or 1 in 100 for river flooding;
- Flood Zone B - where the probability of flooding from rivers and the sea is moderate (between 0.1% AEP or 1 in 1000 and 1% AEP or 1 in 100 for river flooding or between 0.1% AEP or 1 in 1000 and 0.5% AEP or 1 in 200 for coastal flooding); and
- Flood Zone C - where the probability of flooding from rivers and the sea is low (less than 0.1% AEP or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas outside zones A and B.

The FRM Guidelines categorises all types of development as either;

- Highly Vulnerable e.g. dwellings, hospitals, fire stations, essential infrastructure,

- Less Vulnerable e.g. retail, commercial or industrial buildings, local transport infrastructure.
- Water Compatible e.g. flood infrastructure, docks, amenity open space.

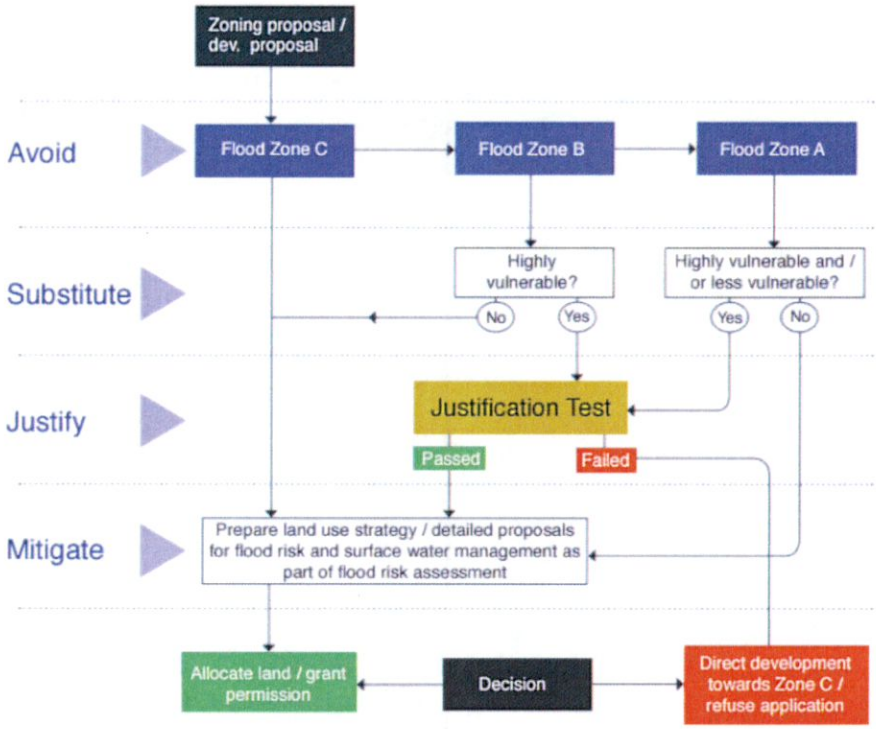


Figure 8 - Sequential Approach Mechanism in the Planning Process

The Sequential Approach restricts development types to occur within the flood zone appropriate to their vulnerability class, see figure 9 below.

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

Figure 9 - Table 3.2 from the FRM guidelines - Matrix of Vulnerability versus Flood Zone to illustrate appropriate development and that required to meet the Justification Test

Proposed Development's Vulnerability

The proposed type of development for this site is to be wholly residential. Residential developments are categorised as **highly vulnerable** and appropriate to be located within Flood Zone C. When situated within Flood Zones A&B it is necessary to provide a justification test for the proposed development. The general site area is not located within either Flood Zone A or B. However, the area at the entrance of the site is positioned in an area identified as Flood Zone A. To provide highly vulnerable development within Flood Zone A, a justification test is required.

Site Specific Flood Risk Assessment for Development

The FRM Guidelines require a SSFRA to "gather relevant information sufficient to identify and assess all sources of flood risk and the impact of drainage from the proposal". It should "quantify the risks and the effects of any necessary mitigation, together with the measures needed or proposed to manage residual risks". It considers the nature of flood hazard, taking account of the presence of any flood risk management measures such as flood protection schemes and how development will reduce the flood risk to acceptable levels. A detailed assessment for a development application should conclude that core flood risk elements of the Justification Test are passed and that residual risks can be successfully managed with no unacceptable impacts on adjacent lands.

SSFRA Key Outputs

Key outputs of an SSFRA are:

- Plans showing the site and development proposals including its relationship with watercourses and structures which may influence local hydraulics;
- Surveys of site levels and comparison of development levels relative to sources of flooding and likely flood water levels;
- Assessments of;
    - Potential sources of flood risk;
    - Existing flood alleviation measures;
    - Potential impact of flooding on the site.
- How the layout and form of the development can reduce those impacts, including arrangements for safe access and egress.
- Proposals for surface water management and sustainable drainage.
- The effectiveness and impact of any mitigation measures.

- The residual risks to the site after the construction of any necessary measures and the means of managing those risks; and
- How flood risks are managed for occupants / employees of the site and its infrastructure.

Stage 1 Flood Risk Identification

Available Flood Risk Information

The initial flood risk identification stage uses existing information to identify and confirm whether there may be flooding or surface water management issues for the lands in question that may warrant further investigation.

To initially identify potential flood risks for the existing site and surrounding area a number of available data sources were consulted, these are listed in Table 1 below.

	Information Source	Coverage	Quality	Confidence	Identified Flood Risks	Flood Risk
Primary Data Source and Modelled Data	OPW ECFRAM - Fluvial https://www.floodinfo.ie/map/floodmaps/	Regional	High	High	Flood maps indicate that the development is not at risk of Fluvial Flooding. (Note entrance area only is affected by fluvial flooding at times)	N
	OPW ECFRAM - Tidal https://www.floodinfo.ie/map/floodmaps/	Regional	High	High	Tidal flood maps indicate that the subject site is outside Tidal Flood Zones	N
	OPW ECFRAM - Pluvial https://www.floodinfo.ie/map/floodmaps/	Regional	High	High	Pluvial Flood Maps indicate minor flooding to areas of the site.	Y
	ICPSS	Nationwide	Moderate to High	Moderate to High	ICPSS maps indicate that the site is located outside Tidal Flood Zones.	N
	SDCC Development Plan SFRA	Local	Moderate to High	Moderate to High	Development is located within Flood Zone C. (Entrance area located at Zone A)	N

Secondary Data Source	Walkover Survey	Local	Varies	Varies	Hardstanding former industrial units with slight fall from centre of site. All drainage underground.	N
	OPW Historic Flood Records	Nationwide	Varies	Varies	No records of site flooding.	N
	Historic OSI Maps	Nationwide	Moderate	Low	Site occupied with structure for over a century	N
	EPA Ex. Rivers	Nationwide	Moderate	Moderate	No rivers in proximity to the site	N
	Drainage Records	Nationwide	Moderate	Moderate	Existing below ground drainage connection to Ballymun Road.	N
	Geological Survey Ireland Maps	County	Moderate	Low	Made ground over clay layers.	N
	Topographic Surveys	Local	High	High	Average site level +45.00m AOD.	N

Table 1 - Review of Available Information

Identified Flood Risks/ Flood Sources

OPW Predictive, Historic & Benefitting Land Maps and Flood Risk Information

From consultation of flood information from the OPW's floodmaps.ie website the site has not suffered from flooding in the past. Information from this source on previous flood events has been included in Appendix B which shows some flooding incidents in other local areas. However, there are no records of the site itself having been flooded.

