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Client	Fingal County Council
Project Title	Proposed Housing at Mayeston, Poppintree, Dublin 11
Report Title	Civil Engineering Report
Prepared For	O'Briain Beary Architects

Project No.	Originator	Volume	Level	Type	Role	Serial No.	Suitability
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P01	Preliminary Draft	AD		22.08.22
P02	Updated Draft for Review	AD		24.08.22
P03	Minor Updates – issue to FCC for review	AD	PD	29.08.22
P04	Updated & issued for Part 8 planning application	AD		07.11.22

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1. INTRODUCTION

As part of its Housing Programme, Fingal County Council (Housing Department) proposes to construct a number of new dwelling units and a crèche at a site located within the Mayeston estate at Poppintree, Dublin 11. The site, which measures approximately 1.34Ha in area, is located between St Margaret's Rd to the south, the M50 to the north, existing residential development to the east, and a public park to the west (refer to Figure 1 below). The site forms part of the Mayeston estate which has been developed in recent years. The southern part of the site forms part of a larger 1.43Ha site for which planning permission was previously granted (planning register ref. F06A/1348). However, only the eastern part of this granted development was constructed. The remaining (current applicant) site was only partially developed – concrete slabs and foundations are in place for unfinished units as indicated in Figure 1. The northern wedge-shaped part of the current applicant site did not form part of the previous planning application. This additional lands measures approximately 0.59Ha. The land is zoned RS-Residential: '*Provide for residential development and protect and improve residential amenity*'.

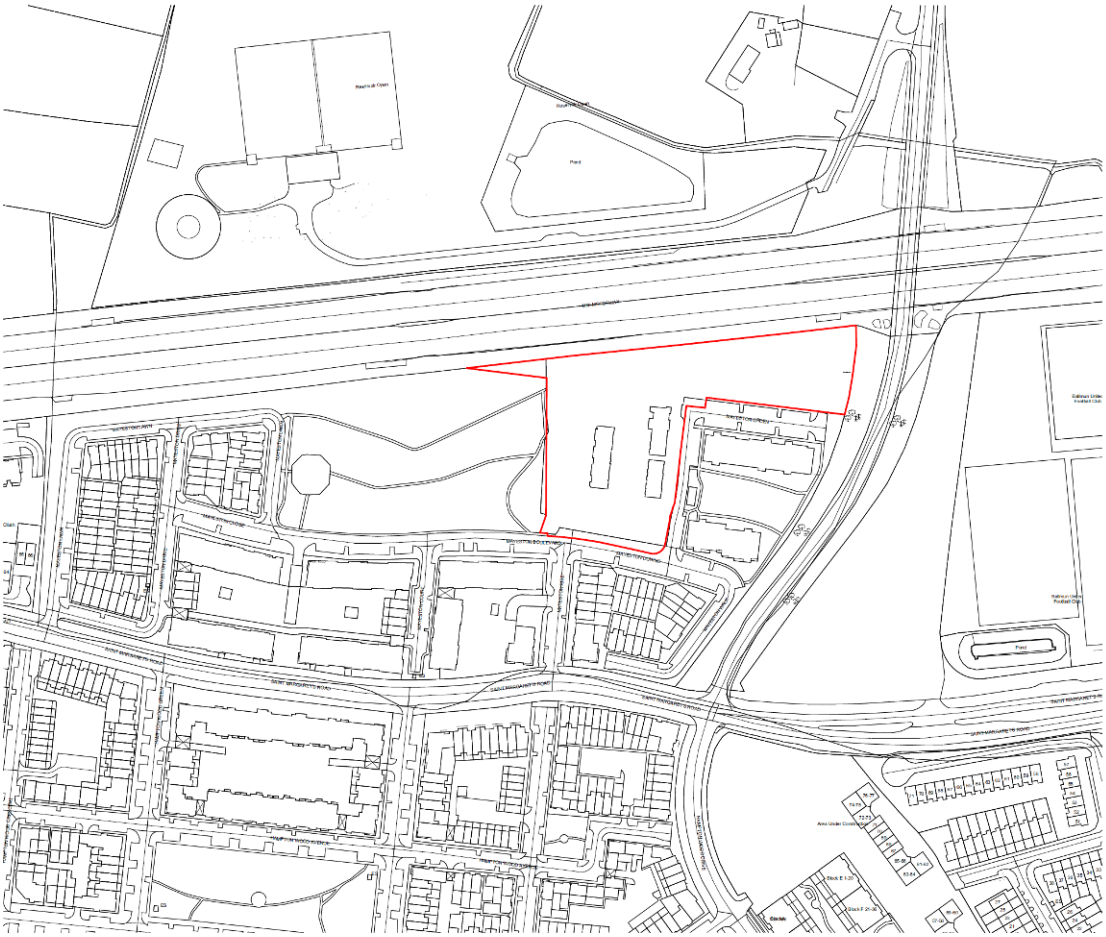


Figure 1 – Site Location Map

The proposed development shall include 5 No. multi-storey apartment blocks with 121 new dwellings and a crèche in a mix of types and sizes as set out in accompanying Architect's drawings and in the following ratios:

House Type	Total Number
1-bed units	36
2-bed 3-person units	19
2-bed 4-person units	54
3-bed unit	12
Total	**121**

Access to the development shall be provided from the existing road network directly off Mayeston Downs and Mayeston Green. Parking is to be provided for 90 cars and 306 bicycles, along with set down parking for the proposed crèche.

Prior to the preparation of detail proposals for site water services, consultation was held with representatives of the relevant engineering departments of Fingal County Council (FCC) and Irish Water regarding existing water supply and drainage services in the vicinity of the site and the requirements for water supply and drainage services for the new development.

A pre-connection enquiry for the development was submitted to the Irish Water New Connections Team (Irish Water Connection Enquiry Reference Number CDS21007943). In response, Irish Water has confirmed that the development can be accommodated by the Irish Water network with no upgrades required to the existing water and wastewater infrastructure – refer to Appendix A for confirmation of feasibility letter. Irish Water has also confirmed that the proposed wastewater for the development shall require a connection through third party infrastructure that has not yet been taken in charge by Irish Water. "As Built" developer drawings for the Mayeston estate were subsequently received from FCC. The information received regarding existing drainage and water supply services has been confirmed on site as part of topographical and underground utility survey undertaken by Apex Surveys.

There follows details of the civil engineering proposals for the development. This report should be read in conjunction with the drawings enclosed as per the schedule at the end of this report.

2. EXISTING WATER SERVICES

Currently the site is a partly developed brownfield site with a relatively level topography, with a number of concrete slabs and spoil heaps associated with previously granted development. There are no existing natural watercourses within the site. Record maps of existing water services in the vicinity of the site were obtained from Irish Water – refer to Figure 2. There are known existing piped water services within and adjacent to the site which were constructed as part of the Mayeston estate but these are not shown on the record maps as they have not yet been taken in charge by Irish Water or FCC. The wider Mayeston estate was built under planning permission F04A/1127 in 2006/2007, which included a new surface water and foul water drainage infrastructure. The adjacent development immediately to the east of the Applicant site was subsequently developed under planning permission F06A/1348. This development included proposals for the southern part the Applicant site that were only partly developed, but which did include construction of the drainage and water supply infrastructure. The details of these water services are shown on developer's "as built" drawings received from FCC.

The record maps and "as built" drawings were used in conjunction with a topographical and underground utility survey carried out by Apex Surveys to map the existing water services on and adjacent to the site. The survey findings are presented on Drawings 5000 to 5002 enclosed.