Fluvial Flood Risk

The OPW's Eastern CFRAM study produced flood risk maps and the assessment of fluvial flood plains over the eastern region of Ireland. The OPW have consolidated this information onto the https://www.floodinfo.ie/map/floodmaps/ website.

Figure 10 below shows that the site is outside the 0.1% AEP, 1.0% AEP and 10% AEP fluvial flood events. Further information is also included in relation to flood levels associated with an increase in rainfall due to future climate change. Figure 11 represents the flood extents with an allowance for a thirty percent increase in rainfall in the future. The information provided on the map indicates that there will be no impact on the proposed development site due to fluvial flooding when considering climate change.

It should be noted that there is potential fluvial flooding on the public road at the entrance to the site. The proposed ground floor level of the apartment building shall be constructed at minimum 2.4m above the road level. Therefore, the proposed buildings are not at risk from any potential fluvial flooding.

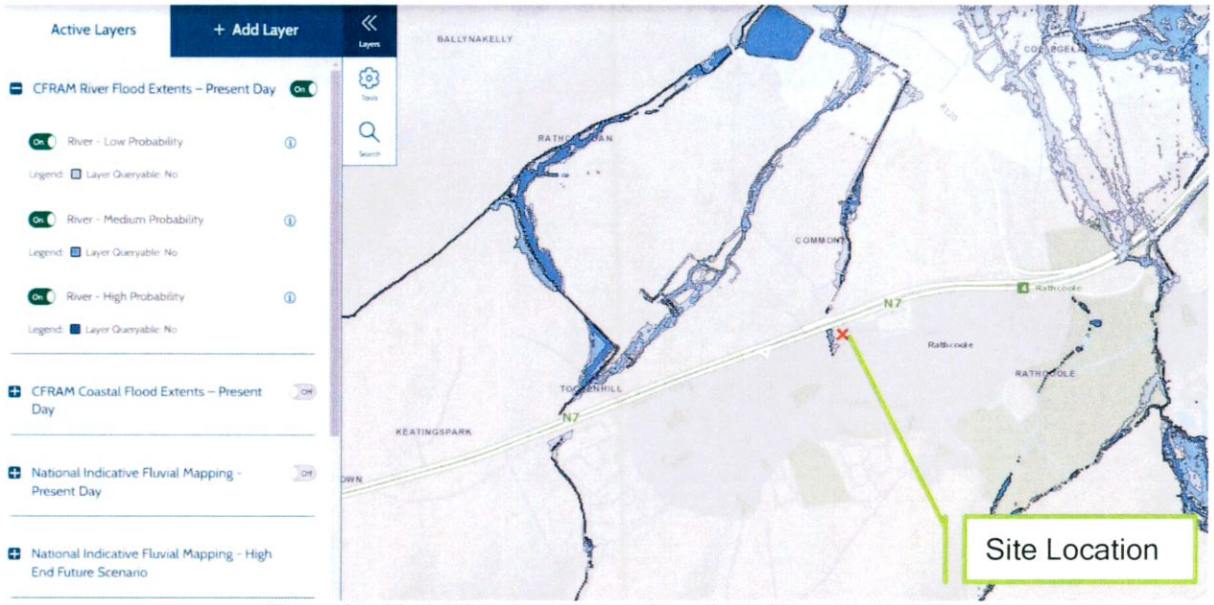


Figure 10 - Fluvial Flooding - Present Day - 10%, 1% and 0.1% AEP

Figure 11 - Fluvial Flooding - High End Future - 10%, 1% and 0.1% AEP

Tidal Flood Risk

The OPW ECFRAM coastal flood risk analysis for 10%, 0.5% and 0.1% AEP return periods show the site is outside the extents of the coastal flood events as seen in Figure 12 below.

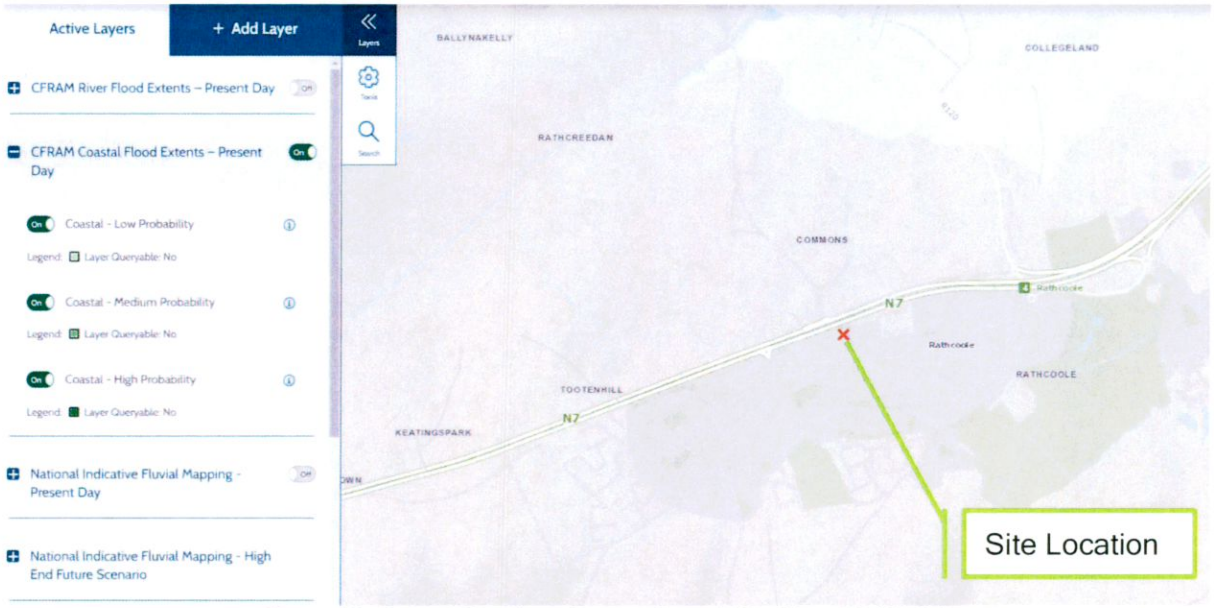


Figure 12 - Coastal Flooding - Present Day - 10%, 1% and 0.1% AEP

Further information is also included in relation to flood levels associated with an increase in rainfall due to future climate change. Figure 13 represents the flood extents with an allowance for a thirty percent increase in rainfall in the future. The information provided on the map indicates that there will be no impact on the proposed development site due to tidal flooding when considering climate change.

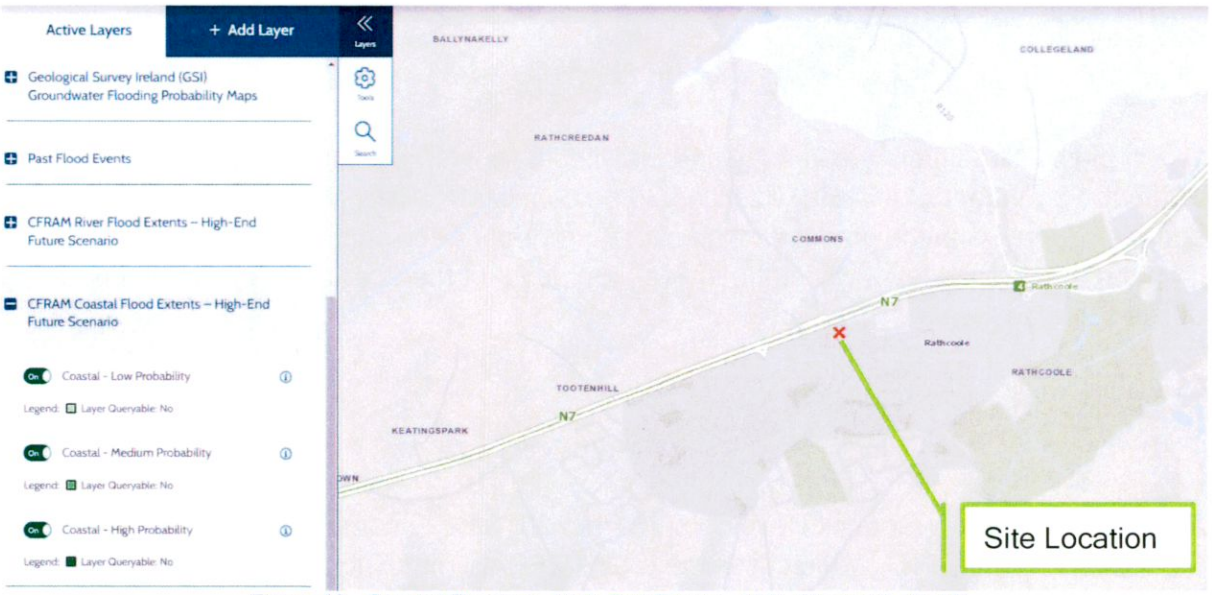


Figure 13 - Coastal Flooding - High End Future - 10%, 1% and 0.1% AE

Pluvial Flood Risk

The pluvial maps available on Floodmaps.ie indicate that there is no pluvial flooding in the subject site and surrounding area. However, the maps available within the Strategic Flood Risk Assessment for South Dublin County Council Development Plan 2016-2022 indicate that the road adjacent to the site does have potential pluvial flooding.
An extract from the Pluvial maps of the SFRA is shown in figure 14 which shows the pluvial extents for a 0.1% AEP and 1.0% AEP event.

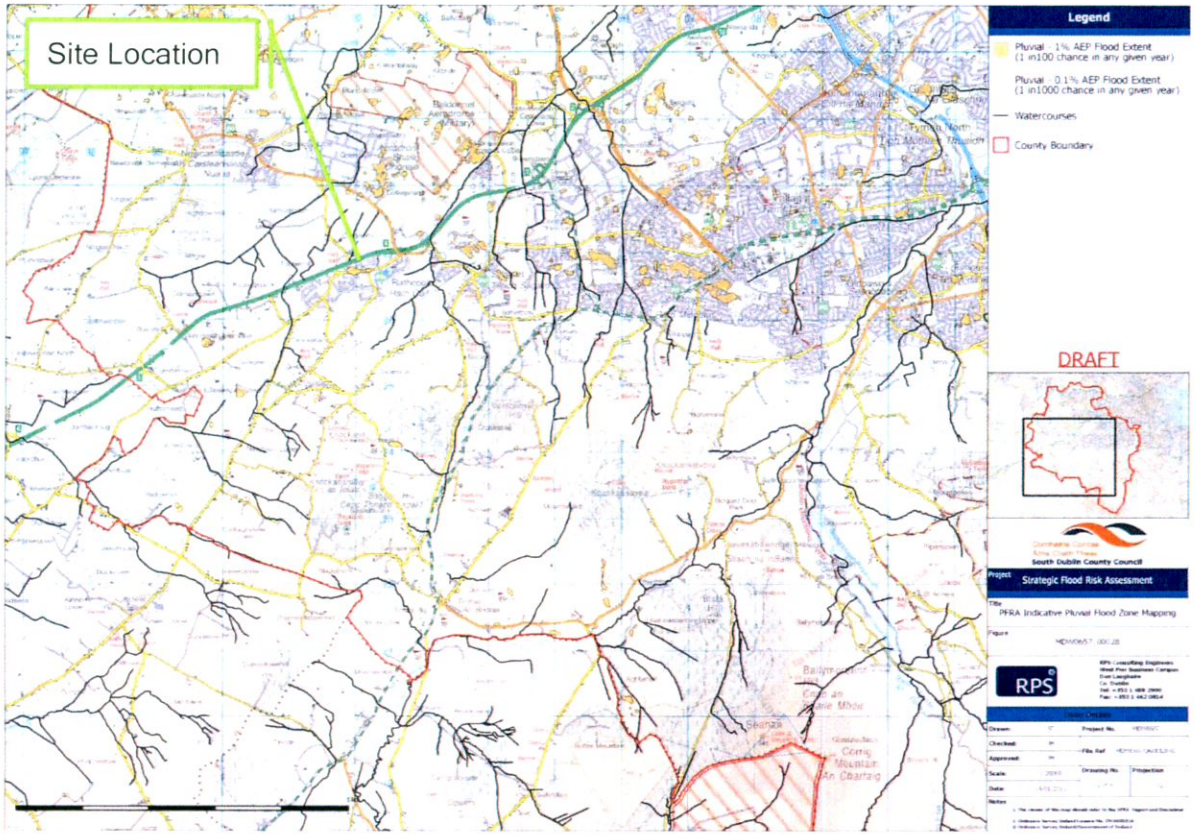


Figure 14 - Pluvial Flooding

Whilst pluvial flooding is noted adjoining the site, there are no references to pluvial flooding within the boundary of the site which would be consistent with the permeable nature of the surface coupled with the gradient of the site. Furthermore, the contours of the site are higher than the public road level whilst the lowest floor level of the apartment blocks will be 2.4m above the road level.