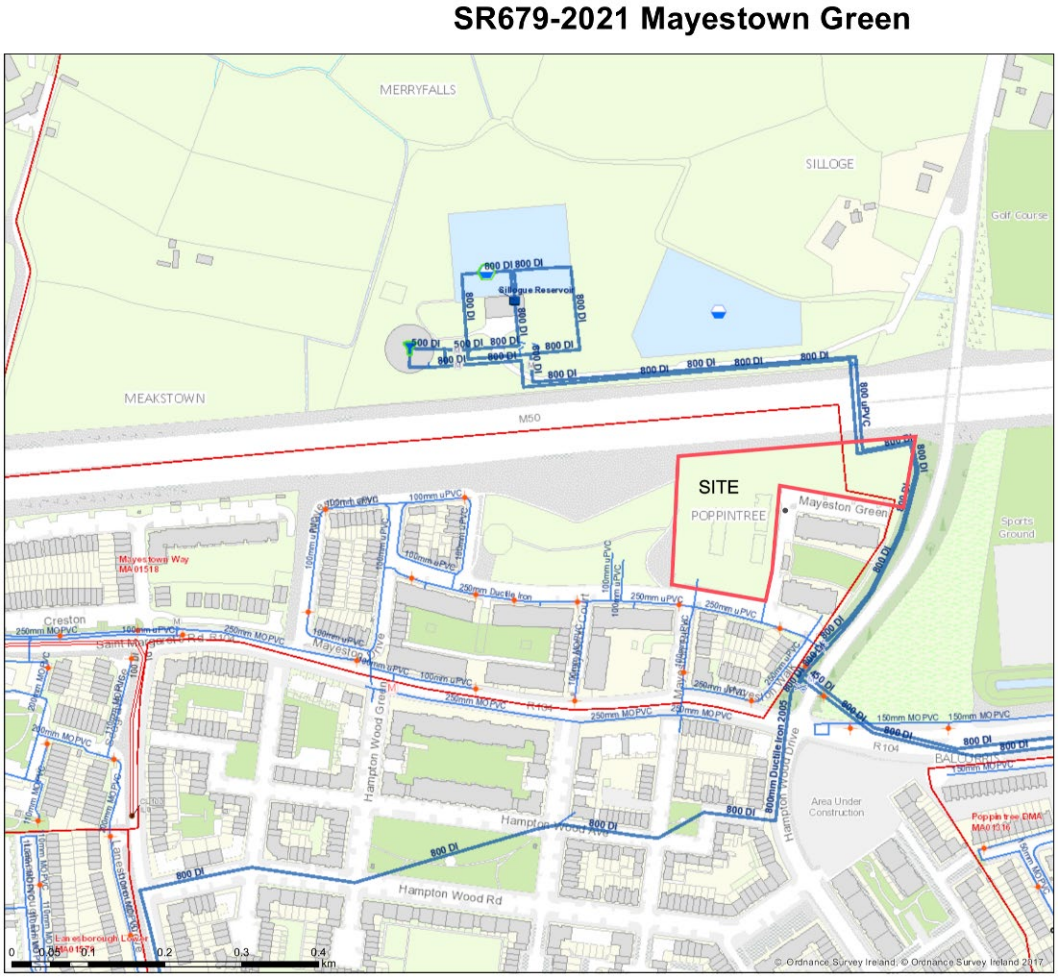


Figure 2 – Irish Water Web Map

Water Supply

The existing water supply network is shown in Figure 2 and on Drawings 5000 to 5002. There is an existing 250mm diameter watermain running to the south of the site on the far side of Mayeston Downs. There is a 100mm diameter watermain running to the east of the site on Mayeston Green, serving the existing development to the east of Mayeston Green. There is also evidence that this watermain extends into the Applicant site as an additional looped main for the undeveloped part of the original site development.

Foul Drainage

The existing foul water drainage network is shown on Drawings 5000 to 5002. There is an existing 225mm diameter foul sewer running eastwards on Mayeston Downs. This sewer then runs southwards towards St. Margaret's Road where it connects to the Irish Water network – the exact location of the connection point is subject to confirmation by Irish Water. There is a 150mm diameter foul sewer running to the east of the site on Mayeston Green, serving the existing development to the east of Mayeston Green. There is also evidence of existing (unused) foul drains within the Applicant site which were constructed for the undeveloped part of the original site development.

Surface Water Drainage

The existing surface water drainage network is shown on Drawings 5000 to 5002. There is an existing surface water drainage network serving the Mayeston estate. As part of this system, there is an existing 300mm diameter surface water sewer on Mayeston Downs and a 225mm diameter surface water sewer on Mayeston Green. There is also evidence of an existing (unused) surface water drain within the Applicant site which was constructed for the undeveloped part of the original site development. Based on the available "as built" developer drawings and DBFL Engineer's design calculations submitted with Planning Application F06A/1348, the existing surface water drainage system is designed in compliance with The Greater Dublin Strategic Drainage Study (GDSDS) and includes attenuation storage within underground storage tanks located in the public open space area immediately to the west of the Applicant site. Discharge from the attenuation system is controlled by a Hydrobrake flow control device. The existing attenuation tank system has a total storage capacity of 2,760m^3, designed to cater for the 1 in 100 year storm event for the Mayeston Estate. This capacity includes an allowance for the current Applicant site as part of the previously proposed development. Based on the design calculations submitted by DBFL, the attenuation system has an allocated capacity for runoff from 9,400m^2 of impermeable area from the recent development on Mayeston Green – refer to Figure 3. The existing Mayeston Green development comprises a total constructed impermeable area of 5,200m^2 (as shown in blue on Figure 3) which leaves a total area allocation of 4,200m^2 for the current development as indicated in pink on Figure 3.

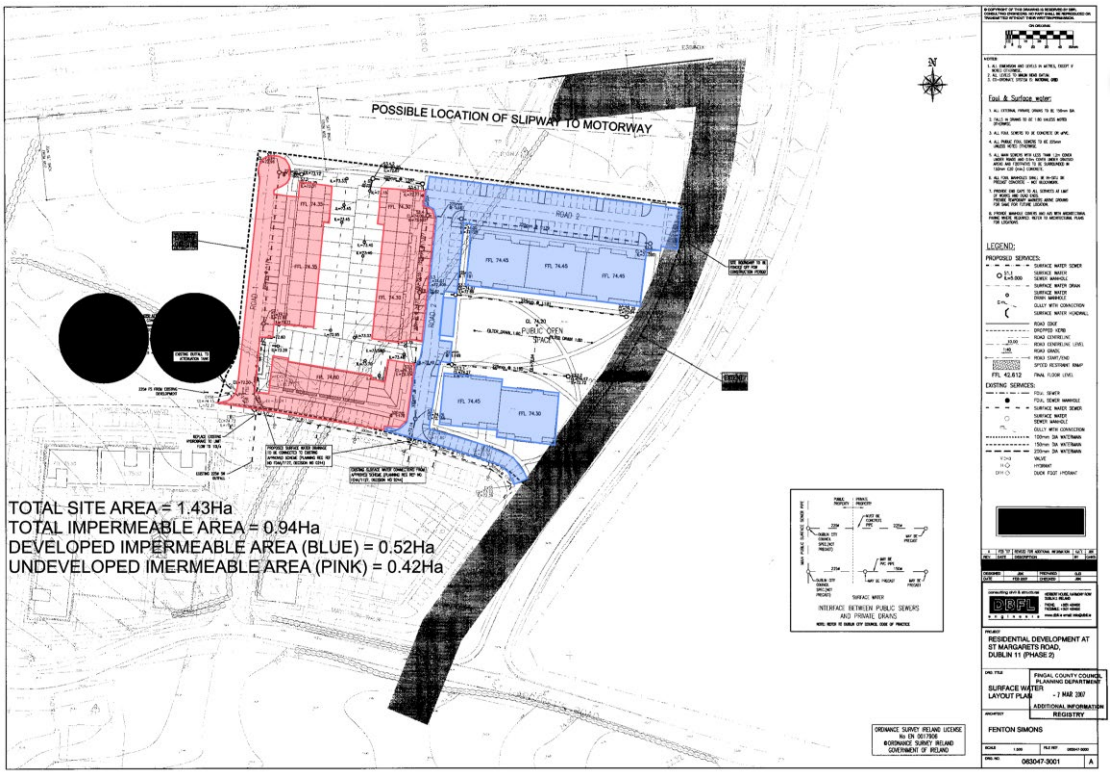


Figure 3 – Existing Attenuation Tank Contributing Areas from DBFL Drawing for F06/1348

With regard to connection to existing services, there is an existing wayleave and right of way agreement between FCC and the owner of Mayeston estate as indicated on the map in Figure 4 below to facilitate the required water services connections.

Figure 4 – Water Services Wayleaves and Right of Way Map

3. PROPOSED FOUL DRAINAGE

The foul water drainage network will be separate to the surface water drainage system and will comply with "Irish Water - Code of Practise of Wastewater Infrastructure: July 2020 IW-CDS-5030-03". The foul water will be collected from the SVP's within each block into external sewers which in turn shall discharge to the existing foul sewer on Mayeston Green as detailed on Drawing 5004, enclosed.

A pre-connection enquiry was submitted to Irish Water regarding the proposed development (Irish Water reference CDS21007943), and a confirmation of feasibility has been received stating that a connection to the Irish Water foul network can be facilitated subject to site specific comments. As the existing Mayeston foul sewer network has not been taken in charge, Irish Water shall require the following as part of any connection application:

1. Identify and procure transfer to Irish Water of the arterial infrastructure within the 3rd party infrastructure.
2. Demonstrate that the arterial infrastructure is in compliance with requirements of Irish Water Code of Practice and Standard Details and in adequate condition and capacity to cater for additional loads from the development.
3. Confirm the connection of the 3rd party infrastructure to the Irish Water Network in 225mm crossing St Margaret's Rd, with a survey before the connection application stage.

The peak wastewater loading for the development has been calculated using guidance from "Irish Water Code of Practise for Wastewater". This guidance states that for new dwellings, dry weather flow (DWF) should be taken as 446 litres / dwelling / day with a peaking factor of 6 used to calculate peak flow for a development of this size. This is based on 2.7 persons per dwelling with a base flow of 150l/person/day and a 10% allowance for infiltration. The base flow rate for the proposed crèche is taken as 90/person/day (non-residential school with canteen cooking on site).