South Dublin County Council Strategic Flood Risk Assessment

South Dublin County Council Development Plan 2016-2022 comprises the Strategic Flood Risk Assessment (SFRA) which uses the draft ECFRAM mapping as its basis for identifying areas at flood risk. The SFRA identifies the subject site on Map 14 which indicates that the

actual site area is designated as an area of Flood Zone C. However, the road adjacent to the site is shown as an area assigned to Flood Zone A.

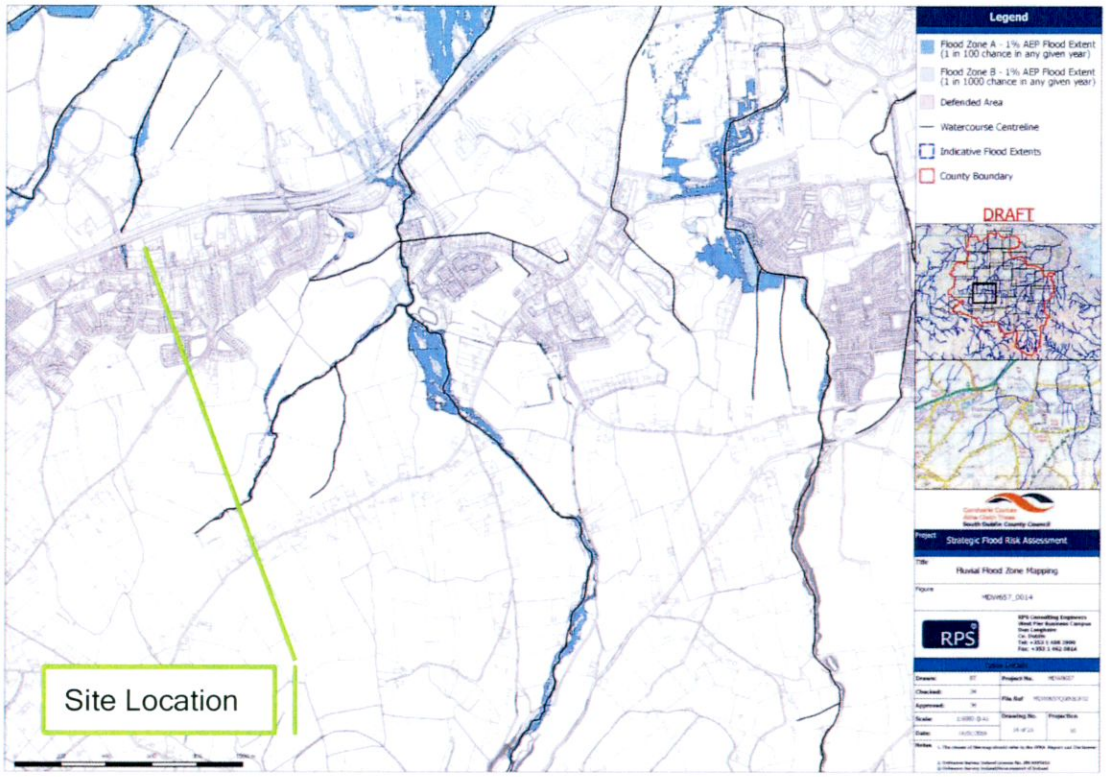


Figure 15 - DCC Flood Zone Mapping

Historical Flood Records

A review of the OPW historic flood events show that there is no history of flooding within the subject site. An extract from the records available is shown in Figure 16 below.

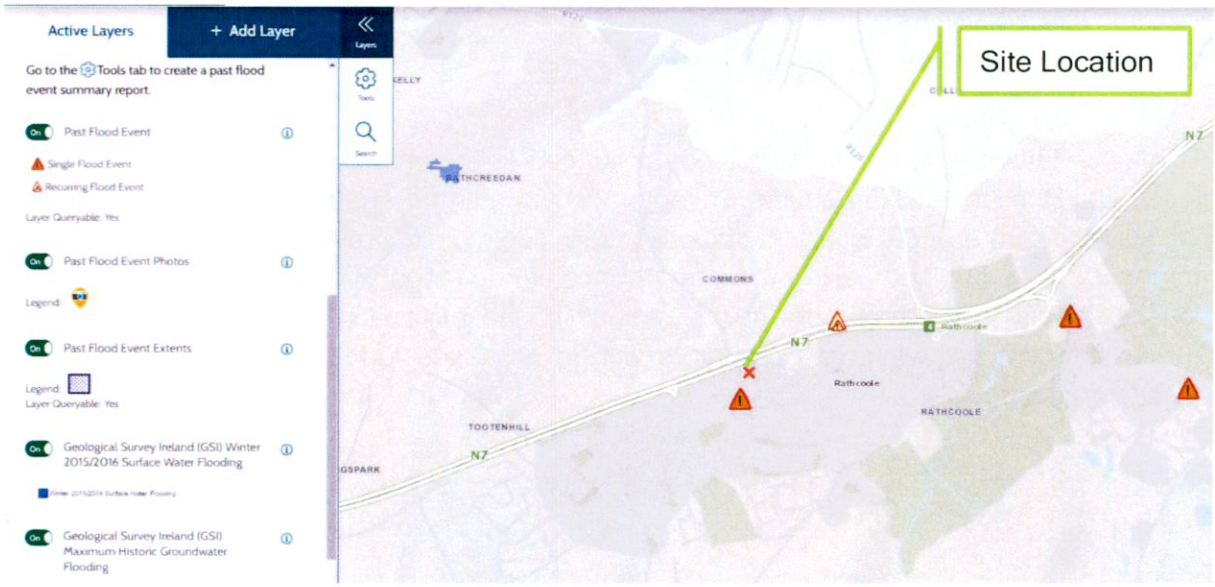


Figure 16 - OPW Historical Flood Records

Topographical Survey

After reviewing the Topographical survey, the subject site falls from east to west. The survey indicates that the existing ground level varies from approximately +111.760m AOD at the west to 113.740m AOD at the east of the site.

Walkover Survey

From a walkover of the site the subject site slopes up from west to east and no evidence of flooding or flow paths are evident on site. The site is predominantly permeable with vegetation covering a large portion of the site. The walkover survey confirmed the proposed development site is as expected and ties in with the topographical survey.

Other Sources

Other information sources were consulted to determine if there was any additional flood risk to the subject site, these included;

- Existing Local Authority Drainage Records - The surrounding area uses separate drainage networks for the foul and surface water. There is a 525mm concrete foul sewer pipe indicated toward the centre of Tay Lane. There is also a 1050mm diameter concrete surface water overflow pipe which runs parallel to the foul sewer within the road. There is a culvert along the edge of the road which has a 750mm diameter pipe bridging across the entrance of the subject site.

- Historic Maps - a review of the historic maps does not show any items of concern with residential use recorded on the 6" Cassini Map.

Source-Pathway-Receptor Model

A Source-Pathway-Receptor model was produced to summarise the possible sources of floodwater, the people and assets (receptors) that could be affected by potential flooding (with specific reference to the proposals), see Table 2. It provides the probability and magnitude of the sources, the performance and response of pathways and the consequences to the receptors in the context of the mixed-use development proposal. These sources, pathways and receptors will be assessed further in the initial flood risk assessment stage.

Source	Pathway	Receptor	Likelihood	Impact	Risk
Tidal	Subject Site outside flood extents	Ground Floor	Very Unlikely	Medium	Medium
Fluvial	Proposed development site outside fluvial flood zone	-	Very unlikely	-	-
Surface Water Drainage	Flooding from surcharging of the developments drainage system	Ground Floor	Very unlikely	-	-
Groundwater Flooding (Pluvial)	Rising ground water on the site	Ground Floor	Unlikely	Low	Low
Infrastructural - Human or Mechanical Error	Blockage of new drainage network	Ground Floor	Unlikely	Low	Low

Table 2 - Source-Pathway-Receptor Analysis

The following section provides a summary of the results of this Source-Pathway-Receptor flooding model for the subject site.

Source-Pathway-Receptor Model Results

As it can be seen in the previous flooding analysis, the proposed development site is not at risk of flooding from coastal, fluvial or pluvial flood events. It is however noted that the road at the entrance to the site could be affected by fluvial flooding.

Stage 2- Initial Flood Risk Assessment Stage

The main sources of flood risk identified from Stage 1 are;

- No flood risks have been identified for the actual site area.
- Potential fluvial flooding on the public road at the site entrance

Flood Zone Category

Following the assessment of the flood risk to the site and the available information it is considered that the proposed development site is located outside a potential flood zone i.e. Flood Zone C, as defined by the Guidelines and indicated by the South Dublin County Council Strategic Flood Risk Assessment. However, as stated above the area adjacent to the site on the public road is susceptible to fluvial flooding.

Stage 3 – Detailed Flood Risk Assessment

The detailed Flood Risk assessment stage will look more closely how the proposed development will mitigate flood risk from the identified source.

In regard to the low pluvial flood risk on adjoining sites, the detailed flood risk assessment stage will assess this in relation to the following;

- Proposed development plans (FFLs, site vulnerability, building extents).
- Impact of proposed development on adjacent properties.
- In relation to the objectives set out in the SDCC SFRA justification test.
- Any residual risks
- Flood exceedance.

Detailed Fluvial Flood Risk Assessment

The existing site is largely permeable with gravel and grass/vegetation to the majority of the site. It is proposed to provide permeable paving to all new areas to allow infiltration of surface water to the ground below. The paving will be constructed with sufficient storage volume under to cater for the 1 in 200-year storm event.

In the worst-case scenario that the paving is blocked, and water begins to pool on the surface, the paving will be constructed with falls away from the building faces. The operational management plan will include regularly cleaning of the paving surfaces to reduce risk of blockages. Flood resilient design measures shall be incorporated into the structure to ensure no risk of flood water entering the site.

The surface water generated from the new roof areas shall be collected in a new network of surface water pipes. This network shall drain to a soakaway which has been designed for the site specific parameters in accordance with BRE365: Design of Soakaways (2016).

Justification Test

The preparation of this report follows the guidelines stated within the Strategic Flood Risk Assessment for South Dublin County Council. The criteria for the proposed development would classify the proposed scheme as a highly vulnerable development in the area of Flood Zone C. According to the matrix of vulnerability versus flood zone within the SFRA this type of development is considered appropriate and would not require a justification test.

Residual Risks

Remaining residual flood risks, include the following;

- Fluvial flooding due to local river/stream surcharging

Mitigation Measures

Proposed mitigation measures to address residual flood risk are summarised below;

- Installation of permeable paving with sufficient sub-surface storage volume will allow for the predicted flood waters to be stored under the surface and infiltrate within the site after rainfall subsides.

- The proposed drainage system to be maintained on a regular basis to reduce the risk of a blockage. This new network shall also include the use of non-return valves to prevent the passage of water within the public network back into the proposed new development.

- Proposed surface water soakaways designed, and to be constructed, in accordance with BRE365: Design of Soakaways (2016). All rainwater collected on the new roof areas will be dispersed to the ground within the site area with no water discharging to the public network under normal conditions.

- The ground floor levels of the proposed buildings shall be constructed at approximately 2.4m above the adjacent road level. Therefore, there is no risk to the building from fluvial flood sources.

Effectiveness of Mitigation Measures

It is considered that the flood risk mitigation measures once fully implemented are sufficient to provide a suitable level of protection to the proposed development.
The proposed development will not increase the run-off rates when compared with the existing site and satisfies the requirement of the SFRA to reduce flooding and improve water quality.

Conclusion

This SSFRA concludes the following;

- This Site Specific Flood Risk Assessment for the proposed clearance of the site at St Bridget's Tay Lane, Rathcoole was undertaken in accordance with the requirements of the "Planning System and Flood Risk Management Guidelines for Planning Authorities", November 2009 and the South Dublin County Council Development Plan 2016-2022 Strategic Flood Risk Assessment.

- The proposed type of development for this site is to be Residential. Residential developments are categorised by the Guidelines as ***Highly vulnerable development*** and appropriate to be located within ***Flood Zone C*** without the requirement for a justification test.

- No sources of flood risk were identified for the actual site area. It is noted that there is potential fluvial flooding on the public road at the entrance to the site. The proposed buildings are at sufficient distance and elevated levels to ensure that there is no risk of flooding to the buildings.

- The flood maps referenced within this document in relation to predicted flood levels in the future allow for a 30% increase in water levels.

- Surface water will be collected within the site boundary and discharged to a site specifically designed soakaway system which has a 20% allowance included for climate change.