(i) Residential:
Total number of residential units = 121
Population/unit = 2.7
Total population = 2.7 x 121 = 327
Flow/person/day = 150 l
Total flow / day = 327 x 150 = 49,050 l
Infiltration allowance = 10%
Dry weather flow (DWF) = 1.1 x 49,050 = 53,955 l/day = 0.62 l/s
Design Peak flow = 6DWF = 6 x 0.62 = 3.72 l/s

(ii) Creche:
Total occupancy of creche = 30
Flow/person/day = 90 l
Total flow / day = 90 x 30 = 2,700 l
Infiltration allowance = 10%
Dry weather flow (DWF) = 1.1 x 2,700 = 2,970 l/day = 0.034 l/s
Design Peak flow = 6DWF = 6 x 0.034 = 0.21 l/s

All foul sewer pipes are designed with a roughness coefficient (ks) of 1.5mm and designed to achieve a minimum self-cleansing velocity of 0.75m/s when flowing half full. Foul sewers for each block are sized in accordance with the recommendations of the IW Code of Practice for multiple properties, i.e 225mm pipe size with a minimum gradient of 1:150

4. PROPOSED WATER SUPPLY

A pre-connection enquiry was submitted to Irish Water regarding the proposed development (Irish Water reference CDS21007943), and a confirmation of feasibility has been received stating that a connection to Irish Water's water supply network can be facilitated with no upgrade requirements.

The new watermain network will comply with "Irish Water - Code of Practise of Water Infrastructure: July 2020 IW-CDS-5020-03". The existing 100mm watermain on Mayeston Green shall be extended with a looped 100mm diameter PE water supply for the development as indicated on Drawing 5003, enclosed. As the development will require in excess of 20m^3 of water per day, the development will require a bulk meter at the connection point for the development. Each apartment block shall be provided with a mains water supply from the looped watermain. Meters for apartments and the crèche will be installed internally within the Premises in accordance with the Building Control Authority's requirements and subject to review by Irish Water. Provision shall be made for meters to be installed in service cupboards along with individual stop valves to isolate the property and meter location. The water service pipe work shall be arranged such that each unit can be individually metered. The meter cupboards shall be installed at a level no higher than 1.50m on each floor level and in a location where a meter reader can be comfortably maintained in the future.

For firefighting purposes, fire hydrants are to be provided within the site off the proposed 100mm diameter watermain to the spacing required by Part B of the Building Regulations including the requirement that hydrants will be provided such that no part of the building elevation shall be more than 46 metres from a hydrant.

The average daily domestic demand (ADDD) is taken as 150 l/day and an average of occupancy of 2.7 persons per dwelling and 90/day for the crèche. The average day / peak week demand is taken as 1.25 times the ADDD. The peak demand is taken as 5 times the average day/peak week.

(i) Residential:
Total number of residential units = 121
Population/unit = 2.7
Total population = 2.7 x 121 = 327
Water consumption/person/day = 150 l
Total Average Daily Domestic Demand = 327 x 150 = 49,050 l = 0.57 l/s
Average day/peak week demand = 1.25 x 49,050 = 61,313 l/d = 0.71 l/s
Peak demand = 5 x 0.71 = 3.55 l/s

(ii) Creche:
Total occupancy of creche = 30
Water consumption/person/day = 90 l
Total Average Daily Domestic Demand = 90 x 30 = 2,700 l = 0.03 l/s
Average day/peak week demand = 1.25 x 2,700 = 3,375 l/d = 0.04 l/s
Peak demand = 5 x 0.04 = 0.20 l/s

5. PROPOSED SURFACE WATER DRAINAGE AND SuDS PROPOSALS

Surface water runoff from new development is to be minimised using appropriate Sustainable Urban Drainage Systems (SuDS) techniques as set out in the current Fingal Development Plan, extract below in Figure 5.

Sustainable urban Drainage Systems

Sustainable urban Drainage Systems (SuDS) can best be defined as offering a "total" solution to rainwater management and must be included in all new developments. Ponds, artificial wetlands and water features can make a positive contribution to the provision of Sustainable Drainage Systems (SuDS) and to the amenity of an area. Properly designed and located SuDS features can be incorporated within and can complement the amenity and aesthetic value of open spaces. SuDS areas do not form part of the public open space provision, except where they contribute in a significant way to the design and quality of open space. The determination shall be at the discretion of the Planning Authority.

Objective DMS73

Ensure as far as practical that the design of SuDS enhances the quality of open spaces. SuDS do not form part of the public open space provision, except where it contributes in a significant and positive way to the design and quality of open space. In instances where the Council determines that SuDS make a significant and positive contribution to open space, a maximum 10% of open space provision shall be taken up by SuDS. The Council will give consideration to the provision of SuDS on existing open space, where appropriate.

Objective DMS74

Underground tanks and storage systems will not be accepted under public open space, as part of a SuDS solution.

Figure 5 - Extract of Fingal Development Plan 2017-2023 Regarding SuDS Policy

As set out in Section 2 above, there is an existing surface water drainage network serving the Mayeston estate that includes attenuation storage within underground storage tanks located in the public open space area immediately to the west of the Applicant site. The existing attenuation tank system includes a storage allowance for runoff from 4,200m^2 of contributing (impermeable) area for the current Applicant site as part of the previously proposed development.

Consultation was held with Phillip Grobler of FCC Water Services regarding appropriate SuDS measures to be adopted for the development. Phillip advised that under the current SuDS policies, it is intended to move away from storage tanks and hard engineered solutions to softer/greener nature based solutions. In this instance, however, it is considered appropriate to utilise the attenuation storage capacity provided by the already constructed tank. Additional to the attenuation requirement it shall be necessary to address the interception and treatment storage requirements as set out by the GDSDS.

There follows details of the proposed SuDS measures proposed for the development based on a comprehensive evaluation of the site.

Existing Water Features & Flow Route Assessment

There is an existing surface water drainage network serving the Mayeston estate that includes attenuation storage within underground storage tanks located in the public open space area immediately to the west of the Applicant site. Discharge from the attenuation system is controlled by a Hydrobrake flow control device. The existing attenuation tank system has a total storage capacity of 2,760m^3, designed to cater for the 1 in 100 year storm event for the Mayeston Estate. This capacity includes an allowance of 4,200m^2 of contributing area runoff from the current Applicant site as part of the previously proposed development. The current applicant site includes an additional 0.59Ha of Greenfield site to the north which did not form part of the previous application.

The following contributing areas apply to the current application:

Total site area:	13,389m^2
Total roof area (including crèche play area):	3,445m^2
Total external pavement area:	4,330m^2

Based on the above, the existing attenuation system has adequate capacity to cater for runoff from the roofs of the buildings. Hence, it is proposed discharge runoff from the roofs direct to the existing attenuation system. Runoff from the remaining hardstanding areas (vehicular and pedestrian pavements) shall incorporate additional SuDS measures prior to discharge to the receiving surface water system. These additional SuDS measures shall be designed to: (a) intercept the additional runoff from the new development; (b) provide preliminary treatment to this runoff; and (c) provide an amenity aspect to surface water runoff.

Examination of Ground Conditions

As part of the site evaluation, a detailed geotechnical site investigation was carried out by Site Investigations Ltd to establish the characteristics of the natural subsoils. The site ground conditions were found to typically comprise MADE GROUND overlying COHESIVE DEPOSITS comprising brown and brown grey sandy gravelly silty CLAY soils, varying from firm to very stiff, becoming stiffer with depth. The MADE GROUND was encountered across the site typically 1.2m to 1.5m depth, but there are deeper spoil heaps to the north of the site. These spoil heaps will need to be removed as part of site clearance/levelling, along with the existing concrete slabs present on the site. The boreholes extended to 15m BGL, and no bedrock was encountered. No groundwater was encountered in the boreholes or trial pits. At two locations on the site, soakaway tests were carried out in accordance with BRE Special Digest 365. The soakaway tests failed the specification as the water level did not fall sufficiently enough to complete the test. The BRE Digest stipulates that the pit should half empty within 24hrs, and extrapolation indicates this condition would not be satisfied. The tests were terminated at the end of the first (of a possible three) fill/empty cycle since further testing would give even slower fall rates due to increased soil saturation. The findings indicate that the subsoils are unsuitable for intensive infiltration solutions. However, extensive infiltration systems such as permeable pavements are considered feasible to encourage direct infiltration, subject to adequate measures being put in place for exceedance rainfall events.

Proposed SuDS Components

Runoff from the roof areas of the development shall be directed to the existing attenuation system serving the Mayeston estate. Sustainable surface water drainage measures are then considered for runoff from the external pavements of the proposed development. Sustainable drainage systems (SuDS) typically include a variety of components, each having different approaches to managing flows, volumes, water quality and providing amenity and biodiversity benefits. SuDS are a suite of components working in different ways that can be used to drain a variety of sites. SuDS components work in several ways: they can infiltrate (soak) into the ground, convey (flow) into a watercourse (or if necessary, a sewer), and they can also provide storage on site and attenuate (slow down) the flows of water. Often SuDS schemes use a combination of these processes and components may use a number of mechanisms, in what is termed a management train. The selection of SuDS components for this project was based on an analysis of the site opportunities and constraints, and an appropriate combination of approaches was developed to maximise the sustainability of the system within the constraints of the site. Each of the following SuDS components or approaches was examined and where appropriate for the site the component or approach has been adopted.

Source Controls

Maximise permeability within a site to promote attenuation, treatment and infiltration reducing the need for offsite conveyance.

Ref	Measure	Suitable	Comment	Adopted
A.1	Green roofs	Yes	An extensive green roof is to be adopted for the proposed bicycle store building.	Yes
A.2	Permeable paving	Yes	Permeable paving is to be adopted for all external paved areas of the development. Due to the poor infiltration characteristics of the subsoils, a partial infiltration system is proposed, with exceedance events catered for by provision of a collector drain within the paved areas.	Yes
A.3	Grass	Yes	Extensive green areas are to be provided.	Yes
A.4	Reinforced grass	Yes	A reinforced grass pavement is to be provided for maintenance vehicles along the western boundary of the site.	Yes
A.5	Gravelled areas	No	Not suitable for the end users of this development.	No
A.6	Rainwater harvesting	No	Not suitable for the end users of this development.	No
A.7	Rain Trap	Yes	Not considered for this development.	No
A.8	Water Butt	No	Individual water butts are not suitable for this type of apartment development.	No

Swales and conveyance channels

Ref	Measure	Suitable	Comment	Adopted
B.1	Swales	Yes	Dry conveyance swales are provided within the central courtyard area as part of the landscaping proposals. The swales shall provide conveyance for exceedance runoff from the permeable pavements.	Yes
B.2	Canals and rills	Yes	Swales are preferred as the means of conveyance.	No

Filtration

Ref	Measure	Suitable	Comment	Adopted
C.1	Permeable pavements	Yes	The granular layers of the permeable pavements are considered appropriate to reduce runoff and treat pollutants adjacent to roadways where there is low pollution loading.	Yes
C.2	Bioretention areas	Yes	Tree pits are proposed adjacent to paved areas in the car park and access road to intercept exceedance runoff. Swales are proposed in the courtyard area to intercept exceedance runoff. The tree pits and swales are considered appropriate to reduce runoff rate and to treat pollutants.	Yes

Infiltration

Capture surface water runoff and allow it to infiltrate (soak) and filter through to the subsoil layer, before returning it to the water table below.

Ref	Measure	Suitable	Comment	Adopted
D.1	Soakaways	No	Not suitable for site subsoils.	No
D.2	Infiltration basin	Yes	The granular layers of the proposed permeable paving shall allow for direct infiltration to the subsoils over an extensive area. The swales and tree pits shall also allow natural infiltration.	Yes
D.3	Rain garden	Yes	Permeable paving, tree pits and swales are preferred means of infiltration to suit the landscaping proposals.	No

Retention and Detention

Designed to either provide storage through the retention of surface water runoff, or attenuation through the detention of surface water runoff.

Ref	Measure	Suitable	Comment	Adopted
E.1	Detention basins	Yes	The granular layer under the permeable paving and the swale depressions shall provide temporary detention for exceedance events.	Yes
E.2	Retention ponds/ Wetland	Yes	Suitable, but the permeable paving and swales are preferred for this development.	No
E.3	Attenuation Tank/Oversized Pipes	Yes	The existing Mayeston estate attenuation system shall be used for runoff from the roofs.	Yes
E.4	Throttle device	Yes	Hydrobrake throttle adopted to restrict outflow from SuDS device.	Yes

Proprietary Treatment Systems

Densely vegetated water bodies that use sedimentation and filtration to provide treatment of surface water runoff.

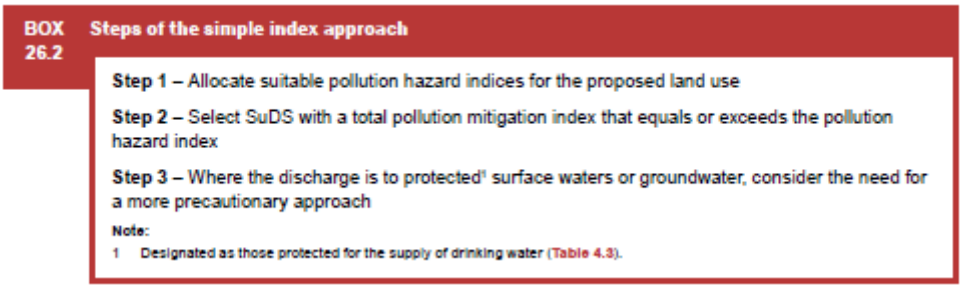
Ref	Measure	Suitable	Comment	Adopted
F.1	Proprietary bioretention system	Yes	Tree pits and swales are adopted as part of bioretention systems (see above).	Yes
F.2	Treatment Channels	No	Not suitable for this development.	No
F.3	Hydrodynamic vortex separators	No	Proprietary system to remove sediments by gravity not deemed necessary. Achieved in tree pits, permeable paving, and swales.	No
F.4	Proprietary filtration system	No	Not suitable for this development.	No
F.5	Oil separator	Yes	Low hydrocarbon pollutant loading. Proprietary system to remove hydrocarbons not deemed necessary. Achieved in permeable paving, bioretention, and swales.	No
F.6	Multi process	No	Complex bespoke system not suitable to this type of development	No

The proposed SuDS solution is detailed on the enclosed Drawings 5004 and 5005.

The water quality, amenity and biodiversity properties of the proposed systems are summarised below.

SuDS Components		
Water Quality	Runoff collection	Standard downpipes shall convey roof rainwater to the underground surface water drainage system. Collector drains comprising a perforated drainage pipe shall convey exceedance runoff from permeable pavements and swales to the receiving surface water sewer.
	Interception	Permeable paving/swales/tree pits/green roof all intercept critical first run-off from impermeable hardstanding and bicycle store.
	Storage	Detention area attenuation volume - 1:100 year, including allowance for climate change.
	Conveyance	Pipes and swales direct water to detention systems and discharge to watercourse.
	Exceedance	Existing topography allows exceedance flows to be intercepted by the watercourse.
	Groundwater protection measures	Roof and carparking area – hazard is low. Permeable paving/swale/tree pits provide protection measures.
Amenity	Open spaces, and bioretention areas provide high amenity spaces	
Biodiversity	Tree pits, green roof, and swales provide ecological area and habitat for a range of species.	

Analysis of the effectiveness of the chosen SuDS components to achieve water quality criteria follows the "simple index approach" as set out in Chapter 26 of CIRIA C753 The SuDS Manual, as follows:



BOX 26.2 Steps of the simple index approach

Step 1 – Allocate suitable pollution hazard indices for the proposed land use

Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index

Step 3 – Where the discharge is to protected[1] surface waters or groundwater, consider the need for a more precautionary approach

Note:
1 Designated as those protected for the supply of drinking water (Table 4.3).

From Table 26.2 of C753, the pollution hazard indices for the proposed land uses are as follows:

Land Use	Pollution hazard level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential car parks; low traffic roads	Low	0.5	0.4	0.4

For the selected SuDS components, from Table 26.3 of C753, the pollution mitigation indices are as follows for the site:

SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Swale	0.5	0.6	0.6
Permeable paving	0.7	0.7	0.6
TOTAL	**1.2**	**1.3**	**1.2**

The individual mitigation indices are greater than the risk indices so water quality requirements are deemed to be satisfied.

Surface Water Drainage Design for Roofs

It is proposed to discharge surface water from the roofs of the development to the existing attenuation storage system within the park adjacent to the southwest of the site. Pipes carrying surface water from the roof areas of the site to the existing attenuation system are sized to cater for a rainfall intensity of 50mm per hour applied to all impermeable roof surfaces. Surface water runoff from impermeable areas is calculated using the Modified Rational Method as follows:

$Q = 2.78C_vC_riA$ (where Q is in l/s, i is in mm/hr and A is in Ha)

$C_v = 0.75$ and $C_r = 1.3$

$Q = 2.78iA$

A roughness coefficient, k_s of 0.6mm is used for surface water drains. Pipe size and gradient for each run are determined using the Wallingford hydraulic design tables.

Attenuation Storage Assessment

Based on the design calculations prepared by DBFL Engineers for the previous development (Planning Register Ref. F06/1348), the attenuation system has an allocated capacity for runoff from 9,400m^2 of impermeable area from development on Mayeston Green. The existing attenuation tank system has a total storage capacity of 2,760m^3, designed to cater for the 1 in 100 year storm event for the Mayeston Estate. This capacity includes an allowance of 4,200m^2 of contributing area runoff from the current Applicant site as part of the previously proposed development. The total contributing roof area of the current application is 3,445m^2, which is within the previously calculated reserve capacity of 4,200m^2.

The surface water pipework layout and details are provided on Drawing 5004.

Surface Water Drainage Design for External Pavements

Surface water design for the proposed additional SuDS components for external pavements is carried out in accordance with the recommendations of the Greater Dublin Strategic Development Study (GDSDS), Regional Drainage Policies Volume 2 – New Development. The surface water drainage system is designed using *Causeway Flow+* hydraulic modelling

drainage design software. Pipes carrying surface water are initially sized to cater for a 1 in 5 year return period rainfall intensity applied to all impermeable surfaces.