- The proposed sustainable drainage measures should ensure that there is no increase in the potential flooding in the local area.

Appendix A

John Pigott

Behan House,
10 Lower Mount Street,
Dublin 2
Co. Dublin
D02HT71

Uisce Éireann
Bosca OP 448
Oifig Sheachadta r
Cathrach Theas
Cathair Chorcaí

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

www.water.ie

3 December 2021

Re: CDS21008044 pre-connection enquiry - Subject to contract | Contract denied

Connection for Housing Development of 58 unit(s) at St. Bridgets Taylane, Rathcoole, Dublin

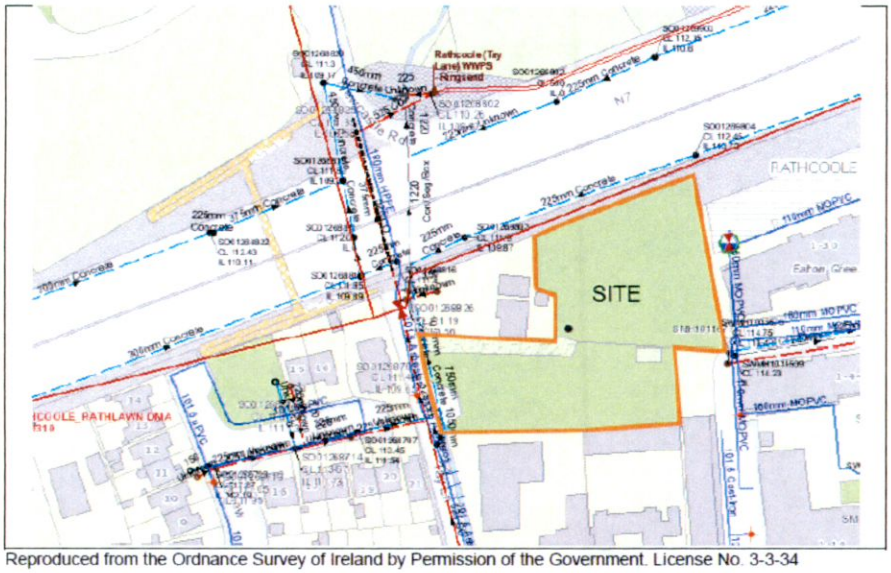
Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at St. Bridgets Taylane, Rathcoole, 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 subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	
Wastewater Connection	There are known constraints in Tay Lane Pumping Station. Irish Water currently has a project underway which will provide the necessary upgrades. This upgrade project is scheduled to be completed in Q1/2026 (this may be subject to change) and the proposed connection could be completed as soon as possibly practicable after this date.

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 Kevin McManmon from the design team at kmcmanmon@water.ie For further information, visit **www.water.ie/connections.**

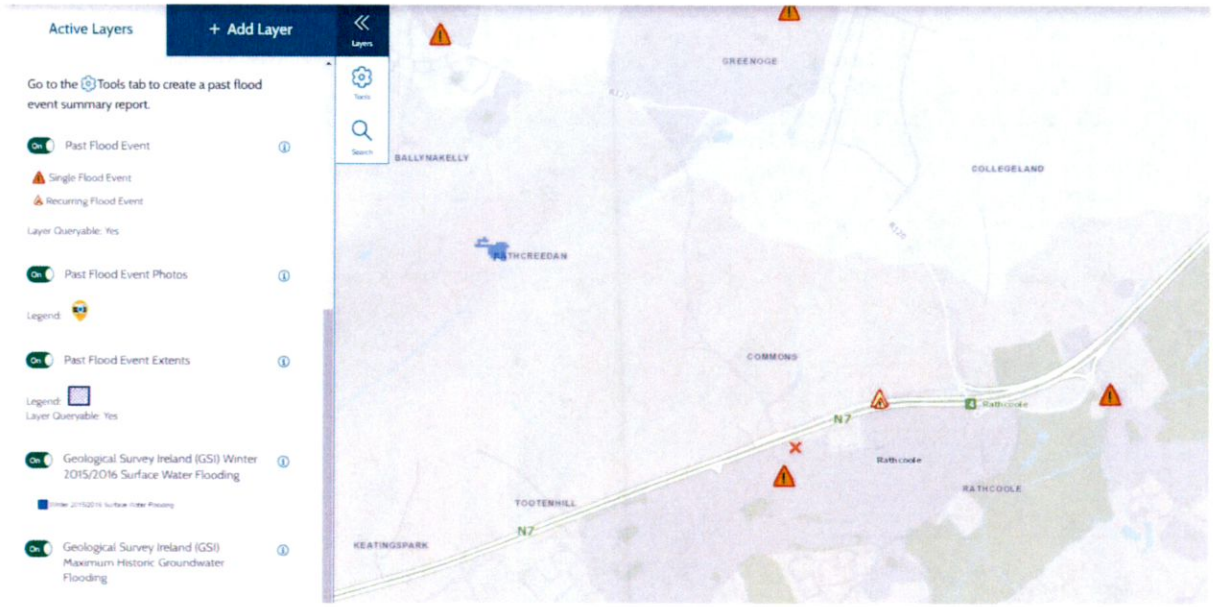
Yours sincerely,

Yvonne Harris

Yvonne Harris

Head of Customer Operations

Appendix B


Active Layers
+ Add Layer
Layers
Tools
Search
Go to the Tools tab to create a past flood event summary report.
Past Flood Event
Single Flood Event
Recurring Flood Event
Layer Queryable: Yes
Past Flood Event Photos
Legend:
Past Flood Event Extents
Legend:
Layer Queryable: Yes
Geological Survey Ireland (GSI) Winter 2015/2016 Surface Water Flooding
Geological Survey Ireland (GSI) Maximum Historic Groundwater Flooding
GREENOGE
BALLYNAKELLY
COLLEGELAND
THCREEDAN
COMMONS
N7
Rathcoole
RATHCOOLE
TOOTENHILL
KEATINGSPARK

Appendix C

CORA Consulting Engineers Behan House 10 Lower Mount Street Dublin D02 HT71	Project: Tay Lane, Rathcoole				Job no.: 2127	
	Calcs for: Surface Water Soakaway				Start page no./Revision: 1 /A	
	Calcs by: KF	Calcs date: 09/08/2022	Checked by:	Checked date:	Approved by:	Approved date:

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.04

Design rainfall intensity

Location of catchment area	Other
Impermeable area drained to the system	A = **1660.0** m^2
Return period	Period = **30** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.266**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.8** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **20** %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = **800** mm
Width of pit	w = **11000** mm
Length of pit	l = **15500** mm
Percentage free volume	V_{free} = **95** %
Soil infiltration rate	f = **30.0**×10^{-6} m/s
Wetted area of pit 50% full	$a_{s50} = l \times d + w \times d$ = **21200000** mm^2