Rainfall Characteristics

Site data for the return period rainfall depths for sliding durations was obtained from Met Eireann as follows:

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 306714, Northing: 240208,

	Interval		Years											
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.5,	3.6,	4.1,	5.0,	5.6,	6.0,	7.5,	9.2,	10.3,	11.9,	13.3,	14.4,	16.0,	17.3,	18.4,	N/A ,
10 mins	3.5,	5.0,	5.8,	6.9,	7.8,	8.4,	10.4,	12.8,	14.3,	16.5,	18.5,	20.0,	22.3,	24.2,	25.7,	N/A ,
15 mins	4.1,	5.8,	6.8,	8.2,	9.1,	9.9,	12.3,	15.0,	16.9,	19.4,	21.7,	23.5,	26.3,	28.4,	30.2,	N/A ,
30 mins	5.4,	7.6,	8.8,	10.5,	11.7,	12.6,	15.6,	18.9,	21.1,	24.2,	27.0,	29.1,	32.4,	34.9,	37.0,	N/A ,
1 hours	7.2,	9.9,	11.4,	13.5,	15.0,	16.1,	19.7,	23.8,	26.4,	30.2,	33.4,	36.0,	39.8,	42.8,	45.3,	N/A ,
2 hours	9.5,	13.0,	14.8,	17.4,	19.2,	20.6,	25.0,	29.9,	33.1,	37.6,	41.5,	44.5,	49.0,	52.6,	55.5,	N/A ,
3 hours	11.2,	15.1,	17.2,	20.2,	22.2,	23.8,	28.7,	34.2,	37.8,	42.7,	47.0,	50.3,	55.4,	59.3,	62.4,	N/A ,
4 hours	12.6,	16.9,	19.2,	22.5,	24.6,	26.3,	31.7,	37.6,	41.5,	46.8,	51.4,	55.0,	60.4,	64.5,	67.9,	N/A ,
6 hours	14.8,	19.7,	22.3,	26.0,	28.5,	30.4,	36.4,	43.0,	47.3,	53.2,	58.3,	62.2,	68.2,	72.7,	76.5,	N/A ,
9 hours	17.4,	23.1,	26.0,	30.2,	33.0,	35.1,	41.8,	49.2,	54.0,	60.5,	66.1,	70.4,	77.0,	82.0,	86.1,	N/A ,
12 hours	19.6,	25.8,	28.9,	33.5,	36.5,	38.8,	46.2,	54.1,	59.2,	66.2,	72.3,	76.9,	83.9,	89.3,	93.6,	N/A ,
18 hours	23.0,	30.1,	33.7,	38.9,	42.3,	44.8,	53.0,	61.9,	67.6,	75.3,	82.0,	87.1,	94.8,	100.6,	105.4,	N/A ,
24 hours	25.9,	33.6,	37.5,	43.2,	46.8,	49.7,	58.5,	68.1,	74.2,	82.5,	89.7,	95.1,	103.3,	109.6,	114.6,	132.0,
2 days	32.2,	40.9,	45.3,	51.6,	55.7,	58.8,	68.5,	78.7,	85.2,	94.1,	101.6,	107.3,	115.9,	122.3,	127.6,	145.3,
3 days	37.3,	46.9,	51.7,	58.5,	62.9,	66.2,	76.5,	87.5,	94.3,	103.6,	111.5,	117.5,	126.4,	133.1,	138.5,	156.8,
4 days	41.7,	52.1,	57.2,	64.5,	69.2,	72.7,	83.6,	95.1,	102.3,	112.0,	120.2,	126.4,	135.6,	142.6,	148.2,	167.0,
6 days	49.6,	61.2,	66.9,	75.0,	80.1,	84.0,	95.9,	108.3,	116.1,	126.5,	135.3,	141.9,	151.7,	159.1,	165.0,	184.9,
8 days	56.6,	69.3,	75.5,	84.2,	89.7,	93.8,	106.6,	119.9,	128.1,	139.2,	148.5,	155.4,	165.8,	173.5,	179.7,	200.5,
10 days	63.0,	76.6,	83.2,	92.5,	98.4,	102.8,	116.3,	130.4,	139.1,	150.6,	160.4,	167.7,	178.5,	186.5,	193.0,	214.6,
12 days	68.9,	83.5,	90.5,	100.3,	106.5,	111.2,	125.4,	140.1,	149.2,	161.2,	171.4,	179.0,	190.2,	198.5,	205.3,	227.6,
16 days	80.0,	96.1,	103.9,	114.6,	121.4,	126.5,	141.9,	157.8,	167.6,	180.6,	191.5,	199.6,	211.6,	220.4,	227.6,	251.2,
20 days	90.3,	107.8,	116.2,	127.8,	135.1,	140.5,	157.1,	174.0,	184.5,	198.2,	209.8,	218.3,	230.9,	240.3,	247.8,	272.6,
25 days	102.4,	121.4,	130.5,	143.1,	150.9,	156.8,	174.6,	192.8,	203.9,	218.5,	230.8,	239.9,	253.2,	263.1,	271.1,	297.2,

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

From the above data:
M5-60 = 16.1mm
M5-2day = 58.8mm
R = M5-60/M5-2day = 16.1/58.8 = 0.274

Greenfield Runoff Rate Calculation

The runoff from the proposed SuDS measures shall be limited to the equivalent Greenfield rate for the additional 0.59Ha of the previously undeveloped northern part of the site. The Greenfield rate, QBAR, is estimated using the HR Wallingford estimation tool (www.uksuds.com) that refers to the Institute of Hydrology Report No. 124 – Flood Estimation for Small Catchments. The input used in the calculation is as follows:

Total Site Area:	0.59Ha
SAAR:	831mm (source: HR Wallingford)
SPR (Soil Type 3):	0.37 (source: HR Wallingford)

$QBAR = 0.00108 \times (0.01 \times AREA)^{0.89} \times SAAR^{1.17} \times SPR^{2.17}$

Where QBAR is the mean annual flood flow from a rural catchment in m^3/s.

The formula for determining the peak Greenfield runoff rate should theoretically not be applied to areas less than 50 hectares. As many developments are smaller than this size this constraint is avoided by calculating $QBAR_{rural}$ for 50 hectares and linearly interpolating flow rates for smaller areas.

$QBAR = 0.00108 \times (0.01 \times 50)^{0.89} \times 831^{1.17} \times 0.37^{2.17} = 0.176\ m^3/s$ or 176 l/s for 50 Ha

Therefore, QBAR = 176 / 50 = **3.52 l/s/Ha**

For the site area, $QBAR_{SITE}$ = 3.52 x 0.59 = 2.1l/s

Infiltration Characteristics

The soakaway tests to BRE 365 carried out as part of the recent site investigation failed to provide a reliable infiltration rate, indicating the subsoils are unsuitable for intensive infiltration solutions. However, extensive infiltration systems such as permeable pavements are considered feasible to encourage direct infiltration, subject to adequate measures being put in place for exceedance rainfall events. The permeable pavements are therefore designed as a partial infiltration system, with the infiltration rate conservatively taken as zero for the purposes of storage design.

Simulation Modelling

A detailed simulation modelling of the network has been carried out using *Flow+* to enable an assessment of the flood risk for extreme events. The following recommended design criteria for level of service (flooding) have been adopted:

- For 1 in 30 year return period, no flooding should occur on site except where specifically planned flooding is approved.
- For 1 in 100 year return period, no internal property flooding should occur on site; planned flood routing and temporary flood storage should be accommodated on site for short high intensity storms; floor levels should be at least 500mm above maximum water level and adjacent onsite storage retention; and no flooding should occur of adjacent urban areas.

Detailed simulation modelling calculations have been carried out for the 5-year, 30-year and 100-year return period, and the results are enclosed in Appendix B. For the 30-year and 100-year storm events, an additional allowance of 20% is included for the effects of climate change. The results demonstrate compliance with the above level of service (flooding) requirements.

Details of the proposed drainage system for the external pavements are provided on Drawing 5005.

6. FLOOD RISK ASSESSMENT

A Stage 2 flood risk assessment for the site has been carried out in accordance with The OPW/Dept. of the Environment, Heritage and Local Government publication "The Planning System and Flood Risk Management – Guidelines for Planning Authorities", November 2009 (FRM Guidelines). The FRM guidelines promote a sequential approach to the flood risk assessment based on the flood zone and vulnerability class. Primary and Secondary sources of flooding information were gathered and assessed individually as defined in Appendix A of the guidelines.

The site is located within an urban area and there are no existing surface watercourses on or immediately adjacent to the site. The nearest significant watercourses to the site are the Santry River approximately 1.5km to the northeast and the Ward River approximately 2.5km to the northwest - refer to Figure 6 below. Both of these rivers have a history of flooding, but they are located well away from the proposed development site, and have no impact.

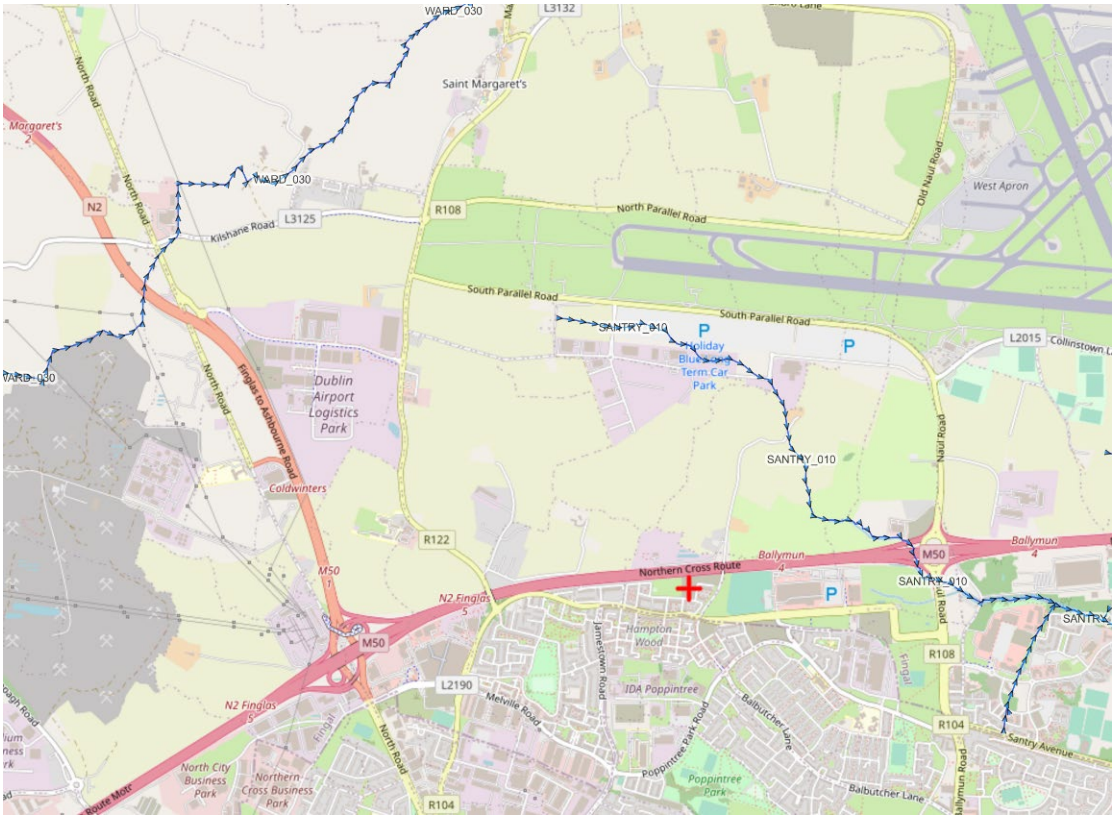


Figure 6 - Extract EPA GIS Map showing watercourses (site location marked with red cross)

Examination of flood maps on the OPW website www.floodinfo.ie revealed the extents of past flooding records and predictive flooding in the vicinity of the site – refer to Figures 7 and 8 below. The records of past flooding within 2.5km of the site in Figure 8 are remote from the site in question. The effects of climate change have been included in Figure 7 using the models available on www.floodinfo.ie applied to the critical duration storm events for the 1% and 0.1% AEP events for both the Mid Range (+20%) and High End (+30%) future scenarios as set out in the OPW's Climate Change Sectoral Adaption Plan – Flood Risk Management (2015 -

2019). Based on the available OPW models, the site is not subject to predictive fluvial flooding and the effects of climate change are insignificant with respect to flood levels and extents in the vicinity of the site, and so have no discernible impact on the site in question.

Conclusions from Flood Risk Assessment

On the basis of the appraisal undertaken, the site is elevated relative to and outside the predictive flood extents any existing watercourses based on current available information. Based on the information, the subject site is considered not at risk of fluvial or tidal flooding. The site can therefore be considered to be in flood Zone C – where the probability of flooding from rivers and seas is low.

The vulnerability class of the development is dependent on the land use and type of development proposed. The "Planning Systems and Flood Risk Management: Guidelines for Planning Authorities" presents a matrix of vulnerability versus flood zone to illustrate appropriate development and the requirement of justification tests. The proposed residential development is classified as a combination of less vulnerable and highly vulnerable development. Vulnerable developments, such as the proposed development, at risk of Zone A and Zone B flooding require a justification test. Therefore, a justification test is not required for the proposed development as, based on the evidence outlined above, the development is considered to be located in Zone C, i.e. an area subject to a low probability of flooding.

Detailed proposals for surface water management SuDS associated with the development to mitigate on and off site pluvial flooding are provided in Section 5 above and on the accompanying drawings.

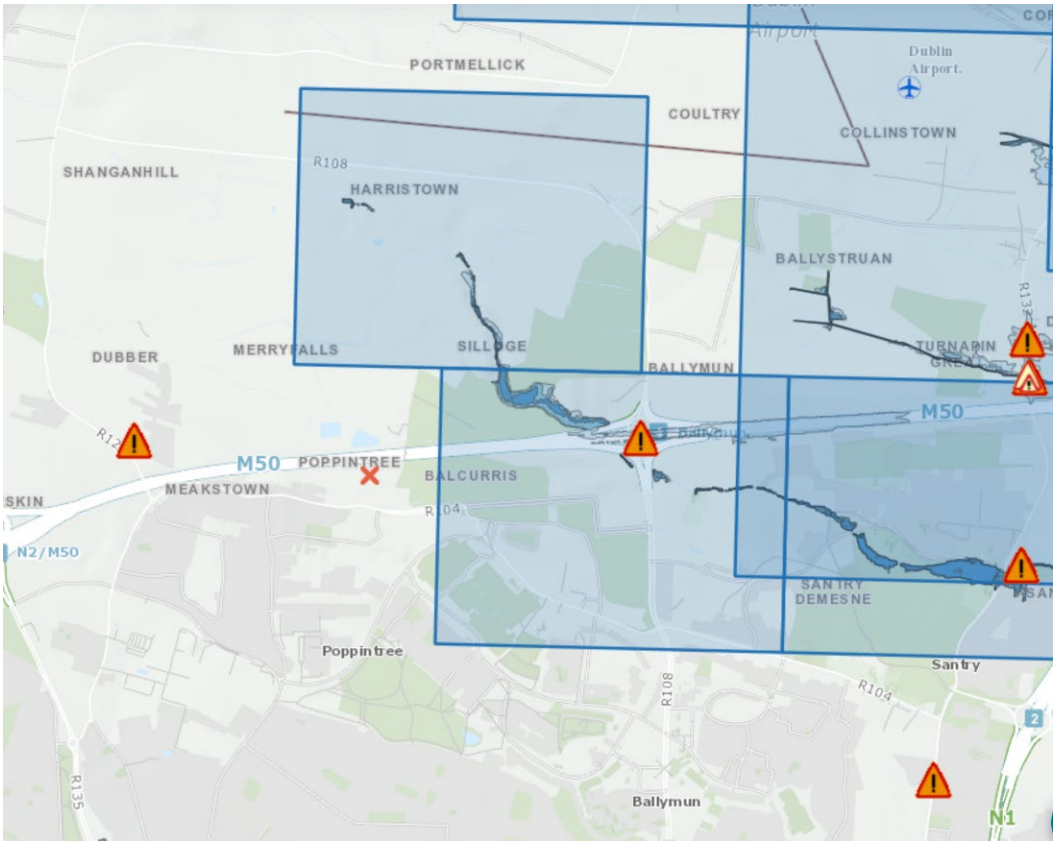


Figure 7 – Existing Water Features, Extent of Predictive Fluvial Flooding and records of Past Flooding Events from www.floodinfo.ie (site marked with red X)

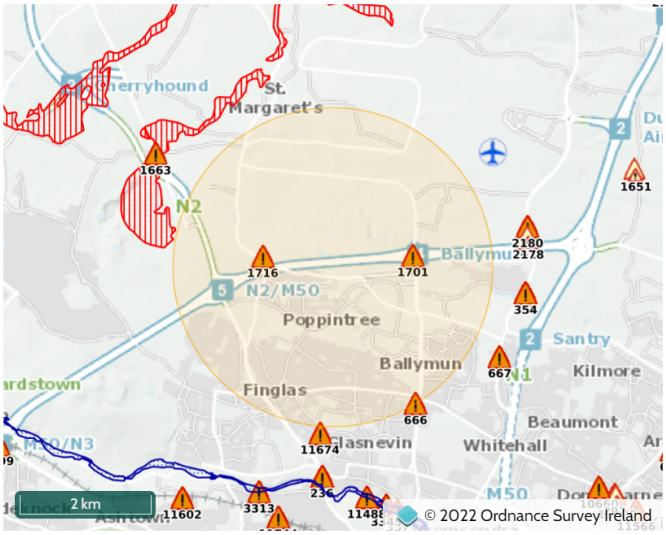
Past Flood Event Local Area Summary Report

OPW Oifig na nOibreacha Poiblí Office of Public Works

Report Produced: **15/8/2022 15:45**

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

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



Map Legend

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

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

3 Results

	Name (Flood_ID)	Start Date	Event Location
1.	M50 at Ballymun Exit Nov 2002 (ID-1701)	13/11/2002	Exact Point
	Additional Information: Reports (1) Press Archive (0)		
2.	Dubber Cross Meakstown Swords Area Nov 2002 (ID-1716)	14/11/2002	Exact Point
	Additional Information: Reports (1) Press Archive (0)		
3.	Wad River Ballymun Dec 1954 (ID-666)	08/12/1954	Exact Point
	Additional Information: Reports (1) Press Archive (0)		

Figure 8 - Past flood event local area summary report from www.floodinfo.ie

7. ACCESS AND TRAFFIC MANAGEMENT

The proposed site access is pre-existing, i.e. Mayeston Green off Mayeston Downs. The footway and traffic access layout is indicated on the enclosed Downes Associates drawings. The road and footpath layouts have been designed according to the standards set out in Design Manual for Urban Roads and Streets (DMURS). Road carriageway widths are a minimum of 6.0m, footpaths are all minimum 2.0m wide and are therefore deemed compliant with DMURS. Corner radii in the junctions in the development are set at 4.5m to 6m which is in line with DMURS which states 4.5 - 6m radii should be used when occasional large vehicles will be using them. As refuse vehicles will be using the development weekly we have deemed this compliant. A swept path analysis has been carried out to verify a refuse vehicle and fire tender can safely manoeuvre into, around and out of the site – refer to the enclosed drawings 5006 and 5007.