Table equations

Inflow (cl.3.3.1)	$I = M30 \times A$
Outflow (cl.3.3.2)	$O = a_{s50} \times f \times D$
Storage (cl.3.3.3)	$S = I - O$

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	30 year rainfall, M30 (mm)	Inflow (m^3)	Outflow (m^3)	Storage required (m^3)
5	0.33;	7.8;	1.47;	11.4;	18.95;	0.19;	18.76
10	0.48;	11.3;	1.49;	16.9;	28.07;	0.38;	27.69
15	0.58;	13.7;	1.49;	20.5;	33.99;	0.57;	33.41
30	0.76;	18.0;	1.48;	26.7;	44.32;	1.14;	43.18
60	1.00;	23.8;	1.46;	34.8;	57.72;	2.29;	55.43
120	1.27;	30.3;	1.44;	43.7;	72.48;	4.58;	67.91
240	1.65;	39.2;	1.42;	55.5;	92.10;	9.16;	82.94
360	1.90;	45.0;	1.39;	62.8;	104.18;	13.74;	90.44
600	2.26;	53.7;	1.37;	73.4;	121.91;	22.90;	99.02
1440	3.13;	74.4;	1.33;	99.1;	164.48;	54.95;	109.53

Required storage volume — S_{req} = **109.53** m^3

Soakaway storage volume — $S_{act} = l \times d \times w \times V_{free}$ = **129.58** m^3

PASS - Soakaway storage volume

Time for emptying soakaway to half volume — $t_{s50} = S_{req} \times 0.5 / (a_{s50} \times f)$ = 23hr 55min 9s

PASS - Soakaway discharge time less than or equal to 24 hours

Appendix D

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 301952, Northing: 226816,

DURATION	Interval 6months,	1year,	Years 2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.7,	4.0,	4.8,	5.9,	6.7,	7.3,	9.3,	11.6,	13.2,	15.5,	17.6,	19.2,	21.8,	23.7,	25.4,	N/A ,
10 mins	3.8,	5.6,	6.6,	8.2,	9.3,	10.1,	12.9,	16.2,	18.5,	21.6,	24.5,	26.8,	30.3,	33.1,	35.4,	N/A ,
15 mins	4.5,	6.6,	7.8,	9.6,	10.9,	11.9,	15.2,	19.1,	21.7,	25.5,	28.8,	31.5,	35.7,	38.9,	41.7,	N/A ,
30 mins	5.9,	8.7,	10.2,	12.5,	14.1,	15.3,	19.5,	24.4,	27.6,	32.3,	36.5,	39.8,	44.9,	49.0,	52.3,	N/A ,
1 hours	7.8,	11.3,	13.2,	16.2,	18.2,	19.8,	25.0,	31.1,	35.2,	41.0,	46.2,	50.3,	56.6,	61.6,	65.7,	N/A ,
2 hours	10.2,	14.7,	17.2,	21.0,	23.5,	25.5,	32.1,	39.7,	44.8,	52.0,	58.5,	63.5,	71.3,	77.5,	82.5,	N/A ,
3 hours	12.0,	17.2,	20.1,	24.4,	27.3,	29.6,	37.2,	45.8,	51.6,	59.8,	67.1,	72.8,	81.7,	88.6,	94.3,	N/A ,
4 hours	13.5,	19.2,	22.4,	27.1,	30.4,	32.9,	41.2,	50.7,	57.1,	66.0,	74.0,	80.3,	89.9,	97.4,	103.7,	N/A ,
6 hours	15.8,	22.5,	26.1,	31.6,	35.3,	38.2,	47.7,	58.5,	65.7,	75.9,	85.0,	92.0,	102.9,	111.4,	118.5,	N/A ,
9 hours	18.6,	26.3,	30.5,	36.7,	41.0,	44.3,	55.2,	67.5,	75.7,	87.3,	97.5,	105.5,	117.9,	127.5,	135.4,	N/A ,
12 hours	20.8,	29.4,	34.0,	40.9,	45.6,	49.2,	61.2,	74.7,	83.7,	96.3,	107.6,	116.3,	129.8,	140.2,	148.9,	N/A ,
18 hours	24.4,	34.3,	39.6,	47.6,	53.0,	57.2,	70.8,	86.2,	96.4,	110.8,	123.5,	133.4,	148.6,	160.4,	170.2,	N/A ,
24 hours	27.4,	38.3,	44.2,	53.0,	58.9,	63.5,	78.5,	95.5,	106.6,	122.3,	136.2,	147.0,	163.6,	176.4,	187.1,	224.4,
2 days	34.5,	46.9,	53.4,	63.0,	69.5,	74.4,	90.3,	107.9,	119.4,	135.3,	149.3,	160.0,	176.4,	189.0,	199.4,	235.4,
3 days	40.4,	54.0,	61.0,	71.3,	78.1,	83.4,	100.1,	118.4,	130.3,	146.6,	160.9,	171.8,	188.4,	201.1,	211.5,	247.3,
4 days	45.6,	60.2,	67.7,	78.6,	85.8,	91.3,	108.7,	127.8,	140.0,	156.7,	171.3,	182.4,	199.3,	212.1,	222.6,	258.7,
6 days	54.8,	71.1,	79.4,	91.3,	99.2,	105.1,	123.9,	144.1,	157.0,	174.6,	189.8,	201.3,	218.7,	231.9,	242.6,	279.3,
8 days	63.0,	80.8,	89.8,	102.6,	111.0,	117.3,	137.2,	158.5,	172.0,	190.3,	206.0,	217.9,	235.8,	249.4,	260.4,	297.8,
10 days	70.7,	89.8,	99.3,	112.9,	121.8,	128.5,	149.3,	171.6,	185.6,	204.5,	220.8,	233.1,	251.5,	265.3,	276.6,	314.7,
12 days	77.9,	98.1,	108.2,	122.6,	131.8,	138.8,	160.6,	183.7,	198.2,	217.8,	234.5,	247.1,	265.9,	280.1,	291.6,	330.4,
16 days	91.4,	113.7,	124.8,	140.4,	150.4,	158.0,	181.4,	206.0,	221.3,	242.0,	259.6,	272.8,	292.4,	307.2,	319.1,	359.2,
20 days	104.0,	128.2,	140.1,	156.9,	167.6,	175.6,	200.4,	226.3,	242.5,	264.1,	282.4,	296.1,	316.5,	331.8,	344.1,	385.3,
25 days	118.9,	145.3,	158.1,	176.1,	187.5,	196.1,	222.5,	249.9,	266.9,	289.6,	308.7,	323.0,	344.2,	360.1,	372.8,	415.4,