Visibility splays have been set to the standards of DMURS i.e. 23m and are deemed compliant throughout the development. The use of parking areas as turning heads has been deemed acceptable by FCC therefore the layout is deemed compliant with the "Recommendations for Site Development Works for Housing Areas".

A combined Stage 1/2 Road Safety Audit has been carried out by Roadplan – refer to separate report.

8. OUTLINE CONSTRUCTION MANAGEMENT PLAN

This section provides an outline of the general construction activities associated with the construction phase of the development. Ultimately, a detailed Construction Management Plan (CMP) for the works will be prepared by the Main Contractor appointed. The CMP will require to be updated as the various stages of the project progress. Typically, the considerations will include health and safety, security, access to and within the site, hoarding/fencing and construction staff parking arrangements.

The CMP will be subject to the constraints imposed by the Employer's Works Requirements. These constraints will typically include:

- access to the premises through the Works area.
- Suitable delineated pedestrian routes within the Works area, along the site periphery and approaches to the site.
- Ensure that existing utilities and services are maintained.
- Provision of adequate emergency services access.

Site Set Up

Standard FCC requirements, control procedures and permits will apply to the Works such as securing of a hoarding license/permit, road opening license, service connection license, delivery license and any related easements applicable. A Site Set-up Plan will have minimal impact on the public realm.

Construction Programme

The building construction programme will take approximately 18-24 months. A detailed construction programme will form part of the final CMP, which will be developed prior to commencement of construction. The appointed construction Contractor will be required to prepare the final CMP. An indicative construction sequence is described below. The final construction sequence will be determined by the appointed Contractor.

Construction Stages

The main stages of construction will proceed in a general sequence as follows:

Enabling Works Stage: Site welfare and accommodation facilities, fencing and hoarding, wayfinding signage, temporary power, water & drainage connections.

Excavation/removal/replacement of Soil: A preliminary estimate indicates that somewhere in the range of 5,000m^3 of bulk excavation & removal will be required including topsoil, made ground, existing concrete slabs and foundations. An estimated average of 600 to 700 HGV movements will be required for the bulk excavation phase. An estimated average of 650 HGV movements will be required for a phased imported fill material stage.

Foundation Construction Stage: Excavations for pad and strip footings, placement of rebar and concrete.

Below-Ground Services Infrastructure: Site drainage, power, communications etc. Excavation of trenches, installation of below ground infrastructure and associated access chambers. Backfilling of construction.

Superstructure Construction Stage: Construction of superstructure including loadbearing vertical structure, floor plates, external leaf masonry/cladding, lightweight roofing envelope. Concrete works.

Mechanical & Electrical Services Installation Stage: Installation of plumbing, electrical, heating & ventilation services. Cranage plans and installation sequence programming. Multi-phase commissioning.

Fit-out Construction Stage: Installation of Finishes, fixtures & furniture.

External Works & Landscaping: Construction of external hardstanding areas and roads, landscaping and biodiversity infrastructure.

Construction Personnel

The peak construction population on site is estimated to be approximately 200 personnel with an average population of 100 persons for the duration of the project.

Construction Health and Safety

General

The requirements of the Safety, Health and Welfare at Work Act 2005, the Safety, Health and Welfare at Work (Construction) Regulations and other relevant Irish and EU safety legislation will be complied with at all times. As required by the Regulations, a Health and Safety Plan will be formulated which will address health and safety issues from the design stages through to completion of the construction and maintenance phases. This plan will be reviewed and updated as required, as the development progresses. In accordance with the Regulations, a "Project Supervisor Construction Stage" will be appointed as appropriate. The Project Supervisor Construction Stage will assemble the Safety File as the project progresses.

Emergency Response Provision

The Contractor will maintain an emergency response action plan which will cover all foreseeable risks, i.e. fire, spill, flood, etc. Appropriate site personnel will be trained as first aiders and fire marshals. In addition, appropriate staff will be trained in environmental issues and spill response procedures. Equipment and vehicles will be locked, have keys removed and be stored securely in the works area.

Site Management and Security

The Construction Management team will be established for the duration of the construction phase. The primary function of site security will be to ensure that no unauthorised entry to site occurs. There will be hoarding/fencing around the construction sites to minimise the risk of unauthorised access.

Construction Traffic Management

Proposed Parking

Car parking will be provided on the site for construction personal during the project. No construction parking will be permitted on the approaches to the site.

Proposed HGV Routes

It is consequential on the site location that the majority of HGV movements will travel via St Margaret's Road which forms the east-west axis running between the closest exits off the M50. The principal route will be via the M50.

Appropriate wayfinding and warning signage will be erected within the environs of the site to direct traffic. This routing strategy is considered appropriate in terms of seeking to minimise disruption and inconvenience on the road network in the area during construction of the project. It is considered that the traffic management principles and the identified mitigation measures are sufficient to mitigate the impacts of the proposed development.

The Contractor will also require to coordinate deliveries to ensure that they do not coincide with peak times in the surrounding road network.

Construction and Demolition Waste Management Plan

Resource and waste generation during construction will be mitigated and managed. A Project Construction and Demolition (C&D) Waste Management Plan is to be prepared by the appointed construction Contractor. This plan should address the following aspects of the Project to ensure compliance with the Waste Management Act 1996 (as amended 2001), the Litter Act 1997 and the Dublin Waste Management Plan (2005-2010):

- analysis of the waste generation/material surpluses;
- specific waste management objectives for the project;
- methods proposed for prevention, reuse and recycling of wastes;
- arrangements for storage and removal/transport of waste;
- material handling procedures; and
- proposals for education of workforce and plan dissemination programme.

Individual headings should be provided, describing the following:

- description of the project;
- wastes arising including proposals for minimisation/reuse/recycling;
- estimated cost of waste management;
- Demolition and/or Construction Plan;
- roles including training and responsibilities for C&D Waste;
- record keeping procedures; and
- waste auditing protocols.

9. DRAWING SCHEDULE

The following drawings should be read in conjunction with this report:

4000: Details	
DOW-00-XX-DR-CE-4000	Manhole Details Sheet 1
DOW-00-XX-DR-CE-4001	Manhole Details Sheet 2
DOW-00-XX-DR-CE-4002	Pipe Bedding Details
DOW-00-XX-DR-CE-4003	Gully Details
DOW-00-XX-DR-CE-4004	Watermain Details
DOW-00-XX-DR-CE-4005	Paving Details
DOW-00-XX-DR-CE-4006	Road Surface Details
5000: Civils	
DOW-00-XX-DR-CE-5000	Existing Site Survey
DOW-00-XX-DR-CE-5001	Existing Utility Survey
DOW-00-XX-DR-CE-5002	Existing Site Layout & Water Services
DOW-00-XX-DR-CE-5003	Proposed Site Levels & Watermain Layout
DOW-00-XX-DR-CE-5004	Proposed Foul & Surface Water Drainage Layout
DOW-00-XX-DR-CE-5005	Proposed Drainage to External Pavements
DOW-00-XX-DR-CE-5006	Swept Path for Fire Tender
DOW-00-XX-DR-CE-5007	Swept Path for Refuse Vehicle

APPENDIX A – IRISH WATER CONFIRMATION OF FEASIBILITY

Andrew Dixon

Cashel Business Centre
Cashel Road,
Kimmage,
Dublin 12,
D12 ET25

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

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

www.water.ie

25 March 2022

Re: CDS21007943 pre-connection enquiry - Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 105 units at Mayeston, Poppintree, Dublin

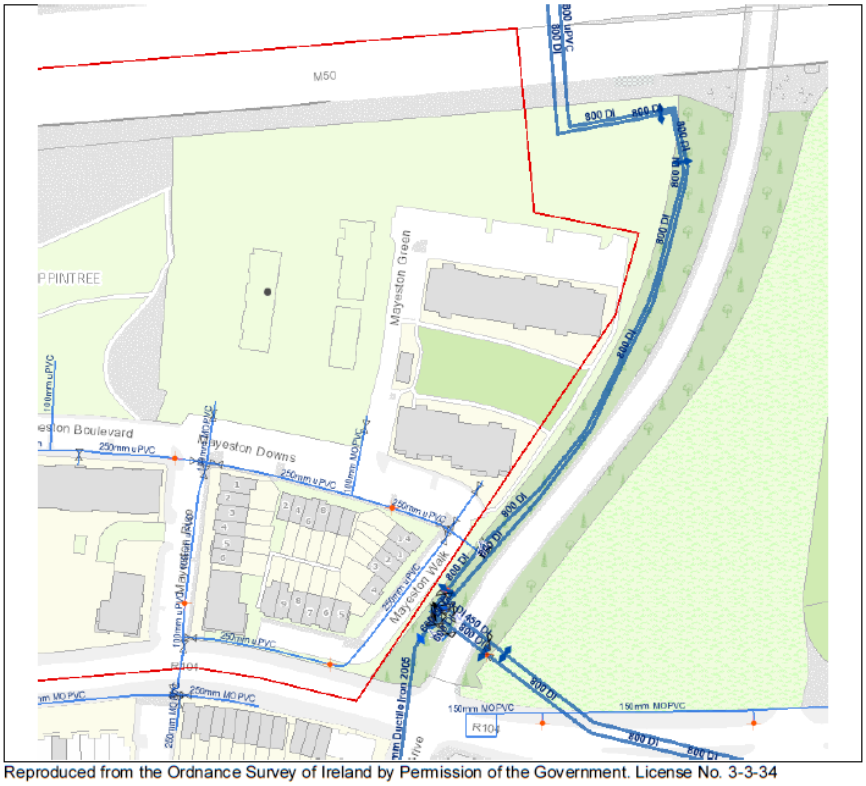
Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Mayeston, Poppintree, 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 networks as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water networks can be facilitated at this moment in time.

SERVICE	OUTCOME OF PRE-CONNECTION ENQUIRY THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible without infrastructure upgrade by Irish Water
SITE SPECIFIC COMMENTS	
Wastewater Connection	The proposed wastewater for this development connects to the Irish Water network via infrastructure that has not been taken in charge by Irish Water (Third Party Infrastructure). Please be advised that at connection application stage and prior to the commencement of any Self-Lay Works, you have to: • Identify and procure transfer to Irish Water of the arterial infrastructure within the Third-Party Infrastructure • Demonstrate that the arterial infrastructure is in compliance with requirements of Irish Water Code of Practice and Standard Details and in adequate condition and capacity to cater for the additional load from the Development.

	The Applicant will have to confirm the connection of the Third Party Infrastructure to the IW network in, 225mm crossing Saint Margaret`s Road, with a survey before the Connection Application stage.
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.

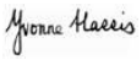
General Notes:

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 Tinus van der Walt from the design team at twalt@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations

APPENDIX B – SURFACE WATER DESIGN CALCULATIONS FOR EXTERNAL PAVEMENTS

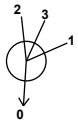
Design Settings

Rainfall Methodology	FSR
Return Period (years)	5
Additional Flow (%)	0
FSR Region	Scotland and Ireland
M5-60 (mm)	16.100
Ratio-R	0.274
CV	0.750
Time of Entry (mins)	10.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	0.90
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	✓
Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Carpark 1	0.303	10.00	74.250		28.146	44.256	1.100
1	0.031	10.00	75.000	1200	27.109	16.045	1.990
2	0.018	10.00	75.250	1200	7.450	8.283	2.250
3	0.046	10.00	74.250	1200	28.805	-12.191	1.250
4	0.035	10.00	74.850	1200	10.551	-20.244	2.040
5			74.750	1200	8.987	-44.853	2.430

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
Carpark 1	74.250	1.100			0	1.000	73.150	225
1	75.000	1.990	1200		1	1.000	73.010	225
					0	1.001	73.010	225
2	75.250	2.250	1200		0	2.000	73.000	225
3	74.250	1.250	1200		0	3.000	73.000	225
4	74.850	2.040	1200		1	3.000	72.810	225
					2	2.000	72.810	225
					3	1.001	72.810	225
					0	1.002	72.810	225

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
5	74.750	2.430	1200	1	1	1.002	72.320	225

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	Scotland and Ireland	Additional Storage (m³/ha)	20.0
M5-60 (mm)	16.100	Check Discharge Rate(s)	✓
Ratio-R	0.274	5 year (l/s)	2.9
Summer CV	0.750	30 year (l/s)	4.0
Winter CV	0.840	100 year (l/s)	4.8
Analysis Speed	Normal	Check Discharge Volume	x
Skip Steady State	x		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
5	0	0	0
30	20	0	0
100	20	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.65
Greenfield Method	IH124	Growth Factor 100 year	1.96
Positively Drained Area (ha)	0.590	Betterment (%)	0
SAAR (mm)	831	QBar	2.5
Soil Index	3	Q 5 year (l/s)	2.9
SPR	0.40	Q 30 year (l/s)	4.0
Region	11	Q 100 year (l/s)	4.8
Growth Factor 5 year	1.20		

Node 4 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	72.810	Product Number	CTL-SHE-0069-2100-0990-2100
Design Depth (m)	0.990	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.1	Min Node Diameter (mm)	1200

Node Carpark 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	73.500	Slope (1:X)	9000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	345	Depth (m)	
Safety Factor	2.0	Width (m)	16.000	Inf Depth (m)	
Porosity	0.30	Length (m)	160.000		

Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	0.900
Node Losses	x	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	x
Minimum Diameter (mm)	150	Surcharged Depth	x
Link Length	✓	Flooding	✓
Maximum Length (m)	100.000	Return Period (years)	100
Coordinates	✓	Time to Half Empty	✓
Accuracy (m)	1.000	Return Period (years)	100
Crossings	✓	Discharge Rates	✓
Cover Depth	x	5 year (l/s)	2.9
Backdrops	✓	30 year (l/s)	4.0
Minimum Backdrop Height (m)	0.200	100 year (l/s)	4.8
Maximum Backdrop Height (m)	1.500	Discharge Volume	x
Full Bore Velocity	✓		

Approval Results

The network has been designed for a 1 in 5 year storm using FSR rainfall
It contains 6 nodes (1 outfall) and 5 links
The total impermeable area is 0.433 ha
1 online control has been defined
1 structure has been defined, providing 339m³ of storage below the flood risk level
Infiltration has not been utilised
Simulations have been completed using FSR summer and winter storms from 15 to 1440 minute duration

No manholes are smaller than that required by the library

The node losses test has not been completed

No circular links have diameters < 150mm

No links have lengths > 100.000m

No links have lengths that differ from their coordinated length by more than 1.000m

No links cross one or more other links

The cover depth test has not been completed

No nodes have backdrops outside the range 0.200-1.500m

No links have full bore velocity outside the range 0.900-3.000m/s

The proportional velocity test has not been completed

The surcharged depth test has not been completed

No nodes flood during the 100 year return period

No infiltrating structures failed to half empty in 1440 minutes during the 100 year return period

No outfalls have a discharge rate greater than 2.9l/s during the 5 year return period

No outfalls have a discharge rate greater than 4.0l/s during the 30 year return period

No outfalls have a discharge rate greater than 4.8l/s during the 100 year return period

The discharge volume test has not been completed

Results for 5 year Critical Storm Duration. Lowest mass balance: 95.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Carpark 1	480	73.593	0.443	7.6	66.9543	0.0000	SURCHARGED
600 minute winter	1	480	73.593	0.583	3.5	0.8410	0.0000	SURCHARGED
15 minute summer	2	12	73.595	0.595	11.6	0.7658	0.0000	SURCHARGED
30 minute winter	3	17	73.598	0.598	5.2	1.1138	0.0000	SURCHARGED
600 minute winter	4	480	73.592	0.782	2.9	1.1526	0.0000	SURCHARGED
15 minute summer	5	1	72.320	0.000	2.1	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	Carpark 1	1.000	1	25.9	0.934	0.711	1.1227	
15 minute summer	1	1.001	4	18.1	0.579	0.493	1.5864	
15 minute summer	2	2.000	4	-10.0	-0.303	-0.237	1.1412	
15 minute summer	3	3.000	4	-7.4	0.301	-0.145	0.7935	
15 minute summer	4	Hydro-Brake®	5	2.1				27.8

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 95.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Carpark 1	690	73.704	0.554	12.0	152.6757	0.0000	SURCHARGED
720 minute winter	1	690	73.704	0.694	2.5	1.0008	0.0000	SURCHARGED
720 minute winter	2	690	73.703	0.703	0.6	0.9050	0.0000	SURCHARGED
720 minute winter	3	690	73.703	0.703	1.5	1.3108	0.0000	SURCHARGED
720 minute winter	4	690	73.703	0.893	3.2	1.3157	0.0000	SURCHARGED
15 minute summer	5	1	72.320	0.000	2.1	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	Carpark 1	1.000	1	31.2	0.972	0.855	1.1227	
15 minute summer	1	1.001	4	19.7	0.620	0.536	1.5864	
15 minute winter	2	2.000	4	-9.0	-0.245	-0.214	1.1412	
15 minute winter	3	3.000	4	10.6	0.397	0.210	0.7935	
600 minute winter	4	Hydro-Brake®	5	2.1				95.4

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 95.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Carpark 1	915	73.779	0.629	12.4	210.6259	0.0000	SURCHARGED
960 minute winter	1	915	73.778	0.768	2.3	1.1089	0.0000	SURCHARGED
960 minute winter	2	915	73.778	0.778	0.6	1.0013	0.0000	SURCHARGED
30 minute winter	3	22	73.787	0.787	12.1	1.4671	0.0000	SURCHARGED
960 minute winter	4	915	73.778	0.968	3.2	1.4259	0.0000	SURCHARGED
15 minute summer	5	1	72.320	0.000	2.1	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	Carpark 1	1.000	1	30.9	0.958	0.849	1.1227	
30 minute winter	1	1.001	4	-23.0	0.593	-0.626	1.5864	
15 minute winter	2	2.000	4	-9.9	-0.274	-0.234	1.1412	
30 minute winter	3	3.000	4	11.7	0.362	0.231	0.7935	
15 minute summer	4	Hydro-Brake®	5	2.1				71.2