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

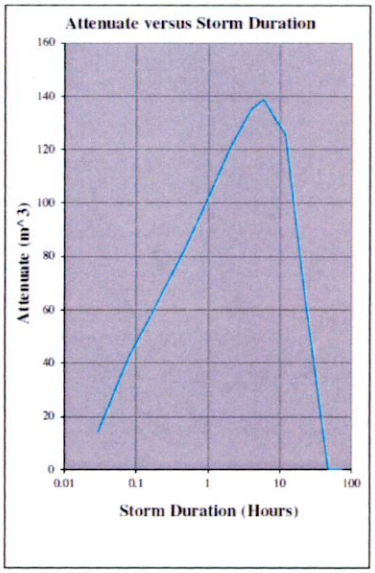
CORA CONSULTING ENGINEERS

Project:	Tay Lane			Job No:	2127
				Page No:	1
Date:	12/08/2022	Calc'd by:	K. Farrell	Checked by:	J. Pigott

Roof Area: 1660 m^2 I. Factor: 0.90 | Paved Area: 0 m^2 I. Factor: 1.00 | Green roof: 0 m^2 I. Factor: 0.75 | Equivalent Impermeable Area: 1494 m^2 | Attenuated Flow Rate: 2.5 l/s

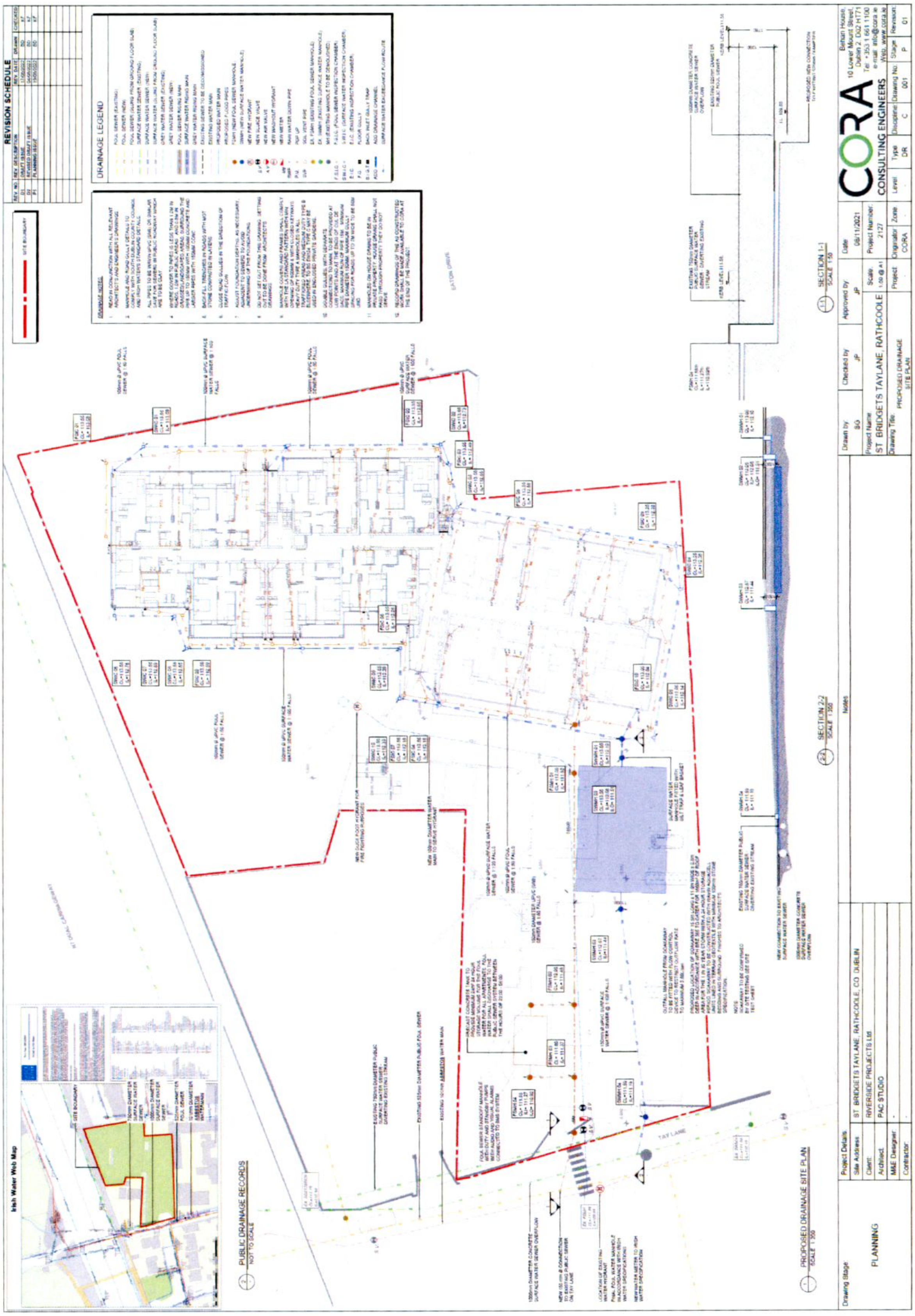
Factors: Climate Change: 1.2 | Simplification of Head/Discharge Relationship: 1.25 Hydrobreak

Storm Duration (Hours)	Rainfall (mm)	Total Surface Water (m^3)	Allowable Discharge (m^3)	Attenuate (m^3)
0.03	7.80	11.65	0.27	14.23
0.08	23.04	34.42	0.72	42.13
0.166	32.16	48.05	1.494	58.19
0.25	37.80	56.47	2.25	67.78
0.50	47.76	71.35	4.5	83.57
1.00	60.36	90.18	9	101.47
2.00	76.20	113.84	18	119.80
4.00	96.36	143.96	36	134.95
6.00	110.40	164.94	54	138.67
12.00	139.56	208.50	108	125.63
24.00	176.40	263.54	216	59.43
48.00	192.00	286.85	432	0.00
72.00	206.16	308.00	648	0.00



Note: This spreadsheet calculates the Volume of Attenuate based on a Return Peroiod of: 100 years.

Appendix E



REVISION SCHEDULE
DRAINAGE LEGEND
DRAINAGE NOTES
CORA
CONSULTING ENGINEERS
ST BRIDGETS TAYLANE, RATHCOOLE
PROPOSED DRAINAGE SITE PLAN
PLANNING
PUBLIC DRAINAGE RECORDS
NOT TO SCALE
Irish Water Web Map
SECTION 1-1
SECTION 2-2
TAYLANE